REPORT OF THE STUDY GROUP
ON THE CHILD WITH IMPAIRED HEARING

(WHO/UN/UNESCO/ILO)

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I. INTRODUCTION

It has long been recognized that a child with impaired hearing presents special educational problems, particularly if the handicap is severe and speech and language development are also affected. Provisions for the care and training of children with hearing handicaps have existed in a number of countries for many years, but the services and facilities provided were mainly for children old enough to attend school. Until comparatively recently, the conventional system of training was based on the conception that if a child had not developed speech, such hearing as he might have was of relatively little importance in enabling him to acquire speech. The child was therefore trained either by manual methods (signs and finger-spelling) or by the oral method (lip reading and speech instruction using vision and touch).

With the design and construction of the first electronic audiometers and hearing aids some 25 years ago, new forms of basic research into hearing and speech and a new approach to the whole problem of hearing impairment became possible. Audiometric surveys of the hearing of pupils in schools for the deaf were initiated. Experiments in the use of hearing aids were made in a number of schools, methods for training residual hearing were evolved and the first hearing-aid clinics were opened. During and after World War II the results of research were applied on a large scale to the rehabilitation of hearing-loss casualties. There have been advances in medical treatment and surgical techniques, and a rapid increase of knowledge in the field of electro-acoustics. In addition, in many adults with impaired hearing, the onset has been traced back to damage sustained in childhood, and, in a large proportion of children born with defective hearing or who have lost their hearing before speech has been naturally acquired, it has been demonstrated that the disability can be effectively lessened, provided that the hearing impairment is detected in infancy or very early childhood and that training starts immediately. As a consequence, the approach now is directed fundamentally towards prevention, with the emphasis on the detection of hearing impairment at the earliest possible age, and subsequent training using the auditory method wherever possible. The aim of this training is to enable the young
child with impaired hearing to develop hearing and speech in the way that a normal child would, primarily through listening. Most children with impaired hearing, even those born so, do have some residual hearing. With the use of the modern hearing aid, these hearing remnants may become of value in the acquisition of speech.

From the public health point of view, this preventive approach is obviously one of great significance and has implications which should be widely understood. Whereas in the past responsibility for the care and training of children with impaired hearing has rested mainly with education authorities, assisted in many instances by the work of voluntary organizations, the problem is now seen as one which needs and deserves much greater attention from public health authorities. In fact, it is an urgent matter that all those who come into contact with young children should recognize the importance of detecting impaired hearing during infancy, and be acquainted with the recent developments in training young children with hearing impairment.

If the services are to be organized with these objectives, then it is essential that there should be the closest understanding and co-operation between the various professions concerned, particularly in the broad fields of health, education and welfare. It is for these reasons that this study group was convened by the World Health Organization.

In considering the problems of the child with impaired hearing, the group referred to, and was frequently guided by, the report of the Joint Expert Committee on the Physically Handicapped Child. The problems are in some respects similar, and many of the general principles in that report are equally applicable to the child with impaired hearing.

"Every child has the right to expect the greatest possible protection against the occurrence of preventable physical handicap before, during, and after his birth.

"Every child also, regardless of the nature of his physical handicap, has the right to develop to the maximum of his abilities, in spite of his disablement. This implies that the child with a physical handicap should have ready access to the best medical diagnosis and treatment, allied therapeutic services, nursing and social services, education, vocational preparation, and employment. In this way he should be able to satisfy the needs of his own personality to the maximum, and become as far as possible a useful and independent member of the community."

1 Wld Hlth Org. techn. Rep. Ser. 58
In view of the widespread conception that "deafness" implies complete inability to hear any sounds at all, the group agreed that it is important to dispel this idea, and suggested that the term "deafness" might be replaced by "hearing impairment".

II. HEARING AND SPEECH

1. The Nature of the Handicap

Speech is the normal means of communication between individuals. Through speech ideas are exchanged, expression is given to the emotions and individuals are welded into a community. Spoken language provides an important vehicle for the communication of abstract thought. The effects of impaired hearing are complex, but the greatest disability imposed is failure to understand spoken language. In the very young child this involves also a failure to talk, in the older child, a loss of speech. Uncompensated hearing impairment therefore interferes with the individual's intellectual and emotional life. Unless properly trained, the child with defective hearing may grow up intellectually retarded and socially maladjusted.

2. The Development of Hearing and Speech in the Normal Child

The infant has no understanding of sounds at first. Sounds are not necessarily understood merely because they are heard. Two mechanisms are involved - a peripheral one in the cochlea, where the sounds are received, and a central one in the auditory centres of the cortex where the sounds are recognized. The ability to distinguish between different sounds is known as auditory discrimination. This auditory discrimination is something which has to be learnt, and the learning is a slow process which goes on unconsciously during the early years of life.

Systematic studies in a number of schools for the deaf have shown that a considerable proportion of the pupils can be trained to use their residual capacity to hear and that many of them can learn auditory discrimination to a useful extent. Similar studies of the results of training given to children with impaired hearing of pre-school age seem to indicate that they can learn more readily to rely on the use of hearing aids. It seems probable that children learn auditory discrimination more easily during the first three years of life than when they are older.
During this learning process, the child not only learns to distinguish between
different sounds, but he also learns to associate them with their meanings. He learns
first to distinguish sounds of importance to himself, such as his parents' voices, the
preparation of a feed, or a toy rattle. Speech is the most complex system of sounds
which he has to learn, and it is the last to be mastered. Long before he can understand
speech he learns, assisted by visual clues, to distinguish between a pleased and
a displeased tone of voice. Gradually, however, by constant listening he begins to
learn the meanings of words and phrases. At the same time he is learning the control
of the complicated muscles of articulation and enters the stage of "babbling", or uttering
apparently meaningless repetitive sounds. These sounds are given meaning when he
finds that his parents respond to them, coming to him with a pleased smile, repeating
the sounds after him, and constantly repeating words and phrases in association with the
objects and activities to which they apply. Eventually he begins to produce speech, at
first words and then combinations of words into short phrases and speech patterns.
Before he can use these speech patterns, however, he can understand them and can obey
simple commands, since understanding of speech always precedes production of speech.
Normally, the first words are used early in the second year. The period between the
age of about 12 to 18 months has been called a period of readiness to speak. It should
be realized that this is preceded by a period of readiness to listen, during the first year
of life.

The fact that the normal child is able to hear his own voice is also of great
importance. Gradually he will learn to control his voice according to what he hears,
the process by which he does this is known as auditory feedback. This ability is
essential for the spontaneous development of rhythmic and fluent speech and also
contributes to the child's awareness of his own personality.

3. The Acoustics of Speech

Sounds are distinguished by their acoustic characteristics. Objective differences
in frequency and intensity are heard subjectively as differences in pitch and loudness.
Speech sounds are composed of various patterns of overtones and frequencies which, to
a great extent, contribute to their distinction. If human speech is to be understood it
is also essential that the natural rhythm and fluency should be present.
Vowels are the easiest sounds to discriminate and to imitate. They are loud and they do not require such complicated articulatory movements as the consonants. The consonants are much weaker sounds and consist largely of high-frequency components. The hearing loss in a severe impairment is shown principally in two ways:

(i) Loss in the high-frequency range, when the reception of consonants is therefore affected more than that of vowels. Consonants also require more complicated articulatory movements to produce them and the child tends to learn them later than he learns vowels. In the English language the last sound of all to be acquired is the "th" and this is the weakest of all speech sounds.

(ii) Loss in the low-frequency range, due to which a child is not able to hear his own voice. Thus vocalization makes no sense to him, and there is failure to establish the auditory feedback process.

The fact that the weak, high-frequency consonants are the sounds most often missing from the pattern of speech sounds perceived by the person with hearing impairment has a very serious effect on the understanding of speech, because words are recognized more by their consonants than by their vowels. So important are the high frequencies that they have been described as essential for the understanding of speech. Under the right conditions, however, it may be possible for a very young child with hearing impairment to learn or to be taught to distinguish most of the speech sounds, even when these "essential" frequencies are missing.

Less hearing is needed to understand speech once it has been learnt, than is necessary for the acquisition of speech, but it should be noted that even for the adult with normal hearing who has learnt speech in the normal way, certain conditions are necessary if speech is to be understood. (i) The right frequencies must be present. People who have learnt speech when able to hear the high frequencies cannot readily recognize words in the absence of these frequencies. If the ability to hear high frequencies is lost, rehabilitation is necessary to enable speech to be understood without them. (ii) Speech must be loud enough. If speech is faint it may be heard without being understood. It is most intelligible when the intensity is at a normal level (50 to 60 decibels) above threshold. There is relatively a great difference in the intensity of the various sounds composing speech patterns so that in faint speech some words may be more difficult to understand than others. This difficulty is a matter of common knowledge. Words are,
of course, easier to understand in a sentence than when isolated because the context will supply a certain number of missing words. Even the persons with normal hearing may find it difficult to understand speech under adverse conditions when the important high-frequency consonants sounds are masked or missing, as may happen in a noisy environment. (iii) Speech must have natural rhythm stress and fluency.

4. The Effect of Hearing Impairment on Speech Sounds and on Development of Speech

The sudden onset of severe impairment, as in meningitis, leads to failure to comprehend speech, partly because it is too faint and partly because it is distorted by the absence of the high frequencies. When this occurs in a child before speech habits have become fixed, there is also a rapid loss of speech over a period varying from a few weeks in very young children, to about six months in older children.

Impairment of slow onset, even when severe, is not nearly so disabling as that of sudden onset. This is because the individual has time to learn various ways of compensating for his disability. The degree of impairment which has to be present to prevent an adult from understanding speech is much greater than that which will usually prevent a child from learning to speak in the normal way. Indeed, the degree of handicap which most adults have before they request a hearing aid is such that if they had been born with it, they would not have learnt speech without special help. Thus one person who develops a hearing loss after learning to speak normally may continue to understand speech after very little practice with a hearing aid, while another, born with an identical hearing loss (as shown by audiogram) but having had no training in the use of his residual hearing at an early age, attaches less meaning to speech sounds and receives only very limited help from a hearing aid in later years.

The extent to which children with impaired hearing can learn to discriminate sound by using their residual hearing has been found to vary greatly. The duration of the training in listening given to them, its motivation and the acoustic conditions in which it is provided, have been shown to be important factors. Research is at present in progress to find how far the capacity of children to benefit from use of a hearing aid may be related to the etiology and history of their hearing impairment. It has been reported that children have been discovered who were holding their own in ordinary schools but had no hearing above 1000 cycles per second, as shown on a pure-tone audiogram. It appears that they had acquired speech without being able to hear its high frequency components that are essential for the recognition of the consonants.
It is not sufficiently appreciated that comparatively few children are born without any capacity to hear sound. Almost all have some hearing and, in a number of cases, this may be sufficient to enable them to acquire speech through listening and watching, provided that steps are taken to enable them to hear sounds, (especially their own voices) often enough and loud enough. The reason why these children fail to talk without special help is that they do not hear sound loud enough or often enough and consequently sound has no meaning for them.

It is essential that special help in the form of auditory training should be given at the right age, that is, beginning during the first year of life.

Early diagnosis and training is also important for the child with acquired hearing loss occurring before the speech habits are fixed. Advantage must be taken of the period (varying from a few weeks to about six months) after the onset of hearing impairment if the child is not to lose the speech which he has already acquired naturally through his hearing.

It is because of these facts that the group places such great emphasis on the early diagnosis and training of the child with impaired hearing.

III. CASE-FINDING AND SCREENING

The importance of detecting hearing impairment at the earliest opportunity cannot be too strongly stressed. It deserves the widest possible recognition especially among physicians and health workers who may not be aware of the possibilities of treatment during the first years of life. For the child born with impaired hearing early detection will enable training to be started during the period of normal physiological development of hearing and speech. In the case of the older child with an acquired impairment, not only may the causative lesion be arrested with treatment, but steps can often be taken to prevent the development of a more serious disability.

The detection of children with impaired hearing need no longer depend upon chance observation that the child is backward in speech, has ear trouble, or that he has become inattentive or even a behaviour problem. Screening procedures are now available which, ideally, are designed to pick out any child with a hearing impairment. If the method is efficient, the majority of children with normal hearing will pass the test.
A screening procedure is a device for testing a large number of children to pick out any who may be suspect. It is not intended to establish a diagnosis or to institute treatment or training of a child with impaired hearing. Any child whose hearing appears to be impaired must be referred to an otological or audiological clinic for accurate diagnostic testing and treatment. Absolute reliance cannot, however, be placed on the efficiency of a single screening test and repetition after an interval is always desirable. In the case of infants and children under three years the aim should be to repeat the test every three to six months, and in older children, once a year.

(a) Screening in very young children

(1) Under three years

While much still remains to be done to develop screening tests for infants up to one year, and for children of two and three years, the work already being carried out in a number of centres shows that simple screening techniques can be used during the first year of life. The group wishes to draw attention to the importance of these tests in these early years. For their application, carefully selected public health nurses are required who must have an adequate period of special training. Screening tests can be carried out in the child's own home, but clinics must be available to which the infants or small children can be referred if there is any doubt that hearing is normal. The group considers that other approaches to promote early detection of defective hearing should be strongly encouraged. These will include education of parents and of the general public concerning the need for early diagnosis, treatment and prevention of hearing defects. An observant mother is likely to detect the earliest signs of hearing impairment. The family doctor and all health or social workers in contact with the family should be on the look out for any failure on the part of the infant to react to sounds, especially if there has been a maternal condition which may be associated with defective hearing in the child, or an infection during early infancy which predisposes to hearing impairment. Time is vital, and health workers who know the importance of early detection and the possibilities of treatment have a duty to ensure that no child they supervise escapes scrutiny in this respect.
(ii) 3-5 years

After the age of three years, routine methods of testing may be employed. Sweep pure-tone audiometry can be satisfactory at this age, but it is more reliable to use voice testing, using specially selected words, with or without the association of pictures. While due regard must be given to the time taken by the technique employed, the tendency to emphasize the exact time taken is to be deprecated. Most children who are normal can be tested quickly, but if a child requires longer than the average, he must not on any account be made to fit into an exact time procedure.

(iii) Over 5 years

Screening tests for older children attending school are now a routine in many countries. The tests may be carried out by group testing, or by individual testing. While it is generally agreed that words would be the most satisfactory test material to be used, this has been too difficult and time-consuming in testing large numbers of children. The use of numbers is unsatisfactory, as a child with a high tone loss can pass the test. Tests by a pure-tone sweep, therefore, are now becoming standard.

A common procedure is to re-test all children who fail a screening test the first time, and then to carry out a complete pure-tone audiogram on the failures of the second test. If necessary, these children are then referred to an audiological clinic for diagnosis and advice.

IV. DIAGNOSIS AND ASSESSMENT, CLASSIFICATION

1. Diagnosis and Assessment

Audiology, the science of hearing, is concerned with all aspects of hearing, and particularly with the prevention of impairment and the training and rehabilitation of those who already have impaired hearing. The otologist, paediatrician, psychiatrist, psychologist, phonetician, acoustic physicist, specialized teacher, public health nurse and social worker all make their own contributions to this field. The part that each may
play varies with the problems of individual cases, but the larger audiology centres should be located at main hospital centres, preferably university centres, where the advice of these various professional disciplines is available and can be co-ordinated. Although special clinics will normally be within otological departments, they cannot be fully equipped to deal with the problems of children with hearing impairment unless psychologist, specialist teacher and social worker also participate, and paediatric and psychiatric consultant advice are available. If the services are to function satisfactorily, it is also essential that there should be close co-operation between audiology centre, local public health (including school health) services and education authorities.

Any medical or otological treatment which may be indicated should, of course, be carried out before an assessment of any child’s hearing is undertaken.

(i) General considerations of tests of hearing

Few children have such hearing loss that they cannot hear sound at all. Most have some hearing, but sounds loud enough to be heard by them occur so rarely that they have not associated them with events and consequently the sounds have no meaning. Children with a little more residual hearing may have learned to discriminate between noises, but not between speech sounds which appear merely as noises. The sounds received by the end-organ of the ear have to be interpreted centrally in the brain, and auditory memory is slowly gained as a result of experience. Familiar sounds are easy sounds and can be heard and understood at distances greater than those necessary for new or difficult sounds. It is impossible to test a child’s use of hearing accurately until there has been an opportunity to train any residual hearing which he may have. The child’s intelligence will also affect the results of hearing tests, and the use which can be made of such hearing as is present. The intelligent child will make full use of a few clues which would be of less value to the less intelligent.

(ii) Effect of auditory training on tests of hearing

It is the child’s ability to hear and understand speech after adequate training which is important. Whenever possible, hearing must therefore always be tested with speech, and it must be tested again and again before a final assessment of the degree of impairment is made. The time required for this will depend on many factors, including the degree of hearing loss, the child’s intelligence, his opportunities for listening (auditory training) and the amount of expert teaching he receives.
At the first examination, the child may not respond to any sound, because he hears so few sounds that sound has no meaning for him. After a period of auditory training sounds begin to have meaning and there is an apparent improvement in hearing. It is therefore important not to take any final decision about the future of a child with hearing impairment until he has been tested after a period of auditory training. Even when there is no response at the first examination, the child should be given the benefit of auditory training for several months using a hearing aid. Several visits may be necessary before a first assessment is made. It is important that the child should not be labelled "deaf" and relegated to a school for children with profound or total hearing loss, until it is quite certain that he has not sufficient hearing to hold his own in a hearing environment.

(iii) Mental testing

The tests should be carried out by a psychologist with knowledge of the communication difficulties due to hearing impairment and who appreciates the need for repetition of tests from time to time as mental growth takes place, consequent upon better communication.

Verbal tests depending on questions and answers are quite unsuitable for children with defective hearing as their speech and language development is inadequate. Non-verbal performance tests should be used, and the way in which these tests are applied to children with impaired hearing must, of course, be fully understood.

2. Degrees of Hearing Impairment

It is possible and necessary to make accurate quantitative assessments of hearing impairment in terms of decibels and differing distribution of frequencies affected. Such assessments are useful in that they readily record certain aspects of the type of hearing difficulty the child experiences, they aid in diagnosis, and they furnish information relative to the child's potential in hearing. They are, however, by no means fixed attributes of the particular child, much less do they measure the ability of the young child to communicate by, or to appreciate, spoken language. It is this
last ability which will determine the way in which the child should be educated. This depends on many factors aside from hearing, especially the child's personality and intelligence, which are of the utmost importance. Other factors which must be taken into consideration are the age of the child, his general health condition, vision, previous training, and the home environment.

The group therefore emphasizes that the classification which follows is rather of the range of training and educational facilities required than of the children who may use them. The group also wishes to stress that each child must be considered as an individual, taking all the various factors present into account. It is obvious that all this cannot be done at once. The important decision to take at the first examination of the child is - does this child hear normally, or not? If hearing impairment is present, or if there is any doubt as to the diagnosis, training should be commenced straight away, as only harm can come by delaying it. In some cases it is only possible to arrive at a final accurate diagnosis by observing a child's response to training.

In order to have some basis on which to indicate the extent of hearing losses which occur and the way in which the disability may be overcome, the range of hearing impairment must be considered. This is described as follows:

normal hearing - slight - moderate - severe - profound - total hearing loss.

Any particular child's status in terms of the range of hearing impairment described above may be modified by the factors already mentioned. Moreover, as a direct product of training, learning and achievement, it is to be expected that his position along the range may change.

(1) Slight impairment of hearing

Children in this group acquire speech spontaneously and their defect will usually be detected only by specific testing. In some cases lip-reading may be helpful and the child should sit in a favourable position in school.

(11) Moderate impairment of hearing

In this group the hearing loss is such that the conversational voice cannot be understood beyond very close range. Children in this group will acquire speech spontaneously. Slight to moderately severe defects of speech may be present, except in those cases where the hearing impairment is acquired, or where the
impairment although congenital, has been detected and treated early enough. When understanding of the conversational voice is defective at close range a hearing aid will be necessary. These children will require special help in order that they may learn to get proper value from the use of a hearing aid, and they should be taught to correct their defective speech. Constant supervision from the audiology centre is necessary, not only to ensure that a child is making satisfactory progress, but also to make sure that he feels adequately supported in overcoming any prejudice which may exist in an ordinary school. The child must have sympathetic help to overcome the handicap, and this is usually readily forthcoming when those concerned understand the disability. These children will rely mainly on hearing, aided by lip-reading.

(iii) Severe impairment of hearing

A number of intelligent children in this group whose impairment dates from birth acquire speech spontaneously, although it will be very defective and often delayed. Understanding of the conversational voice is possible only at the shortest distances. If the hearing loss is detected in infancy and adequate auditory training is given, these children will often be able to acquire speech. It is important that children in this group should be detected early since training will enable a number of them to be taught in ordinary schools and to hold their own with hearing children. Into this group should be placed children with a severe high tone loss. This type of hearing loss is frequently missed and the children are set down as being dull and backward. These children will require special training during most of their school life, especially during its early stages. This group of children will also rely mainly on hearing, but need to combine this with lip-reading.

(iv) Profound hearing impairment

Children in this group fail to develop speech spontaneously. First tests of hearing may show hearing for the voice at the ear meatus, but without comprehension of speech. Others of these children may show no response to sound at the first testing and may be classified as having total hearing loss, but subsequent testing, after adequate auditory training, may show the presence
of some residual hearing, so that they can be classified as having a profound hearing loss. Some children of average intelligence in this group may eventually be transferred to the previous group, i.e. severe impairment of hearing, as after adequate training, they will be able to talk and to comprehend speech in others, and they can be trained to take their place in a normal hearing environment. Most of the children in this group will however need education in a special school and they will have to rely mainly on lip-reading.

(v) Total hearing loss

Comparatively few children have no hearing at all, but many who suffer from a profound impairment and fail to comprehend speech are regarded as suffering from a total hearing loss, with the result that the opportunity to use their residual hearing in the acquisition of speech is denied them. Those who are really totally without hearing will require to learn speech through lip-reading, and the use of other non-auditory methods.

In view of the changes in the results of hearing tests after auditory training, it should always be stated clearly whether the classification of any child is made before or after adequate auditory training.

V. TYPES, CAUSATION AND PREVALENCE OF HEARING IMPAIRMENT

1. Types of hearing impairment

Conductive type (middle ear deafness) is caused by interference with the transmission of sound waves to the inner ear. The loudness of sounds is affected.

Perceptive type (nerve deafness) is caused by damage to the neural receptor elements. Characteristically, high tones are affected before low tones. Sound is distorted and in some cases after amplification some frequencies appear painfully loud. The ability to understand speech (discrimination) is seriously affected. This is the type of impairment present in those born with defective hearing.

Mixed type. This is usually a conductive type with additional perceptive changes.

Psychogenic hearing impairment is a field as yet little explored, cases are seen from time to time, but are rare in children.
Central hearing impairment does occur and there is reason to suggest that it may be more common than is generally realized. Sounds seem to be heard normally, but the process of auditory recognition and recall is faulty, and speech sounds heard cannot be accurately interpreted. It should be remembered that a central lesion must be bilateral in order to cause hearing impairment.

2. Causes of hearing impairment

The group considered that, from the point of view of prevention, the causes of hearing impairment in children should be described according to the time when the damage occurs to the hearing mechanism, i.e. before, during, or after birth, rather than using the terms "congenital" or "acquired".

(a) Prenatal period

Two main categories of impairment must be differentiated:

(1) Hereditary impairment due to genetic factors

Knowledge of the inheritance of hearing impairment is still confused. Twenty-five per cent. of all cases of congenital impairment are believed to be inherited. It was formerly held that a large number of cases of "sporadic deafness" were in fact hereditary, due to a recessive gene; but since it has been shown that some cases of "sporadic deafness" are caused by maternal rubella, attention has been drawn to other possible non-hereditary prenatal causes. More detailed study of the genetic factors producing hearing impairment is urgently needed.

(II) Non-hereditary impairment

Especially during the first three months of pregnancy, when the embryonic ear is developing, damage may result from a variety of causes - maternal infection, especially from virus diseases and, in particular, German measles (rubella). Toxic agents such as quinine, streptomycin, lead and alcohol, the actions of physical agents such as X-rays or radium, maternal nutritional deficiencies, allergy and toxæmia and rhesus incompatibility may, at various stages of pregnancy, cause hearing impairment. Maternal syphilis, if untreated, may be transmitted to the foetus later in pregnancy and be apparent at birth, or make its appearance later. The incidence of congenital syphilis varies greatly from country to country, being almost non-existent in some countries.
(b) Perinatal period

(i) Trauma associated with prematurity and prolonged labour resulting in cerebral anoxia.

(ii) Untreated haemolytic disease of the newborn.

(c) Post-natal period

(i) Infection

(a) General, meningitis (tuberculous and non-tuberculous), encephalitis, mumps, scarlet fever, measles, chickenpox, whooping cough, pneumonia.

(b) Local infections which result in damage to the outer, middle or inner ear.

(ii) Toxic agents, e.g. streptomycin, dihydrostreptomycin, quinine.

(iii) Allergy

(iv) Trauma – head injuries.

(v) Mechanical obstruction, foreign bodies or wax in the ear.

3. Prevalence

The data available from several countries using commonly employed criteria of measurement indicate that the prevalence of impaired hearing in school-age children is approximately five per cent. Such a group, ascertained by organized screening, includes many children who have only a minor impairment and who, with early diagnosis and treatment, will regain and keep normal hearing. Of every 10 children found by the screening procedure, seven or eight frequently prove to have a conductive type of impairment that is amenable to treatment. The remaining children have a more serious impairment commonly involving perceptive-type or mixed-type deafness. It is this group which claims most attention as handicapped children. Estimates of children in this group vary from 0.5 per cent. to 1 per cent. of the total school populations. If children with multiple handicaps are included, the estimates range from two per cent. upwards of the school-age populations.

Corresponding data are not at present obtainable for pre-school children (under six years of age). It is thought, however, that the general prevalence of hearing impairment is lower at this age, but that the proportion of these children with a severe handicap is higher.
VI. PREVENTION

The group considered that a useful distinction can be made between "primary" and "secondary" prevention and agreed with the definition of these terms given by the Joint Committee on the Physically Handicapped Child, i.e. primary prevention relates to measures which prevent the initial occurrence of the handicap. Secondary prevention relates to early discovery, early diagnosis, and early and continuous treatment and rehabilitation, so that the extent of the impact of the disability will be mitigated as much as possible. ¹

1. Primary Prevention

(a) Impairment of hearing due to prenatal and perinatal causes. (Congenital impairment.)

(1) Hereditary

Primary prevention of hearing impairment is very difficult on account of the incomplete knowledge of the etiology. Genetic causes of impaired hearing can only be eliminated if hereditarily affected persons do not marry, or at any rate do not have children. The group do not wish to suggest the prohibition or even the obstruction of such marriages, but stress that the risks should be more precisely evaluated and more generally understood. In the present state of knowledge, medical advice sought as a prelude to marriage can be given only in fairly general terms, unless there is a clear family history of hearing impairment over generations, especially when it is on both sides.

It should be recognized that some of the social elements in most programmes for assisting the hearing handicapped actually encourage intermarriage amongst those with hereditarily impaired hearing. The modern trend to try and establish the individual with impaired hearing in a normal hearing environment should have as a secondary advantage a reduction in this tendency towards intermarriage.

(2) Non-hereditary

Prevention of prenatal causes of hearing impairment is essentially a question of improved medical and obstetric services. For example, it has been shown that toxaemia of pregnancy can be reduced by giving special attention to prenatal care focused on early detection and prompt treatment. This in turn, should reduce the incidence of both prematurity and antepartum haemorrhage and so of foetal asphyxia and some of the risks of intranatal foetal injury. Better prenatal care might also reduce prematurity unassociated with toxaemia.

¹ WHO Hth Org. techn. Rep. Ser. 58
Although Rhesus incompatibility is a common and unavoidable factor, it leads to sensitization of the mother and haemolytic disease of the infant in only one in 200 births. Routine prenatal rhesus typing, followed by serological examination of all Rh-negative women for antibodies late in pregnancy will detect the probable case of haemolytic disease before birth. The confinement should then be arranged, if possible to take place in an obstetric unit where immediate estimation of the bilirubin in cord blood is possible, and an exchange transfusion can be carried out within eight hours of birth. This procedure will save most of the infants born alive. Whether it will always prevent hearing loss is uncertain but it should prevent kernicterus, and thus prevent some, at least, of the cases of impaired hearing. The other forms of foetal sensitization are very rare but their detection prenatally or immediately after birth may still be possible, especially from the experience of earlier pregnancies.

All the foregoing preventive measures will flow from provision of the best possible obstetric care. Prevention of hearing impairment is therefore in the broad sense a minor by-product of a far greater saving of maternal, infant and foetal lives. They are discussed chiefly because this relatively small factor is nevertheless real and calls for improvement in prenatal paediatrics.

The problem of maternal rubella is essentially different in that it is not a material risk to the mother. There is evidence that rubella in the first trimester of pregnancy, may produce foetal abnormality, particularly of the eye, ear and heart. Such estimates as are available range from 100 per cent. at the ninth week, downwards, but none is based upon a prospective study starting from the definite diagnosis of maternal rubella in the first three months and compared with matched controls chosen at that time. Nothing less can give a reliable estimate of the risk to her infant which faces the mother who has contracted rubella early in pregnancy. More information is urgently needed, but there can be no question about the desirability of preventing rubella during pregnancy.

(b) Impairment of hearing due to post-natal causes. (Acquired impairment.)

(1) General

Any improvement in the public health of a country causing a reduction in the incidence of specific fevers and upper respiratory infections will have as a secondary result a reduced incidence of impairment of hearing due to these diseases.
(ii) Local

Adequate early treatment of suppurative and non-suppurative disease of the middle ear results in a reduced incidence of hearing impairment due to these causes. Adequate facilities for early diagnosis and treatment exist as part of the general medical services in many parts of the world. Where this is not so, consideration should be given to the establishment of special centres where these conditions can be treated, before more elaborate services are developed.

2. Secondary Prevention

As has been pointed out, the disability of the child with impaired hearing is not just a matter of his hearing impairment, but of the intellectual and emotional retardation consequent upon the failure to develop speech. Prevention of the disability depends on early diagnosis, so that the young child may acquire speech during the normal period of learning speech. Case-finding and screening programmes are therefore of the utmost importance. Methods of detecting impairment of hearing in infants still need considerable improvement and there is an urgent necessity for awareness of the problem on the part of the parents, family doctors, maternity and child health workers, paediatricians, otologists, as well as the general public.

Speech habits are not fixed in the young child and acquired impairment of hearing results in loss of speech. Early detection and adequate rehabilitation of children with acquired hearing loss is essential; for example, the child with hearing impairment resulting from meningitis should, if possible, receive a hearing aid and start auditory training while still in hospital. All those looking after children with specific fevers should be alive to the possibilities of hearing impairment as a complication and the urgency of its treatment.

Hearing impairment due to catarrhal causes is often variable and requires careful follow-up. The education of children with this type of hearing handicap is difficult. Impairment of hearing may occur for two to three weeks, during which the child misses so much that he is unable to catch up. A hearing aid may be necessary during these periods, and he must be assisted at all times by a favourable position in class.
VII. AUDITORY TRAINING

The modern individual or group hearing aid and other electro-acoustical devices have made it possible to utilize degrees of hearing that were previously regarded as of no use for the acquisition of language and speech. These developments have resulted in an auditory approach to the training of children with impaired hearing, wherever this is possible.

The aim of the auditory method of training is to reproduce for the child with a hearing handicap, (but not with total hearing loss) conditions as close as possible to those in which the normal child learns to listen and to speak.

It is essential that the child with defective hearing should be trained to use any residual hearing capacity which he may have, and also that children with impaired hearing become "ear-minded".

Certain conditions are however necessary if this auditory training is to be successful:

Age. For the child born with defective hearing, or acquiring a hearing impairment before speech habits have been fixed, training must be begun as early as possible, preferably during the first year of life. The reasons for this have already been pointed out. Training at this early age should be given in the family, and, as far as possible, by the mother. She is the person from whom the normal-hearing child receives most of his early auditory stimulation, and she is the one who can give the constant individual attention which is necessary. Sounds must be repeated over and over again if auditory discrimination is to be learnt.

As soon as the diagnosis is made, the parents (particularly the mother) must be helped to understand the important and essential part which they have to play in teaching the child to speak. The child's progress depends, to a great extent, upon the mother's acceptance of the disability and her willingness to undertake the exacting task of seeing that her child will have constant listening practice. Mother and child should visit the audiology centre from time to time so that the child's progress can be supervised and the mother encouraged and taught what she can do to help.
Hearing aid. An individual hearing aid is necessary. These have been supplied to children as young as nine months and there is no reason why even younger children should not have them. It is very important that the child should have the aid when he begins to crawl, since it is at this time that he is farther away from the stimulus of his mother's conversation. Young children readily accept their aids and will not be parted from them, in contrast to the child who is given an aid when he is past the age of easy learning of auditory discrimination. These older children take longer to become accustomed to their aids, and may find excuses for not wearing them because sound has less meaning for them and they have acquired the habit of looking rather than listening. It is an interesting fact that the child with acquired hearing impairment of severe degree will learn to lip-read to help his remaining hearing, but the child with a congenital but profound hearing loss whose residual hearing is untrained and who has been taught only to lip-read, seems to be less capable of adding on the ability to listen, without special help.

Environment. The only environment in which it is possible to learn to understand speech and to acquire spoken language is one in which speech is used. Even children with normal hearing may be retarded in the development of understanding of speech and in learning to talk if they are brought up in residential nurseries where they do not receive enough individual attention. The child with impaired hearing must be kept in an environment where he will be able to listen to speech all day long, and because of his handicap special efforts must be made to talk to him as much as possible. The learning of auditory discrimination in all children, whether their hearing is normal or defective, depends upon sufficient repetition of sounds within their hearing ranges. There is no short cut to this process.

In the practical application of auditory training, it is convenient to distinguish four periods in the life of a child:

1. **Age 0–2 years.** It has been shown that infants with impaired hearing benefit most if auditory training starts during the first year of life. Hearing aids are being used with children of nine months. The most important part of the treatment is that the mother is taught the details of normal hearing development, and how to teach her child in terms of his particular needs. This involves working out with her how to stimulate and hold attention to promote auditory discrimination and listening habits. Every situation during the child's waking hours offers an opportunity for listening practice.
2. **Age 2-6 years.** During this period in a child's development and growth, increasing consideration has to be given to the expanding range of his activities and interests. It is assumed that the child is always wearing his hearing aid. If the child has had the advantage of early auditory training he may have begun to comprehend speech. In this case, he will benefit from an association with normal children in an ordinary nursery school, although it will still be necessary to continue to provide him with auditory training, lip-reading practice and speech instruction.

At the age of compulsory attendance at school (five, six or seven years) it will be necessary to reassess the child and to decide upon the facilities required for his further education. It will be found that while some children are ready to take their place in an ordinary school, there will be others who, owing to poor hearing potential or to a late start will still need considerable training. Thus those who have only reached the stage of vowel discrimination must have expert teaching and constant practice in listening, combined with lip-reading and speech training by other means that are known to be helpful to children with a heavy handicap before they can achieve the more difficult discrimination of consonants. Without this expert training, these children are likely to become educationally retarded. Practice in pure auditory discrimination should be continued, with the provision of incentives and opportunities to encourage them to follow speech by ear.

3. **Age 6-12 years.** In planning auditory training for children within this age range, three groups should be distinguished on the basis of difference in their experiences:

(a) children whose hearing has been impaired from birth, or from an early age, but who have benefited from auditory training during the pre-school and nursery school periods sufficiently to enable them to attend an ordinary school;

(b) children who have not had the advantage of early auditory training;

(c) children whose impairment of hearing is progressive and others whose impairment has been of sudden onset after they have learned to talk.

The children in group (a) will still require auditory training and help in order that they may maintain progress in an ordinary school.
For children in group (b) considerable auditory training will be required. It must be made to suit the maturity and interests of the child, and the active co-operation of the parents is very essential if the child is to get the amount of listening practice necessary. The child who by the age of 8-10 years has not had any auditory training and cannot discriminate between any speech sounds will fail to learn fluent speech through his hearing. Even if this training is given individually, he will take several years to acquire speech sound discrimination and speech will never be fluent.

A child in group (c) with a progressive hearing loss is often suffering from a conductive type of impairment, and this hearing loss is, as a rule, overcome with a hearing aid. The hearing impairment of sudden onset is usually due to meningitis and, as mentioned previously, auditory training should be begun while the child is still in hospital to enable him to learn to make full use of the distorted remnants of hearing. If rehabilitation is delayed, the child may lose his speech. This will later be difficult to regain. Since the onset of hearing impairment is occasionally delayed, medical supervision should be continued for three to six months after discharge from hospital.

4. **Age above 12 years.** The aims of auditory training for children above the age of 12 years who have not previously developed speech and language are necessarily limited, if the child has received a hearing aid for the first time. However, it is worth encouraging children in this group to use aids as there may be an improvement in the voice, and, if considerable listening practice can be given, there may be some improvement in a child's understanding of speech. However, for children who, before the onset of impairment had already acquired good speech and language development, listening practice and the use of a hearing aid will improve their understanding of speech.

There are many problems associated with the use of aids in this age-group as older children at first find the unavoidable background noises disturbing and are sometimes reluctant to accept a hearing aid which they feel shows their disability to the public.
VIII. SPECIAL FACILITIES WITHIN AN EDUCATIONAL SYSTEM

A comprehensive system of special facilities to provide for all children with impaired hearing requires cooperation between school and health authorities to be so close that transfer of pupils, both between ordinary schools and special schools, and between different types of special schools, can be readily effected.

The initial decision as to the best means by which special educational treatment can be provided for a child should be provisional. The group considers that it should be based on examinations and recommendations by the physician, otologist, audiologist, psychologist and educator, and in consultation with the parents. Every child should be re-examined periodically to find if the provision that has been made for him is adequate.

First, facilities are required for education of those who can hold their own in ordinary schools if they are also provided with facilities for continued training in an audiology centre. The arrangements should provide for pupils in all types of nursery, primary, and secondary schools, for students taking higher education and for vocational guidance.

Second, special schools are required to cater for those children who are not yet ready to hold their own in ordinary schools, or who, for various reasons, are unlikely to be able to do so.

**Training of the parents; nursery schools**

Children with impaired hearing should have the help of their parents in order to overcome their handicap. This is especially important during the first years of life, when the basis of language and speech is being laid down. Parents are taught how to help by advice and demonstrations in centres which may be attached to universities, or hospitals, or under local authorities, or by private arrangement. The general mental growth and speech development of many young children with impaired hearing can be assisted by their admission to nursery schools for normal-hearing children, but the expert help of a teacher with specialized training must continue, in order that the child may have good comprehension of speech, and clear speech, and to help the mother during the time the child is at home.
In some cases children are admitted to nursery schools attached to special schools for the hearing-handicapped. Attendance at these nursery classes should however be on a daily basis so that the young child may live at home or, if this is not possible, in a foster home. Although residential nurseries do exist, they are not desirable. If such a nursery is considered necessary, the children should be boarded in small groups and the conditions made as home-like as possible in order that there may be the maximum individual attention to each child.

Children in ordinary schools

All children with slight hearing impairment, many of those with moderate impairment, and some of those with severe impairment may be expected to hold their own in ordinary schools. The proportions should increase as early diagnosis and facilities for special education improve.

Children who use hearing aids in ordinary schools must be under the expert supervision of a specialized teacher and an otologist, so that auditory training and other help can be given as required. Audiological centres must recognize their continuing responsibility for this supervision.

Usually, teachers and pupils readily accept a handicapped child once his difficulties are understood and soon take his presence in the group for granted. Teachers will understand the need to use a clear voice at all times, to avoid hurried speech, and to face the class when they talk. The child will be placed in a classroom so that he has the best opportunity for using hearing and vision, i.e. near the front of the class and as close to the main window as possible. The ordinary classroom may present acoustical problems which are serious for the child using a hearing aid. It is necessary therefore, also to ensure that, in this respect, the room is suitable.

If a child dislikes his hearing aid, so that he does not use it consistently, or even discards it altogether, the teacher should encourage him to resume its use and should notify the director of the audiology centre concerned.

Children in special schools

The children with impaired hearing who will need instruction in special schools will include the majority of those whose impairment has not been detected in time for them to obtain full benefit from use of their residual hearing, those who have profound or total hearing loss, and a number who have physical or mental handicaps additional to their hearing impairment. There will also be some children with a moderate or severe hearing loss who, for various reasons, fail to make the progress required for an ordinary school.
In the organization of special schools it is important to avoid placing children who have already acquired speech and language, either naturally or as a result of special training in schools planned to receive children who enter without speech and language.

In special schools, just as in ordinary schools, the aim is to train the children to be active, happy and well-adjusted members of society. Where special educational treatment necessitates the child’s removal from his family, the boarding arrangements should be made as home-like as possible. Alternatively, private fostering with specially selected foster parents may be arranged.

Language is best acquired in relation to direct experience of people, things and activities that are interesting to ordinary children of similar age. School buildings need to be planned to facilitate this and materials, equipment, pictures, film-strips and books should be provided in school libraries to ensure that the child has opportunities to learn the language of everyday life, and, as far as possible, the information that is acquired by ordinary children with the help of language and speech. By these means their experience is enriched, their interests and capacity for initiative are stimulated and their vocabulary is increased.

Audiology services are necessary in special schools, not only to ensure that the pupils have the best possible opportunities to develop speech comprehension, and good speech and language, but also to facilitate their progress in general education and social adjustment, and to increase the possibilities of their transfer either to units or schools for the partially hearing, or to ordinary schools. It has been found that many children in special schools for the hearing-handicapped will profit from extensive use of group hearing aids as well as from continuous use of individual aids. Effective use of these will be related to the acoustical conditions provided in schoolrooms and other parts of the school buildings. It has been shown that effective measures can be taken to treat rooms in existing schools to make them acoustically satisfactory. In a schoolroom, not less than one-fourth of all surfaces of walls, ceilings and floors should be treated with sound-absorbent material.

The principle of rehabilitation calls for some reassessment of the curricula in special schools for the hearing handicapped. The whole life of the children must be planned so that speech and the use of hearing aids are accepted as the normal means of communication, and the children welcome social contacts with normal hearing people.
The contribution that parents can make to this rehabilitative process cannot be over-estimated and every means has to be explored to ensure the closest possible contacts between the school and the parents of the children, and to give the parents guidance to help their children to meet the personal social and economic problems that they will have to face as they grow up and leave the school. Periodic assessment of the potentialities and attainments of each pupil should constitute a basis for the grouping of the pupils in classes and for other purposes.

Particular attention should be given to the selection, at an early age, of able and gifted pupils who, if given the opportunity of developing the use of their abilities, may become suitable for admission to a special high school or a technical school, or for transfer to an ordinary high school or technical school.

Provision also needs to be made for special educational treatment to be given to those children who are mentally retarded. There are, in addition, certain children who seem to possess normal hearing and normal intelligence, but who for some obscure neurological or psychological reason have special difficulty in acquiring speech. There is a great need of research into the nature of the handicap in this group.

Children with multiple handicaps are a particular problem. Impaired hearing may be complicated by defective vision, cerebral palsy and mental retardation. Educational facilities must also be provided for these children, giving due priority to the dominating disability. It has been shown that their achievements, in spite of their handicaps, are often satisfactory and many of them obtain employment on leaving school.

**Secondary and higher education.**

Evidence is given elsewhere in this report of the wide range of occupations that can be followed by persons who suffer from impairment of hearing. Some of those whose impairment is profound, or even total, have been enabled, after suitable education, to pursue with success careers in technical occupations, scientific research, in work such as librarianship and in a variety of non-manual posts in industry as well as manual occupations that call for different degrees of skill and different kinds of training. It has been proved that audiological treatment can help a larger number of pupils from special schools for the hearing-handicapped to enter some of these occupations than
have done so in the past. Higher education for boys and girls who suffer from severe and profound hearing loss is at present being provided in two ways. High school or grammar-school education and technical education are being given in special schools to pupils who have been selected for admission to them after attending other schools. A number of boys and girls with moderate to severe, and a few with sub-total hearing loss, are attending ordinary high schools and technical schools. Already some former pupils of special schools and some young men and women who are handicapped by severe, profound or total hearing impairment have taken courses in arts or science in universities, in certain cases with distinction. Some have succeeded in gaining higher degrees after courses of post-graduate study and research.

The group recognizes that considerable changes will be needed in the traditional organization and pattern of education for children with impaired hearing if their education in the future is to be consistent with the philosophy and principles set out in this report.

IX. VOCATIONAL GUIDANCE, TRAINING AND EMPLOYMENT

1. Hearing Impairment and Employment

The idea that "the deaf", because of their handicap, are suitable only for a very limited range of occupations, especially of the handicraft or sheltered workshop type, is now out of date. Hearing impairment, by itself, should not be a bar to employment, except in a few specific occupations where good hearing is an essential part of the job for reasons of safety, communication or working efficiency.

Post-war studies carried out in several countries (notably in the United States of America), have shown not only that where employment opportunities have been available have persons with hearing handicaps been able to fill them satisfactorily, but also that the range and complexity of occupations open to them is much wider than might be expected. But, because of the very nature of their handicap, there is a need for special services of vocational guidance and vocational training for them in order to make sure that they are given every possible assistance in becoming suitably employed
and properly adjusted to their employment. The Recommendations of the International Labour Conference concerning vocational guidance, vocational training, vocational rehabilitation and the organization of employment services offer guides to the techniques and methods as well as administrative structures necessary in the preparation for, and settlement in, employment of all handicapped persons, including those with hearing handicaps.

2. Vocational Guidance

The purpose of vocational guidance for the adolescent with impaired hearing should be to provide the maximum opportunity for eventual satisfaction from employment in a remunerative occupation selected, wherever possible, at the highest level of his latent or proved abilities and with due regard to the opportunities on the employment market.

The personal interview, or series of interviews, by the vocational guidance officer with the adolescent and preferably also his parents, is the heart of the matter. It is only by seeing and assessing the individual handicapped adolescent and by understanding his and his parents' aspirations that a useful vocational plan can be made.

Consideration should first be given to the unique characteristics of each individual child: his aptitudes, interests, educational record, health record, intelligence, general psychological make-up, etc. This can be supplemented, where necessary, by the results of any psychological or other special tests which have been necessary in individual cases. These tests should be required only in cases presenting difficulty, and should always be an addition to, and not an alternative for, the information obtained at the interview.

The assessment of the individual adolescent should then be matched by information about suitable employment opportunities open to him. This should take into account not only general information on the industries and occupations for which he appears suitable, but also detailed information about local opportunities in these occupations and industries. In addition local peculiarities and deviations from the usual requirements of occupation or occupations considered suitable should be considered. These may affect the job requirements and also the working conditions and the particular demands that the job is likely to make on persons engaged in it.
Only on this basis of appraisal of the individual and of realistic consideration of available jobs, can efficient vocational guidance be given.

Vocational guidance should be a long and continuous process beginning well before the child with a hearing handicap leaves school. Cumulative school records should be made of each child's progress over several years. These records must be carefully designed to suggest answers to certain specific questions. Teachers should be encouraged to think of the child in relation to his future job and should be asked to play a part in the vocational guidance conferences which concern children whom they know.

Guidance to those with hearing handicaps can best be given within the framework of general vocational guidance services for all adolescents. But, because of the nature of the handicap and the extra care and attention needed in dealing with each individual case, specially selected and trained staff should be provided for this purpose.

3. **Vocational Training**

Because of communication difficulties, many adolescents with impaired hearing are less mature than their hearing contemporaries, and are therefore less well equipped to enter direct employment or to undertake ordinary apprenticeships when the time comes to leave school. This puts them at a grave disadvantage in the search for suitable employment and in the settling down process which takes up the first few years of a young person's working life.

Accordingly, vocational training facilities should be provided for the adolescents with hearing handicaps on a sufficient scale to compensate them for these early disadvantages. This training should be designed to provide them with the acquisition of skills equal to their employment potential, and also with the self-confidence and maturity needed to make entry into employment a more amenable process. This vocational training should of course be provided whenever possible in company with, and under the same conditions as, hearing adolescents, either in ordinary vocational training centres or with employers. Where necessary, because of difficulties of communication, special training establishments should be set up for the hearing-handicapped to prepare them for subsequent work on the ordinary employment market.
And for the small minority, who are considered unsuitable for ordinary employment, special arrangements should be made for their training and subsequent employment under sheltered conditions. It should be emphasized, however, that every attempt must be made to avoid segregation of those with hearing handicaps during this training or semi-apprenticeship period.

It is worth stressing that vocational training should be provided in the years following compulsory education and that the range of occupations and skills covered by this training should be as wide as possible. It may be considered better to provide training in the basic skills required for groups of allied occupations, so that this training can be utilized as the stepping-stone to increased skill in the specific occupations finally selected.

It is not recommended that vocational training should be provided during the normal educational period, because time is lost that would be better spent on general education and the number of occupations that can be taught in schools is limited, with obvious results in the narrowing of employment opportunities. The educational process could, however, include the varied practical activities and pre-experiences that are available to hearing children, in as much as the adolescent with a hearing handicap can benefit from them.

4. Employment

Because of their need for a longer school life than hearing children, and their possible immaturity when they arrive at school leaving age, adolescents with hearing handicaps may be likely to start work at a later age than their hearing contemporaries. This presents problems of work status, wages, and the possibility of not undertaking ordinary apprenticeships.

Everything should be done to ensure that at the age of 18 or 20 years they are not given the same wages and the same position accorded to a hearing child of 15 or 16 years. Arrangements should be made for the additional years spent at school beyond normal school-leaving age and years spent undergoing recognized vocational training to count towards seniority with the employer and for parity of wages. Similarly, where upper age limits are fixed for the starting of an apprenticeship, these could be increased to take into account any recognized educational course or training course undertaken. Moreover, the time spent on extra education and vocational training could count, in whole or in part, towards the period fixed for the apprenticeship.
The hearing-handicapped need special help in being placed in employment and in the work induction process. They are at a disadvantage at an interview with an employer because of the problem of communication. For this reason they need an intermediary – a specially selected and trained employment officer – who can speak on their behalf and place their qualifications before a prospective employer and then assist in the settling-in process once work has been started. This settling-in process should include advice to the employer and his subordinates and to the new employee on such aspects of good working relationships as the means of communication, methods of instruction, psychological reaction, and integration of the new employee into the firm's working team.

X. TRAINING OF PERSONNEL

When considering the problems of providing specialized personnel and the appropriate training requirements, the group agreed upon the following basic principles:

(1) The training of the various specialists involved in prevention, case-finding, differential diagnosis, treatment and education of the child with impaired hearing should be based on a thorough knowledge of normal development. Too early specialization should be discouraged.

(2) Because of the complexity of the problems of hearing impairment, specialists from many different fields are necessary. It is important that they should understand how to work together.

(3) Audiology is a rapidly developing science and clinical art, consequently there is need to keep up with new developments so that these may readily be applied to improve services for children with impaired hearing. Although the standards and requirements for professional qualifications will naturally vary from one country to another, the basic training in audiology should include the following subjects:

(i) anatomy and physiology of hearing; psychology of normal and of impaired hearing;

(ii) development of the normal child; development of hearing, speech and language, in the normal and the handicapped child;
(iii) electro-acoustics and audiometry, with practical training and experience in the use of hearing aids, group amplifiers and other electro-acoustic devices;

(iv) otology, with reference to causation, prevention, diagnosis and treatment of hearing impairment.

1. **Training of Medical and Nursing Personnel**

   In training students for the medical and nursing profession, sufficient attention is not always given to normal child development and to the importance of early detection of hearing and speech problems. The group strongly recommends that appropriate facts and information on procedures should be included in the undergraduate and post-graduate training of both doctors and nurses.

2. **Training of Social Workers and Vocational Rehabilitation Personnel**

   The use of social workers in the management of children with impaired hearing merits consideration. If social workers are to make their maximum contribution in this field they should have an opportunity of studying the normal development of hearing, language and speech in children, as well as the deviations which may result from impairment of hearing.

   Vocational guidance officers, instructors and youth employment officers should first be qualified to carry out their functions for normal hearing children. Additional training and experience which will enable them to understand and deal with some of the special problems of the hearing-handicapped is very desirable.

3. **Training of Specialized Teachers**

   The group recognized that the training of specialized teachers is organized in different ways in various countries, and that in some countries it is not organized at all. However, in order to provide a supply of teachers who have been trained for work with children with impaired hearing in the different types of services that have been described, the group wishes to emphasize the following points:

   (a) It is essential for all teachers of the handicapped, and particularly for teachers of children with impaired hearing, first to study and become familiar in practice with the physical, mental and social growth and development of normal children.
(b) In training courses for teachers of children with impaired hearing, the fundamental practice should be based on the development of hearing and speech in the normal child and how this can be applied to a child with impaired hearing. This will include the effect of hearing impairment on speech. The special curricula will also include the theory and practice of the development of language in children with profound or total hearing loss, phonetics and methods of improving their speech by means additional to auditory training and opportunities for lip-reading.

(c) It is essential that all teachers (whether they work in audiology clinics, special schools or classes, or in a peripatetic capacity helping children with impaired hearing who are attending ordinary schools), should have a clear understanding of the principle that the aim of all special educational treatment is to teach handicapped children to adjust themselves as completely as possible to life with other children and adults who are not handicapped. They should also fully appreciate that in special classes and schools it is their responsibility to assist as many of their pupils as possible to reach standards that will fit them to attend either ordinary schools, or a type of special school in which levels of aspiration can be higher than in the school or class in which a child is first placed.

(d) It has been found that these requirements can best be satisfied by a course of full-time training of not less than one year's duration after teachers have had training in work with normal children, not necessarily in methods of teaching them, but certainly in understanding the characteristics which are typical of different stages in their growth and development.

(e) In each country a reasonable standard of qualification as a special teacher should be required, taking into account the principles enumerated above. The effects of this should be to direct attention to the need for special university training courses. In some countries it may be necessary to evaluate and reorganize existing training courses for specialized teachers and for courses to be designed to complete the training of partially qualified teachers, where these exist.
(f) Audiology is a rapidly changing subject and it is important that all those working in this field should preserve a flexible approach and avoid rigid attitudes of mind. When research is being carried out in the training centres, the pupils in them naturally tend to adopt this flexible approach. One of the advantages of establishing departments for training teachers of handicapped children in universities is that it encourages collaboration with other departments, such as those of normal education, phonetics, otolaryngology, paediatrics and child psychiatry.

Finally, the group recommends that doctors, nurses, teachers, social workers, vocational training specialists - indeed all the specialists working with hearing-handicapped children - should have practical experience in audiology centres and the opportunity for extensive observation in special schools for children with impaired hearing.

These recommendations imply a considerable change from the present methods of training that exist in many countries. Particular emphasis is given to continuing interchange of information and procedures among the various professional disciplines. This, the group considered, would be a healthy development; it would provide insight and intellectual stimulus for the professional workers involved and would go far toward stimulating interprofessional relations, and would greatly improve services for the child with defective hearing.

XI. ORGANIZATION OF SERVICES

The Joint Expert Committee on the Physically-Handicapped Child\(^1\) has made some generalizations which are equally apposite to the problems of the child with a hearing handicap. Effective provision depends upon the organization of general medical, educational and social services, of which provision for those with impaired hearing must be a part. The level of development which is practicable in any country must therefore depend on the readiness of the basic health, education and social

\(^1\) WHO, 1960. For further information, see the report of the Joint Expert Committee on the Physically-Handicapped Child.
services to develop in this special field. Provision of a special institute for the "deaf" unassociated with these basic services, as an emotional response to recognition of the individual difficulties of those with impaired hearing may also ensure their isolation and increasing dependence, whereas their real need is to attain the maximum of self-sufficiency within the society in which they must live.

There are five main elements in the basic services which contribute to the programme for care of those with hearing impairment. They are the hospital and specialist medical services, the public health services, medical and nursing care in the home and the social and educational services. Their functions overlap, especially in the medical field, but they are broadly those of ascertainment, accurate diagnosis, treatment and subsequent education and training. To these may be added the support of adequate technical services for maintenance and repair of electro-acoustic apparatus, and a more general need for public and professional education in this subject.

Public health education should include relevant material on hearing impairment. The medical, educational, social and vocational needs of those with impaired hearing are not generally understood. There is too great readiness to provide special facilities which themselves produce segregation and loss of a wider range of social contacts which the handicapped need no less than the normal. The special school, institute or club has a place, but as a complete solution of the problem it represents essentially rejection by society, unless there is compensation in other outlets to the hearing world. The public need information on the benefits of early diagnosis and treatment, the possibilities of prevention and mitigation, and the importance of the contribution they themselves can make to preserve normal social outlets for the handicapped, whether from hearing impairment or other cause.

In congenital hearing impairment as in many other congenital defects, e.g. cerebral palsy, cleft palate, imperforate anus, time is vital to effective treatment. Equally, acquired hearing impairment of more than minimal degree requires prompt detection if any practicable treatment is to be effective. Time lost in the learning years can be irrecoverable and the learning years of hearing for speech are early and few. Therefore early ascertainment is the indispensable element in any programme for the care of children with impaired hearing.
Observant parents will be the earliest to suspect deviations from the normal, but the proportion of informed, observant parents in the present state of public education on child development is necessarily low. Health services should therefore be designed to supplement and help parents' observation. The methods used will depend upon the organization of health services in the individual country. Wherever the basic health services are well organized, some medical or health worker will see the child during its first year of life for the purpose of advising the mother, or for the treatment of illness. This person may be the family doctor, a paediatrician, public health nurse, social worker, or one of the staff at a child-health centre. Frequently it will be the public health nurse (or her equivalent) who sees the infant routinely during the first year. She will, as part of that routine, record the progress of the child in diet, weight, general health and development of various abilities such as sitting, crawling, walking or speech; to these should now be added the answer to the question "Can this child hear?" Simple screening tests have been designed and public health nurses can and should be trained in the most simple technique of screening, not to diagnose hearing impairment, but to select the small minority of children under the age of one year whose hearing capacity is in doubt. This will inevitably be a crude screening process and will pick out some who are normal but who happen to have responded badly, some who have other defects such as mental impairment, but it should include all with a genuine hearing loss. Screening by this method is not necessarily a single procedure on one occasion only. There is a gradation of responses from the reflex of the three-months infant to the more precise localization and more elaborate response of the same child six months later. The mother will usually collaborate by more continuous observation and a single failure of response at an early age need not raise immediate alarm, but the observer should seek to assure herself before the end of the first year, and preferably before the age of nine months, that the infant's hearing is not materially impaired.

While these suggestions are in terms of the public health nurse, or her equivalent, it is obvious that others, especially the family doctor, paediatrician and child health clinic doctor should be fully conversant with the methods used and be prepared, where appropriate, to make tests themselves.
The child with suspected impairment who has been screened in this way must then go on to precise diagnosis. For this purpose, clinics with specially trained staff and suitable equipment are necessary. It has sometimes been found convenient to provide special clinic sessions within the child-health services attended either by otologists or by specially trained doctors and nurses of the service, where more elaborate tests may be made at leisure. Such a solution may well be effective in the largest urban centres, but elsewhere the otological service of the hospitals may have to be used.

Special diagnostic and treatment clinics can be organized either at hospitals or at public health centres but however they are organized they must use the specialist otological service of the area or region. It is not sufficient to refer children, especially infants, with suspected hearing impairment to routine otological clinics attended by patients with many other otological conditions. An unhurried approach to child and mother in a quiet environment is essential. Separate clinic sessions must be held. Moreover these clinics require the services of other specialist staff, in particular the paediatrician, child psychiatrist and audiological technician, as well as others such as the educational psychologist, social worker and the specialized teacher.

At present special diagnostic clinics tend to be concentrated in a few large, mainly university, centres. Some decentralization is essential but is impeded by lack of interest in some otologists and lack of time and facilities for others. Nevertheless, a full programme cannot be provided by few and centralized clinics. The need for repeated visits, the time required for each, and the importance of avoiding excessive fatigue of infant, mother and staff alike call for provision within reasonable distance of the child's home. Distribution of hospital and specialist services is already determined by these factors, but this service cannot be distributed even as widely as hospitals. Some travelling from sparsely-populated areas is unavoidable, but otological services even in these areas can help by some further preliminary scrutiny, provided they work within a regional plan of reference to special clinics. This is already a familiar pattern in hospital services. Special facilities may be concentrated at larger hospital centres with which smaller ones are associated.

Development of special services for the child with impaired hearing can only proceed effectively at a pace adjusted to the development of the basic services. An attempt to introduce a complete service before essential elements, e.g. sufficiently
widely distributed diagnostic facilities can be provided, will fail and in failing may impede a well-timed later programme. Nevertheless the specialized diagnostic clinic at a medical teaching centre may be practicable in a country which cannot yet make full provision for all its population. Such a development is the seed from which a full service can grow in time and is to be encouraged as a first step of great educational value to the professions and public alike.

The detection of hearing impairment present from birth, or acquired in very early childhood presents greater difficulties than detection of later acquired damage. Where a clearly apparent condition, such as otitis media or mastoiditis occurs, medical advice will usually be obtained for the treatment of the primary condition. The risk of permanent hearing impairment should be clearly appreciated and treatment of the primary condition should be followed by rehabilitation of any residual impairment at the special diagnostic and treatment centre. Equally, hearing damage as a sequel to meningitis, head injury, or the like, will normally be recognized and should lead to reference of the child to the special clinic. The less severe forms of hearing impairment, secondary to otitis media, nasopharyngeal infections or other causes may not be detected at the time of the primary lesion. Here again the observant parent or school-teacher may detect the condition, but many cases will only be discovered by routine screening at school, on entry or subsequently. Such children may find their way to the special clinic either through special school clinics dealing with ear, nose and throat abnormalities, or through the hospital otological clinics, family doctors, or paediatricians. The precise method will vary according to the organization of health services. The main point is that the diagnostic and treatment clinic should be within the ambit of the specialist services of the region.

The essentials of treatment are set out in earlier chapters. They include special medical or surgical treatment which may be necessary, the provision and maintenance of an individual hearing aid for every child who can use one; persistent auditory training where any useful hearing remains; and special educational facilities within which rehabilitation of hearing can continue. While residential hostel facilities may sometimes be used for mothers and children at the beginning of training, continuous training by the parent is so essential to success with the very young that
something more than periodic attendance at a special clinic may be needed. The clinic may suffice for large urban centres, but home follow-up may help even there, elsewhere it may be essential. There are three main resources for such a follow-up - the public health nurse, the specialized teacher and special clinic workers. Others may help, the family doctor, the local paediatrician, otologist or social worker, but in the main a regular visitor working on direct instructions from the clinic should provide the best assistance. The public health nurse, suitably briefed, may do this, or it may be possible to link some of the teaching staff of schools for the hearing-handicapped with the special clinics for this purpose, provided always that there is no conflict of method. In some cases, the special visitor working from the clinic may be used. Although there may be differences of approach between some specialized teachers, otologists and audiologists at present, it is clearly advantageous that the development of auditory training where this is possible, should become the concern of all.

Educational facilities for children with impaired hearing must clearly form part of the general provision for education. The object of all the medical rehabilitative processes described is admission of the child as completely as possible to a hearing environment. Auditory training and the use of hearing aids, and language training, along with lip-reading, may enable the child from the first to enter a normal school, provided his special needs are recognized. Other children, however, will require special teaching appropriate to their limited acquisition of speech and language despite the presence of some hearing capacity, while special provisions are needed for educating those who are wholly or almost wholly without hearing.

Education has been fully discussed and it remains only to re-emphasize here that its provision must be so integrated that a child with the capacity to do so must be helped to pass from a school for those less able to surmount their difficulties of personal inter-communication by speech to one for those with greater facility, and, if possible, to a school for normally-hearing children. The group stresses that the rehabilitative approach must persist throughout school life, and believes that greater use of special classes in schools and nursery schools for normal children would encourage this. Moreover, such special classes might be more widely distributed at less cost than special day or residential schools, so facilitating these handicapped children to remain in their own homes. The great advantage of a good home environ-
ment, even a foster home, over a residential group is in limiting the sense of deprivation of the child. The psychological problems of children with hearing impairment are inevitably great, and the mitigating effect of a good home life, as well as the continued auditory training of life in a speaking group, should be preserved if possible.

While recognizing that much has been achieved, the group considers that there is room for improvement, particularly in the liaison between those working in health and education in providing for children with impaired hearing. Each has a contribution to make and specialized teachers might participate in the work of hospital clinics and home training, while otologists should visit special schools and classes in a consultative capacity. Such sharing of responsibility requires agreement on policy in handling the child, and especially acceptance of the importance of the auditory approach, making the utmost use of residual hearing with the aid of electro-acoustic devices, where appropriate.

The group expresses the hope that national governments will do everything possible to encourage the production of suitable hearing aids at an economic price, and to see that these are made available for all children who need them.

Finally the group acknowledges that the effort of the United Nations and its specialized agencies in planning and in integrated action gives an example of co-ordination at the international level. The group urges that governments, in the development of services for children with impaired hearing, give attention to the same need for the integration of the various services necessary to allow for full development of these children.