

A budget impact analysis of implementing changes to the eligibility criteria for cochlear implants in NHS Scotland.

What were we asked to look at?

NHS National Services Division (NSD) asked us to estimate the potential budget impact of changing the eligibility criteria for cochlear implants in Scotland. This follows a change to NICE guidance in England, which includes modifications to the clinical criteria for what constitutes severe or profoundly deaf, and how 'adequate benefit' from hearing aids is measured.

Why is this important?

The Scottish Cochlear Implant Programme is a centrally provided national service, hosted within NHS Ayrshire & Arran and funded through NSD. Changes to the eligibility criteria will increase the number of people eligible for cochlear implants, which may have resource implications for the national service, depending on uptake. There is currently low uptake among the total eligible population in Scotland, and any change to criteria may also raise awareness of eligibility, leading to increased demand and a reduction in unmet need.

The revised criteria are already being implemented in England following an update to the NICE guidance in March 2019. There is a need for NSD to consider patient access in Scotland.

What was our approach?

We conducted a base case estimate and various scenario analyses for the budget impact of the proposed eligibility changes. The estimates were calculated over the next five years during which we expect the changes to take effect.

What next?

NSD will use the findings of this work to inform the funding allocation for the Scottish Cochlear Implant Programme.

Key points

- Cochlear implants are deemed to be clinically and cost effective based on pre-existing NICE technology appraisal guidance (TA566).
- Changes to the assessment of eligibility for cochlear implants is expected to increase the number of people eligible to receive a cochlear implant in Scotland.
 - Our main (base case) analysis suggests an increase in the number of patients treated from the current figure of 99 per year, to 173 patients receiving a cochlear implant year on year within five years – an increase of 74 per year.
 - This increase in annual patient numbers was varied in four scenario analyses ranging from 47 additional patients (a 37% increase) to 113 (114% increase).
 - These figures represent a 5% (3% to 8%) increase in the total number of patients known to the service (i.e. total patient cohort).
- The base case budget impact analysis illustrates that an estimated £2.27m additional funding is required annually. Depending on the range of uptake described above, the additional annual amount required could be between £1.5m and £3.4m.
- Costs were calculated across an anticipated five-year eligibility criteria implementation period, and annually thereafter. The per-patient cost analysis included the following: resource associated with additional patients referred to the service; implantation costs for those patients who are suitable and wish to proceed with surgery; hospital stay; annual post-implantation support; additional maintenance; spare parts and repairs; overheads; processor stock; and upgrade costs.
- The results may differ from the NICE analysis owing to the need for the base case analysis to use both population estimates and unit costs relevant to Scotland. The impact of applying the NICE costs was explored within scenario analyses.

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Introduction

The annual incidence of severe and profound hearing loss in children is expected to remain stable; an estimated one in every 1,000 children aged three years old, and two in every 1,000 children among the aged 9-16 years old age group are thought to be affected.^{1,2} Adult incidence estimates are not available but, since the service in Scotland began, the number of cochlear implant recipients is approximately 261 adults per million population (range between 200 to 555 per million population across NHS Board areas), and 395 children per (total child) population (range between 0 to 559 per million population across NHS Board areas).³ Overall prevalence of severe and profound hearing loss may increase depending on the population structure (e.g. the estimated life expectancy of an ageing population).

By providing cochlear implants, the NHS aims to improve the hearing and quality of life of those with permanent, bilateral, severe to profound sensorineural hearing loss if they do not gain adequate benefit from conventional acoustic hearing aids.¹ In Scotland, cochlear implantation is considered a specialised service⁴ and NHS National Services Division (NSD) commission NHS Ayrshire and Arran to provide this service centrally through the Scottish Cochlear Implant Programme based at University Hospital Crosshouse.¹

There is no upper age limit for adult referrals to the service, although all participants are required to be sufficiently physically and mentally fit for surgery, and to participate in programming sessions.¹ There is no upper age limit for children either, although both children and adults must have experienced sufficient exposure to spoken language to be eligible. There is no specified lower age limit, but to maximise the benefit received from a cochlear implant (particularly with regard to neuroplasticity in children) it is best for children to receive the implant when they are aged between 12-18 months. However, even among some congenitally deaf children, cochlear implantation may be possible up to the age of five years old provided they have the potential to benefit, have developed adequate listening skills through consistent use of hearing aids and can give sufficient feedback for device programming.¹

Current eligibility thresholds for cochlear implants in NHS Scotland are dependent on testing a person's level of profound hearing loss using various tests, following recommendations made by the National Institute for Health and Clinical Excellence (NICE) in Technology Appraisal Guidance TA166 in 2009.⁵ Changes to these eligibility criteria - warranted on a clinical basis in relation to how severe to profound hearing loss are defined - have recently been accepted by NICE and in March 2019 they issued updated guidance on cochlear implants in Technology Appraisal Guidance TA566.²

The changes to definitions for children and adults as described in NICE TA566 are presented in Table 1.

Table 1: Definitions of Eligibility for Cochlear Implants

	Severe/Profound hearing loss	Adequate benefit from hearing aids
Adult (previous)	people who could not hear sounds quieter than an average of 90 dB HL when tested at frequencies of 2 kHz and 4 kHz without acoustic hearing aids	could identify 50%* or more of keywords at a sound intensity of 70 dB SPL in quiet conditions
Adult (revised)	Sounds > than 80 dB HL (pure-tone audiometric threshold equal to or greater than 80 dB HL) at 2 or more frequencies (500 Hz, 1,000 Hz, 2,000 Hz, 3,000Hz and 4,000 Hz) bilaterally without acoustic hearing aids	a phoneme score of 50% or greater on the Arthur Boothroyd word test presented at 70 dBA
Child (current)	See adult definition	development and maintenance of speech, language, communication and listening skills that are appropriate for the age, developmental stage and cognitive ability of the child.
Child (revised)	See adult definition	speech, language and listening skills appropriate to age, developmental stage and cognitive ability

*in Scotland a threshold of 30% was used until fairly recently

It is expected that implementation of the changes to the eligibility criteria will require additional resources. As part of the NICE guidance update, a Resource Impact Template (RIT) and costing statement were included.² Owing to differences in the way in which funding is provided for cochlear implants in Scotland, the Scottish Health Technologies Group (SHTG) was asked by NSD to explore the corresponding budget impact for Scotland. This report summarises our findings.

Health technology description

A cochlear implant is an electronic device. Unlike conventional hearing aids which work by making sounds louder, a cochlear implant provides direct electrical stimulation to the nerve endings (spiral ganglion) in the cochlea. Hearing aids are not expected to benefit those who have a severe to profound sensory hearing loss because for these people the sensors (hair cells) in the cochlea are absent, significantly reduced or do not function correctly and do not

transmit the required information to the spiral ganglion. By bypassing these sensors (hair cells) and stimulating the nerve endings directly, cochlear implants allow the nerve to convey the information to the brain in the same way that it does for those who do not have severe to profound sensory hearing loss.¹

A cochlear implant has two parts. The passive internal part is surgically implanted and consists of a receiver/stimulator package and an electrode array. The active part of the device which powers and activates the internal part is externally worn behind the ear and consists of a sound processor and a transmit coil. The processor is programmed to ensure it delivers the appropriate patterns of electrical stimulation to each electrode on the electrode array within the internal part of the implant inserted into the cochlea, in order to provide the user with a meaningful sound sensation.¹

There is no relevant comparator for this technology as the eligible population are not expected to derive benefit from hearing aids. However, it should be noted that some people - who meet the eligibility criteria - will not consider meeting these criteria to be an impairment.

Clinical effectiveness

The clinical effectiveness of cochlear implants is not being considered as part of this work as this was established by the original NICE TA166 guideline in 2009.⁵ This guideline included a systematic review of 33 studies, of which 13 involved adults and 20 involved children, and additional data submitted by three companies (Advanced Bionics UK, Cochlear Europe and MED-EL UK) on the effectiveness of their own systems.

Safety

No safety issues related to cochlear implants were identified in the work to inform this budget impact analysis. Data from the Scottish Cochlear Implant Programme indicate a good safety record and no adverse events occurred in 2018/19.¹

Patient and social aspects

The analysis takes an NHS perspective and so does not include patient or wider societal costs within the budget impact analysis. The perspective is appropriate to the remit of the work and the timeframe, although it is accepted that consideration of alternative perspectives can be particularly valuable for this population.⁶

Cost effectiveness

The cost-effectiveness of cochlear implants was demonstrated within the original NICE technology appraisal. This involved a review of economic evidence that identified nine studies taking an NHS perspective, with incremental cost-effectiveness ratio (ICER) values ranging from £2,000 to £20,000 per quality-adjusted life-year (QALY) gained for children, and £11,000 to £18,000 per QALY gained for adults. Additional submissions from three manufacturers (Advanced Bionics UK, Cochlear Europe and MED-EL UK) were considered and the NICE assessment group conducted additional cost-effectiveness modelling at that time to inform its recommendations.

Budget Impact

The following analysis estimates the potential budget impact of changes to the eligibility criteria for cochlear implants in Scotland, as a result of modifications to the clinical criteria for what constitutes severe or profoundly deaf, and how 'adequate benefit' from hearing aids is measured.

Methodology

The following data were captured to inform the assessment:

Population Estimates

Population estimates were taken from the latest mid-year estimates from the National Records of Scotland (NRS) for adults (aged 18 years and over) and children (aged 0 to 17 years) separately.⁷ The sources used are consistent with the ONS data used elsewhere.⁸ The base case assumes that the adult population is aged 18 and over^a.

The proportionate size of the Scottish population compared to England is 9.75%⁹, and this enabled the increased numbers of patients receiving cochlear implants in Scotland to be calculated directly from the NICE RIT population estimates.⁸

The base case does not include the impact of changes to the composition of the Scottish population over time in terms of age or population projections relating to migration. Data are available on population projections for Scotland, but over a much longer timeframe than the five year implementation period, and are not broken down by age.

^a Some data sources may include data on those aged 18 years old within their child estimates. We tried to account for this in our analysis wherever it had been mentioned but it was not always clear.

Mortality

All-cause mortality adjustments were made to the revised estimates in the NICE RIT, on the basis that a small number of people may die before they can receive a cochlear implants for which they have become eligible.⁸ The reasoning within the NICE analysis was applied here; no additional significant excess mortality is associated with being deaf, and that some people subscribe to a ‘cultural model of deafness’ in which it is not considered an impairment.² However, the extent to which the cultural model of deafness is accepted may depend on whether a person has become deaf after having functioned for much of their life in a hearing environment, or whether they were born deaf into a hearing family. The net impact overall is unclear on mortality is unclear, hence the use of all-cause mortality.

Current eligibility and uptake of a suitable cochlear implant

Direct data from the Scottish service show that 72 adults and 29 children (101 total) received cochlear implants in 2018/19. This translates to 0.0016% of the total population for adults and 0.0028% of the total population for children (Table 2). Applying pro-rata estimates based on the Scottish population to the British Cochlear Implant Group (BCIG) data for the UK - as was the method used in the NICE RIT - the corresponding totals for Scotland equates to 82 adults and 42 children (0.0019% and 0.0041% of the Scottish population totals).

The base case used the direct estimates, because using the pro-rata BCIG data would give a total of 124 patients receiving implants which exceeds the current funding allocation for the number of anticipated patients seen in the Scottish Cochlear Implant Programme (110 patients). However, scenario 2 uses these data to provide an alternative estimate for the budget impact, on the basis that the key information of interest is the number of *additional* patients, rather than the method that best predicts current numbers seen.

Table 2 – Estimating current and future population receiving cochlear implants.

Uptake % from total population	Current Adult	Current Child	Future Adult	Future Child
% derived from numbers according to pro-rata BCIG (UK)¹¹ data.^b Estimates for England only	0.002%	0.0035%	-	-
% derived from numbers according to pro-rata BCIG (UK)¹¹	0.0019%	0.0041%	-	-

^b NB: There is a typo in the second slide whereby the total new cases for the whole of the UK should read 1504 not 1404 – the NICE results are unaffected].

Estimates for Scotland only				
% derived from external model and in proportion with current practice rates (England)	-	-	0.0036%	0.0050%
Scotland – derived from external model and other sources	-	-	0.0032%	0.0069%
Scotland – direct referral data¹ (base case)	0.0016%	0.0028%	0.0029%	0.0039%

Future eligibility and uptake

Changes to the number of people receiving cochlear implants will result from:

- the estimated number of people becoming eligible due to the criteria changes;
- any additional changes to uptake among those who are already currently eligible, perhaps owing to increase awareness of the service and/or the criteria;
- changes to the overall population and its composition in terms of age.

NICE applied revised uptake estimates following the criteria change based on an external manufacturer model that revised the UK total number of referrals. The total of new referrals estimated for England was split to retain the same proportions of adult/child and unilateral/bilateral implants as seen under current practice. The NICE method was applied to the proportional Scottish population, giving an estimate for Scotland of 210 patients per annum in total, of which 139 (66.2%) are expected to be adult patients and 71 (33.8%) are expected to be children.

The robustness of this assumption was tested by applying the direct data on implants received at the Scottish Cochlear Implant Centre, and calculating the increase as proportionate to the increase shown in the NICE estimates for eligibility (where it was a 70.87% increase overall; a 44.2% increase for the child population and an 83.6% increase in the adult population). This approach resulted in an expected increase to 173 patients in Scotland; 41 child and 132 adult patients receiving implants.

Beyond the new eligible population, additional uptake among those already eligible for cochlear implants is possible. Increased public awareness is assumed to have led to peaks in new referrals to the Scottish Cochlear Implant Programme previously. However, is difficult to estimate what the additional change in uptake might be, and the scenario analyses presented account for some additional uptake from among the currently eligible population within Scotland.

The timing of the impact on resources may not be proportionately distributed across the next five years. Some individuals may be eagerly awaiting the implementation of the revised eligibility criteria if they expect to meet the new definitions, in which case uptake rates may peak in the early years of implementation but then return to a steady state. Conversely, it may be that public awareness of the changes to eligibility increases over time more gradually and uptake rates may therefore peak later on. The latter is assumed both in the NICE RIT and in this base case analysis, whereby uptake is 20% in year 1, 40% in year 2, 60% in year 3, 80% in year 4 and 100% in year 5.

A list of population parameter values used in the base case and scenario analyses are provided in Table 3.

Table 3 – Parameter Estimates used in the budget impact analysis

Parameter	Base case value	Scenario 1 9.75% of NICE values	Scenario 2 BCIG data for UK but Scotland is 8.2%	Scenario 3 BCIG data for current, base case values for future	Scenario 4 Base case values for current, BCIG data for future
Child population	1,028,798	1,149,065	1,028,798	1,028,798	1,028,798
Adult population	4,409,302	4,239,572	4,409,302	4,409,302	4,409,302
% of current population eligible (child)	0.0028%	0.0036%	0.0041%	0.0041%	0.0028%
% of current population eligible (adult)	0.0016%	0.0020%	0.0019%	0.0019%	0.0016%
% of future population eligible (child)	0.0040%	0.0050%	0.0069%	0.0040%	0.0069%
% of future population eligible (adult)	0.0030%	0.0036%	0.0032%	0.0030%	0.0032%
% of current child implants unilateral	12.0%	18%	18%	12.0%	18%
% of current child implants bilateral	88.0%	82%	82%	88.0%	82%
% of current adult implants unilateral	97.1%	99%	99%	97.1%	99%
% of current adult implants bilateral	2.9%	1%	1%	2.9%	1%

Parameter	Base case value	Scenario 1 9.75% of NICE values	Scenario 2 BCIG data for UK but Scotland is 8.2%	Scenario 3 BCIG data for current, base case values for future	Scenario 4 Base case values for current, BCIG data for future
% of future child implants unilateral	12.0%	18%	18%	18%	12.0%
% of future child implants bilateral	88.0%	82%	82%	82%	88.0%
% of future adult implants unilateral	97.1%	99%	99%	99%	97.1%
% of current adult implants bilateral	2.9%	1%	1%	1%	2.9%

Cost Estimates

Costs have been provided by the Scottish Cochlear Implant Programme.¹ Recurring costs include staffing costs (salaries), implantation costs including surgery, inpatient stay and equipment, direct supply costs for spares, repairs and other calibration costs, as well as overhead costs. Table 4 presents the cost data used within the base case analysis.

Table 4: Unit cost components applied in base case

Component	Base case value per patient
Assessment (child)	£1346
Assessment (adult)	£1210
Unilateral - Hospital Admission, Surgery and Equipment costs	<u>Commercial in Confidence</u>
Bilateral - Hospital Admission, Surgery and Equipment costs	<u>Commercial in Confidence</u>
Maintenance and Programming (Year 1)	£123

Component	Base case value per patient
Maintenance and Programming (Year 2 onwards)	£31
Rehabilitation (Year 1) – Children only	£123
Rehabilitation (Year 2 onwards) – Children only	£31
Other (includes annual processor upgrade costs to keep up with demand, overheads)	£7,536
Unilateral - savings expected	£322
Bilateral – savings expected	£423

The base case cost estimates also took into account the likely service impact. In practice, increasing procedure numbers beyond an additional 50 patients per annum receiving cochlear implant surgery³ would necessitate increased theatre session capacity. As the cochlear implantation procedure takes 2 hours, and theatre lists are expected to host 2 to 4 patients, an additional weekly theatre list may be anticipated.

There is a corresponding need to provide additional assessment and multidisciplinary team (MDT) clinics for increased numbers of patient referrals, even if these cases do not result in surgery. Currently 24 clinics are provided annually, each hosting between 3 to 7 patients; therefore the maximum number of referrals the service can comfortably see for assessment in 1 year is 168.

The following routine cost data - predominantly from ISD¹³ and the PSSRU Unit Costs of Health and Social Care¹⁴ – were applied in the base case analysis:

- Assessment assumes three outpatient visits per patient receiving an implant in addition to the original GP referral, a local ENT outpatient appointment, audiology visit and imaging tests (which are conducted at the source referral site in an assumed 70% of referrals). For the remaining 30%, CT/MRI and ABR assessment costs are included for the national centre in Ayrshire. A paediatric inpatient cost is also applied to 5% of paediatric patients, owing to the need for general anaesthetic among those who go on to receive an implant. An uplift is applied to account for the fact that in addition to those receiving a cochlear implant, other patients being referred will also require assessment that does not result in surgery (in approximately 45% of cases) and additional resource use from these patients also needs to be included in the analysis.

- Surgery costs including the cost of equipment, the theatre costs and the required specialty inpatient costs for the post-operative stay in hospital for all new and repeat referrals that proceed to implantation.
- Maintenance and programming costs following implantation include eight clinical scientist visits in year 1, falling to two from year 2 onwards.
- Rehabilitation costs apply to children receiving cochlear implants, and this involves eight visits in year 1, falling to one visit by year 2 onwards.
- Other costs include an addition to the number of stock processors being purchased because this is expected to correspond to the number of new patients receiving a cochlear implant each year. Although this is inclusive of processors being lost or damaged beyond repair each year, it is assumed that the cost of 2.5% of all stock processors being damaged could be recouped through warranties.
- The cost of upgrades to processors was applied separately based on annual spend data provided, but allocated as a per-patient (“on the books”) annual additional cost.^c A per-patient cost for additional overheads was also based on the total number of patients on the books. Extra costs of outsourcing that may be incurred if additional patient numbers breach current theatre list capacity at the hospital were accounted for (i.e. beyond an additional 50 patients).
- Savings expected as a result of reduced use of services for hearing aids among those now receiving cochlear implants instead. NICE Resource Impact costs have been used in lieu of the ISD outpatient Hearing Aid clinic cost including the device component. Savings associated with hearing aid repair costs have been added to the per annum saving at a rate of 4% based on the number of people needing repairs to cochlear implant processors per annum.

A scenario analysis applied the unit costs provided in the NICE Resource Impact Report.⁸

Limitations of the analysis

Although the analysis accounts for various factors, some remain outwith the scope of this work. These are as follows:

- That local GPs, audiologists and paediatrician behaviour will not change (i.e. behaviour is not expected to become more relaxed or strict compared to how criteria for referral were implemented previously).

^c We applied overhead, upgrades and spare parts as dependent on the increased patient numbers as a proportion of the numbers of all patients “on the books” because there was negligible difference compared with using the additional number of ears “on the books” as a proportion of all ears “on the books”.

- It is assumed that the number of patients seen will increase. It did not seem plausible, under the circumstances that patient numbers will decrease. But it is difficult to predict whether the uptake *rate* will increase or decrease. For instance, a higher proportion of those referred may not be candidates (even if the assumption above holds that GP, audiologist and paediatrician behaviour will not change). The analysis assumes uptake rates will remain stable but it is acknowledged there is considerable uncertainty.
- Hair cell regeneration has not been included in our analyses as that is treatment is not expected to be available within the next 10 years.¹ A conservative decision has been taken so that virtual check-up ‘app’ technologies are not included in the analysis, even though in the medium to longer term such technologies could reduce costs.

Results

A detailed breakdown of the base case budget impact expected for each of the next five years is provided in Table 5. Results indicate that additional investment of £2.27 million is required annually to meet the increased demand. Scenario analysis results are provided in Table 6 and indicate a range for the additional funding required, of between £1.5m and £3.4m annually.

It should be noted that uptake rates have been phased within the model. As presented within Table 5, the net budget impact is £790,000 in year one rising to £3.57m in year 5 once all eligible individuals have benefitted from the service.

All scenario analyses were re-run using the unit costs from the NICE Resource Impact Analysis, and the results were found to be similar. It is difficult to account for variation without investigating in detail what is and is not included within each of the tariff prices used by NICE, for example, how ‘other’ costs are defined.

One notable difference in approaches is that the NICE analysis assumes assessment costs only under circumstances where the patient went onto receive an implant. An uplift to assessment costs was added to account for the fact that there will still be costs associated with assessment even if the process does not result in a cochlear implant being received by the patient, and it is assumed that surgery takes place in only 55% of referrals.

Table 5: Results of the base case budget impact analysis

Component	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
A: Annual Numbers Treated (previous criteria)	99	99	99	99	99	99	99
B: Annual numbers treated (new criteria)	173	173	173	173	173	173	173
Increase C = (B-A)	74	74	74	74	74	74	74
Treated in same year of incidence D= A+((C/5)*Column Year number)	99	114	129	143	158	173	173
Displaced patients (from this calendar year who are treated in the following calendar year during implementation phase) E: (0.2*Column Year number)*C	0	15	30	45	60	0	
F: Mortality		0	1	3	4	6	
Treated this calendar year (less mortality rate) G = D+(E for Column Year Number -1)-F		114	142	170	198	226	173
Additional patients being treated this year H = G-(D for Column Year Number – 1)		15	28	41	54	67	-
Additional Costs (£000)		£794.8	£1,511.3	£2,228.4	£2,939.9	£3,642.3	£2,369.8
<i>Of which - Implants, Procedure and Stay</i>		<u>CiC</u>	<u>CiC</u>	<u>CiC</u>	<u>CiC</u>	<u>CiC</u>	<u>CiC</u>
<i>Of which - Assessment</i>		£680,009	£1,293,014	£1,906,526	£2,515,181	£3,116,121	£1,731,178
<i>Of which - Maintenance and Programming</i>		£93,969	£178,679	£263,459	£347,568	£430,610	£90,632
<i>Of which - Rehabilitation:</i>		£17,940	£34,112	£50,298	£66,356	£82,210	£18,062
<i>Of which - Other</i>		£2,910	£5,534	£8,160	£10,765	£13,337	£3,007
Change in spend expected through reduced hearing aids (£000)		- £5.15	- £15.44	- £30.87	- £51.45	- £77.18	-£102.91
Net additional budget impact needed (£000)		£789.7	£1,495.9	£2,197.6	£2,888.4	£3,565.1	£2,266.9

Table 6: Scenario analyses around the results

Component	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Thereafter additional annual spend needed
Base case numbers – see also Table 5 “Treated this calendar year (less mortality rate)”	99	114	142	170	198	226	173
Base case net budget impact		£789,683	£1,495,903	£2,197,570	£2,888,415	£3,565,096	£2,266,884
Base case assumptions with NICE unit costs – net budget impact		£1,245,247	£2,362,152	£3,474,856	£4,573,495	£5,652,811	£2,285,571
Scenario 1 Numbers assuming population is 9.75% of NICE estimates for England	126	143	175	207	238	270	210
Scenario 1 net budget impact		£908,389	£1,713,795	£2,516,446	£3,307,670	£4,083,065	£2,570,900
Scenario 1 with NICE unit costs – net budget impact		£1,447,587	£2,734,933	£4,021,374	£5,293,122	£6,543,183	£2,604,552
Scenario 2 Numbers applying same method as NICE but using Scottish proportion of the BCIG data	126	143	176	209	241	274	212
Scenario 2 net budget impact		£974,934	£1,841,660	£2,704,993	£3,556,047	£4,390,263	£2,649,089
Scenario 2 with NICE unit costs – net budget impact		£1,556,737	£2,944,683	£4,330,814	£5,700,977	£7,047,907	£2,841,413
Scenario 3	99	122	165	209	252	294	212

Component	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Thereafter additional annual spend needed
Numbers using base case data to estimate current eligibility but using the NICE BCIG method for future uptake							
Scenario 3 net budget impact		£1,236,025	£2,371,106	£3,489,000	£4,586,030	£5,659,305	£3,405,499
Scenario 3 with NICE unit costs – net budget impact		£1,910,242	£3,669,121	£5,405,787	£7,114,574	£8,791,023	£3,734,233
Scenario 4 Using the NICE BCIG method for current numbers but the NICE BCIG method for future eligibility estimates	126	135	153	170	187	205	173
Scenario 4 net budget impact		£526,892	£962,570	£1,407,720	£1,850,742	£2,286,578	£1,510,557
Scenario 4 with NICE unit costs – net budget impact		£886,364	£1,621,907	£2,375,580	£3,127,918	£3,870,437	£1,392,834

Conclusion

Owing to recent changes to the eligibility criteria for cochlear implants, the base case results of this budget impact analysis indicate that additional funding of £2.27 million per year may be required to meet unmet need. Depending on uptake, the overall annual resource impact could be as low as £1.5m and as high as £3.4m per year. There remains substantial uncertainty surrounding the anticipated uptake rates.

Equality and diversity

Healthcare Improvement Scotland is committed to equality and diversity in respect of the nine equality groups defined by age, disability, gender reassignment, marriage and civil partnership, pregnancy and maternity, race, religion, sex, and sexual orientation.

The process for producing evidence syntheses has been assessed and no adverse impact across any of these groups is expected. The completed equality and diversity checklist is available on www.healthcareimprovementscotland.org

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- 8 NICE TA566 Resource Impact Template, available at <https://www.nice.org.uk/guidance/ta566/resources>
- 9 Office of National Statistics, UK Population Estimates 2018, available at <https://www.ons.gov.uk/file?uri=/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/populationestimatesforukenglandandwalesscotlandandnorthernireland/mid2001tomid2018detailedtimeseries/ukpopulationestimates18382018.xlsx>
- 10 Personal Communication T Mann, 26th June 2019
- 11 BCIG Cochlear Implant Activity for 2018, available at <https://www.bcig.org.uk/wp-content/uploads/2018/09/CI-activity-2018.pdf>
- 12 Personal Communication, Alex Little, 15th July 2019
- 13 ISD Cost Book 2017/18, available at <https://www.isdscotland.org/Health-Topics/Finance/Costs/File-Listings-2018.asp>
- 14 PSSRU Unit Costs of Health and Social Care, available at <https://www.pssru.ac.uk/project-pages/unit-costs/unit-costs-2018/>

Appendices

Table A1: Detailed Tables for Projected Patients Seen (Scenario 1)

Component	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
A: Annual Numbers Treated (previous criteria)	126	126	126	126	126	126	126
B: Annual numbers treated (new criteria)	210	210	210	210	210	210	210
Increase C = (B-A)	84	84	84	84	84	84	84
Treated in same year of incidence D= A+((C/5)*Column Year number)	126	143	160	177	193	210	210
Displaced patients (from this calendar year who are treated in the following calendar year during implementation phase) E: (0.2*Column Year number)*C			17	34	51	68	0
F: Mortality			2	4	5	7	
Treated this calendar year (less mortality rate) G = D+(E for Column Year Number -1)-F		143	175	207	238	270	210
Additional patients being treated this year H = G-(D for Column Year Number – 1)		17	32	47	62	77	0
Additional Costs (£000)		£914.6	£1,732.0	£2,552.6	£3,367.5	£4,172.6	£2,687.8
Savings expected through reduced hearing aid use (£000)		£5.87	£17.61	£35.23	£58.72	£88.07	£117.43
Net additional budget impact needed (£000)		£908.7	£1,714.4	£2,517.3	£3,308.8	£4,084.5	£2,570.3

Table A2: Detailed Tables for Projected Patients Seen (Scenario 2)

Component	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
A: Annual Numbers Treated (previous criteria)	126	126	126	126	126	126	126
B: Annual numbers treated (new criteria)	212	212	212	212	212	212	212
Increase C = (B-A)	86	86	86	86	86	86	86
Treated in same year of incidence D= A+((C/5)*Column Year number)	126	143	160	178	195	212	212
Displaced patients (from this calendar year who are treated in the following calendar year during implementation phase) E: (0.2*Column Year number)*C			17	34	51	68	0
F: Mortality			2	4	5	7	
Treated this calendar year (less mortality rate) G = D+(E for Column Year Number -1)-F		143	176	209	241	274	212
Additional patients being treated this year H = G-(D for Column Year Number – 1)		17	33	48	64	79	0
Additional Costs (£000)		£981.2	£1,860.2	£2,741.8	£3,617.2	£4,481.8	£2,769.2
Savings expected through reduced hearing aid use (£000)		£6.04	£18.11	£36.22	£60.36	£90.54	£120.72
Net additional budget impact needed (£000)		£975.1	£1,842.1	£2,705.6	£3,556.8	£4,391.2	£2,648.5

Table A3: Detailed Tables for Projected Patients Seen (Scenario 3)

Component	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
A: Annual Numbers Treated (previous criteria)	99	99	99	99	99	99	99
B: Annual numbers treated (new criteria)	212	212	212	212	212	212	212
Increase C = (B-A)	113	113	113	113	113	113	113
Treated in same year of incidence D= A+((C/5)*Column Year number)	99	122	144	167	190	212	212
Displaced patients (from this calendar year who are treated in the following calendar year during implementation phase) E: (0.2*Column Year number)*C			23	46	69	92	0
F: Mortality			2	4	6	8	
Treated this calendar year (less mortality rate) G = D+(E for Column Year Number -1)-F		122	165	209	252	294	212
Additional patients being treated this year H = G-(D for Column Year Number – 1)		23	43	64	85	105	0
Additional Costs (£000)		£1,244.2	£2,395.3	£3,537.1	£4,665.9	£5,778.9	£3,562.5
Savings expected through reduced hearing aid use (£000)		£7.89	£23.66	£47.33	£78.88	£118.32	£157.77
Net additional budget impact needed (£000)		£1,236.3	£2,371.6	£3,489.8	£4,587.0	£5,660.5	£3,404.8

Table A4: Detailed Tables for Projected Patients Seen (Scenario 4)

Component	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
A: Annual Numbers Treated (previous criteria)	126	126	126	126	126	126	126
B: Annual numbers treated (new criteria)	173	173	173	173	173	173	173
Increase C = (B-A)	47	47	47	47	47	47	47
Treated in same year of incidence D= A+((C/5)*Column Year number)	126	135	145	154	164	173	173
Displaced patients (from this calendar year who are treated in the following calendar year during implementation phase) E: (0.2*Column Year number)*C			9	18	27	36	0
F: Mortality			2	3	4	6	
Treated this calendar year (less mortality rate) G = D+(E for Column Year Number -1)-F		135	153	170	187	205	173
Additional patients being treated this year H = G-(D for Column Year Number – 1)		9	17	25	33	41	0
Additional Costs (£000)		£530.4	£972.8	£1,428.0	£1,884.4	£2,336.9	£1,575.9
Savings expected through reduced hearing aid use (£000)		£3.29	£9.87	£19.73	£32.89	£49.33	£65.78
Net additional budget impact needed (£000)		£527.1	£963.0	£1,408.3	£1,851.5	£2,287.5	£1,510.1