Summary: Intervention & Options

Department /Agency:	Title:	
Department of Health	Impact Assessment of a National Screening Programme for Abdominal Aortic Aneurysms	
Stage: Final	**Version:** 5	**Date:** 1 July 2008
Related Publications: None		

Available to view or download at:

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What is the problem under consideration? Why is government intervention necessary?

Between 4-8% of older men are affected by an abdominal aortic aneurysm (AAA) and most deaths are in men aged over 65, for whom rupture of an AAA is responsible for 2.1% of deaths. The number of deaths in 2005 in England and Wales from abdominal aortic aneurysms was approximately 7,000. Because most AAAs do not produce clear symptoms, there is a high rate of sudden rupture with a 65-85% mortality rate. Therefore government intervention is required to improve the detection of AAAs through the use of a cost-effective intervention.

What are the policy objectives and the intended effects?

The implementation of a national screening programme for AAA will: i) increase the detection of AAAs; ii) promote the use of cost-effective interventions to enable detection of AAAs; and iii) provide doctors and patients with the required information to enable safe treatment of AAAs.

What policy options have been considered? Please justify any preferred option.

The four options considered are: i) status quo - do nothing; ii) impose a minimum threshold on elective AAA repair; iii) screening programme for men aged 65; and iv) screening programme for men aged 65, with screening for men aged 70 for five years.

Option iii is the preferred option as the early detection through screening enables regular surveillance and the offer of planned surgery at an appropriate time to repair it minimising the risk of rupture and emergency surgery. See paras 65 – 67 for further details.

When will the policy be reviewed to establish the actual costs and benefits and the achievement of the desired effects?

The screening programme will be subject to an annual quality assurance review and effectiveness of treatment will be monitored via annual reports of a National Vascular Audit.

Ministerial Sign-off For final proposal/implementation stage Impact Assessments:

I have read the Impact Assessment and I am satisfied that, given the available evidence, it represents a reasonable view of the likely costs, benefits and impact of the leading options.

Signed by the responsible Minister: Ann Keen ..... Date: 3-7-08

Summary: Analysis & Evidence

Policy Option: ii Elective AAA repair	Description: Impose a minimum threshold on the number of elective AAA repairs by a surgeon per year

COSTS

ANNUAL COSTS	
One-off (Transition)	**Yrs**
£	20
Average Annual Cost (excluding one-off)	
£ 0.01m	

Description and scale of **key monetised costs** by 'main affected groups' Increase in cost to patients through travel to hospitals further away.

Total Cost (PV) **£ 0.14m**

Other **key non-monetised costs** by 'main affected groups'

BENEFITS

ANNUAL BENEFITS	
One-off	**Yrs**
£	20
Average Annual Benefit (excluding one-off)	
£ 66.82m	

Description and scale of **key monetised benefits** by 'main affected groups' Benefits measured as quality adjusted life years, and monetised on the basis of valuing a QALY at £40,000.

Total Benefit (PV) **£ 1,603.57m**

Other **key non-monetised benefits** by 'main affected groups'

Key Assumptions/Sensitivities/Risks Differential mortality rates, and average life years gained.

Price Base Year 2008	Time Period Years 20	**Net Benefit Range** (NPV) £	**NET BENEFIT** (NPV Best estimate) **£ 1,603.44**

What is the geographic coverage of the policy/option?			England	
On what date will the policy be implemented?			Commence March 09	
Which organisation(s) will enforce the policy?			PCT	
What is the total annual cost of enforcement for these organisations?			£ N/A	
Does enforcement comply with Hampton principles?			Yes	
Will implementation go beyond minimum EU requirements?			Yes	
What is the value of the proposed offsetting measure per year?			£ N/A	
What is the value of changes in greenhouse gas emissions?			£ N/A	
Will the proposal have a significant impact on competition?			No	
Annual cost (£-£) per organisation (excluding one-off)	Micro	Small	Medium	Large
Are any of these organisations exempt?	No	No	N/A	N/A

Impact on Admin Burdens Baseline (2005 Prices) (Increase - Decrease)

Increase of £ Decrease of £ **Net Impact** £ N/A

Key: **Annual costs and benefits: Constant Prices** **(Net) Present Value**

Summary: Analysis & Evidence

Policy Option iii: Screen at 65	Description: Screen all men at 65 years old (phased roll out over 5 years)

COSTS

ANNUAL COSTS		Description and scale of **key monetised costs** by 'main affected groups' Costs of implementing screening programme, carrying out screening, increase in elective surgery, and other associated policies.
One-off (Transition)	**Yrs**	
£ 14.0m	20	
Average Annual Cost (excluding one-off)		
£ 26.0m		**Total Cost** (PV) **£ 419.9m**

Other **key non-monetised costs** by 'main affected groups'

BENEFITS

ANNUAL BENEFITS		Description and scale of **key monetised benefits** by 'main affected groups' Benefits measured as quality adjusted life years to patients and monetised on the basis of estimate of social value of a QALY at £40,000.
One-off	**Yrs**	
£	20	
Average Annual Benefit (excluding one-off)		
£ 266.7m		**Total Benefit** (PV) **£ 4,304.0m**

Other **key non-monetised benefits** by 'main affected groups'

Key Assumptions/Sensitivities/Risks Unit costs of screening and operations, and probability of self-referral.

Price Base Year 2008	Time Period Years 20	**Net Benefit Range** (NPV) **£ 3,810.1m - 4,010.2m**	**NET BENEFIT** (NPV Best estimate) **£ 3,884.1**

What is the geographic coverage of the policy/option?			England	
On what date will the policy be implemented?			Commence March 09	
Which organisation(s) will enforce the policy?			PCT	
What is the total annual cost of enforcement for these organisations?			£ N/A	
Does enforcement comply with Hampton principles?			Yes	
Will implementation go beyond minimum EU requirements?			Yes	
What is the value of the proposed offsetting measure per year?			£ N/A	
What is the value of changes in greenhouse gas emissions?			£ N/A	
Will the proposal have a significant impact on competition?			No	
Annual cost (£-£) per organisation (excluding one-off)	Micro	Small	Medium	Large
Are any of these organisations exempt?	No	No	N/A	N/A

Impact on Admin Burdens Baseline (2005 Prices) (Increase - Decrease)

Increase of £ Decrease of £ **Net Impact** £ N/A

Key: Annual costs and benefits: Constant Prices (Net) Present Value

Summary: Analysis & Evidence

Policy Option iv: Screen at 65 and 70	Description: Screen all men at 65 years old and 70 years old for five years (phased)

COSTS

ANNUAL COSTS	
One-off (Transition)	**Yrs**
£ 14.0m	20
Average Annual Cost (excluding one-off)	
£ 23.2m	

Description and scale of **key monetised costs** by 'main affected groups' Costs of implementing screening programme, carrying out screening, increase in elective surgery, and other associated policies.

Total Cost (PV) **£ 391.5m**

Other **key non-monetised costs** by 'main affected groups'

BENEFITS

ANNUAL BENEFITS	
One-off	**Yrs**
£	20
Average Annual Benefit (excluding one-off)	
£ 339.2m	

Description and scale of **key monetised benefits** by 'main affected groups' Benefits measured as quality adjusted life years to patients and monetised on the basis of estimate of social value of a QALY at £40,000.

Total Benefit (PV) **£ 5,730.8m**

Other **key non-monetised benefits** by 'main affected groups'

Key Assumptions/Sensitivities/Risks Unit costs of screening and operations, and probability of self-referral.

Price Base Year 2008	Time Period Years 20	**Net Benefit Range** (NPV) **£ 5,238.6m - 5,339.3m**	**NET BENEFIT** (NPV Best estimate) **£ 5,339.3m**

What is the geographic coverage of the policy/option?			England	
On what date will the policy be implemented?			CommenceMarch09	
Which organisation(s) will enforce the policy?			PCT	
What is the total annual cost of enforcement for these organisations?			£ N/A	
Does enforcement comply with Hampton principles?			Yes	
Will implementation go beyond minimum EU requirements?			Yes	
What is the value of the proposed offsetting measure per year?			£ N/A	
What is the value of changes in greenhouse gas emissions?			£ N/A	
Will the proposal have a significant impact on competition?			No	
Annual cost (£-£) per organisation (excluding one-off)	Micro	Small	Medium	Large
Are any of these organisations exempt?	No	No	N/A	N/A

Impact on Admin Burdens Baseline (2005 Prices) (Increase - Decrease)

Increase of £ Decrease of £ **Net Impact** £ N/A

Key: Annual costs and benefits: Constant Prices (Net) Present Value

Evidence Base (for summary sheets)

[Use this space (with a recommended maximum of 30 pages) to set out the evidence, analysis and detailed narrative from which you have generated your policy options or proposal. Ensure that the information is organised in such a way as to explain clearly the summary information on the preceding pages of this form.]

Evidence base: National screening programme for Abdominal Aortic Aneurysm (AAA)

Introduction

1. This document sets out the evidence base in support of implementing a national screening programme for abdominal aortic aneurysm (AAA), including reasons for policy intervention, the options considered, and details of a full cost benefit analysis. Having considered the options, the document makes a recommendation for a preferred option: **the phased implementation of a systematic population based screening service for the male population during their 65th year.**

What is the problem under consideration?

2. AAA occurs when the abdominal aorta is weakened and stretches to a diameter of 3 cm or greater in the abdominal section. Most AAAs do not produce symptoms for years, but as many as one in three eventually rupture if left untreated. Most patients with ruptured aneurysms either die before reaching hospital or do not survive emergency surgery.

3. The number of deaths in 2005 in England and Wales (for both men and women of all age groups) from abdominal aortic aneurysms was approximately 7,000. An exact figure cannot be identified because of the amalgamation of thoracic and abdominal aortic aneurysms in some sub-codes of the International Classification of Disease.

4. Early detection through screening can be achieved through a single ultrasound scan and enables regular surveillance to see if it enlarges over time and the offer of planned surgery at an appropriate time to repair it.

Why is government intervention necessary?

5. Because most AAAs do not produce symptoms for years, there is a high risk of sudden rupture and emergency surgery resulting in a high mortality rate. These emergencies use a substantial amount of unscheduled theatre time, intensive care facilities and blood supplies.

6. The cause of AAA is not fully understood and primary prevention is not possible. One option considered is to improve surgical procedures. However this would only have a small impact, as AAA would still remain undetected and open to rupture if left untreated and monitored.

7. Government intervention is required to increase the detection of AAAs through the use of cost-effective screening interventions. Under current policy, there is a lack of information, where neither the patient nor the doctor know whether a AAA is present.

Policy objectives and intended effects

8. Early detection through screening can be achieved through a single ultrasound scan, and enables regular surveillance to see if the AAA enlarges over time and the offer of planned surgery at an appropriate time to repair it.

9. Once implemented, the AAA screening programme is intended to:
   - increase the detection of AAAs
   - promote the use of cost-effective interventions to enable detection of AAAs
   - provide doctors and patients with the required information to enable safe treatment of AAAs.

10. Most AAAs do not produce symptoms, but a third will rupture suddenly. 50% of people with rupture die before reaching hospital, and the death rate of those who reach hospital alive and have emergency repair is over 50%. However planned surgery for AAA that has not yet ruptured has a much lower risk. Death rates from elective, open surgical repair average between 6-8%. The implementation of a national screening programme for AAA will mean that there are fewer emergency admissions and a higher number of elective admissions, therefore reducing the number of lives lost.

11. As with all other national screening programmes, the screening programme needs to have a managed national roll out to realise the benefits of the combination of screening to safe and effective standards, and ensuring appropriate treatment service reconfiguration.

12. A draft set of operating procedures (SOPs) has been developed by the AAA screening working group of the UK NSC. The SOPs cover every aspect of the patient pathway for AAA screening and procedures for running a screening clinic and patient follow up. The working group also developed a draft set of programme standards which would form the basis for ensuring the quality of a national programme.

13. The AAA screening programme applies to England only, and it is the decision of the devolved assemblies whether they implement the screening programme within their country

Policy options

14. The policy options have been considered in two stages. The first stage considered a broad range of potential options:
   - Status quo – do nothing
   - Primary Prevention
   - Improve elective surgical outcomes
   - Improve emergency surgical outcomes
   - Screening programme for men and women
   - Screening programme for men with risk factors
   - Screening programme for men aged 65
   - Screening programme for men aged 65-74
   - Screening programme for men extended beyond age 74
   - Screening programme for men extended below age 65

15. In order to facilitate a short listing of policy options, an assessment of the evidence from existing resources was undertaken. Of particular importance was the availability of trial-based research evidence of screening programmes, in order to consider fully the potential costs and benefits of implementing various policy options. The full detail of this assessment is in Annex 2.

16. The four options emerging from the short listing were:
   - Status quo – do nothing
   - Improve surgical outcomes , by imposing a minimum volume threshold for elective surgery
   - Screening programme for men aged 65

- Screening programme for men aged 65, with screening for men aged 70 for five years

Status quo – do nothing

17. There are around 7000 deaths related to AAA in England and Wales in the year 2000. Most AAAs do not produce symptoms; about a third will rupture suddenly. Fifty percent of people with rupture die before reaching hospital; the death rate of those who reach hospital alive and have an emergency surgical repair is over 50%. These emergencies use a substantial amount of unscheduled theatre time, ITU facilities and blood supplies.

18. A few AAAs may be detected by physical examination in the course of other medical care, but this method of detection has limited sensitivity.

Improve elective surgical outcomes

19. The aim of this option is to improve the outcomes of elective surgery for AAA by excluding surgeons from performing elective surgery if they carry out less than a minimum number of elective operations in any one year. The National Confidential Enquiry into Patient Outcome and Death (NCEPOD) report suggests that there is no evidence to support surgeons carrying out less than ten operations a year.

20. An extract from the NCEPOD report Abdominal Aortic Aneurysm Care (2005[1]) is as follows: 'there is little to support surgeons continuing to treat single figure number of elective cases on a regular annual basis'. On this basis, it is suggested that the minimum threshold is set at ten elective operations per surgeon per year. Surgeons falling below this limit would be expected to undergo external peer assessment in order to assess their competency to continue performing elective AAA surgery.

21. In the report, it was found that 82% of procedures were performed by surgeons who had probably performed more than ten elective aneurysm repairs in the year 2002/03.

22. NCEPOD reported that the numbers of procedures done by individual hospitals were too small for meaningful examination of whether there was an association between volume of work and outcome by individual hospital. Therefore, hospitals were grouped according to whether they performed fewer elective open AAA repairs (low volume group) or more elective repairs (high volume group) than the median value for the number of elective repairs reported for 2002/03. The results show there does not appear to be a pattern to suggest that there is a reduced proportion of deaths associated with hospitals that perform a greater number of operations.

Screening programme for men aged 65

23. The aim of the screening programme is to reduce AAA related mortality by providing a systematic population based screening service for the male population during their 65th year and on request for men over 65. The target population to be screened is all men registered with a general practitioner within the local PCT within a screening centre area. Selection will be based on year of birth. Men will be offered screening during the year in which they are 65, (i.e. in 2008 men born in 1943 would be invited). A facility would also be available for men age over 65 on request.

[1] http://www.ncepod.org.uk/2005b.htm

24. The screening programme is divided into four stages:

i) Basic screen, to detect any abnormality. A sonographer or screening technician undertakes an examination of the abdominal aorta using ultrasonography. Measurements of the maximum aortic diameter are recorded.

ii) Screening assessment (based on aortic measurements) of the AAA to determine whether immediate referral to a vascular surgeon or regular surveillance is required.
- If the maximum aortic diameter is less than 3cm, the man will be advised that no aneurysm has been detected, given the appropriate explanatory letter and no further follow up will be arranged.
- If the AAA measures 3.0 - 4.4 cm, a follow up will be arranged in one year; 4.5 – 5.4 cm, a follow up will be arranged in 3 months; and 5.5ccm or greater, a referral to a consultant vascular unit will be made.

iii) Clinical assessment following referral to a vascular unit (including physical and additional radiological examinations and medical investigations)

iv) Surgical treatment of the screen-detected aneurysm as appropriate, within the guidelines of the Vascular Society of GB and Ireland

25. Further, there are other policy elements to implementing a national screening programme. These involve a National Vascular Database, implementing a set of vascular networks, providing informational support to aid patient decision making, and implementing an agreed minimum threshold to improve elective AAA repair.

26. Quality assurance and audit of outcomes are critical to a screening programme, as the anticipated benefits will not be realised without this rigour. The Vascular Society is working with the UK National Screening Committee (NSC) and Department of Health (DH) officials to develop the National Vascular Database Audit to monitor treatment outcomes in an ongoing audit.

27. The National Vascular Database (NVD) is currently a voluntary audit of outcomes following major vascular surgery in the UK and Ireland run by the Vascular Society of Great Britain and Ireland. The database contains data on 8500 aneurysm repairs by surgeons.

28. It is in the interest of patients, surgeons, and healthcare providers to improve the accuracy of the audit[2]. There is already a high level of cooperation from the clinical community with regard to this audit, and it is intended that the NVD will form the key component of the quality assurance of surgical treatment for AAA identified via the screening programme. Submission of data to the NVD would be compulsory for all surgeons wishing to participate in the AAA screening programme.

29. The screening programme will be supported by local vascular networks, which are groups of surgeons and other clinicians who deliver interventions for screen-detected AAA. Networks will consist of clinicians from more than one hospital, and the network will be expected to deliver the best possible outcomes for patients identified through the screening programme. Newer interventions such as Endovascular repair of Aneurysms (EVAR) will not be available in every hospital, and the network will be expected to organise itself to ensure that patients are offered the most appropriate treatment for their needs.

[2] A collaborative study has been performed with the Dr. Foster Group comparing the National Vascular Database (NVD) with Hospital Episode Statistics (HES) data. In some centres, there was good agreement between the two datasets with regard to mortality rates, whereas in other centres the data were less well matched.

30. Support for patients deciding whether or not to undergo elective surgery to repair a large aneurysm are also considered to be an essential part of the screening programme. This will include informational leaflets and a decision support website.

31. It is intended that the AAA screening programme will be managed in a phased national roll-out to realise the benefits of the combination of screening to safe and effective standards, and ensuring appropriate treatment service reconfiguration. The evidence is also presented below to reflect implementation over a five year basis, with a proportional increase each year up to 100% coverage.

Screening programme for men aged 65, with screening for men aged 70 for five years

32. The aim of the Screening Programme is to reduce AAA related mortality by providing a systematic population based screening service for the male population during their 65th year. Furthermore for the first five years of the programme, a screening service would be provided for the male population during their 70th year. Selection will be based on year of birth. Men will be offered screening during the year in which they are 65 and 70 (i.e. in 2008 all men born in 1943 and 1938 would be invited). By the end of the fifth year of the programme, all men aged between 65 and 74 will have been offered screening and the programme will from that point only be offered to men aged 65.

Cost and benefit analysis

33. This section describes the research and analysis undertaken to understand the costs and benefits likely to emerge for each policy option. Key assumptions, risks, and consequential uncertainties are discussed in the following section. Table EB4 in the summary section below shows the costs and benefits for each policy option. Annex 4 details the costs and benefits for each policy option on an annual basis.

Status quo – do nothing

Costs

34. The costs of doing nothing (ie remaining with current policy for treating AAA) are assumed to have a zero baseline. The costs of treating AAA will vary over time with the introduction of new technologies, such as EVAR[3], changes in the epidemiological profile of the population, and changes in overall population. However, in line with Impact Assessment guidance on best practice, costs not directly attributable to the policy options under consideration are not incorporated in this analysis, as they would apply to all options.

Benefits

35. The benefits of the status quo are also assumed to have a zero baseline. Health benefits will change over time with the variables mentioned above. As with costs, benefits not directly attributable to the policy options under consideration are not incorporated in this analysis, as they would apply to all options.

[3] Endovascular aneurysm repair (EVAR) has a lower 30 day operative mortality than open repair, but the long term results of EVAR are still uncertain (The Lancet, 2005). NICE clinical guidelines suggest that the evidence on efficacy and short term safety supports the use of EVAR for AAA repair, but the follow-up phase of the trials continues with long term results expected to be published in 2010.

Improve elective surgical outcomes

Costs

36. The costs of implementing a minimum volume threshold for elective AAA repair are those primarily associated with increases in patient travel costs. Any costs resulting from reorganisation of services to accommodate shifting locations of service provision are considered to be negligible.

37. Patient travel costs are derived by estimating the proportion of elective operations that would be impacted by setting a threshold of ten repairs per year. This is done using HES data for 2005/06, although the most disaggregated breakdown possible is at the provider level, rather than hospital. There were an estimated 24 providers carrying out less than ten elective AAA repairs in 2005/6, which amounted to 4% of total operations. This value was then applied to an estimated average distance to travel to the nearest hospital, and converted into monetary values using the Department for Transport's TAG (Transport Analysis Guidance), referred to in the list of assumptions in Annex 3.

38. Under this option, it would be necessary to implement local vascular networks to ensure the coordination of treatment services. The aim of the network would be to deliver the best possible outcomes for patients, and to ensure that newer interventions such as EVAR are offered to the patients who will receive most benefit.

Benefits

39. Health benefits arising from implementing a minimum threshold are calculated by comparing average mortality rates from hospitals carrying a low number[4] of elective operations a year with average mortality rate from hospitals carrying out a high number of elective operations a year, to get an estimate of deaths averted. This is then converted into Quality Adjusted Life Years (QALYs) by using an estimate of the mean age of a patient undergoing elective AAA repair.

Screening programme for men aged 65

Costs

40. The costs are broken down into 3 parts: the cost of implementing the screening programme and screening; the cost of the change in the number of elective and emergency operations; and the cost of associated policies such as auditing, vascular networks, and improving elective surgical outcomes.

Costs of implementing the screening programme and screening and operations

41. The cost of implementing the screening programme[5] relates to staffing and training of staff, the screening equipment and mobile units[6], and accommodation. It is envisaged that one unit will serve a total population of 800,000, giving a total of approximately 64 units for England. Per unit there will be clinical staff (director, ultrasound consultant, nurse practitioner), screening staff (senior sonographer, six screening technicians), and office staff (coordinator, clerical officer, medical physicist). Training costs are necessary for the senior sonographer, who will in turn be responsible for training the screening technicians.

[4] Unspecified but refer to National Vascular Database report 2004 for detail
[5] The costing of the screening programme is based on the draft UK NSC AAA Screening Working Group Standard Operating Procedures, 2007
[6] Mobile units are only necessary if local GPs do not sign up to the programme on a voluntary basis. The worst case scenario is taken that no GPs sign up and mobile units are necessary across England.

The training cost per screening centre is estimated at £190,500, based on training for one senior sonographer and six screening technicians (4-month course for the latter). In addition it is estimated that ten[7] training centres will be required at a cost of £182,000 each, mainly for equipment.

42. The initial cost of capital equipment (screening equipment and mobile units) is estimated at approximately £103,500 per unit, plus £14,000 for maintenance and travel.

43. The NSC Standard Operating Procedures on which this protocol is based is still in draft form, and detail such as variability in staffing requirements for screening different sections of the population is not yet complete. Therefore the SOPs have been used to verify cost analysis based on unit costs from the Multicentre Aneurysm Screening Study (MASS) clinical trials, detailed below. The unit cost of an average screen is comparable to the cost of a re-screen from the MASS trials (£61 compared to £67 respectively). This difference is related to the potentially higher volume of screens that the SOPs allow for, but this cost difference is nevertheless tested in the sensitivity analysis below.

44. The main elements of the cost analysis are therefore based on the outputs and subsequent analysis from MASS. The MASS group has several members, listed at the back of a paper published in The Lancet, 2002[8]. The MASS group set out to assess the cost effectiveness of ultrasound screening for abdominal aortic aneurysms.

45. The study is a four year cost effectiveness analysis based directly from a randomised controlled trial, in which patients were allocated to invitation to ultrasound screening or a control group not offered screening between 1997-99. The study is drawn from a population based sample of 67,800 men aged 65-74 years, and set in four centres in the UK, with screening delivered in primary care settings with follow up and surgery in the main hospitals.

46. Subsequent analysis has been carried out by the MASS group to estimate the long term effectiveness of AAA screening in men[9]. This study uses a Markov decision model to extrapolate estimates over a 30 year period. Each outcome from a decision node in the model is estimated by a parameter giving the probability of the event conditional on reaching that point in the pathway, with the parameters being estimated using data from the MASS trials.

47. The outputs from the Markov model give rates of screens, re-screens, consultations before elective surgery, elective surgery, and emergency surgery per 10,000 men. Rates were estimated for screening men between the ages of 65-74 across a 30-year period. Extrapolating from these rates across the whole population of England using Government Actuaries Department population projections[10], we are then able to project estimates for each of these variables. A 20-year period was chosen on the basis that service delivery would change significantly beyond this to make the estimates unfounded, although services may also change within this period.

48. The unit costs for screening and elective and emergency operations are based on MASS trials[11]; screening costs include time for each member of clinic staff (and their associated

[7] It is expected that between 5 and 15 training centres will be required, with a central estimate of 10.
[8] 'The Multicentre Aneurysm Screening Study (MASS) into the effect of abdominal aortic aneurysm screening study on mortality in men: a randomised controlled trial', Lancet 2002, Vol 360: 1531-39
[9] Described in Kim et al (2007), 'How cost effective is screening for abdominal aortic aneurysms?', Journal of Medical Screening, Vol 14, No 1
[10] http://www.gad.gov.uk/Demography_Data/Population/Index.asp
[11] A full explanation of the calculation of the unit costs is available in the article: MASS Study Group (2002), 'Multicentre aneurysm screening study: cost effectiveness analysis of screening for abdominal aortic aneurysms based on four year results from randomised controlled trial', BMJ; 325; 1135-

travel costs), disposables, maintenance costs for equipment, charge for clinic rooms, and an annual charge for the capital cost of equipment (assuming a useful life of five years). An alternative cost base (ie costs based on relevant HRGs) was also considered. However, the MASS unit costs are more comprehensive and reliable, and are based on a detailed bottom-up costing, taking into account patient-specific costs.

49. The cost of individuals aged between 65 and 74 self-referring for screening has also been factored into the costs. A likely self-referral rate for this population is based on rates of self-referral from other screening programmes and the AAA screening pilots, combined with clinicians judgement. Sensitivity analysis has also been carried out on this rate, and included below.

The cost of operations

50. The costs of surgery include ambulance transfer (for emergency), time spent in intensive care and high dependency units, general surgical wards before and after surgery, theatre costs (including hospital overheads, building charges, and routine theatre capital equipment), staffing levels, consumables and drug use.

51. These increases in elective surgery are considered to be insufficient to warrant an increase in capital investment or associated staff. The impact of increases in elective AAA repair on surgical workload is assumed to be negligible. The MASS group estimate that, for a typical District General Hospital (DGH) serving 400,000, this option will create an additional two elective operations per month[12]. The analysis carried out here suggests that after ten years, this figure will be as low as 1.2 operations per month per typical DGH.

52. Mean costs were calculated for each type of surgery by centre and combined. Unit costs were originally calculated on a 2000/01 price basis, and have been uplifted to reflect 2008/09 prices[13].

53. Details of the unit costs can be seen in the table below:

Table EB1: Unit cost associated with each cost parameter

£	2000/01	2008/09
Cost of elective operation	6,909	9,165
Cost of emergency operation	11,176	14,825
Cost of an invitation	1.31	1.74
Cost of a reinvitation	1.28	1.70
Cost of an initial screen	19.08	25.31
Cost of a recall screen	46.04	61.07
Cost of consultation before elective surgery	309.88	411.07

Costs of associated policies

54. The costs of the National Vascular Database include a start up cost of £51,500 and an annual running cost of £40,000 (see assumptions in Annex 3 for details). The cost for vascular networks are estimated to be £40,000 for a director and support administrative costs. The vascular networks will serve other purposes besides coordinating AAA services, hence it is unlikely that all costs are directly attributable to a AAA screening programme. However, all these costs are included as part of this policy. These network costs are somewhat lower than the current costs for the cardiac network. However the cardiac

[12] Kim et al (2005), 'Implications of screening for abdominal aortic aneurysms on surgical workload', British Journal of Surgery, 92: 171-176

[13] Uplift based on HCHS pay and prices index up to 2005/06, PbR uplift for 2006/07 & 2007/08, and CSR bid uplift for 2008/09

network has a wider range of functions, and considerably more resource than is required for the vascular networks[14].

55. The costs of introducing a national minimum threshold for elective AAA repair are set out in the same policy option above.

56. The total costs of the alternative options are set out in the summary tables below.

Benefits

57. The benefits are also derived from the same 30-year Markov model based on MASS parameters described above[15]. A profile of the number of deaths averted across the 20-year period of analysis is estimated, based on the decreased rupture rate (multiplied by the probability of death from rupture), and the increased levels of elective surgery (multiplied by the probability of death from elective surgery).

58. Life years are then obtained by assuming the difference between death averted at 65 and life expectancy at birth of 77[16] is attributed to the screening programme. The life years are then quality adjusted using the population norms for EQ-5D in Kind et al (1999)[17]. QALYs are discounted at a rate of 1.5% (3.5% less 2% to account for the increased value of life years gained across time).

Screening programme for men aged 65 and 70 (for 5 years)

Costs

59. The costs for this option are modelled on the same basis as a screening programme for men aged 65. The 70 year old population is added to the 65 year old population for the first five years.

Benefits

60. The benefits for this option are modelled on the same basis as a screening programme for men aged 65. The 70 year old population is added to the 65 year old population for the first five years.

Summary of costs and benefits

61. The table below sets out the costs and benefits of the two main options for screening programmes, with alternative cost scenarios for implementation. Further details on the costs and benefits across the 20-year period can be seen in Annex 4.

62. The table shows the total costs using the likely outcome assumptions (for phased and immediate implementation) and also the upper limit of uncertainty in the key assumptions (for maximum). The key assumptions involving uncertainty are discussed below.

[14] In terms of resources, a typical cardiac network has a network director, 1-2 Improvement Leads, 2-3 Improvement Facilitators, 1-2 Admin staff, a clinical lead and about 20% non-pay costs.

[15] The Markov model actually estimates QALYs gained across the 30 year period. However, problems of data access meant that QALYs have been estimated using rupture rates and rates of elective surgery

[16] Life expectancy at 65 is 17 years, but the lower estimate is selected to give more conservative outcomes

[17] Kind et al (1999), 'UK population norms for EQ-5D', Discussion paper 172, University of York, Centre for Health Economics

Table EB2: Summary of the two options for screening programmes

20 year period	*Phased implementation*			*Immediate implementation*			*Maximum cost*		
Option	Total costs (£m)	Total benefits (£m)	Mean ICER (£/QALY)	Total costs (£m)	Total benefits (£m)	Mean ICER (£/QALY)	Total costs (£m)	Total benefits (£m)	Mean ICER (£/QALY)
Screen at 65	372	4,383	3,400	420	4,304	3,903	494	4,304	4,590
Screen at 65 and 70	336	5,660	3,382	392	5,731	3,748	492	5,731	4,679

63. The table below shows the undiscounted annual costs of the two screening options, with different assumptions used for implementation and uncertainty, over a five year period.

Table EB3: Undiscounted costs over a five year period

£m	*Screen at 65*			*Screen at 65 and 70*		
Year	**Phased**	**Immediate**	**Maximum**	**Phased**	**Immediate**	**Maximum**
2008/09	7.86	36.17	40.69	9.58	39.64	46.31
2009/10	13.74	26.13	31.46	17.71	34.14	44.28
2010/11	20.15	28.56	34.44	24.58	35.10	46.16
2011/12	29.72	33.51	40.20	32.81	37.05	49.17
2012/13	38.17	35.36	41.84	40.78	37.97	49.43

64. The following table sets out the total costs and benefits and net present value of the four options.

Table EB4: Costs and benefits of all four options

£m	*Do nothing*	*Minimum operation threshold*	*Screen at 65*	*Screen at 65 and 70*
Costs				
One-off	0.00	0.00	14.01	14.01
Annual	0.00	0.01	29.17	26.85
PV (20 years)	0.00	0.14	419.92	391.51
Benefits				
One-off	0.00	0.00	0.00	0.00
Annual	0.00	66.82	215.20	286.54
PV (20 years)	0.00	1,603.57	4,304.00	5,730.84
Net benefit PV (20 years)	0.00	1,603.44	3,884.08	5,339.33
Minimum	0.00		3,810.13	5,238.62
Maximum	0.00		4,010.22	5,323.72
Range	0.00		200.08	85.10

Preferred Option

65. The analysis of costs and benefits has highlighted the similar incremental cost effectiveness ratios of the two options for a screening programme (screening programme for men aged 65, or screening programme for men aged 65 with screening for men aged 70 for five years). However, unsurprisingly the option which includes screening men aged 70 for 5 years has highlighted the additional benefit that could be achieved by including this older age group for the start up period.

66. As a result of this work, it has been necessary to reflect upon the practicality of implementation of the two options. In particular, there has been the need to focus on the

additional work required to implement the option that includes screening for men aged 70 for 5 years. In addition, there has been the need to consider immediate vs. phased implementation. The advantages and disadvantages of these options are compared and contrasted in the following tables.

Immediate Implementation	***Phased Implementation***
Advantages: • Faster implementation	**Advantages:** • Lower total costs • Lower Incremental cost effectiveness ratios • Learning from early implementation sites can be adopted for full national programme.
Disadvantages: • Higher total costs • Higher Incremental cost effectiveness ratios • lack of trained staff and a need to develop training for screening technicians • lack of existing screening units • untested computer systems for data management • commissioners will need to be convinced that Quality Assurance and robust fail safe systems are in place • vascular networks will need to be established • likely lack of support from vascular specialists for this option	**Disadvantages:** • Slower implementation

Screening programme for men aged 65	Screening programme for men aged 65, with screening for men aged 70 for five years
Advantages • Numbers manageable (as demonstrated by pilot programmes in Chichester and Gloucester) • Surgical workload manageable • Time is available to train staff • Time to establish good quality data collection and monitoring • Screening rate would initially be low until the newly trained screening technicians gained in confidence and expertise. • High levels of self referral could lead to earlier benefit than has been estimated • A programme of a manageable size will ensure that staff can be fully trained to a high standard with capacity for new trainees to learn the skills in the ongoing programme • Screening at 65 has been evaluated as a working model **Disadvantages** • Longer time to full benefit • Lower total benefits and higher total costs	**Advantages** • Shorter time to full benefit • Higher total benefits and lower total costs **Disadvantages** • Numbers not manageable (without reducing the size of the population each unit screens, or doubling up screening staff) • Screening teams immediately expected to work at full capacity • Insufficient ultrasonographers: will require training of screening technicians before starting • No time to gain experience with manageable work load • Double the surgical workload presenting to hospital immediately on starting screening. Could result in detection, without available space for treatment • As the prevalence of the condition increases with age, the number of AAAs detected would be greater at age 70 than at 65. As a result the surveillance programme would need to more than double in size • the number of elective operations would be considerably increased, with greater demands in ITU facilities • The higher surgical workload would have a knock on effect on other patient specialties. • The programme would be criticised if AAAs were detected but treatment delayed because of lack of vascular services. • This option is a theoretical and not an existing model

67. Having assessed the advantages and disadvantages of the options and the speeds of implementation, the recommendation for a preferred option is:

A phased implementation of a systematic population based screening service for the male population during their 65th year. Screening would also be made available to men age over 65 on request.

Sensitivity analysis

68. The MASS cost effectiveness analysis included extensive sensitivity analysis, and found the model to be relatively insensitive to increasing or decreasing the cost differential between elective and emergency surgery. This was done using the maximum and minimum differences between the screening centres. Confidence intervals around the unit cost of elective and emergency operations were also calculated. Since these are the largest cost drivers in the costing analysis described above, the upper limits of the 95% confidence interval were used to obtain maximum values for the total cost of the screening programme.

69. The 30-year Markov model uses a number of key assumptions in its structure and extrapolation. Most parameters are estimated from the MASS trials, and given the size of this study provide sound evidence for the values. A small number of parameters are estimated from systematic reviews. Validation of the estimates of the model were conducted in comparison with the original MASS trial after four years, with the proposed structure adequately matching results from the trial including numbers and timing of key events.

70. However, where possible, confidence intervals for key parameters in the costing model have been used to calculate the maximum possible cost. This included the probability that consultation following the detection of a large AAA, the patient will have an elective AAA repair, for which the upper limit of a 95% confidence was used.

71. The table below sets out the key cost assumptions and parameters with uncertainty, including a likely outcome and an upper limit of uncertainty used to calculate the maximum costs of an option.

72. There was some uncertainty over the level of self-referral rate for the screening programme. The baseline assumption was for a 3% referral rate, which decreased by 10% each year. Sensitivity analysis was performed by assuming a higher 5% referral rate and seeing how this impacted the costs. This assumption was encompassed in the "screen at 65 maximum" and "screen at 65 & 70 maximum costs". While there was (a predictable) increase in cost, the net benefit did not change significantly, nor did the decision.

Table EB5: Uncertainty in key parameters

Parameter	*Assumption*	*Maximum*	*Minimum*
Probability of attending screening if invited	0.8022	0.9	
Probability of starting rate self-referral for 65-74 year olds	3%	5%	
Probability of decision at consultation is elective operation	68%	72%	
Cost of elective operation (£)	9,165	9,990	8,567
Cost of emergency operation (£)	14,825	17,720	12,783
Cost of re-screen (£)	61.07	77.41	

73. Full details of all the assumptions and data sources are listed in Annex 3.

Specific Impact Tests: Checklist

Use the table below to demonstrate how broadly you have considered the potential impacts of your policy options.

Ensure that the results of any tests that impact on the cost-benefit analysis are contained within the main evidence base; other results may be annexed.

Type of testing undertaken	*Results in Evidence Base?*	*Results annexed?*
Competition Assessment	No	No
Small Firms Impact Test	No	No
Legal Aid	No	No
Sustainable Development	No	No
Carbon Assessment	No	No
Other Environment	No	No
Health Impact Assessment	Yes	No
Race Equality	No	Yes – annex 5
Disability Equality	No	Yes – annex 5
Gender Equality	No	Yes – annex 5
Human Rights	No	Yes – annex 5
Rural Proofing	No	No

Health Impact Assessment

74. All the elements of a Health Impact Assessment have been addressed within the main evidence base of this full impact assessment.

Annexes

Annex 1: Assessment of evidence

There are four randomised controlled trials that have evaluated population-based screening for AAA:

The UK Multicentre Aneurysm Screening Study (MASS)

Ashton HA, Buxton MJ, Day NE, et al. The Multicentre Aneurysm Screening Study (MASS) into the effect of abdominal aortic aneurysm screening on mortality in men: a randomised controlled trial. *Lancet* 2002;360:1531-9.

The Chichester screening study

Scott RA, Wilson NM, Ashton HA, Kay DN. Influence of screening on the incidence of ruptured abdominal aortic aneurysm: 5-year results of a randomized controlled study. *Br J Surg* 1995;82:1066-70.

Scott RA, Bridgewater SG, Ashton HA. Randomized clinical trial of screening for abdominal aortic aneurysm in women. *Br J Surg* 2002;89:283-5.

Vardulaki KA, Walker NM, Couto E, et al. Late results concerning feasibility and compliance from a randomized trial of ultrasonographic screening for abdominal aortic aneurysm. *Br J Surg* 2002;89:861-4.

Ashton HA, Gao L, Kim LG, Druce PS, Thompson SG, Scott RA. Fifteen-year follow-up of a randomized clinical trial of ultrasonographic screening for abdominal aortic aneurysms. Br J Surg. 2007 Jun;94(6):696-701

The Viborg County, Denmark, screening study.

Lindholt JS, Juul S, Fasting H, Henneberg EW. Hospital costs and benefits of screening for abdominal aortic aneurysms. Results from a randomised population screening trial. *Eur J Vasc Endovasc Surg* 2002;23:55-60.

The Western Australia screening study

Jamrozik K, Norman PE, Spencer CA, et al. Screening for abdominal aortic aneurysm: lessons from a population-based study. *Med J Aust* 2000;173:345-50.

Lawrence-Brown MM, Norman PE, Jamrozik K, et al. Initial results of ultrasound screening for aneurysm of the abdominal aorta in Western Australia: relevance for endoluminal treatment of aneurysm disease. *Cardiovasc Surg* 2001;9:234-40.

Norman PE, Jamrozik K, Lawrence-Brown MM, et al. Population based randomised controlled trial on impact of screening on mortality from abdominal aortic aneurysm. *BMJ* 2004;329:1259.

Summary of AAA Screening Trials

Trial	MASS	Western Australia	Viborg	Chichester, Men	Chichester, Women
Reference	Ashton, 2002	Norman, 2004	Lindholt, 2002	Scott, 1995	Scott, 2002
Location	UK	Australia	Denmark	UK	UK
Recruitment	Population screening	Population screening	Population screening	Population screening	Population screening
Age	65–74 years	65–83 years	65–73 years	65–80 years	65–80 years
Gender	Male	Male	Male	Male	Female
Ethnicity	Unknown	> 90% Caucasian	100% Caucasian	Unknown	Unknown
Total Randomized	67,800	38,704	12,658	6,433	9,342
Duration of Follow-up, Year	4.1	3.6	5.1	2.5	2.5
Invited for Screening	33,839	19,352	6339	3,205	4,682
Screened, %	80%	63%	69%	73%	65%
Uninvited Controls	33,961	19,352	6,319	3,228	4,660
Ascertainment of Outcomes					
Death Registry	Yes	Yes	No	Yes	Yes
Hospital Records	Yes	Yes	Yes	Yes	Yes
Outcomes ascertained, %	99%	99%§	100%	Not reported	Not reported

* Only hospital records available to ascertain outcomes

Source: http://www.ncbi.nlm.nih.gov/books/bv.fcgi?rid=hstat3.table.30130

Results of AAA Screening Trials

Study	MASS	Western Australia	Viborg	Chichester, Men	Chichester, Women	Pooled Estimates for Men over 65
Reference	Ashton, 2002	Norman, 2004	Lindholt, 2002	Scott, 1995	Scott, 2002	
Invited for Screening	33,839	19,352	6339	3,205	4,682	
Scanned	27,147	12,203	4843	2,342	3,052	
Accepted Screening, %	80%	63%	69%	73%	65%	72%
AAA in Scanned, n (%)	1330 (4.9%)	875 (7.2%)	191 (4.0%)	178 (7.6%)	40 (1.3%)	5.5%
Uninvited Controls	33,961	19,352	6,319	3,228	4,660	
Duration of Follow-up, Yr	5	2.5	5	5	5	
AAA-Specific Mortality						
Invited	65 (0.19%)	18 (0.09%)	6 (0.09%)	10 (0.31%)	2 (0.04%)	
Controls	113 (0.33%)	25 (0.13%)	19 (0.30%)	17 (0.36%)	2 (0.04%)	0.72 per 1000 person-years
OR* (95% CI)	0.58 (0.42, 0.78)	0.72 (0.39,1.32)	0.31 (0.13, 0.79)	0.59 (0.27,1.29)	1.00 (0.14, 7.07)	0.57 (0.45, 0.74)
All-cause Mortality						
Invited	3750 (11.1%)	1976 (10.2%)	-	532 (16.6%)	503 (10.7%)	
Controls	3855 (11.4%)	2020 (10.4%)	-	508 (15.7%)	476 (10.2%)	
OR* (95% CI)	0.97 (0.93, 1.02)	0.98 (0.91, 1.04)	-	1.07 (0.93, 1.22)	1.05 (0.92, 1.19)	0.98 (0.95, 1.02)
Elective Repair						
Invited	332 (0.98%)	107 (0.55%)	50 (0.79%)	28 (0.87%)	4 (0.08%)	0.96% (0.88%,1.06%)
Controls	92 (0.27%)	54 (0.28%)	14 (0.22%)	5 (0.15%)	2 (0.04%)	0.28% (0.24%, 0.34%)
Emergency Repair						
Invited	27 (0.08%)	9 (0.05%)	6 (0.09%)	3 (0.09%)	1 (0.02%)	0.11% (0.08%, 0.14%)
Controls	54 (0.16%)	8 (0.04%)	30 (0.47%)	8 (0.24%)	1 (0.01%)	0.23% (0.19%, 0.28%)
AAA Rupture						
Invited	67	33 (0.17%)	4	8 (0.25%)	3 (0.06%)	0.18% (0.15%,

	(0.20%)		(0.10%)			0.23%)
Controls	134 (0.40%)	38 (0.20%)	20 (0.3%)	20 (0.62%)	2 (0.04%)	0.40% (0.35%, 0.46%)
Operative Mortality						
Elective Repair %	6%	4.3%	6%	0%	0%	6%
Urgent/Emergent Repair %	37%	50%	39%	25%	33%	37%

CI, confidence interval, MASS, Multicentre Aneurysm Screening Study; OR, odds ratio.
* Odds ratios were obtained by pooling trials for men using random effects meta-analyses.
Source: http://www.ncbi.nlm.nih.gov/books/bv.fcgi?rid=hstat3.table.30132

Annex 2: Assessment of Options

	Option		Assessment
	Status quo - do nothing	No screening programme	Rupture of an aneurysm in the abdominal aorta caused approximately 6,800 deaths in England and Wales in the year 2000. The great majority occur in men because the age-specific prevalence of the condition is six times greater in men than in women. In men older than 65 years, rupture of an abdominal aneurysm is responsible for 2.1% of all deaths and the overall mortality from rupture is between 65% and 85%. Aneurysms of the abdominal aorta do not regress. The mortality rate from aneurysm rupture is due not only to the severity of the injury but also to the speed of its evolution. Of all the deaths attributed to ruptured aneurysms, about half take place before the patient reaches hospital, and of those who reach hospital the mortality rate for emergency treatment is between 30% and 75%. In the 4 RCTs of AAA screening, there were 174 AAA specific deaths in the uninvited male population and 99 deaths in the invited male population.
	Primary Prevention	No screening programme	The cause of abdominal aortic aneurysm is not understood and primary prevention, other than smoking avoidance, is not possible. As with other vascular diseases efforts to prevent people smoking or to help them stop smoking will influence risk but there are many other reasons to advocate smoking cessation, and at present abdominal aortic aneurysm can be regarded as a disease that cannot be prevented.
	Improve elective surgical outcomes	No screening programme	"Abdominal Aortic Aneurysm: A service in need of surgery?" 2005 http://www.ncepod.org.uk/2005b.htm Recommendations for elective surgery Clinicians, purchasers, Trusts and Strategic Health Authorities should review whether elective aortic aneurysm surgery should be concentrated in fewer hospitals. Major elective surgery should not take place unless all essential elements of the care package are available. Patients with an aortic aneurysm requiring surgery must have equal priority with all other patients with serious clinical conditions for diagnosis, investigation and treatment. Trusts should take action to improve access to Level 2 beds for patients undergoing elective aortic aneurysm repair so as to reduce the number of operations cancelled and inappropriate use of Level 3 beds. Trusts should ensure that clinicians of the appropriate grade are available to staff preoperative assessment clinics for aortic surgery patients. Trusts should ensure that anaesthetists can identify the major cases that they have managed in order to support audit and appraisal. Anaesthetic departments should review the allocation of vascular cases so as to reduce the number of anaesthetists caring for very small volumes of elective and emergency aortic surgery cases. Trusts should ensure they that they have robust systems for the postoperative

			care of epidural catheters with accompanying appropriate documentation. Anaesthetic departments and critical care units should review together whether vascular surgery patients who routinely receive postoperative mechanical ventilation could be managed in a Level 2 High Dependency Unit breathing spontaneously.
	Improve emergency surgical outcomes	No screening programme	"Abdominal Aortic Aneurysm: A service in need of surgery?" 2005 http://www.ncepod.org.uk/2005b.htm Recommendations for emergency surgery: Trusts should ensure the availability outside normal working hours of radiology services including CT scanners. Strategic Health Authorities and Trusts should co-operate to ensure that only surgeons with vascular expertise operate on emergency aortic aneurysm patients, apart from exceptional geographical circumstances. Anaesthetic departments should review the allocation of vascular cases so as to reduce the number of anaesthetists caring for very small volumes of elective and emergency aortic surgery cases.
	Screening Programme for Men and Women		The Chichester trial included 9342 women age 65 to 80 years who were randomly assigned to either an invitation-to-screening group or a control group. Sixty-five percent of women attended screening, compared with 73% of men ($P < 0.001$). The AAA prevalence in women was 1.3%, compared with 7.6% in men. At 5 years of follow-up, there were no differences between women invited for screening and the control group in either AAA-related mortality (OR, 1.0 [CI, 0.14 to 7.07]) or all-cause mortality (OR, 1.05 [CI, 0.92 to 1.19]). At 10 years, the incidence of AAA rupture was the same for women in the screening and control groups. Abdominal aortic aneurysms are much less prevalent in women overall, occur on average 10 years later than in men, and are most likely to rupture after 80 years of age.
	Screening Programme for Men with Risk Factors		A history of smoking is the most significant risk factor distinguishing populations at higher risk for AAA (OR 5.07 for AAA ≥ 4.0 cm; 95% CI, 4.13–6.21). While it is likely that the benefit of population screening is related to prevalence as predicted by AAA risk factors such as smoking, there is no direct trial evidence in this regard. The major risk factors for AAA include male sex, a history of ever smoking (defined in surveys as 100 cigarettes in a person's lifetime), and age 65 or older. Other lesser risk factors include family history, coronary heart disease, claudication, hypercholesterolemia, hypertension, cerebrovascular disease, and increased height. Factors associated with decreased risk include female sex, diabetes mellitus, and black race. After adjustment for other risk factors, significant risk factors for AAAs of 4.0 cm or greater also include family history (OR, 1.94 [CI, 1.63 to 2.32]), coronary artery disease (OR, 1.52 [CI, 1.37 to 1.68]), hypercholesterolemia (OR, 1.44 [CI, 1.27 to 1.63]), and cerebrovascular disease (OR, 1.28 [CI, 1.11 to 1.47]). Risk for AAA is significantly lower for black persons (OR, 0.53 [CI, 0.40 to 0.69]) and patients with diabetes (OR, 0.52 [CI, 0.45 to 0.61]). Lederle FA, Johnson GR, Wilson SE, et al. The aneurysm detection and management study screening program: validation cohort and final results. Aneurysm Detection and Management Veterans Affairs Cooperative Study

			Investigators. *Arch Intern Med* 2000;160:1425-30. However, although such risk factors may be important in managing individual patients, population screening strategies based on these factors have not been shown to perform better than strategies using age, sex, and smoking history in selecting high-risk populations for screening. Lindholt JS, Henneberg EW, Fasting H, Juul S. Mass or high-risk screening for abdominal aortic aneurysm. *Br J Surg* 1997;84:40-2. *Conclusion* If screening for AAA is desirable, the authors recommend mass rather than high-risk screening. Spencer CA, Jamrozik K, Norman PE, Lawrence-Brown MM. The potential for a selective screening strategy for abdominal aortic aneurysm. *J Med Screen* 2000;7:209-11. *Conclusions* Selective screening for AAA using easily recognisable risk factors is feasible but is not worthwhile as approximately 25% of clinically significant cases would be missed.
	Screening Programme for Men aged 65 years		All trials had ORs favouring an association between an invitation for men to attend screening and a reduction in AAA-related deaths. The association was significant in MASS (OR, 0.58; 95% CI, 0.42 to 0.78) and in the Viborg County study (OR, 0.31; 95% CI, 0.13 to 0.79). Pooled OR shows a reduction in AAA-related mortality favouring screening (OR, 0.57; 95% CI, 0.45 to 0.74). The Multicentre Aneurysm Screening Study, the largest of the trials and the trial with the narrowest CI, contributed the most weight to the pooled OR.
	Screening Programme for Men aged 65-74 years		Age is a significant AAA risk factor. The odds ratio of finding an AAA of at least 4.0 cm, adjusted for other risk factors, increases by 1.71 (CI, 1.61 to 1.82) for each 7-year age interval. The Western Australia trial was the only study reporting AAA-related mortality for different age groups. Overall, there was no significant difference in AAA-related mortality between those invited to screening and uninvited controls (OR, 0.72 [CI, 0.39 to 1.32]) In a post hoc analysis, an invitation to screening was associated with a significant reduction in AAA-related mortality for men age 65 to 75 years (OR, 0.19 [CI, 0.04 to 0.89]) and a trend toward increased mortality in older men.
	Screening Programme for Men extended beyond 75 years		The Western Australia screening study included patients 75 to 83 years of age. In a post hoc analysis, a significant reduction of AAA-related mortality from screening was seen in men 65 to 74 years of age but not in older men.
	Screening Programme for Men younger than 65 years		The prevalence of an AAA greater than 5.0 cm in men aged 50 to 79 is estimated to be 0.5 percent. Almost all deaths from ruptured AAAs occur in men older than 65; most AAA-related deaths occur in men younger than 80; and most AAA-related deaths in women occur when they are older than 80.

Annex 3: List of assumptions

ASSUMPTIONS

Item	Assumption	Min	Max	Data source and comments
Risk parameters				
Probability of reinvitation	0.1360			Lois Kim et al, J. of Med. Screening, 2007 Vol14 No 1
Probability of attending screening if invited	0.8022		0.9	Lois Kim et al, J. of Med. Screening, 2007 Vol14 No 1
Probability of death from a rupture	0.8018			Lois Kim et al, J. of Med. Screening, 2007 Vol14 No 1
Probability of decision at consultation is elective operation	0.6840		0.716	Lois Kim et al, J. of Med. Screening, 2007 Vol14 No 1
Probability of death from an elective operation	0.0580			Lois Kim et al, J. of Med. Screening, 2007 Vol14 No 1
Auditing and networks				
No. of vascular networks needed	32			No. of cardiac networks currently is use (from Sue Dodd)
Cost per vascular network	40,000			Cost per cardiac network. Estimate confirmed following correspondence between Jennie Carpenter, Gary White (Health Improvement Team, Tel:07879498546), and Francis Dickinson.
Annual cost of running audit database	40,000			From National Vascular Society (£10k running cost, £20k admin cost, £10k new data developments)
Recurrent cost of national implementation team	500,000			0.3 WTE consultant (£50K), Clinical advice (£30K), Mgrs & admin (£190K), training expertise (£30K), non-pay (£100K), contribution to database (£100K). Source: Jennie Carpenter, email 28/01/2008
Start up cost of national audit database	51,500			From National Vascular Society
One-off costs for national team, spread over years one and two	575,000			Info material (£250K), IT system (£100K), evaln of pilots (£200K), supporting U/S procurement (£25K). Source: Jennie Carpenter, email 28/01/2008
Unit costs of screening resources (£)				
Cost of elective operation	9165.12	8,566.84	9,990.23	MASS Paper, BMJ 2002; 325; 1135-
Cost of emergency operation	14825.50	12,782.61	17,720.02	MASS Paper, BMJ 2002; 325; 1135-
Cost of an invitation	1.74			MASS Paper, BMJ 2002; 325; 1135-
Cost of a reinvitation	1.70			MASS Paper, BMJ 2002; 325; 1135-
Cost of an initial screen	25.31			MASS Paper, BMJ 2002; 325; 1135-
Cost of a recall scan	61.07		69.10	MASS Paper, BMJ 2002; 325; 1135-
Training cost per screening centre	190,500			Based on estimates provided by Alan Scott, and Dr Hussain for senior sonographer and 6 technicians.
Cost of 10 training centres	1,820,000			10 Training Centres: Each centre £182K: Admin £22K, 4 U/S machines @ £15K ea, 2 simulators @ £25 ea, clinical workshops hire £50K. Source: Alan Scott and Dr Hussain, and revisions with Robert Sherriff (30/04/08).
Cost of clinical staff per unit	68,535			NSC Working Group DRAFT Standard Operating Procdures, 2007 (Director - consultant grade - 0.5 days wte @ £148701; ultrasound consultant - consultant grade - 0.5 days wte @ £148701; nurse practitioner - qualified nurse @ £38795)
Cost of screening staff per unit	250,999			NSC Working Group DRAFT Standard Operating Procdures, 2007 (Senior sonographer - ST&T @ £35857; 6 screening technicians - ST&T @ £35857)
Cost of admin staff per unit	135,264			NSC Working Group DRAFT Standard Operating Procdures, 2007 (Coorindator - manager @ £72415; clerical officer @ £24054; medical physicist - ST&T @ £35857)
Cost of accomodation per unit	19,200			NSC Working Group DRAFT Standard Operating Procdures, 2007 (Office - 32 sq.m @ £300/sq.m p.a. - LIFT primary care rental cost; clinic - 32 sq.m)
Cost of equipment per unit	125,458			NSC Working Group DRAFT Standard Operating Procdures, 2007 (Cost of mobile unit and screening equipment @ £103,500; maintenance and travel @ £14000). Source: Brodlie paper, and Alan Scott
Units of screening resources				
No. of centres (per 0.8m population)	64			NSC Working Group DRAFT Standard Operating Procdures, 2007
No. of sonographers per unit	1			Recommended by Robert Sherriff, public health specialist
Capacity of screening unit from SOP	7000			NSC Working Group DRAFT Standard Operating Procdures, 2007
Operations thresholds				
Recommended minimum number of operations per surgeon per year	10			National Confidential Enquiry into Patient Outcome and Death report 2005
Number of providers with performing less than 10 elective AAA repair operations per year	24			HES data 2005/06
Number of patients treated by providers performing less than 10 elective AAA repair operations per year	4%			HES data 2005/06
Average extra miles required to travel	22			Analysis distance versus time from Toyota route planner (see John Henderson email)
Average minutes per 22 miles	55			Analysis distance versus time from Toyota route planner (see John Henderson email)
Average cost per 55 minutes	55.52			Transport analysis guidance, DfT, cost of working person time (for taxi/minicab - upper limit)
Average mortality rate for hospitals carrying out low volume of elective repairs/year	8%			National Vascular Database, 2004
Average mortality rate for hospitals carrying out high volume of elective repairs/year	5%			National Vascular Database, 2004
Benefits				
Mean life years gained per patient from screening	0.0200			Lois Kim et al, J. of Med. Screening, 2007 Vol14 No 1
Average number of life years gained per life saved at 65	12.2		17.7	Difference between 65 and life expectancy at birth (ONS website)
Average number of life years gained per life saved at 70	7.2			Difference between 70 and life expectancy at birth (ONS website)
Value to adjust for quality	0.78			UK population norms for EQ-5D, Kind et al, Centre for Health Economics
Monetary value of a QALY	40000.00			Donald Franklin, Economist, DH, Draft Impact Assessment Guidance

Phased implementation				
Year 1	20%			Recommended by Robert Sherriff, public health specialist
Year 2	40%			Recommended by Robert Sherriff, public health specialist
Year 3	60%			Recommended by Robert Sherriff, public health specialist
Year 4	80%			Recommended by Robert Sherriff, public health specialist
Year 5	100%			Recommended by Robert Sherriff, public health specialist
Discount rates				
Costs	3.5%			Green Book, HMT
QALYs	1.5%			Recommended by John Henderson, Economist, DH, to account for higher value placed on lives saved in the future
Rate of self-referral for 65-74 year olds with 65 screen				
Year 1	3.0%		5.0%	
Year 2	2.7%		4.5%	
Year 3	2.4%		4.0%	
Year 4	2.1%		3.5%	
Year 5	1.8%		3.0%	
Year 6	1.5%		2.5%	
Year 7	1.2%		2.0%	
Year 8	0.9%		1.5%	
Year 9	0.6%		1.0%	
Year 10	0.3%		0.5%	
Rate of self-referral for 65-74 year olds with 70 screen				
Year 1	3.0%		5.0%	
Year 2	2.4%		4.0%	
Year 3	1.8%		3.0%	
Year 4	1.2%		2.0%	
Year 5	0.6%		1.0%	
Factor of scale increase due to self-referrals with 65 screen				
Year 1	31%	31%	45%	
Year 2	27%	27%	40%	
Year 3	24%	24%	36%	
Year 4	22%	22%	32%	
Year 5	16%	16%	23%	
Year 6	14%	14%	21%	
Year 7	13%	13%	19%	
Year 8	10%	10%	15%	
Year 9	7%	7%	11%	
Year 10	4%	4%	5%	
Factor of scale increase due to self-referrals with 70 screen				
Year 1	17%	17%		
Year 2	13%	13%		
Year 3	10%	10%		
Year 4	7%	7%		
Year 5	3%	3%		

Annex 4: Final costs

FINAL COSTS (£m)

Screening 65 year olds

	Year	Staff training	Cost of screening	Cost of consultation and operations	Cost of audit	Cost of National Team	Cost of networks	Cost of minimum threshold	Total costs	Total costs discounted (3.5%)	QALYs	QALYs discounted (1.5%)	Benefits	Cost effectiveness ratio (£/QALY)
1	2008/09	14.01	8.14	11.85	0.09	0.79	1.28	0.01	36.17	34.95	56	55	2.21	623,879
2	2009/10	0.00	9.11	14.91	0.04	0.79	1.28	0.01	26.13	24.39	662	643	25.72	36,818
3	2010/11	0.00	9.74	17.00	0.04	0.50	1.28	0.01	28.56	25.76	1,445	1382	55.27	17,833
4	2011/12	0.00	10.45	21.23	0.04	0.50	1.28	0.01	33.51	29.20	1,951	1838	73.54	14,966
5	2012/13	0.00	12.10	21.43	0.04	0.50	1.28	0.01	35.36	29.77	2,713	2518	100.72	10,974
6	2013/14	0.00	11.86	20.82	0.04	0.50	1.28	0.01	34.51	28.07	3,906	3573	142.90	7,186
7	2014/15	0.00	11.33	19.71	0.04	0.50	1.28	0.01	32.86	25.83	5,054	4554	182.17	5,110
8	2015/16	0.00	10.90	18.00	0.04	0.50	1.28	0.01	30.73	23.34	6,142	5452	218.08	3,600
9	2016/17	0.00	10.50	16.65	0.04	0.50	1.28	0.01	28.98	21.26	6,958	6085	243.41	3,056
10	2017/18	0.00	10.18	15.45	0.04	0.50	1.28	0.01	27.45	19.48	7,616	6562	262.48	2,555
11	2018/19	0.00	9.90	14.36	0.04	0.50	1.28	0.01	26.09	17.87	8,155	6923	276.93	2,191
12	2019/20	0.00	9.66	13.70	0.04	0.50	1.28	0.01	25.49	16.87	8,648	7233	289.32	1,951
13	2020/21	0.00	9.66	13.43	0.04	0.50	1.28	0.01	25.23	16.13	9,031	7442	297.68	1,786
14	2021/22	0.00	10.17	13.49	0.04	0.50	1.28	0.01	25.49	15.75	9,294	7545	301.80	1,694
15	2022/23	0.00	10.49	13.82	0.04	0.50	1.28	0.01	26.14	15.60	9,479	7581	303.26	1,646
16	2023/24	0.00	10.86	14.06	0.04	0.50	1.28	0.01	26.75	15.43	9,667	7618	304.71	1,596
17	2024/25	0.00	11.02	14.34	0.04	0.50	1.28	0.01	27.19	15.15	9,866	7660	306.39	1,536
18	2025/26	0.00	11.23	14.91	0.04	0.50	1.28	0.01	27.97	15.06	10,013	7659	306.36	1,504
19	2026/27	0.00	11.62	15.47	0.04	0.50	1.28	0.01	28.91	15.04	10,144	7645	305.79	1,482
20	2027/28	0.00	11.89	16.10	0.04	0.50	1.28	0.01	29.83	14.99	10,278	7631	305.25	1,458
	Total	14.01	211.41	320.72	0.85	10.58	25.60	0.17	583.35	419.92	131,078	107600	4304.00	3,903
	NPV	3884.08												(Mean)

FINAL COSTS (£m)

Screening 65 and 70 year olds

	Year	Staff training	Cost of screening	Cost of consultation and operations	Cost of audit	Cost of National Team	Cost of networks	Cost of minimum threshold	Total costs	Total costs discounted (3.5%)	QALYs	QALYs discounted (1.5%)	Benefits	Cost effectiveness ratio (£/QALY)
1	2008/09	14.01	12.83	10.63	0.09	0.79	1.28	0.01	39.64	38.30	441	434	17.36	88,915
2	2009/10	0.00	14.15	17.88	0.04	0.79	1.28	0.01	34.14	31.87	2,025	1965	78.61	15,743
3	2010/11	0.00	14.67	18.60	0.04	0.50	1.28	0.01	35.10	31.66	3,432	3282	131.28	9,224
4	2011/12	0.00	15.02	20.20	0.04	0.50	1.28	0.01	37.05	32.29	5,127	4831	193.24	6,297
5	2012/13	0.00	16.82	19.32	0.04	0.50	1.28	0.01	37.97	31.97	6,840	6349	253.97	4,674
6	2013/14	0.00	11.26	11.99	0.04	0.50	1.28	0.01	25.08	20.40	8,178	7479	299.17	2,495
7	2014/15	0.00	10.66	10.44	0.04	0.50	1.28	0.01	22.93	18.02	9,140	8235	329.40	1,972
8	2015/16	0.00	10.32	9.17	0.04	0.50	1.28	0.01	21.31	16.18	9,877	8768	350.71	1,639
9	2016/17	0.00	10.07	8.58	0.04	0.50	1.28	0.01	20.48	15.03	10,296	9005	360.19	1,460
10	2017/18	0.00	9.98	8.43	0.04	0.50	1.28	0.01	20.24	14.35	10,532	9075	363.02	1,362
11	2018/19	0.00	9.98	8.53	0.04	0.50	1.28	0.01	20.34	13.93	10,656	9046	361.85	1,307
12	2019/20	0.00	10.01	8.63	0.04	0.50	1.28	0.01	20.46	13.54	10,747	8988	359.53	1,260
13	2020/21	0.00	9.99	9.15	0.04	0.50	1.28	0.01	20.97	13.41	10,755	8863	354.51	1,247
14	2021/22	0.00	10.19	10.01	0.04	0.50	1.28	0.01	22.03	13.61	10,671	8563	346.54	1,275
15	2022/23	0.00	10.51	11.10	0.04	0.50	1.28	0.01	23.44	13.99	10,548	8437	337.49	1,326
16	2023/24	0.00	10.89	12.02	0.04	0.50	1.28	0.01	24.74	14.26	10,471	8252	330.06	1,362
17	2024/25	0.00	11.05	12.90	0.04	0.50	1.28	0.01	25.78	14.37	10,444	8109	324.34	1,376
18	2025/26	0.00	11.27	13.98	0.04	0.50	1.28	0.01	27.08	14.58	10,402	7957	318.26	1,402
19	2026/27	0.00	11.66	14.98	0.04	0.50	1.28	0.01	28.47	14.81	10,377	7820	312.81	1,427
20	2027/28	0.00	11.94	15.96	0.04	0.50	1.28	0.01	29.73	14.94	10,388	7713	308.50	1,438
	Total	14.01	233.25	252.51	0.85	10.58	25.60	0.17	536.97	391.51	171,347	143271	5730.84	3,748
	NPV	5339.33												(Mean)

FINAL COSTS (£m) - PHASED IMPLEMENTATION OVER FIVE YEARS

Screening 65 year olds

	Year	Staff training	Cost of screening	Cost of consultation and operations	Cost of audit	Cost of National Team	Cost of networks	Cost of minimum threshold	Total costs	Total costs discounted (3.5%)	QALYs	QALYs discounted (1.5%)	Benefits	Cost effectiveness ratio (£/QALY)
1	2008/09	2.80	1.63	2.37	0.02	0.79	0.26	0.00	7.86	7.60	15	14	0.58	519,223
2	2009/10	2.80	3.64	5.96	0.03	0.79	0.51	0.00	13.74	12.82	337	327	13.09	38,034
3	2010/11	2.80	5.84	10.20	0.03	0.50	0.77	0.00	20.15	18.18	1,079	1032	41.27	16,847
4	2011/12	2.80	8.36	16.98	0.04	0.50	1.02	0.01	29.72	25.90	1,898	1788	71.52	13,649
5	2012/13	2.80	12.10	21.43	0.05	0.50	1.28	0.01	38.17	32.14	3,140	2915	116.61	10,233
6	2013/14	0.00	11.86	20.82	0.04	0.50	1.28	0.01	34.51	28.07	4,471	4089	163.55	6,279
7	2014/15	0.00	11.33	19.71	0.04	0.50	1.28	0.01	32.86	25.83	5,702	5137	205.49	4,530
8	2015/16	0.00	10.90	18.00	0.04	0.50	1.28	0.01	30.73	23.34	6,768	6008	240.30	3,448
9	2016/17	0.00	10.50	16.65	0.04	0.50	1.28	0.01	28.98	21.26	7,454	6519	260.75	2,852
10	2017/18	0.00	10.18	15.45	0.04	0.50	1.28	0.01	27.45	19.46	7,893	6801	272.04	2,466
11	2018/19	0.00	9.90	14.36	0.04	0.50	1.28	0.01	26.09	17.87	8,155	6923	276.93	2,191
12	2019/20	0.00	9.66	13.70	0.04	0.50	1.28	0.01	25.49	16.87	8,648	7233	289.32	1,951
13	2020/21	0.00	9.56	13.43	0.04	0.50	1.28	0.01	25.23	16.13	9,031	7442	297.68	1,786
14	2021/22	0.00	10.17	13.49	0.04	0.50	1.28	0.01	25.49	15.75	9,294	7545	301.80	1,694
15	2022/23	0.00	10.49	13.82	0.04	0.50	1.28	0.01	26.14	15.60	9,479	7581	303.26	1,646
16	2023/24	0.00	10.86	14.06	0.04	0.50	1.28	0.01	26.75	15.43	9,667	7618	304.71	1,596
17	2024/25	0.00	11.02	14.34	0.04	0.50	1.28	0.01	27.19	15.15	9,666	7660	306.39	1,536
18	2025/26	0.00	11.23	14.91	0.04	0.50	1.28	0.01	27.97	15.06	10,013	7659	306.36	1,504
19	2026/27	0.00	11.62	15.47	0.04	0.50	1.28	0.01	28.91	15.04	10,144	7645	305.79	1,482
20	2027/28	0.00	11.69	16.10	0.04	0.50	1.28	0.01	29.83	14.99	10,278	7631	305.25	1,458
	Total	14.01	193.45	291.25	0.77	10.58	23.04	0.16	533.26	372.48	133,330	109567	4382.69	3,400
	NPV	4010.22												(Mean)

FINAL COSTS (£m) - PHASED IMPLEMENTATION OVER FIVE YEARS

Screening 65 and 70 year olds

	Year	Staff training	Cost of screening	Cost of consultation and operations	Cost of audit	Cost of National Team	Cost of networks	Cost of minimum threshold	Total costs	Total costs discounted (3.5%)	QALYs	QALYs discounted (1.5%)	Benefits	Cost effectiveness ratio (£/QALY)
1	2008/09	2.80	2.57	2.13	0.02	0.79	1.28	0.00	9.58	9.26	104	102	4.08	89,425
2	2009/10	2.80	5.66	7.15	0.03	0.79	1.28	0.00	17.71	16.53	934	906	36.25	17,707
3	2010/11	2.80	8.80	11.16	0.03	0.50	1.28	0.00	24.58	22.17	2,321	2220	88.80	9,552
4	2011/12	2.80	12.01	16.16	0.04	0.50	1.28	0.01	32.81	28.59	4,486	4226	169.06	6,374
5	2012/13	2.80	16.82	19.32	0.05	0.50	1.28	0.01	40.78	34.34	7,199	6683	267.32	4,769
6	2013/14	0.00	11.26	11.99	0.04	0.50	1.28	0.01	25.08	20.40	8,409	7691	307.63	2,426
7	2014/15	0.00	10.66	10.44	0.04	0.50	1.28	0.01	22.93	18.02	9,405	8474	338.96	1,916
8	2015/16	0.00	10.32	9.17	0.04	0.50	1.28	0.01	21.31	16.18	10,133	8995	359.81	1,597
9	2016/17	0.00	10.07	8.58	0.04	0.50	1.28	0.01	20.48	15.03	10,499	9182	367.30	1,431
10	2017/18	0.00	9.98	8.43	0.04	0.50	1.28	0.01	20.24	14.35	10,646	9173	366.93	1,348
11	2018/19	0.00	9.98	8.53	0.04	0.50	1.28	0.01	20.34	13.93	10,656	9046	361.85	1,307
12	2019/20	0.00	10.01	8.63	0.04	0.50	1.28	0.01	20.46	13.64	10,747	8988	359.53	1,280
13	2020/21	0.00	9.99	9.15	0.04	0.50	1.28	0.01	20.97	13.41	10,755	8863	354.51	1,247
14	2021/22	0.00	10.19	10.01	0.04	0.50	1.28	0.01	22.03	13.61	10,671	8663	346.54	1,275
15	2022/23	0.00	10.51	11.10	0.04	0.50	1.28	0.01	23.44	13.99	10,548	8437	337.49	1,326
16	2023/24	0.00	10.89	12.02	0.04	0.50	1.28	0.01	24.74	14.26	10,471	8252	330.06	1,362
17	2024/25	0.00	11.05	12.90	0.04	0.50	1.28	0.01	25.78	14.37	10,444	8109	324.34	1,376
18	2025/26	0.00	11.27	13.98	0.04	0.50	1.28	0.01	27.08	14.58	10,402	7957	318.26	1,402
19	2026/27	0.00	11.66	14.98	0.04	0.50	1.28	0.01	28.47	14.81	10,377	7820	312.81	1,427
20	2027/28	0.00	11.94	15.96	0.04	0.50	1.28	0.01	29.73	14.94	10,388	7713	308.50	1,438
	Total	14.01	205.63	221.80	0.77	10.58	25.60	0.16	478.54	336.32	169,596	141501	5660.04	3,382
	NPV	5323.72												(Mean)

FINAL COSTS (£m) - MAXIMUM

Screening 65 year olds

	Year	Staffing costs not part of unit cost of screening	Cost of screening	Cost of consultation and operations	Cost of audit	Cost of National Team	Cost of networks	Cost of minimum threshold	Total costs	Total costs discounted (3.5%)	QALYs	QALYs discounted (1.5%)	Benefits	Cost effectiveness ratio (£/QALY)
1	2008/09	14.01	10.06	14.45	0.09	0.79	1.28	0.01	40.69	39.31	56	55	2.21	701,716
2	2009/10	0.00	11.18	18.17	0.04	0.79	1.28	0.01	31.46	29.37	662	643	25.72	44,833
3	2010/11	0.00	11.68	20.74	0.04	0.50	1.28	0.01	34.44	31.07	1,445	1382	55.27	21,503
4	2011/12	0.00	12.66	25.71	0.04	0.50	1.28	0.01	40.20	35.03	1,951	1838	73.54	17,952
5	2012/13	0.00	14.39	25.63	0.04	0.50	1.28	0.01	41.84	35.23	2,713	2518	100.72	12,988
6	2013/14	0.00	14.04	25.09	0.04	0.50	1.28	0.01	40.96	33.32	3,906	3573	142.90	8,530
7	2014/15	0.00	13.35	23.92	0.04	0.50	1.28	0.01	39.09	30.72	5,054	4554	182.17	6,079
8	2015/16	0.00	12.73	21.95	0.04	0.50	1.28	0.01	36.51	27.73	6,142	5452	218.08	4,515
9	2016/17	0.00	12.12	20.30	0.04	0.50	1.28	0.01	34.25	25.13	6,958	6085	243.41	3,612
10	2017/18	0.00	11.58	18.76	0.04	0.50	1.28	0.01	32.16	22.80	7,616	6562	262.48	2,994
11	2018/19	0.00	11.08	17.31	0.04	0.50	1.28	0.01	30.21	20.70	8,155	6923	276.93	2,538
12	2019/20	0.00	11.15	16.69	0.04	0.50	1.28	0.01	29.67	19.63	8,648	7233	289.32	2,270
13	2020/21	0.00	11.15	16.47	0.04	0.50	1.28	0.01	29.45	18.83	9,031	7442	297.68	2,085
14	2021/22	0.00	11.38	16.58	0.04	0.50	1.28	0.01	29.79	18.41	9,294	7545	301.80	1,980
15	2022/23	0.00	11.74	16.98	0.04	0.50	1.28	0.01	30.55	18.23	9,479	7581	303.26	1,924
16	2023/24	0.00	12.15	17.28	0.04	0.50	1.28	0.01	31.26	18.03	9,667	7618	304.71	1,865
17	2024/25	0.00	12.33	17.63	0.04	0.50	1.28	0.01	31.79	17.71	9,866	7660	306.39	1,795
18	2025/26	0.00	12.57	18.27	0.04	0.50	1.28	0.01	32.67	17.59	10,013	7659	306.36	1,757
19	2026/27	0.00	13.00	18.91	0.04	0.50	1.28	0.01	33.74	17.55	10,144	7645	305.79	1,730
20	2027/28	0.00	13.31	19.63	0.04	0.50	1.28	0.01	34.77	17.48	10,278	7631	305.25	1,700
	Total NPV	14.01 3810.13	243.85	390.45	0.85	10.58	25.60	0.17	685.51	493.87	131,078	107600	4304.00	4,590 (Mean)

FINAL COSTS (£m) - MAXIMUM

Screening 65 and 70 year olds

	Year	Staffing costs not part of unit cost of screening	Cost of screening	Cost of consultation and operations	Cost of audit	Cost of National Team	Cost of networks	Cost of minimum threshold	Total costs	Total costs discounted (3.5%)	QALYs	QALYs discounted (1.5%)	Benefits	Cost effectiveness ratio (£/QALY)
1	2008/09	14.01	15.45	14.68	0.09	0.79	1.28	0.01	46.31	44.75	441	434	17.36	101,557
2	2009/10	0.00	17.15	25.01	0.04	0.79	1.28	0.01	44.28	41.34	2,025	1965	78.61	20,420
3	2010/11	0.00	17.79	26.54	0.04	0.50	1.28	0.01	46.16	41.63	3,432	3282	131.28	12,131
4	2011/12	0.00	18.21	29.14	0.04	0.50	1.28	0.01	49.17	42.85	5,127	4831	193.24	8,358
5	2012/13	0.00	19.98	27.62	0.04	0.50	1.28	0.01	49.43	41.62	6,840	6349	253.97	6,085
6	2013/14	0.00	13.67	18.59	0.04	0.50	1.28	0.01	34.09	27.73	8,178	7479	299.17	3,391
7	2014/15	0.00	12.86	16.40	0.04	0.50	1.28	0.01	31.08	24.43	9,140	8235	329.40	2,673
8	2015/16	0.00	12.27	14.38	0.04	0.50	1.28	0.01	28.47	21.62	9,877	8768	350.71	2,189
9	2016/17	0.00	11.77	13.13	0.04	0.50	1.28	0.01	26.73	19.61	10,296	9005	360.19	1,905
10	2017/18	0.00	11.42	12.33	0.04	0.50	1.28	0.01	25.58	18.14	10,532	9075	363.02	1,722
11	2018/19	0.00	11.17	11.78	0.04	0.50	1.28	0.01	24.77	16.97	10,656	9046	361.85	1,592
12	2019/20	0.00	11.20	11.84	0.04	0.50	1.28	0.01	24.87	16.46	10,747	8988	359.53	1,532
13	2020/21	0.00	11.18	12.36	0.04	0.50	1.28	0.01	25.37	16.22	10,755	8863	354.51	1,509
14	2021/22	0.00	11.41	13.24	0.04	0.50	1.28	0.01	26.47	16.36	10,671	8663	346.54	1,533
15	2022/23	0.00	11.76	14.36	0.04	0.50	1.28	0.01	27.96	16.69	10,548	8437	337.49	1,582
16	2023/24	0.00	12.18	15.32	0.04	0.50	1.28	0.01	29.33	16.91	10,471	8252	330.06	1,615
17	2024/25	0.00	12.37	16.25	0.04	0.50	1.28	0.01	30.44	16.96	10,444	8109	324.34	1,624
18	2025/26	0.00	12.61	17.39	0.04	0.50	1.28	0.01	31.83	17.14	10,402	7957	318.26	1,646
19	2026/27	0.00	13.05	18.45	0.04	0.50	1.28	0.01	33.33	17.34	10,377	7820	312.81	1,671
20	2027/28	0.00	13.36	19.51	0.04	0.50	1.28	0.01	34.71	17.44	10,388	7713	308.50	1,679
	Total NPV	14.01 5238.82	270.86	348.34	0.85	10.58	25.60	0.17	670.41	492.21	171,347	143271	5730.84	4,679 (Mean)

Annex 5 - Equality Impact Assessment for Abdominal Aortic Aneurysm screening

Summary

Ministers announced in January 2008 the introduction of Abdominal Aortic Aneurysm (AAA) screening for men aged 65.

AAA occurs when the abdominal aorta is weakened and stretches to a diameter of 3cm or greater in the abdominal section. Most AAA do not produce symptoms for years, but as many as one in three eventually rupture if left untreated. Most patients with ruptured aneurysms either die before reaching hospital or do not survive emergency surgery.

The implementation of a national screening programme for AAA will:

- Increase the detection of AAAs
- Promote the use of cost effective interventions to enable early detection of AAAs and
- Provide doctors and patients with the required information to enable safe treatment of AAA

Early detection through screening can be achieved through a single ultrasound scan and enables regular surveillance over time and the offer of planned surgery at an appropriate time to repair it. The implementation of a national screening programme for AAA will mean there are fewer emergency admissions and a higher number of elective admissions therefore reducing the number of lives lost.

1. Discussions are underway with stakeholders to plan implementation starting with pilots in selected sites in England. The aim is for the programme to be operational in all SHAs over the next five years.

Assessment

There is inbuilt inequality within the AAA screening programme based on two specific points; age and gender. This is fully justified by high quality clinical evidence and recommends screening men aged 65 (this being the age at which risks of elective surgery following a positive screen and diagnosis were least) however, the evidence shows that there is no benefit of screening women.

The quality of data varies between the groups. Age and gender are well recorded and data is routinely available. Information on ethnicity, disability, religion or belief and sexual orientation is historically poorly recorded in NHS records although this is now improving.

	Age	Disability	Race	Religion and Belief	Gender	Sexual Orientation
1.a) Do different groups have different needs, experiences, issues and priorities in relation to the proposed policy?	y	n	n	n	y	n
1.b) Is there potential for or evidence that the proposed policy will promote equality of opportunity for all and promote good relations between different groups?	n	y	y	y	n	y
1.c) Is there potential for or evidence that the proposed policy will affect different population groups differently (including possibly discriminating against certain groups)?	y	n	n	n	y	n
1.d) Is there public concern (including media, academic, voluntary or sector specific interest) in the policy area about actual, perceived or potential discrimination against a particular population group or groups?	n	n	n	n	n	n
1.e) Is there doubt about answers to any of the above questions (for instance there is not enough information to draw a conclusion)?	n	n	n	n	n	n

Evidence

- Age

Age is a significant risk factor when screening for AAA. The Cochrane review recommended screening men between the ages of 65 to 79. The UK NSC recommended an age of 65 for the screen based on this being the age at which the risks of elective surgery following a positive screen and diagnosis were least. As age increases, the risks of surgery increase.

The MASS trial also found significant differences in uptake of AAA screening with age. Compared with men aged 65-69 those aged 70-74 were less likely to attend screening, and were less likely to attend for follow up.

- Disability

As part of the screening programme all men aged 65 will be offered screening for AAA.

Evidence drawn from other screening programmes suggests that uptake of screening is lower for people with disabilities. It is reasonable to expect this may also occur for AAA screening. The AAA trials reported no findings.

The screening test, carried out by an ultrasound scan is a simple, sensitive and reliable test. The hand held mobile device will enable trained screening technicians to manoeuvre the device in order for the man being screened to be as comfortable as possible.

Patient information will be available in different formats in order to accommodate patient needs.

Although screening centres have not yet been finalised, it is envisaged that sites will be based in community clinics, including hospitals and GP surgeries making the screening test as accessible as possible.

Screening site planners will be asked to assure accessibility and ensure sufficient space is available internally to accommodate wheelchairs.

- Race

The proposed policy is unlikely to have an immediate effect on race. All men aged 65 will be offered AAA screening regardless of ethnicity. Evidence shows however, that men of black race have a decreased risk of AAA.

The AAA trials reported no findings on differential access by racial group, however, the UK NSC review on equality did find lower uptake in BME populations which was drawn from experiences of other screening programmes. It is reasonable to expect that this situation will follow for AAA screening.

- Religion and belief

All men aged 65 will be offered screening for AAA regardless of their belief. Men will have the choice to accept screening or not as they wish.

- Gender

There is high quality evidence from a Cochrane review to suggest that there is a significant reduction in mortality from under going AAA screening in men, but not for women.

There is insufficient evidence to demonstrate benefit in women. The prevalence in AAA in women was 1.3%, compared to 7.6% in men. AAA are much less prevalent in women overall, occur on average 10 years later than in men, and are most likely to rupture after 80 years of age in which case there mortality rate from elective surgery would be too high. Scott RA, Bridgewater SG, Ashton HA, Randomised controlled trial of screening for AAA in women. Br J Surg 2002;89: 283-5 [PubMed}

- Sexual Orientation

All men aged 65 will be invited for AAA screening regardless of their sexual orientation.

Action plan

The outcome for the AAA screening programme is a reduction in mortality from related to AAA. With regard to equality, the goal is to achieve:

- Equal access to the test by all men aged 65 years

- Equal uptake of the screening test in all populations of men aged 65 years
- Equal access to surveillance and surgery where indicated as a treatment

The UK NSC commissioned a scoping report. Its purpose was to:

- Assess whether screening services achieved equality
- Assess the baseline position
- Develop options for further work on equality in screening programmes

Published evidence, confirmed by the experience of national screening programme managers showed that there is inequality in access among key population groups including those from socially disadvantaged circumstances, those with a disability and black and minority ethnic groups.

The report, presented to the UK NSC recommended that a UK wide project should be undertaken to address equality in screening. A project is currently being commissioned. It is anticipated the report will be due in Spring 2009.

A review of the AAA screening programme including monitoring and uptake of different groups will be undertaken once the first pilot sites have been implemented.

Evidence references

The MASS trial, a Medical Research Council funded randomised controlled trial in the UK with economic evaluation, which showed screening to be clinically and cost effective. This first reported in 2002.

A recent study reported a 7 year follow up on the MASS trial cohort and concluded that the early mortality benefit was maintained and cost effectiveness of screening improves over time.

A Cochrane Review in 2007 of four randomised controlled trial of screening in the UK, Denmark and Australia reported that "the results provide evidence of a benefit from screening in men with a strongly significant reduction in deaths from AAA"