Screening in child health

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Screening programmes in child health have evolved on the basis of individual enthusiasm and professional consensus, rather than being based on objective evidence of benefit. Three reviews have been carried out in the UK over the past 10 years. The only programmes which show robust evidence of effectiveness are those for PKU and hypothyroidism. The value of screening for hearing loss and vision defects is widely accepted, but there are many unresolved issues. Programmes for detection of congenital dislocation of the hip, congenital heart disease and growth disturbances are of doubtful value. Early identification of developmental problems is stressed by parents, but screening may not be the best way to achieve this. The UK programme of well-child care places increasing emphasis on promotion of physical and emotional health; screening tests should either be subjected to quality monitoring, or removed from the programme if they cannot fulfil the classic criteria of Wilson and Jungner.

The routine checking of apparently healthy children is a popular activity throughout the western world, but does it offer value for money? Screening in childhood is rarely carried out in isolation; rather, it is packaged with other tasks such as immunization, advice and support in a programme commonly known in the UK as child health surveillance (CHS). Three working parties have reported on the role of CHS in the past 10 years and many systematic reviews and much research have been commissioned. The evidence is not, and probably never will be, complete; nevertheless, pragmatic guidelines and decisions about screening policy have to be made. This evidence-based approach has produced a programme of preventive child care that is probably the leanest in the western world and the one with the most clearly articulated aims. It remains to be shown how the benefits will compare with more intensive packages such as the Bright Futures programme in the US.

Four types of child health screening programme can be identified (Table 1). The screening tests with the most robust evidence of effectiveness are those for PKU and hypothyroidism. There are many other procedures for which the evidence is scanty and many have been discontinued because they did not fulfil the classic criteria and may even
Table 1 Four types of screening programmes currently available

1 **Biochemical**: PKU, hypothyroidism; additional screening possible for other inherited metabolic disorders by tandem mass spectrometry; screening for cystic fibrosis, Duchenne muscular dystrophy, neuroblastoma, haemoglobinopathies, fragile-X, maternal HIV, lead intoxication.

2 **Screening involving objective measurements**: vision screening; hearing screening; blood pressure; growth monitoring – height, weight and head circumference.

3 **Screening involving physical examination procedures**: congenital dislocation of the hip; spinal defects; congenital heart disease; genitalia and undescended testes; adolescent scoliosis. It is also possible to consider the complete physical examination as a single screening entity.

4 **Screening involving an understanding of child development**: recognition of cerebral palsy and other motor disorders; speech, language and communication disorders, including autism; behavioural and emotional disorders; screening for parental mental health problems which may affect the child.

Screening for hearing and vision deficits

Fifty years ago it was not uncommon for deaf, blind or partially sighted children to be misdiagnosed as mentally retarded or behaviour disordered. A screening method for hearing loss was developed by the Ewings\(^7\) and introduced in 1957. Sheridan was the first to seek simple methods of testing for visual deficits – the STYCAR tests\(^5,8\) (Sheridan Tests for Young Children and Retardates). The emerging concept of the critical or sensitive period in biological research suggested that early deprivation of input, via the special sense organs to the brain, would result in irreparable limitation of neural development, lending a sense of urgency to the detection and remediation of defects.

To most parents and professionals it seemed self-evident that early detection of sensory deficits must be desirable. By the end of the 1960s these procedures had become a cherished part of routine well-child care.
and were not questioned for another 10 years. The difficulties that now arise in evaluating and changing, or discontinuing these long-established activities exemplify the hazards of launching screening programmes before they have been fully assessed.

### Hearing screening

**Justification.** Approximately 840 children each year are born in the UK with a hearing impairment that substantially affects quality of life for them and their family. The vast majority of these children have sensorineural hearing loss. Children with even a modest permanent congenital hearing impairment (PCHI) have increased difficulty in language acquisition and those with a hearing loss of 55 dB or greater rarely learn to talk without intervention. Provision of amplification and expert teaching ensure that most children will acquire at least some spoken language and comprehension of speech.

**Middle ear disease – an added complication.** The following discussion focuses on PCHI, but the difficulties of evaluating screening for PCHI are compounded by the explosion of interest in screening for conductive deafness due to secretory otitis media, or otitis media with effusion (OME), over the past two decades. This arose from concern that mild hearing loss due to OME might have subtle but potentially serious and long-lasting effects on behaviour, language acquisition, reading and general health. Screening tests which had been introduced to identify PCHI of moderate degree or worse, were now asked to take on the job of identifying OME, a task for which they were quite unsuitable. Recent evidence suggests that these supposed adverse outcomes from OME are of less concern than originally predicted and screening is no longer thought appropriate for a condition which is in a state of constant change and has a highly variable natural history. Parent and professional vigilance is the key to detecting those cases of OME which are of real significance to the child (Table 2).

The justification for screening is 2-fold: first, that early diagnosis improves outcome; second, that PCHI is not obvious to the parents. Evidence as to whether age of diagnosis and of intervention is important to outcome is very difficult to gather. In the absence of any screening programme, the age of diagnosis is affected by parents' attitudes and education and by the severity of the hearing loss, factors which also affect the prognosis. Outcome can be measured in terms of early progress in language development, but arguably the most important outcomes are to do with quality of life as an adult, in terms of mental and emotional health, employment and relationships. Furthermore, if
Table 2  Epidemiology of hearing loss

Estimated birth prevalence of congenital sensorineural hearing loss (SNHL) defined as > 40 db in the better ear averaged over the frequencies 0.5, 1, 2, and 4 kHz is 1.16 per 1000.

1.3 children per 1000 have this degree of hearing loss and need a hearing aid. The difference between this and the birth prevalence is accounted for by acquired hearing loss and conductive hearing loss.

The incidence of SNHL is at least 10 times higher in babies admitted to neonatal intensive care units.

At least half of all children have at least one episode of otitis media with effusion (OME). Around 7% have OME for at least half the time between 2 and 4 years.

Parents are pressured into compliance with intensive early intervention before they are emotionally prepared to handle the diagnosis of deafness, they may become alienated from the whole process. Some parents who are themselves deaf and reliant on sign language resent the implication that their language is somehow second best to spoken language and prefer to teach their child signing as his first language. Notwithstanding all these difficulties, however, a recent review concluded that early diagnosis is beneficial – early, in this context, means in the first few months of life. There remains some uncertainty about the magnitude of the benefit, but the need to identify cases and give a trial of conventional amplification before cochlear implantation have added impetus to the arguments for early detection. Although much remains to be learned about long-term prognosis for cochlear implants, the excellent results now being obtained when this procedure is undertaken at a young age have transformed the outlook for many severely and profoundly deaf children.

Screening would only be justified if parents could not identify PCHI themselves. Hearing impaired children look normal and apparently behave like other children, though there are subtle changes in their pattern of babble and communication. Parents do identify a proportion of cases, but a combination of uncertainty about what is normal and, perhaps, an element of denial, result in many children being diagnosed as late as 3 years of age. Modest improvements in this situation can be obtained by parent education and increased professional sensitivity to parents’ worries, but on their own these are not sufficient to deliver the very early diagnosis now thought desirable.

What screening tests are available? In the UK, the mainstay of screening in infancy is the Ewing distraction test, though it was never widely adopted overseas and indeed screening for PCHI in infancy was included in the child care programmes of few other countries. The screening test, traditionally performed by two health visitors working together, is known as the health visitor distraction test (HVDT). It relies
on the fact that there is a narrow window in development, between 6 or 7 months when a baby learns to sit and balance, and 12 or 13 months when he has acquired a sense of object and person permanence, during which he will repeatedly turn his head in search of an unfamiliar sound. By presenting a series of quiet sounds of known frequency and intensity, the hearing levels can be assessed.

In expert hands, and for diagnostic purposes, this apparently crude test provides surprisingly accurate results. As a screening test, its performance has consistently been poor due to inadequate training, lack of commitment, poor feedback, inclusion of other screening and health promotion tasks in the same appointment, high background noise levels, and the exceptional visual alertness and searching behaviour characteristic of deaf babies. As a result, the test has low sensitivity, sometimes as low as 20%, and poor specificity, with some screeners referring 10 or even 15% of all babies for further investigation. Notwithstanding this damning evidence, there has until very recently been great reluctance to abandon the HVDT.

The concept of high risk infants. The incidence of PCHI is much higher in certain groups of infants. The risk factors are: history of more than 48 h care in neonatal intensive care (whatever the reason); family history of permanent childhood deafness; craniofacial anomalies; congenital infections due to rubella or cytomegalovirus. Around 60% of children with PCHI have one or more of these risk factors, and could, in theory, be identified by testing 10% of the population. In practice, it is difficult to identify all at risk babies so that the 60% target is unlikely to be achieved and 40–50% is a more realistic figure. In addition, it is considered good practice to test the hearing of any infant or child with other neurological problems, such as cerebral palsy, though the yield is small. The most important cause of acquired hearing loss in childhood is meningitis and failure to check the hearing promptly after recovery in these children is negligent.

Neonatal screening, Identification of PCHI in the new-born offers an alternative to the HVDT and can be applied either to high risk infants (targeted neonatal screening, TNS) or to all infants (universal neonatal screening, UNS). It is attractive for two reasons. First, it permits very early diagnosis and intervention; second, there is a captive population, which simplifies the logistics of screening.

Three methods are available to test newborns. The auditory response cradle (ARC) is a behavioural test, relying on automated analysis of sudden head movements and changes in respiratory pattern in response to loud sounds. It is easy to use, acceptable to parents and effective at identifying severe and profound PCHI in otherwise normal babies. Doubts about its sensitivity for moderate PCHI, coupled with repeated
technical problems, are largely responsible for the current low profile of this method\textsuperscript{15}.

The two methods that now dominate debate about neonatal screening are oto-acoustic emissions (OAE) evoked by clicks, and brainstem evoked response audiometry (BSER). The method of OAE is based on an observation by Kemp that when the cochlea is stimulated by sound input, it emits sound energy in response by an active physiological mechanism\textsuperscript{16}. This has been variously called an echo or regarded as a form of resonance, though neither is strictly a true description of the physiology. The sound output can be collected via a microphone placed in the ear canal and the pattern analysed and displayed graphically, with automatic pass-fail criteria built into the algorithm. In principle, the method is quick and easy to use, but it is very sensitive to correct placement of the probe in the ear canal and the emission is abolished by even minor hearing deficits or by middle ear fluid. As a result, its use in the first few days of life produces a significant number of false positive results, but most of these are eliminated by a second OAE test\textsuperscript{17}. Since hearing in one ear is sufficient for language acquisition, for screening purposes it is enough to show normal responses in one ear and this reduces the number of re-tests and referrals required.

Those infants in whom no emission can be detected in either ear after two tests are then tested using BSER. This measures the changes in EEG activity in response to sound stimuli using computer averaging techniques. It requires electrode placement and is more demanding and time-consuming than OAE, so it is used as a second filter after OAE for most infants. For those newborns designated high risk, particularly graduates of neonatal intensive care, BSER may be a better primary screening test.

\textit{Does the programme work?} There is extensive experience of targeted neonatal screening in the UK. Only three centres have operated universal neonatal screening programmes; one used the auditory response cradle\textsuperscript{18} and two used OAE backed up by BSER\textsuperscript{17}. In the US, similar programmes now operate in many centres. High coverage of over 90\%, yields of confirmed cases in the predicted range and generally high parent acceptability are being reported. However, implementation and quality assurance of UNS will test the managerial and technical skills of both health and education professionals in districts where there is no previous experience of TNS.

\textit{Unresolved issues.} Since coverage of neonatal screening will never be 100\%, because of refusals, early hospital discharges and home deliveries, and some forms of PCHI are progressive, the ideal programme would need to include a safety net to test children missed in the neonatal screen and identify those with progressive hearing loss. This could be achieved
by retaining the HVDT for those children, as suggested in the recent systematic review. However, no such scheme has yet been implemented, so any economic assessment must be based on theoretical projections from existing data. It would present considerable logistic problems and would probably be costly in terms of incremental yield. The practical implications of the proposal need to be tested in pilot trials before it could be adopted as policy.

Costs of hearing screening. If the HVDT is performed according to standards set out in 1981 and endorsed many times since, it is labour intensive and, therefore, expensive. The estimated programme cost is £15-25,000 per 1000 children born, with the variability being due primarily to differing grades of staff doing the test. The test is considerably cheaper if done as part of a health promotion review but, given the evidence of poor performance even when carried out in protected time, without other intrusions on the health visitors’ attention, there seems little value in doing it in obviously sub-optimal conditions. The cost per case detected is probably around £75,000 and this figure is rising as TNS becomes more effective, reducing the pool of children still waiting to be diagnosed after the first month of life. If UNS is introduced, the cost per case detected by the HVDT, even if working at maximum effectiveness, will possibly exceed £100,000. In contrast, the programme cost for UNS is around £12-13,000 per 1000 births and the cost per case detected is around £18-20,000.

Cost and policy issues. These costs are high for a condition that is not life threatening and where the magnitude of benefit from early intervention is not yet certain. If a proposal were now made to introduce UNS de novo, it would probably be rejected pending better evidence on the value of early diagnosis. However, it is ethically and politically difficult to withdraw the existing HVDT screening programme and abandon the goal of early detection, when a much more effective approach is available at considerably less cost. The logical course of action is to withdraw resources from the HVDT and re-invest them in a UNS programme, but this too will present difficult management challenges.

Screening after infancy. If most PCHI can be detected in the first year of life, and children recovering from meningitis are screened, there will be very few seriously hearing impaired children undetected in the community after the first year of life. The incremental yield of any further screening will be very low and the cost per case detected will be high. The main argument regarding any further screening in early childhood (age 2–4 years) and at school entry now centres on the issue
of OME, as discussed above. However, in some communities high coverage of screening may be difficult to achieve even with a neonatal programme and a steady arrival of children in the UK from overseas may mean that some hearing impaired children might still be undetected when they start school. The extent of this problem has yet to be fully assessed and, until further data are available, most authorities will continue to advise a universal screen for hearing loss at school entry.

Vision screening

The debate on hearing screening has focused on the imperative to identify children with serious PCHI and screening for mild hearing impairment due to OME is not widely supported. In contrast, serious visual defects are not the subject of any current screening debate and the controversy centres around screening for mild defects. This is because infants with serious visual impairment are usually identified by the obviously abnormal appearance of the eyes or their visual behaviour with diminished response to visual stimuli, failure to establish eye contact or inability to develop fixation and tracking. Screening is not needed for such problems and the crucial issue is the quality of service response to parental worries about their baby's vision, which often leaves much to be desired. The only screening initiatives for severe vision defects are examination of the eyes with an ophthalmoscope to detect congenital cataract (a procedure which is not as easy as it sounds and is of uncertain effectiveness in the hands of non-specialists) and expert examination of infants at risk of retinopathy of prematurity. Occasionally, visual impairment develops later in childhood (for example, optic atrophy due to intracranial tumour) but the incidence of new cases is too low for screening to be justified on these grounds alone, though a visual acuity check is part of good practice in any child with neurological complaints or school problems.

The conditions to be sought by screening. Minor defects of vision include squint, refractive error and amblyopia. These are collectively very common, with 5-10% of children being affected, and there is much debate about whether they merit a screening programme (Table 3).

Justification for vision screening

Squint. This is usually cosmetically obvious and is considered unattractive in our society. Failure to refer and receive treatment is usually due not to lack of identification but to parental or professional
Table 3 Terminology for vision screening

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<tr>
<th>Term</th>
<th>Definition</th>
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<tr>
<td><strong>Visual acuity</strong></td>
<td>A measure of how well a person can separate adjacent visual stimuli.</td>
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<tr>
<td><strong>Refractive error</strong></td>
<td>A disturbance of the optical system of the eye so that a sharp image is not formed precisely on the retina.</td>
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<tr>
<td><strong>Myopia or short sight</strong></td>
<td>A condition in which the image falls in front of the retina. It is correctable by concave spectacles. Distant vision is affected but close work is not impaired.</td>
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<tr>
<td><strong>Hypermetropia or long sight</strong></td>
<td>A condition in which the image falls behind the retina. It is correctable by convex spectacles. Distant vision is not impaired; close vision may be. The child can accommodate to overcome this but this may be associated with squint.</td>
</tr>
<tr>
<td><strong>Astigmatism</strong></td>
<td>Means that the degree of refractive error is different between the axes of the eye.</td>
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<tr>
<td><strong>Anisometropia</strong></td>
<td>Means that the degree of refractive error is different between the two eyes; the resulting difference in image size may predispose to amblyopia.</td>
</tr>
<tr>
<td><strong>Amblyopia</strong></td>
<td>A condition of reduced vision in which the eye is healthy but the brain has either suppressed or failed to develop the ability to perceive a clear image from that eye.</td>
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ignorance about its possible significance. Micro-squint or small angle squint is not visible to simple inspection. It can be detected by expert orthoptic examination, but usually presents with amblyopia. Identification of micro-squint is not sufficiently important to justify vision screening, nor would screening be feasible by anyone other than an orthoptist, because of the level of skill involved.

**Refractive error.** This is a commonly used term but is difficult to define. Few eyes are perfect optical systems. Measurements of the refraction of healthy eyes in childhood form an approximately normal distribution curve but there is no exact correlation between the optical properties of the eye as measured by refraction and the visual acuity. Mild degrees of myopia (short sight) or hypermetropia (long sight) are common and are probably of little significance. More severe hypermetropia in the first year of life is thought to be a pre-disposing factor to squint and amblyopia.

There is no precise definition of what constitutes refractive error, nor is there any evidence as to whether or how much hypermetropia or myopia cause any disability. Reduced visual acuity may adversely affect sporting and academic achievement. In early childhood, however, the common refractive error is hypermetropia which is more likely to present with a squint than to seriously reduce visual acuity. Severe astigmatism is uncommon but significantly reduces visual acuity.

Detection of myopia is the main goal of vision screening in older children and teenagers. It is uncommon in young children and is more prevalent in the teens and early twenties. It is associated with better educational performance, though possibly has an opposite effect on
sporting skill. While screening is still widespread, the benefits are modest at best. Many mild cases of myopia are identified and glasses are prescribed, but few children with mild myopia wear their glasses regularly. Myopia becomes important when it impacts on quality of life; in these circumstances individuals become aware of their impaired visual acuity because of difficulties with sports, cinema screens or reading bus numbers. Vision screening may well be superfluous in later childhood and adolescence, provided that children have easy access to diagnostic testing whenever there is doubt about their visual acuity; and in many places vision screening after the first year at school is being reduced or even phased out altogether21.

**Amblyopia.** The detection of refractive error and squint are not the primary motivation for screening for vision defects in young children. The main argument in favour of vision screening in young children is the identification of amblyopia16. This is usually associated either with either a squint (which may be the presenting feature) or with refractive error (hypermetropia or astigmatism). A difference in the degree of refractive error between the two eyes (anisometropia) may be found. Amblyopia reduces the visual acuity in the affected eye to a variable degree, with the worst cases being effectively blind in that eye.

The disability associated with amblyopia is not easy to define22. Some impairment of stereopsis is inevitable and this might interfere with, for example, ball games and some careers, though many people seem to compensate well by using other cues to gain depth perception. Loss of the good eye through disease or trauma might leave the individual functionally blind or partially sighted, though this appears to be a very uncommon event and little is known about how much recovery in the amblyopic eye can be expected at various ages under these circumstances. Amblyopia also may bar an individual from certain career choices where sudden temporary loss of vision in the one good eye, due for instance to a foreign body, is judged to be unduly hazardous.

**Does treatment for amblyopia work?** In addition to doubts about the extent of the disability caused by amblyopia, little is known about the effectiveness of treatment23, which usually involves correction of any refractive error and occlusion of the normal eye. Animal experiments some 20 years ago suggested that there may be a critical period for development of the visual pathways and connections. These findings not only created an enthusiasm for detection of vision defects as young as possible, but also generated a belief that any trials of the benefits of such an approach would be unethical.

Occlusion therapy has been in use for at least 50 years but there are still no satisfactory trials to show the magnitude or permanence of the
benefits obtained from this treatment\textsuperscript{24,25}. Furthermore, although it is generally agreed that improvement in amblyopia is less likely to occur after the age of 7 years, there is no evidence that treatment at age three or four is more beneficial than at age five or six. It is often said that children will experience less distress if treated before they start school and that occlusion therapy after starting school will lead to teasing or bullying. There is no evidence to confirm or refute this opinion.

\textit{Minimum age for screening.} Primary prevention of amblyopia by early identification and treatment is an attractive goal. As refractive errors may predispose to amblyopia, spectacle correction of refractive errors in the first two years of life might reduce the incidence of squint and amblyopia in childhood\textsuperscript{26}. There is some evidence that this is so, but it does not eliminate them; many cases with amblyopia and squint are found among those who did not have significant refractive error in the first year of life. Automated refraction methods allow screening for vision defects in infancy, but much remains to be done before this could either be justified or considered as a practical proposition.

Most children younger than 3.5 years cannot reliably co-operate with a visual acuity test and their vision can only be assessed indirectly by refraction, which in young children needs considerable skill. Screening for vision defects currently is only a practical proposition at around the age of 3–3.5 years onwards. At this age, the issue is the detection and treatment of established amblyopia rather than its primary prevention. Since amblyopia is generally a unilateral condition, each eye must be tested separately, and children find this more difficult than tests with both eyes open. If screening is attempted with children who lack the maturity to give reliable unilateral visual acuity measures, there will be many incorrect results and a high re-test rate.

\textit{Policy issues.} As with hearing screening, decision making is much more difficult with the existing programme than would be the case with a new proposal. Since the evidence suggests that vision defects, though common, are of only modest importance to the individual, and the effectiveness of treatment for the most potentially important condition, amblyopia, is in doubt, it is difficult to justify substantial expenditure on a vision screening programme and it could be argued that the programme should be discontinued altogether. However, it is counter-intuitive to suggest that there is no value in checking a child’s eyesight. A small number of children do have severe refractive errors which are worth correcting, and ophthalmologists remain convinced that occlusion therapy is indeed effective. For these reasons, it is probably necessary to continue with some form of vision screening, at least until more evidence is available, and the aim, therefore, is to devise the most cost-effective programme possible\textsuperscript{27}. 

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If the aim of screening is primarily to identify amblyopia, then the *sine qua non* is a visual acuity check of each eye separately, *i.e.* with one eye closed. Visual acuity testing is difficult for young children and acceptable results without a high re-test rate can probably only be achieved at 3.5 or even 4 years of age. In this age group, some children have started school; many attend playgroups or nurseries, and a large proportion of parents are at work. As a result, few screening programmes in this age group achieve a coverage of over 70% and often the figure is lower. Several studies have shown that acceptable sensitivity and specificity for vision screening in this age group are achieved only by orthoptists, who are trained specifically for the assessment of vision in children. Health visitors, who see many healthy children for routine checks, and doctors, are not cost-effective vision screeners.

The simplest and cheapest solution is to test the visual acuity when each child starts school at the age of 4 or 5 years. A captive population is then available and the quality of, and conditions for, testing can be monitored. As there is no evidence that a slightly later start of treatment for amblyopia is a disadvantage, this is an acceptable approach.

An orthoptic service to community clinics can greatly streamline the process of deciding who needs a full ophthalmic examination whenever a parent or professional suspects a squint or impaired vision. This service is cost-effective and is said to reduce inequity between prosperous and poor neighbourhoods in the age at which vision disorders are diagnosed, but it does not seek to see every child and is not, therefore, a screening programme.

If the goal is achieved of ensuring that every child has a competent visual acuity test by or soon after the age of 5 years, essentially all cases of amblyopia will be detected. New cases of amblyopia, thereafter, are exceedingly uncommon and certainly do not merit screening. Indeed, there is probably no justification for further visual acuity screening after the age of 5 years and this can be replaced by written information to parents regarding optometrist services for any child about whom there is concern.

**What next?** Uncertainty about the benefits of occlusion therapy for amblyopia could be resolved by a large randomised trial, but the complexities of such a trial are such that it will be expensive and protracted. More work on assessing the true disability caused by amblyopia is needed. The literature is virtually silent on the prevalence of varying degrees of impaired visual acuity due only to refractive error or colour vision defects or on the disability associated with these impairments.

Meanwhile, pragmatic decision making will continue. Even the minimal programme set out above is probably more than can be justified.
on purely evidence based grounds but equally it is probably the slimmest programme that would be acceptable to parents and professionals.

**Other aspects of screening in childhood – the policy context**

Changing the policy regarding one aspect of child health screening has knock-on effects for many other parts of routine well-child care. For example, if universal neonatal hearing screening is introduced successfully, the number of children with serious hearing loss still to be detected in the 2–5 year-old group will be very small indeed. Some projections suggest that over 90% of cases would be found within the first year. This means that there may be only one or two cases per 10,000 preschool children with undetected permanent hearing impairment.

It is considered good clinical practice to exclude hearing loss as the cause of delay in speech and language acquisition. This is an extremely common problem; although the exact prevalence depends on how it is defined, figures quoted range between 3–7%. Conventional audiological assessment of these children is quite time-consuming and there is often a long waiting list, which, when combined with the waiting list for assessment by a speech therapist, can result in considerable delays in diagnosis and intervention. The yield is small and is largely confined to otitis media with effusion, which is disabling to a few children but an incidental or trivial finding in most. Universal neonatal screening will mean that the probability of permanent hearing loss being the cause of delayed speech and language development will decline further. Although this will still be an important condition to consider, the rarity of permanent hearing loss coupled with changing perceptions of the importance of middle ear disease suggest that detailed audiological testing may not be an efficient first-line procedure in these children and that we need more efficient ways of identifying or excluding hearing problems in this group of children.

The arguments about vision screening in preschool children provide another example of how decision making must be integrated with other children's services. It is national policy to offer a child health surveillance review to all children at around 3.5 years of age and this is usually undertaken by the family's health visitor. The coverage varies widely, from as low as 40% to over 80%. It has become clear in the last few years that health visitors are good at prioritising their workload if permitted to do so; for example a review of a healthy 3.5 year old in a stable competent family might take second place to working with families who have problems. This policy has been officially endorsed by many community managers and as a result, the coverage of the 3.5 year assessment is falling. Even if it were thought desirable for health visitors
to carry out a vision screening examination in this age group, it would be increasingly difficult to deliver without substantial new resources.

In contrast, the assessment of all 5 year old children starting school is widely accepted by parents and professionals. It is easy to achieve high coverage. It fulfils a statutory duty laid on the Secretary of State to provide for the health of school children to be assessed. It is possible to carry out several screening procedures at the same time, so that the cost of any one test is low and the savings to be made by discontinuing any procedure are marginal. No screening test should be undertaken if it produces more harm than good. However, currently the school nursing service has the opportunity to screen for vision and hearing defects, to measure height and weight, and to identify children who have missed out on preschool health care, and this is thought to offer reasonable value for money. Health care must be based on evidence as far as possible, but decision making must take account of the political climate, legislation, public perceptions and demands, and professional opinion.

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