



FORTY-FOURTH WORLD HEALTH ASSEMBLY

Provisional agenda item 17.2

CONTROL OF ACUTE RESPIRATORY INFECTIONS

Report by the Director-General

The programme for the control of acute respiratory infections was established in 1982 with the primary objective of reducing the severity of these infections and the mortality from them in children. It is believed that 25% to 30% or about four million of the estimated 13 million deaths occurring each year in children under 5 years are caused by acute respiratory infections, particularly pneumonia.

This report reviews the progress made in the programme. It describes the control strategies being promoted, the technical policies on case management, and the activities and achievements of the health services and research components of the programme. It examines the current status of the programme activities in relation to the targets set for 1995 and outlines the action that needs to be taken by Member States in collaboration with WHO, in order to achieve them.

An earlier version of this report was submitted to the eighty-seventh session of the Executive Board, which recommended for adoption by the World Health Assembly the draft resolution contained in resolution EB87.R1.¹

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¹ Document EB87/1991/REC/1, p. 3.

1. BACKGROUND

1.1 In both the Seventh and the Eighth General Programmes of Work, covering the periods 1984-1989 and 1990-1995¹ respectively, the acute respiratory infections programme is classified under Disease prevention and control.

1.2 The principal objective of the programme is to reduce mortality from acute respiratory infections in children. Particular attention is paid to pneumonia, which is the first or second cause of infant and early childhood mortality in the majority of developing countries. Of the estimated 13 million deaths that occur each year in children under 5 years of age, 25%-30% are caused by acute respiratory infections, particularly pneumonia. Thus, in absolute numbers, pneumonia accounts for about four million childhood deaths annually. The programme must therefore be seen as an important part of efforts directed towards child survival.

1.3 Some of the four million deaths (fewer than one quarter) can be prevented by immunization against measles and whooping cough. In the long term, other deaths can be prevented by the introduction of effective, safe and inexpensive vaccines against the most common agents of pneumonia in children, and by the gradual elimination of risk factors for this disease. One strategy that can be applied immediately to avert most of the pneumonia deaths is timely and appropriate case management.

1.4 In addition, acute respiratory infections account for 30%-50% of visits by children to health facilities and 20%-40% of hospitalizations of children. They are the condition most frequently involved in the unnecessary use of antibiotics and other drugs in outpatient services. In view of the magnitude of these problems, correct case management of the infections must be seen as an essential component of the "appropriate treatment of common diseases and injuries", one of the eight essential elements of primary health care.²

1.5 The other objectives of the programme are to reduce the severity of and prevent complications from acute upper respiratory infections, to reduce the incidence of acute lower respiratory infections, and to reduce the inappropriate use of antibiotics and other drugs for the treatment of acute respiratory infections in children.

1.6 To meet its objectives, the programme has two components: a health services (or control) component, which is concerned with the planning, implementation and evaluation of national programmes, including the transfer of available knowledge on control strategies through dissemination of information and training of national staff in technical and managerial skills; and a research component, which is concerned with the promotion, support and evaluation of research to develop new or improved tools and approaches for application in countries. While for convenience these two components are described separately below, there is a close interrelationship between the two approaches. The research focuses on priorities corresponding to the needs of the services activities, and consequently research findings are rapidly applied in control programmes.

1.7 The programme has been guided from the beginning by a Technical Advisory Group, composed of leading scientists and experts in public health. The Group has met five times since 1983 to review and evaluate the programme from the scientific and technical point of view. Since August 1987, when the programme was placed under the same

¹ Eighth General Programme of Work covering the period 1990-1995. Geneva, World Health Organization, 1987 (Health for All Series, No. 10).

² Primary health care. Geneva, World Health Organization, 1978 (Health for All Series, No. 1).

management as the diarrhoeal diseases control programme, it has also been reviewed annually, particularly with regard to budgetary and financial matters, by the Management Review Committee of the Diarrhoeal Diseases Control Programme, composed of representatives of WHO, UNDP, UNICEF and the World Bank. Since 1988 the recommendations of these two groups have been submitted to the annual Meeting of Interested Parties of the Diarrhoeal Diseases and Acute Respiratory Infections Control Programmes, attended by representatives of governments and agencies that are contributing, or are interested in contributing, financial support to these programmes, and by representatives from developing countries with national control programmes. This meeting reviews the progress and plans of the programme for the control of acute respiratory infections and receives pledges of financial support.

1.8 Since 1982 the programme has received financial resources from 18 contributors (including WHO/PAHO) totalling US\$ 16.3 million. The programme's budget for the 1990-1991 biennium is US\$ 9.3 million; and its projected budget for the 1992-1993 biennium is US\$ 11.0 million.

1.9 The following is a brief account of the present status and plans of the programme. Further details of its activities are available in documents issued by the programme, in particular its fourth programme report.¹

2. HEALTH SERVICES ACTIVITIES

Control strategies

2.1 Correct case management is the main strategy to reduce mortality from acute respiratory infections. Most community-acquired pneumonias in children in developing countries are caused by bacteria, particularly Streptococcus pneumoniae and Haemophilus influenzae, and can usually be treated at home with an inexpensive and safe oral antibiotic. Studies supported by the programme in several developing countries have demonstrated that the application of a standard treatment protocol by peripheral health workers can prevent a substantial number of deaths from pneumonia.² In addition to the management of pneumonia, the case management strategy seeks to achieve the secondary objectives of diminishing the severity of acute upper respiratory infections, preventing complications from these infections, and reducing the inappropriate use of antibiotics and of cough and cold medicines for the treatment of acute respiratory infections in children.

2.2 Immunization is a specific strategy to prevent acute respiratory infections caused by measles, pertussis and diphtheria. The programme has the role of promoting the benefits of immunization for the prevention of morbidity, while national immunization programmes are responsible for its performance.

2.3 National programmes for the control of acute respiratory infections are being advised to support nutrition and maternal and child health/family planning programmes, including the promotion of breast-feeding, since malnutrition and low birth weight appear to be the most important risk factors for pneumonia in children. Chilling and exposure to cold are also likely risk factors for pneumonia in young infants. Indoor air pollution from biomass fuel used for cooking and heating, or from tobacco smoke, may be a risk factor as well. The importance of vitamin A deficiency is currently under study.

2.4 The relative importance of each of these risk factors, and the extent to which they can be prevented through feasible and cost-effective strategies, have not yet been

¹ Programme for control of acute respiratory infections. Fourth programme report, 1988-1989. Document WHO/ARI/90.7 (1990).

² Case management of acute respiratory infections in children: intervention studies. Document WHO/ARI/88.2 (1988).

determined. With the collaboration of the London School of Hygiene and Tropical Medicine, the programme is making an analysis of available information on the effectiveness, feasibility and cost of interventions that seek to reduce risk factors for pneumonia, with the ultimate goal of identifying feasible strategies for its prevention.

Technical policies on case management

2.5 Technical guidelines for the case management of acute respiratory infections in children in developing countries, based on existing scientific evidence and a consensus of recognized experts, were first issued by WHO in 1985.¹ After several years of experience with training courses, intervention studies and programme implementation, an overall evaluation of the guidelines was initiated in 1988 and completed in 1990. A Case Management Chart was prepared which presents the key elements of a revised clinical protocol for the management of a child with cough or difficult breathing. This is supplemented by a second chart on the management of a child with an ear or throat problem. Existing training modules for the supervisors of health workers at first-level facilities were extensively revised to bring them into line with the new guidelines and chart, and consolidated into a single module named "Management of the young child with an acute respiratory infection". The revised guidelines have been issued as a manual.²

2.6 The WHO protocol for the case management of acute respiratory infections in first-level health facilities and by community-based health practitioners deals with the identification of cases of pneumonia among the many children with cough or difficult breathing to ensure that they receive antibiotic therapy. Recognition of pneumonia is based on two clinical signs, fast breathing and lower chest wall indrawing. The combination of these signs, as defined by WHO, has high sensitivity and specificity for the diagnosis of pneumonia. The presence of chest indrawing indicates severe pneumonia and, if feasible, a child with this sign should be immediately referred to a hospital where injectable antibiotics, oxygen and more intensive medical and nursing care are available.

2.7 The clinical protocol also provides guidance on the identification and treatment of wheeze (bronchiolitis or asthma), chronic cough and upper respiratory infections that require antibiotic treatment (acute otitis media and suspected streptococcal pharyngitis). If these conditions are not present, the case is considered to be a simple cough or cold.

2.8 The protocols limit the use of oral antibiotics to pneumonia (non-severe), acute otitis media, and suspected streptococcal pharyngitis. WHO has taken a strong stand against the inappropriate use of antibiotics for the vast majority of acute respiratory infections which are classified as coughs and colds, because they are mild, self-limiting viral infections. The use of most cough and cold medicines is discouraged since they are expensive, many are ineffective, and the few effective ones may have important side-effects in children. WHO recommends using either safe home-made remedies or a one-ingredient, safe and inexpensive expectorant such as glyceryl guaiacolate. For home care, emphasis is laid on continued feeding and the administration of fluids, together with observation of the child for signs that may indicate pneumonia or very severe disease so that treatment can be sought quickly when these signs occur.

2.9 The guidelines contain special instructions for the recognition and treatment of pneumonia, sepsis and meningitis in young infants (less than 2 months of age), because the etiology and clinical manifestations in these infants differ from those in older children. Young infants constitute a special risk group and account for 20% to 30% of all deaths from acute respiratory infections in children under 5 years in the majority of developing countries.

¹ Case management of acute respiratory infections in children in developing countries. Document WHO/RSD/85.15 Rev.2 (1985).

² Acute respiratory infections in children: case management in small hospitals in developing countries. A manual for doctors and other senior health workers. Document WHO/ARI/90.5 (1990).

2.10 The preparation of a series of technical review papers began in 1989. The aim is to disseminate information on the technical basis of the WHO policies on case management. One paper has been issued on the use of antibiotics.¹ The subjects of other papers under preparation are: use of bronchodilators, use of cough and cold medicines, use of oxygen therapy, scientific basis of the case management strategy, policy options for control programmes, technical justification for age-specific definitions of fast breathing, and an annotated bibliography on the case management of pneumonia in children.

Appropriate technology

2.11 Two priority areas have been identified for the development of appropriate health technology. Since counting the frequency of breaths is an essential step in the identification of pneumonia in children, a simple device to measure the respiratory rate is required for auxiliary health personnel and community-based health practitioners. WHO has issued specifications for a one-minute electronic timer that can produce an audible alarm after 30 and 60 seconds, is accurate at extreme temperatures and high levels of humidity, and is waterproof and noncorrodable. In 1989 these specifications were, in collaboration with UNICEF, distributed to interested manufacturers in different parts of the world. In 1990 samples of timers developed in Denmark, Singapore and the United Kingdom were tested in the laboratory and in the field (in the Gambia, India and Nepal). The tests revealed inadequacies in the performance of these devices, which are being corrected by the manufacturers.

2.12 Oxygen administration is a life-saving supportive measure for children with severe pneumonia or severe wheeze. The current generation of small oxygen concentrators (devices that convert air into a continuous supply of more than 95% pure oxygen) offers a solution to the problem of irregular or complete lack of oxygen supply at small hospitals in developing countries. However, the units that are currently available do not tolerate wide variations in voltage and function poorly in humid, tropical climates and dusty environments, conditions which are common in developing countries. At a joint meeting organized by WHO and the World Federation of Societies of Anaesthesiologists in London in 1989, experts drew up specifications for an oxygen concentrator that would perform satisfactorily under the working and environmental conditions encountered in small hospitals in developing countries. More than 20 manufacturers were invited to submit machines for testing at an independent laboratory in the United Kingdom selected by WHO. Four machines were tested in 1990 and one met the requirements of the WHO test protocol; the others have been returned to the manufacturers for modifications. Models conforming to the WHO standard will be available through UNIPAC, the UNICEF Packing and Assembly Centre in Copenhagen. An information leaflet, a user manual, and maintenance and repair manuals are being prepared to meet the need for adequate training materials to support the introduction of this technology in developing countries.

Implementation of national programmes

2.13 By December 1990 plans of operation for control programmes had been prepared in 54 countries in the six WHO regions (Table 1). In 47 of the countries, the programmes are considered to be operational because the standard case management strategy is being delivered in one or more administrative jurisdictions of the country; and in 11 cases the activities are reported to be under way on a national scale throughout the primary health care system. Five additional countries have taken the initial step of designating a national programme manager and issuing technical guidelines. Thus a total of 59 countries have taken some action to establish a national control programme. The logistic system recommended for the supply of antibiotics and other drugs is based on guidelines prepared by the Action Programme on Essential Drugs.

¹ Antibiotics in the treatment of acute respiratory infections in young children.
Document WHO/ARI/90.10 (1990).

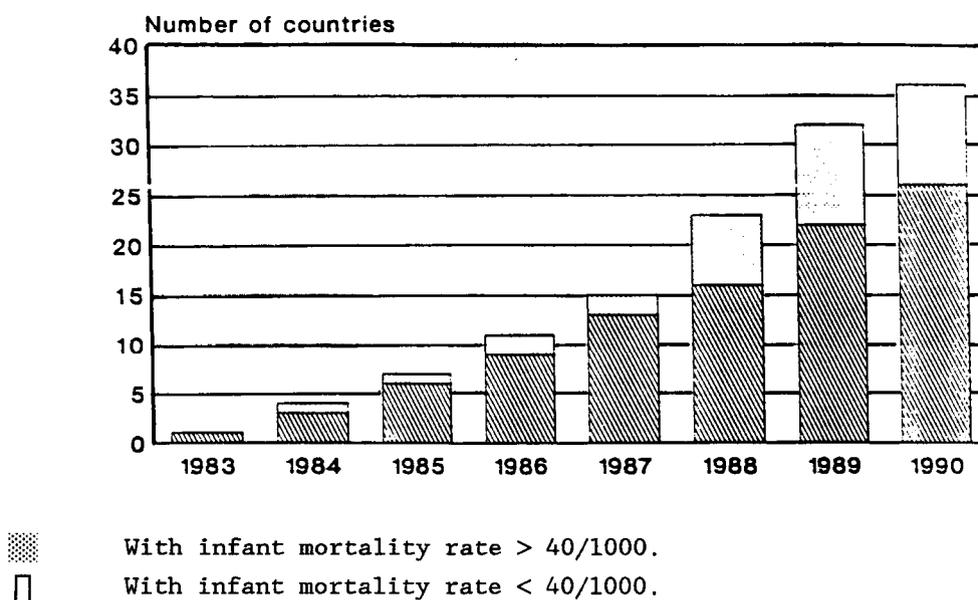
TABLE 1. NUMBER OF COUNTRIES WITH TECHNICAL GUIDELINES, PLANS OF OPERATION, AND OPERATIONAL PROGRAMMES, DECEMBER 1990

Region	Technical guidelines	Plan of operation	Operational programme	
			Total	Infant mortality rate >40/1000
Africa	10	9	6	6
The Americas	19	16	15	11
South-East Asia	7	7	6	4
Europe	1	1	1	1
Eastern Mediterranean	9	9	8	8
Western Pacific	13	12	11	4
TOTAL	59	54	47	
With IMR >40/1000	41	39		34

2.14 One of the major targets of the programme is for operational control programmes to be established by 1995 in all countries with an infant mortality rate greater than 40 per 1000 live births per year. The rationale is that in these countries most community-acquired pneumonias in children are bacterial, and therefore the recommended case management strategy is likely to have the greatest impact in reducing mortality from this disease. The United Nations Population Division lists 88 countries with an infant mortality rate that exceeds this level.¹ Among the 47 countries that currently have operational programmes, 34 are included in this list. Thus 39% of the programme's primary target countries had operational programmes by the end of 1990. Figure 1 shows the increase in the number of operational programmes each year from 1983 (when the first programme started in Para State, Brazil) to 1990. The emphasis that the programme places on the control of acute respiratory infections in countries with an infant mortality rate greater than 40 per 1000 does not imply that other developing countries need not have a control programme. Such programmes are fully justified in these countries because they generally have some areas, especially rural, where infant mortality is higher than the national average. In addition, all countries need to address the other objectives of the programme, namely, reducing the inappropriate use of antibiotics and other drugs for the treatment of acute respiratory infections in children, preventing complications from acute upper respiratory infections, and reducing the incidence of acute lower respiratory infections.

¹ United Nations World Population Chart 1988. New York, United Nations Population Division, 1989.

FIGURE 1. NUMBER OF COUNTRIES WITH AN OPERATIONAL PROGRAMME FOR THE CONTROL OF ACUTE RESPIRATORY INFECTIONS, 1983-1990



Training

2.15 Managerial and technical training are priority areas of activity. During the developmental phase of the programme, 20 intercountry seminars and workshops were organized, with the participation of 640 paediatricians, epidemiologists and health administrators, to review the situation with respect to acute respiratory infections, develop a common understanding of the technical guidelines on case management, and promote the WHO-recommended control policies.

2.16 Initial efforts to implement control activities provided the field experience needed to develop a programme managers' training course, which became available at the beginning of 1990. Since then eight intercountry programme managers' courses (four in English, three in Spanish, and one in French) have been held, and attended by 233 health officers with managerial or technical responsibilities in national programmes. In addition, 15 countries have organized national courses, using the WHO training modules and the national plan of operation. By December 1990 at least 4000 health staff had taken part in supervisory skills courses in which WHO training materials were used. The revised case management training module that forms part of this course became available in 1990 in English, French and Spanish. The programme has also produced several training aids (a video film, sets of slides, flip-charts), which are now being modified to bring them into line with the revised technical guidelines and training modules.

2.17 One of the main tasks in the first stage of a control programme is to organize training for health staff in case management, which involves clinical practice with direct patient care. The programme has promoted the establishment of training units in several countries to organize clinical training; it has also started to prepare guidelines for the directors of such units and a package of teaching materials to assist them in conducting courses. Training materials for community health workers are also being prepared.

Communication

2.18 Communication activities should be appropriate to the stage of development of the national programme. At present, the majority of countries are just starting to implement programmes, with emphasis on ensuring increased access to correct case management through

first-level health facilities and community-based health practitioners. During this initial stage, communication activities should make use of face-to-face methods bringing together health workers and families, especially mothers, and should focus on a limited set of key behaviours: recognizing signs that may indicate pneumonia, seeking treatment when these signs are observed, and providing recommended treatment. The programme is currently field-testing a guide to assist countries in conducting focused ethnographic assessment studies (see paragraph 3.3) to collect information on existing practices in the household management of acute respiratory infections in children and in using this information to formulate the educational advice that health workers will give to mothers. With support from WHO and other agencies, particularly UNICEF, many countries have developed health education materials for face-to-face communication based on the WHO flipchart "Children with coughs". WHO's policy is that mass media approaches should not be adopted at the start of a national programme when health workers have not been trained and equipped to deal with the demand for the publicized services. Training, logistics and communication activities must be planned together, so that families learn about a service that providers are trained and equipped to give.

Evaluation

2.19 Most of the activities undertaken by the programme so far in the area of evaluation have been of a developmental nature. Fourteen priority indicators have been selected to assess progress towards operational subtargets: seven to determine the rate of access to correct case management and seven to measure the rate of use of correct case management. One module of the programme managers' course is devoted to evaluation; it describes the indicators, identifies the data needed to measure them, suggests possible sources from which the data can be obtained, and provides guidelines for analysing and interpreting the results. A country programme profile system has been prepared and field tested in Colombia, and will be offered to national programmes as a means of facilitating reporting on progress in relation to programme indicators.

2.20 In addition to the ethnographic guide mentioned in paragraph 2.18, the following instruments are being prepared: a health facility survey instrument for systematically evaluating the practices of health staff in the diagnosis and treatment of acute respiratory infections and determining the extent to which health workers follow national case management guidelines (to be field-tested in 1991); a household morbidity and treatment survey instrument for estimating the proportion of children with pneumonia who were treated by a trained provider and determining the practices used in home treatment of acute respiratory infections (preliminary studies to test the survey questionnaires have been conducted in Ghana, Peru and the Philippines); and a drug survey instrument for assessing the impact of the programme on the use of antibiotics and cough and cold medicines for the treatment of acute respiratory infections in children, and associated expenditure.

Surveillance

2.21 A common concern among clinicians and health administrators is that the standard antibiotic treatment (cotrimoxazole, amoxicillin, or injectable procaine penicillin) may become ineffective in places where the proportion of S. pneumoniae and H. influenzae strains that are resistant to these antibiotics is increasing. With the collaboration of the Centers for Disease Control in Atlanta (USA), WHO has prepared a manual describing epidemiological and microbiological techniques for the surveillance of drug resistance. The manual was reviewed by a group of experts in December 1990, and will be field-tested in 1991.

Collaboration with other WHO programmes and other agencies

2.22 At the global, regional and country levels the programme is collaborating with numerous other WHO programmes and multilateral and bilateral agencies. Within WHO it is working with the diarrhoeal diseases control programme in producing compatible materials to facilitate joint training, monitoring and evaluation at the country level; the Expanded Programme on Immunization in implementing training and communication

activities; the Action Programme on Essential Drugs in improving drug supply systems and reducing the inappropriate use of drugs; the pharmaceuticals programme in defining essential drugs; the microbiology and immunology support services programme in carrying out surveillance of bacterial drug resistance; the clinical technology programme in developing appropriate oxygen concentrators; the malaria control programme in preparing guidelines for case management of children with signs of acute lower respiratory infections and fever; the Global Programme on AIDS in preparing guidelines for case management of HIV-infected children with acute respiratory infections; and the relief programme in planning activities for control of these infections among refugees.

2.23 The problem of acute respiratory infections in children has provided a further incentive for collaboration between WHO and UNICEF in the struggle for child survival. Agreement by the two agencies on approaches to control was expressed in a joint statement¹ approved by the UNICEF/WHO Joint Committee on Health Policy at its twenty-fifth session in 1985. UNICEF/WHO cooperation is particularly concerned with country programmes and includes joint support in the preparation of plans of operation, the organization of training courses, the production of locally adapted training materials, the provision of supplies, and the implementation of evaluation activities. UNICEF has cooperated with WHO in ensuring that the antibiotics and other drugs recommended for national programmes are included in the UNIPAC catalogue. Both agencies have agreed to issue identical recommendations on technical equipment for national programmes, such as timers, and oxygen concentrators. UNICEF joined WHO in providing support to the newsletter ARI News in 1987.

2.24 Substantial financial contributions have been received from UNDP for research and for the general development of the programme, as part of its own programme on strengthening of primary health care: development of new tools for disease prevention and control. The governments of Australia, Denmark, Finland, Germany, Italy, Japan, the Netherlands, Sweden, the United Kingdom and the United States of America have provided support to the programme at the intercountry and country level. Belgium, Denmark, Italy and the Netherlands have assigned associate professional officers to work with the programme. Private and voluntary organizations (the Arab Gulf Programme for United Nations Development Organizations, the Federation of Finnish Lung Disease Associations, the Kellogg Foundation, and the Sasakawa Health Trust Fund) have also provided invaluable external support at both the global and the country level. An international consultation on acute respiratory infections, sponsored jointly by UNICEF, UNDP and WHO, will be convened in Washington, DC, in December 1991, with the participation of developing countries and all interested bilateral and multilateral cooperation agencies. The aim of this meeting will be to make the technical basis of the programme more widely known, to stimulate interest and commitment in developing countries, and to attract international support.

3. RESEARCH ACTIVITIES

Management of research

3.1 In 1988 the programme prepared a list of priority research questions that had been identified during the elaboration and revision of the technical guidelines, the development of training and managerial materials, and the implementation of control activities. In 1989 this list was reviewed by the Technical Advisory Group, which selected a limited number of priority topics for support in the areas of clinical, behavioural, health systems and disease prevention research. The programme has identified expert advisers in these priority areas to assist in establishing research methodologies, to review proposals and to collaborate with investigators in implementing and analysing studies. Decisions on the funding of projects are made after consultation with these experts.

¹ Basic principles for control of acute respiratory infections in children in developing countries. A joint WHO/UNICEF statement. Geneva, World Health Organization, 1986.

Case management research

3.2 Clinical research is undertaken to strengthen the technical basis of the case management strategy. As at 31 December 1990 there were 10 active projects. The major activities in this area have been as follows:

(1) Validation of chest indrawing as the key sign for the detection of severe pneumonia. Field studies in the Gambia had shown a problem with the original definition of chest indrawing. Indrawing between the ribs (intercostal indrawing) was found in a high proportion of infants and children with pneumonia who did not need referral for hospitalization. A revised definition was therefore adopted, limiting chest indrawing to an inward motion of the lower chest wall (often called subcostal indrawing). The new definition was tested in the Philippines and Swaziland in 1989, and its higher specificity for identifying severe pneumonia was confirmed.

(2) Validation of the definition of fast breathing for the detection of pneumonia. Several investigators and clinicians had pointed out the deficiencies of a single definition (50 or more breaths per minute) for fast breathing in all age groups. Its specificity in young infants and its sensitivity in children older than one year were both found to be too low. These deficiencies were confirmed in studies conducted in the Philippines and Swaziland. As a result, the programme has adopted different definitions of fast breathing according to the age of the child: 60 breaths per minute for infants less than 2 months of age, 50 breaths per minute for infants aged 2-11 months, and 40 breaths per minute for children older than 12 months. The application of these age-specific respiratory rate thresholds has ensured adequate sensitivity in case detection in children aged 1-4 years and adequate specificity for young infants.

(3) Studies on the clinical signs and etiological agents of pneumonia, sepsis and meningitis in young infants. In some areas, 20%-30% of specific mortality from acute lower respiratory infections in children under 5 years of age occurs during the first two months of life. The programme has used the available data and expert clinical advice to develop guidelines for young infants which are designed to be safe and relatively easy to teach to health workers at first-level facilities. The guidelines assume that young infants with pneumonia, sepsis or meningitis need parenteral antibiotic therapy, which is standard practice in developed countries but is still not feasible in many areas in developing countries. Very little is known about which organisms actually cause this high rate of death in young infants in developing countries. A multicentre study has been initiated using standardized clinical and laboratory techniques (chest X-ray, pulse oximetry, blood culture, lumbar puncture, and other diagnostic tests) to examine young infants brought to a health facility for an illness that began at home. The combined data from all the study sites will be analysed with the aim of identifying a simple set of clinical signs with high sensitivity, specificity and predictive value for pneumonia or other serious bacterial infections. The study is being carried out in five sites in Ethiopia, the Gambia, Haiti, Papua New Guinea and the Philippines, all with a high neonatal mortality rate.

(4) Investigation of the pharmacokinetics of chloramphenicol and oral cotrimoxazole in young infants with pneumonia, sepsis and meningitis. Although the case management guidelines recommend the referral of young infants with pneumonia or sepsis to hospital for treatment with parenteral antibiotics, this is not possible in many rural settings, leaving oral cotrimoxazole and chloramphenicol as the only treatment option. At several sites in the multicentre study mentioned in section (3) above, the investigations will incorporate pharmacokinetic studies of oral cotrimoxazole, and intramuscular and oral chloramphenicol in young infants who are sick.

(5) Studies on the clinical signs and etiological agents of pneumonia in severely malnourished children. The programme's current clinical guidelines recommend hospital admission and parenteral therapy for these children, in view of the wide

range of etiological agents that may be involved. The programme will support studies of pneumonia in severely malnourished children, since little is known about its clinical presentation and causative agents.

(6) Investigation of the overlap in the clinical presentation and treatment of pneumonia and Plasmodium falciparum malaria. Since fever is a sign common to malaria and acute respiratory infections in children, the overlap of the clinical picture of these conditions and their management has been the subject of frequent consultations between the acute respiratory infections and malaria control programmes. In particular, the need to give chloroquine in addition to cotrimoxazole to a child with fever and signs suggesting pneumonia has been questioned. The programme, together with the Centers for Disease Control in Atlanta (USA) provided support to a study in Malawi, which indicated that cotrimoxazole is effective for the treatment of P. falciparum malaria in children under 5 years of age. Further studies at other sites will be supported by the Special Programme for Research and Training in Tropical Diseases. The Malawi study, and similar studies in the Gambia, have shown that there can be a considerable clinical overlap in the presentation of pneumonia and malaria. Although cotrimoxazole is not a particularly attractive antimalarial drug owing to its 5-day dosing regimen, its use alone for children with fever and signs suggesting pneumonia would offer a solution to the problem of the clinical overlap of the case definitions of the two conditions.

Behavioural research

3.3 The major activities in this area have been as follows:

(1) Development of a focused ethnographic assessment protocol. The protocol will allow national programmes to identify the signs of pneumonia that mothers recognize as severe and to determine their relationship to clinical pneumonia; to help staff design effective educational messages to inform mothers about home care; to identify potentially modifiable constraints on the prompt seeking of care from a worker trained in standard case management of pneumonia; to identify maternal expectations concerning antibiotic and other drug therapy and to anticipate common problems affecting compliance with treatment; and to assist staff and health workers in understanding cultural characteristics and conditions that are likely to have a strong influence on community responses to programme activities. The protocol was tested in Ghana, Guatemala, Haiti, Honduras, the Philippines and Turkey, and was found to be helpful to investigators in describing the local cultural "explanatory model" of acute respiratory infections (the description of signs and symptoms, terms for illness, and beliefs concerning causes and treatments). A complex cultural picture of the condition, with an elaborate terminology and multiple illness categories for acute lower respiratory infections, was found. These cultural illness categories influence the mother's perception of her child's condition and household decisions concerning the seeking of medical care. They also influence the manner in which mothers receive and evaluate information communicated by health practitioners.

(2) Identification of modifiable determinants of household management of pneumonia and modifiable risk factors for pneumonia incidence and severity. Although little is currently known about these determinants and risk factors, it is likely that a number of factors are common to diverse cultural settings. The programme is therefore developing studies to allow a more systematic examination of sociocultural and behavioural factors than can be achieved with rapid assessment techniques. At present, it is not known whether specific hygiene behaviours or other child-care practices contribute to the early nasopharyngeal carriage of respiratory bacterial pathogens (H. influenzae and S. pneumoniae) or to the incidence and severity of pneumonia and other serious bacterial infections in young infants. The importance of hand-washing before handling a young infant or of allowing only the mother to handle the child is not known. In many cultures the mother and the neonate are kept in seclusion for the first 1-2 months; this may be protective, particularly for low-birth-weight neonates. Transmission of infection as a result of crowded

sleeping arrangements may be important and could possibly be reduced. Other risk factors that may be modifiable include chilling, habits that increase exposure to indoor air pollution, and early discontinuation of breast-feeding or failure to feed young infants exclusively at the breast.

Health systems research

3.4 The major activities in this area have been as follows:

- (1) Studies to find more practical methods for the surveillance of bacterial antibiotic resistance. The best way of monitoring the emergence of antibiotic resistance among the main organisms that cause pneumonia has not yet been clearly established. Two studies have been carried out in Pakistan to determine whether nasopharyngeal isolates of S. pneumoniae and H. influenzae are similar in their capsular type or other microbiological markers, as well as in their antimicrobial sensitivity, to blood isolates collected during the same period from children with invasive S. pneumoniae and H. influenzae disease. The results indicate that the surveillance of nasopharyngeal strains in children with signs of pneumonia is adequate for monitoring the sensitivity patterns of invasive strains. The information has been of immediate value to the programme in the preparation of guidelines for the national surveillance of drug resistance.
- (2) Intervention studies. The results of seven intervention studies on acute respiratory infections, which sought to determine the feasibility of the case management strategy and its impact on mortality, have been summarized in a document¹ and in the programme report for 1988.² The studies examined the case management strategy implemented through the health care system, including community health workers. They show that auxiliary health staff and community health workers who have been properly trained and supervised are able to recognize the signs of pneumonia in children and administer the correct treatment. Taken together, the results of the studies show that the case management strategy is effective. A substantial impact on specific mortality from pneumonia was found, and this was also reflected in a reduction in overall childhood mortality. A reduction in mortality was demonstrated in high-risk groups such as low-birth-weight infants; in areas with high infant mortality and a high prevalence of malnutrition; and in settings in which case management relied almost entirely on home treatment because referral to hospital was not feasible.
- (3) Development of survey techniques for measuring the number of episodes of pneumonia. Numerous methodological problems exist in ascertaining retrospectively that an episode of pneumonia occurred and that care was sought for it from a trained provider. Studies are being carried out to develop feasible techniques to overcome these problems so that a credible household morbidity and treatment survey instrument can be developed. The advantages of using different periods of recall by the mother and the value of including questions that incorporate culturally-appropriate categories of illness are being examined.

Disease prevention research

3.5 The major activities in this area have been as follows:

- (1) Research on the risk factors for pneumonia incidence and severity. Certain biological factors such as low birth weight and malnutrition, environmental factors such as indoor air pollution, or behavioural factors affect the incidence and severity of pneumonia. However, there is very little information from developing

¹ Case management of acute respiratory infections in children: intervention studies. Document WHO/ARI/88.2 (1988).

² Programme for the control of acute respiratory infections. Programme report, 1988. Document WHO/ARI/89.3 (1989).

countries that can be used to quantify the importance of these factors. A case-control study was therefore initiated in Brazil in 1989, to assess potentially important risk factors for pneumonia in young children.

(2) Field-testing of vaccines. Invasive disease due to H. influenzae and S. pneumoniae is the prime target for vaccine development and evaluation. While support of laboratory-based research to develop new vaccines for pneumonia is primarily the responsibility of WHO's programme for vaccine research and development, field trials of candidate vaccines will be carried out with the participation of the programme for the control of acute respiratory infections. Although the programme will be unable to support the total cost of large-scale vaccine field trials with the resources it expects to receive, it will provide technical support for certain priority studies. It has supported the surveillance of invasive H. influenzae type b disease in the western region of the Gambia, prior to a vaccine efficacy trial which is to take place in 1992, using a newly developed conjugated vaccine. Technical support is being provided for the design and evaluation of the vaccine trial.

4. FUTURE DIRECTIONS

4.1 The targets of the programme were originally formulated in 1987 when the medium-term programme for the Eighth General Programme of Work, covering the period 1990 to 1995, was prepared. In 1990 they were adjusted to reflect updated estimates based on experience in country programmes, and were reviewed and endorsed by the Technical Advisory Group. The major targets relate to countries having an infant mortality rate greater than 40 per 1000 live births per year (see paragraph 2.14). Table 2 presents the major targets for 1995 together with an estimate of the level of their achievement when the programme started in 1984 and at the end of 1990. By 1995 it is intended to have operational programmes established in all countries with an infant mortality rate greater than 40 per 1000 live births; to have 100 000 facility-based health workers trained in case management; to increase to 50% the rate of access of the population to correct case management; and to increase to 40% the percentage of childhood pneumonia cases treated with recommended antibiotics. The programme has been developing instruments to measure progress in the achievement of these targets, as indicated in paragraphs 2.19 and 2.20. Their achievement will contribute significantly to reducing mortality from pneumonia in children by one-third by the year 2000 - an objective that was recommended by the programme and adopted by the Bellagio IV conference organized by the Task Force for Child Survival in Bangkok on 1-3 March 1990, and by the World Summit for Children, in New York in September 1990.

4.2 Achievement of these targets will not be easy. It will require a strong political commitment on the part of governments, which will need to provide sufficient financial resources and ensure that control of acute respiratory infections is recognized as a high priority activity in the training and supervision of health workers. Special attention should be given to communication activities to ensure the recognition by those taking care of children of signs that may indicate the presence of pneumonia and consequently the need for prompt care-seeking. Such activities should be undertaken only after health workers have been trained and adequate supplies of antimicrobials have been made available.

4.3 If physicians alone are responsible for assessing and treating pneumonia in children, as is the practice (and in some cases the law) in many developing countries, the targets for access to and use of treatment for pneumonia, as indicated in paragraph 4.1, are not likely to be achieved. This is an issue that ministries of health have to resolve when initiating a control programme. In many countries the training of and provision of drugs to paramedical staff, and eventually community health workers, to enable them to treat pneumonia when a doctor is not accessible, will be necessary to achieve a significant decrease in pneumonia mortality. This effort must be accompanied by steps to discourage the widespread use of antibiotics for mild episodes of acute respiratory infections, and the use of harmful and ineffective cough and cold medicines.

TABLE 2. PROGRAMME STATUS AND TARGETS FOR COUNTRIES WITH AN INFANT MORTALITY RATE GREATER THAN 40/1000^a

	Status in		Target for
	1984	1990	1995
No. of operational ^b programmes	4	34	88
No. of facility-based staff trained ^c in case management	1 000	10 000	100 000
Percentage of the population with access to a trained ^c health worker and a source of free or affordable antibiotics	-	5	50
Percentage of cases of childhood pneumonia treated with recommended antibiotics	8	12	40

^a Source: United Nations World Population Chart 1988. New York, United Nations Population Division, 1989.

^b Operational = having a well-formulated plan (with targets, specified activities, and a description of monitoring and evaluation methods), technical guidelines on case management, a designated programme manager, planned activities being carried out and monitored in at least one part of the country, and a funded budget.

^c Trained = having received training in the assessment and treatment of pneumonia at a course using either the WHO training modules or another acceptable procedure, including the demonstration and treatment of cases.

4.4 At the same time, countries that have achieved a relatively low rate of mortality from pneumonia should give increased attention to the implementation of strategies and activities to reduce the incidence and severity of the disease. On the basis of present knowledge, feasible and cost-effective approaches for the prevention of morbidity will be identified, but their successful implementation will also require careful planning and well-designed training, communication and evaluation activities.

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