

ari

programme for control
of acute respiratory infections

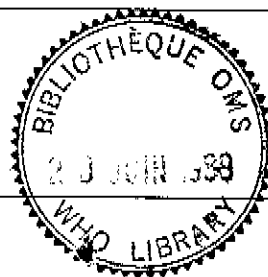
**PROGRAMME
REPORT
1988**



World Health Organization

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**Programme for the Control of
ACUTE RESPIRATORY INFECTIONS**

1. INTRODUCTION

The acute respiratory infections rank among the most common diseases of children the world over. Everywhere they represent either the first or the second cause of visits to health services by young children. Their impact, however, is far more serious in developing than in developed countries. While the annual incidence of pneumonia, the most severe manifestation of acute respiratory infection, is 3-4% in children under 5 years of age in developed countries, it ranges from 10 to 20% in the developing countries, reaching levels of as high as 80% in populations with a high prevalence of malnutrition and low birth weight.

Furthermore, in most developing countries, pneumonia is associated with high case-fatality and mortality rates. Of the estimated 15 million deaths occurring each year in children under 5 years of age, 25-30% are due to acute respiratory infections, and the vast majority of these are caused by pneumonia. Thus, in absolute numbers, pneumonia accounts for about 4 million childhood deaths annually.

Therefore, the primary objective of the WHO Programme for the Control of Acute Respiratory Infections (ARI) is to reduce the severity of and mortality from pneumonia in children. Because of the magnitude of the problem, the ARI Programme must be seen as an important part of efforts directed towards child survival and as an essential component

of the "appropriate treatment of common diseases and injuries", one of the eight elements of primary health care. Other objectives of the Programme are to reduce the incidence of acute lower respiratory infections (ALRI), to reduce the severity of and complications from acute upper respiratory infections (AURI), and to rationalize the use of antimicrobials and other drugs for the treatment of ARI in children.

Since its establishment by the World Health Assembly in 1982, the ARI Programme has been accumulating the basic technical and operational information needed to enable it to formulate strategies, technical policies, targets, and indicators for national programmes. In 1986, the Programme issued its first materials for use in the management of control programmes and began to support national efforts to formulate technical guidelines, plan activities, and train health personnel. The early experiences of national programmes and the results that have emerged from ARI studies in developing countries in the past two years have provided new and important insights into the problem and led to an overall re-examination of policies and approaches. As a result, the Programme undertook in 1988 a revision of its managerial and clinical management materials and the production of new operational instruments. At the same time, it increased the support given to national control activities and continued to promote and support research and development.

Thus the WHO ARI Programme has two major components: a **health services component**, concerned with the implementation of available strategies for the control of ARI in children; and a **research component**, directed to developing new or improved methods and approaches for control.

This report describes the activities undertaken by the ARI Programme in 1988.

**Programme for the Control of
ACUTE RESPIRATORY INFECTIONS**

2. HEALTH SERVICES

2.1 Control strategies

Correct case management is the central strategy to reduce mortality due to acute respiratory infections. It has been demonstrated in studies supported by the Programme and by others that children who die from pneumonia are frequently treated inappropriately, brought too late for treatment, or not treated at all. Intervention studies supported by the Programme in several developing countries have provided additional evidence that proper ARI case management can prevent a substantial number of deaths from pneumonia, even in places where the prevalence of malnutrition and low birth weight is high and poverty and illiteracy are common (see section 3.4).

Immunization is a specific strategy to prevent respiratory infections in children caused by diphtheria, measles, pertussis, and tuberculosis. By reducing the incidence of disease these vaccines also contribute to reducing ARI deaths, in particular those associated with pertussis and post-measles pneumonia. Although the delivery of immunizations is the responsibility of national Expanded Programmes on Immunization, the ARI Programme stresses the benefits of vaccination for the prevention of morbidity and reinforces educational messages about the timely vaccination of children.

There are a number of other interventions, which are not specific to the control of ARI, that may reduce the incidence of acute lower respiratory infections. They include measures that can reduce or eliminate risk factors for ARI, such as low birth weight, malnutrition, specific nutritional deficiencies (vitamin A), chilling, indoor air pollution (smoke from fuel and tobacco), urban air pollution, and overcrowding. However, the relative importance of these interventions in reducing the incidence and severity of pneumonia, and the degree to which they can be implemented through feasible and cost-effective approaches, are not known. In 1989 the Programme will initiate an analysis of available information on the effectiveness, feasibility, and cost of these interventions with the goal of identifying specific areas of activity for ARI programmes.

In the meantime, national ARI programmes are being advised to support and strengthen nutrition and MCH/family planning programmes, since malnutrition and low birth weight appear to be the most important risk factors for pneumonia in young children.

2.2 Technical policies

WHO technical guidelines on ARI case management were first issued in 1985 (1). They were prepared following a series of consultations in 1984, during which a group of paediatricians reviewed the clinical experience and existing scientific evidence, and identified the most appropriate components of case management for application in developing countries. Three clinical signs were selected to indicate the degree of clinical severity of a case with cough:

- chest indrawing or inability to drink: these indicate "severe" infection, which requires referral to the district hospital for parenteral antimicrobial treatment (benzylpenicillin or chloramphenicol) and, in some cases, oxygen therapy;
- a breathing rate of over 50 per minute: in the absence of the above two signs, indicates "moderate" infection, which requires antimicrobial treatment at home (with oral co-trimoxazole, ampicillin, amoxycillin, or intramuscular procaine penicillin).

In the absence of the above three signs, the case is considered as "mild", and only supportive measures and close observation at home are indicated.

The guidelines also provide instructions for the management of children with upper respiratory infections and of cases with wheeze and stridor.

A more detailed guide on case management was published in 1986 for staff working in small hospitals (2). Training and educational materials, consistent with the guidelines, were also produced.

In 1988, the Programme undertook a revision of these guidelines on case management, based on new evidence available from recent research and experience gained in the use of the WHO materials in regional workshops, training courses, and control programmes. A group of paediatricians met initially for this purpose in Geneva from 29 February to 2 March, and frequent individual consultations with experts followed during the year. *While the basis of the clinical management of pneumonia, as explained above, remained unchanged, the following important modifications or new instructions were introduced into the guidelines:*

(a) *Terminology:* As indicated above, the original classification of ARI included three categories of severity and was based on three signs that led to two major management decisions: whether or not to prescribe antimicrobials, and whether to treat at home or to refer to a higher-level health facility. These categories were called "mild", "moderate", and "severe" ARI. Although this action-oriented classification had practical value, its use presented two operational problems. First, since each category of ARI included a number of different clinical entities (e.g., "moderate" ARI included pneumonia, otitis media, and pharyngitis), it was not possible for health staff to monitor the frequency and the quality of treatment of each of these entities. Second, though many societies recognize and even have a local word for pneumonia, this is not always the case for "ARI"; use of the less familiar term "ARI" made it difficult for health workers to communicate with mothers.

It was therefore decided to revise the classification by separating ear and throat infections from other upper and lower respiratory infections presenting with cough or difficult breathing, and to describe the latter according to a new terminology, namely, coughs and colds (or no pneumonia), pneumonia, and severe pneumonia. However, the clinical criteria used to classify the latter are the same as those used in the original classification.

(b) *Neonatal pneumonia:* Pneumonia in the extended neonatal period (first two months of life) is a frequent cause of death, accounting for 20% of all mortality from ARI in children under 5 years in many developing countries. It appears to be a relatively common cause in developing countries with infant mortality rates of less than 100/1000. Since the etiology and clinical manifestations of pneumonia in neonates differ from those in older children, it was incorrect to use the same guidelines for all children, as originally recommended. For example, normal newborns breathe almost 50 times a minute, so that it is inappropriate to use this respiratory rate as a cut-off value for the diagnosis of pneumonia. In view of the difficulties in separating (clinically) pneumonia from other septic conditions (septicaemia, meningitis), the new guidelines list the signs by which any of these conditions can be recognized and give instructions for their treatment by antimicrobials and supportive measures.

(c) *Children who should be examined for pneumonia:* The previous clinical criterion, cough alone, has been expanded to cough or difficult breathing, to avoid missing neonates and other children with pneumonia who may not cough.

(d) *Wheeze:* While wheeze is uncommon in some parts of the world, it is very common in others; therefore, recommendations for the management of wheeze were originally included in the ARI clinical guidelines. However, these did not take into account the fact that some wheezing infants and young children have bacterial pneumonia complicating bronchiolitis or are wheezing as a direct result of pneumonia (and thus require an antibiotic), while most only have bronchospasm (and can be managed with bronchodilators at first-level facilities). The revised guidelines ensure that antibiotic therapy is given to wheezing children who may have bacterial pneumonia and allow staff in first-level facilities where wheezing is common to first assess the response to bronchodilators in the facility. In addition, the use of salbutamol has been extended to infants, based on recent evidence of its efficacy. When nebulized salbutamol is available, it should be used in preference to epinephrine and aminophylline, both of which are more toxic.

(e) *Reassessment of a child with pneumonia:* The procedures by which caretakers should reassess a child with pneumonia after two days of antimicrobial treatment at home are described in detail and emphasized in the revised guidelines. Such procedures are important to reduce mortality due to inadequate treatment or antimicrobial resistance.

The Programme's manual for doctors, "Respiratory infections in children: Management at small hospitals" (2), is being revised to incorporate these changes and some others with respect to the management of upper respiratory infections. The revised manual will also contain more information about treatment with oxygen, the use of bronchodilators, and supportive care for the child in hospital and at home. It will be supplemented by review papers on antimicrobials, cough and cold medicines, and bronchodilators used in the treatment of ARI in children, which will be prepared by the Programme in 1989.

The key elements of the revised clinical protocol have been condensed into a graphical representation (an ARI Treatment Chart) to be used as a wall poster or a desk display at first-level health facilities. The chart will constitute a quick training and reference guide to the care of children under 5 years of age with ARI for doctors, medical assistants, and other paramedical staff. The recognition and treatment of pneumonia is the most prominent feature of the chart, which is consistent with the main objective of the ARI Programme.

With the cooperation of the Ministry of Health of the Philippines, a prototype chart was field-tested in two hospitals in Manila in October 1988. The objective of the field test was to evaluate the ability of health workers (midwives posted in first-level health facilities outside Manila) to understand and use the chart to clinically assess and treat children with ARI. The main conclusion of the field test was that the participants could be taught to use the chart with relative ease.

2.3 Appropriate technology

Appropriate health technology is generally defined to mean techniques and equipment that are scientifically valid, adapted to local needs, acceptable to those who use them, and affordable. The ARI Programme has identified two procedures related to the prevention of mortality for which appropriate technology is required, namely counting the respiratory rate for the diagnosis of pneumonia and supplying oxygen for the treatment of severe pneumonia at small hospitals.

(a) Counting the respiratory rate

A timer is essential to count the frequency of the child's breathing movements, on the basis of which a diagnosis of pneumonia can be established with a reasonable degree of accuracy. In a study conducted in Manila in 1988, at the time of the evaluation of the ARI Treatment Chart, three kinds of timer were compared: an electronic timer, a watch, and a sand-glass timer. It was found that the electronic timer is the easiest for midwives to use correctly, because it produces an audible alarm at the end of the set time and thus allows the health worker to keep his/her eyes on the child's chest to count the respiratory movements, without having to glance frequently at the timer to see when the 30- or 60-second period runs out. While electronic timers are currently available on the commercial market for kitchen or laboratory use that measure from 1 to 99 minutes, these are too complex and expensive for ARI programmes. Therefore, the Programme has prepared specifications for a one-minute timer, which can produce an audible alarm after 30 and 60 seconds and is non-corrodable, waterproof, and suitable for storage and use at extreme temperatures. The power source can be either electronic (long-life batteries, or batteries recharged by solar cells) or mechanical (spring or other clockwork mechanism), and should last for a minimum of 5000 applications. In collaboration with UNICEF, these specifications are being distributed to manufacturers who may be interested in developing a timer, at a cost that developing countries can afford.

(b) Oxygen supply

Experience with the supply of oxygen cylinders to small hospitals has been very similar throughout the developing world: oxygen is available for only 25% or less of the year, if at all, because transportation is expensive and difficult. The recent advent of a small oxygen concentrator (an electrically powered device which converts air into a continuous supply of more than 95% pure oxygen at a flow rate of up to 4 litres per minute) has raised the possibility of assuring a reliable supply in small hospitals, since most of them have electricity. There are also battery-operated models. However, the units available on the market are not ideal for use in developing countries: they need regular servicing, do not tolerate wide variations in voltage (a common problem), and function poorly in humid,

tropical climates. As a joint activity of the WHO ARI and Clinical Technology programmes, and with the collaboration of the World Federation of Societies of Anaesthesiologists, a small group of clinicians and experts in the electroengineering of oxygen concentrators will meet in London on 2-3 May 1989 to draw up specifications for a simple and robust oxygen concentrator suited to the working conditions in small hospitals in developing countries. It is expected that industry will be interested in developing concentrators to meet these specifications.

2.4 Planning and implementation of national control programmes

In 1988, during the preparation of modules for a programme managers' training course, the Programme revised and expanded its recommendations relating to the management of ARI control activities. The criteria for determining that a national programme is operational are now defined as follows:

- a programme manager - full or part-time - is responsible at the national level for the ARI programme;
- technical guidelines on case management (i.e., the diagnosis and treatment of pneumonia and other respiratory syndromes at different levels of the primary health care system) have been approved and issued officially by the ministry of health;
- the objectives, strategies, targets for activities, indicators for evaluation, and budget of the programme are described in a distinct plan of operation; and
- delivery of the case management strategy has started in one or more administrative jurisdictions of the country, such as a province or a district, and is technically consistent with the national guidelines.

By the end of 1988, 23 countries, mostly in the Regions of the Americas and the Western Pacific, had operational control programmes according to the above mentioned criteria (Table 1). Eight of them started operations during the year. Only four countries reported having implemented their programme on a national scale: Colombia, Costa Rica, Oman, and Zimbabwe. In the other 19 countries, the case management strategy has been introduced in a few limited areas in order to gain experience and build up the necessary capability to support its expansion.

Another 10 countries have issued technical guidelines and drafted a plan of operation, and a further eight countries have taken the first step towards organizing a control programme by designating a national programme manager and issuing technical guidelines. Thus, a total of 41 countries have taken some action to combat the problem of ARI.

Table 1: Status of ARI control programmes, December 1988

Region and Country	MOH unit responsible ^a	Technical guidelines	Plan of operation	Started operations ^{b,c}	Coverage
AFRICA					
Gambia	EPID	Yes	Yes	-	-
Malawi	EPID	Yes	Yes	-	-
Swaziland	EPID	Yes	Yes	-	-
U.R. of Tanzania	EPID	Yes	-	-	-
Zimbabwe	EPID	Yes	Yes	Yes*	national
AMERICAS					
Argentina	TRI	Yes	-	-	-
Belize	MCH	Drafted	Yes	-	-
Bolivia	MCH	Yes	Yes	Yes*	400 health units
Brazil	MCH	Yes	Yes	Yes*	2900 health units
Chile	TRI	Yes	-	-	-
Colombia	MCH	Yes	Yes	Yes*	national
Costa Rica	MCH	Yes	Yes	Yes	national
Dominican Rep.	MCH	Yes	Yes	-	-
Ecuador	MCH	Yes	Yes	-	-
El Salvador	EPID	Yes	Yes	-	-
Guatemala	EPID	Yes	Yes	Yes*	817 health units
Honduras	EPID	Yes	Yes	Yes*	632 health units
Mexico	EPID	Yes	Yes	Yes*	2 states
Panama	MCH	Yes	Yes	Yes	328 health units
Paraguay	MCH	Yes	Yes	Yes*	16 health units
Peru	MCH	Yes	Yes	-	-
Venezuela	MCH	Yes	Yes	Yes	4 states
SOUTH-EAST ASIA					
Burma	EPID	Yes	Yes	-	-
India	MCH	Yes	-	-	-
Indonesia	EPID	Yes	Yes	Yes*	9 provinces
Sri Lanka	EPID	Yes	Yes	Yes	4 provinces
EUROPE					
Turkey	MCH	Yes	Yes	Yes*	1 province
EASTERN MEDITERRANEAN					
Oman	MCH	Yes	Yes	Yes*	national
Sudan	EPID	Yes	Yes	-	-
Tunisia	MCH	Yes	Yes	Yes*	3 governorates

WESTERN PACIFIC

China	MCH	Yes	Yes	<u>Yes</u>	3 provinces
Fiji	PH	Yes	Yes	<u>Yes</u>	3 divisions
Laos	EPID	Yes	Yes	<u>Yes*</u>	1 province
Malaysia	EPID	Yes	-	-	-
Papua New Guinea	EPID	Yes	Yes	<u>Yes*</u>	1 province
Philippines	MCH	Yes	Yes	<u>Yes*</u>	2 regions
Samoa	PH	Yes	-	-	-
Solomon Islands	PH	Yes	-	-	-
Tonga	EPID	Yes	-	-	-
Vanuatu	EPID	Yes	Yes	<u>Yes</u>	1 district
Viet Nam	TRI	Yes	Yes	<u>Yes*</u>	21 provinces

- ^a EPID: Epidemiology/communicable diseases
MCH: Maternal and child health
MOH: Ministry of health
PH: Public health or primary health services
TRI: Tuberculosis and respiratory infections

^b Underlining indicates operations started in 1988.

^c Asterisk indicates a country with infant mortality greater than 40/1000, United Nations Population Division, World Population Chart, 1988.

During 1988, eight WHO staff members and nine consultants visited 31 countries to collaborate in formulating technical policies, revising guidelines, drafting plans of operation, or conducting training courses; the countries visited included two in Africa (Malawi and, in collaboration with UNICEF, Gambia), 13 in the Americas, five in South-East Asia (Bangladesh, Burma, India, Indonesia, and Thailand), four in the Eastern Mediterranean (Pakistan, Somalia, Sudan, and Tunisia), and seven in the Western Pacific.

Efforts to plan and implement control programmes need to be accelerated during the next three years. Countries that have already initiated activities should review their technical guidelines in the light of their own experience and the revised WHO recommendations on technical policies and management, and gradually move towards national coverage with their programme. Countries that have not yet started activities, especially those with high infant mortality rates, should begin the planning process.

While it may appear easy to draw up technical guidelines and initiate a programme in a limited area, the objectives of ARI control will be achieved only if the plan of operation is backed by a strong political will and carried out on a national scale.

2.5 Training

At the global level, the major effort in training has been the development of a Programme Managers' Training Course. During 1988 the Programme revised its past recommendations concerning programme staging, targets, and evaluation indicators; prepared a flowchart and list of tasks for a national ARI programme manager; identified the skills and knowledge required of an ARI manager which have to be addressed in the training modules; developed an overall outline of the course; and drafted full outlines of five modules. Logistical systems are being developed, based on the guidelines of the WHO Drug Action Programme, and staff of both programmes meet periodically to coordinate their efforts. In 1989, the Programme will complete and undertake a field test of the course.

The experience of the WHO Diarrhoeal Diseases Control (CDD) Programme has shown that clinical training on case management can be strengthened through the establishment of training units in large facilities at national and provincial level. The ARI Programme will build on this experience as part of its efforts to support the clinical training of senior health staff on a wide scale. Thus the Programme plans to develop a Director's Guide for ARI Training Units (ATUs), which will provide guidance on how to (i) set training objectives; (ii) organize the physical facility, and prepare the faculty; (iii) plan and conduct courses (with emphasis on "hands-on" training, in which each participant devotes the greater part of the learning time to managing sick children under supervision); and (iv) assist participants after the course in changing practices at their own facility, and, where appropriate, establishing their own ATU. The guide will be supplemented by a set of lecture notes, slides, and other supporting materials.

During 1988 the Programme provided support for the establishment of ATUs in a few countries to gain some initial experience in conducting clinical management courses; this will help it in preparing the Director's Guide and other training materials. By the end of 1988 ATUs had been established at El Chatby Hospital in Alexandria, Egypt, and in five Latin American countries (Argentina, Bolivia, Brazil, Colombia, and Peru). A sixth unit will be set up at San Lazaro Hospital in Manila, Philippines, and the first training course will be run there, with the assistance of a consultant, in June 1989.

At the regional level, the Programme continued to provide ministries of health, teaching institutions, and non-governmental organizations with available materials in English, French, Spanish, and Portuguese to assist in training activities; these materials included technical guidelines, modules on case management for supervisory skills courses and clinical training, and a package of audiovisual aids (a set of slides, a cassette, a video film, two flip charts, and a poster). Translation of training materials into local languages was carried out in China, Indonesia, Laos, Republic of Korea, Somalia, Sri Lanka, Sudan, and Viet Nam.

Three intercountry workshops were organized by the Regional Office for the Americas for programme managers and paediatricians with teaching responsibilities in Santa Fe, Argentina (28 participants from five countries); Mexico City (40 participants from five countries); and Montevideo, Uruguay (20 participants from 10 countries). The agenda of these workshops included a review of the technical bases of the ARI Programme, the use of training modules on case management, and discussions (with exercises) related to the operational aspects of programmes. Such workshops will be replaced in the future by the Programme Managers' Training Course described above.

National seminars or workshops were held with collaboration from WHO in nine countries in the Regions of the Americas, South-East Asia, and the Eastern Mediterranean, and were attended by a total of 841 participants (Table 2). The meetings in Brazil and Colombia addressed programme managers at state or department level and followed the agenda used for intercountry workshops. The aims of the other meetings were to promote the objectives and strategies of the national ARI programme and enlist the support of specialists in public health, paediatricians, and the medical profession in general.

Table 2: National ARI seminars or workshops held in 1988

Region and place	Number of participants	Comments
AMERICAS		
Belem, Brazil	40	Northern states
Natal, Brazil	40	Northeastern states
Rio de Janeiro, Brazil	40	Southern states
Villa Leyva, Colombia	70	Associated with CDD
SOUTH-EAST ASIA		
Dhaka, Bangladesh	46	Jointly sponsored with UNICEF
Jakarta, Indonesia	57	-
Ulaanbaatar, Mongolia	54	On diagnosis of ARI
Colombo, Sri Lanka	43	-
Bangkok, Thailand	320	Associated with CDD
EASTERN MEDITERRANEAN		
Khartoum, Sudan	31	-
Tunis, Tunisia	100	One-day seminar
TOTAL	841	

During 1988, mid-level courses were reported by 14 countries (Table 3). These courses were attended by 854 participants with responsibility for training and supervising health staff at the district or provincial level. In four courses the ARI modules were used together with the CDD and EPI supervisory skills modules. At the courses devoted exclusively to ARI, materials adapted from the intercountry workshops were utilized. A seminar on health education was conducted in Tunis at which the participants learned in practice how to produce educational materials on the basis of information they had gathered from observations and discussions with mothers in community activities.

Table 3: ARI courses for mid-level supervisors held in 1988

Region and place	Number of participants	Comments
AMERICAS		
Argentina	130	4 courses, one week each (Cordoba, Parana, Resistencia, and Tucuman)
Colombia	111	3 courses, one week each, (Armenia, Cali, and Caldas)
Quito, Ecuador	22	Associated with CDD
Guatemala	33	Associated with CDD, for teachers in nursing schools.
SOUTH-EAST ASIA		
Thimphu, Bhutan	200	Associated with EPI and CDD
Calcutta, India	30	Associated with EPI and CDD, for nurse trainers
Calcutta, India	30	For nurses
Indonesia (6 places)	96	For doctors and nurses
Colombo, Sri Lanka	32	-
EASTERN MEDITERRANEAN		
Khartoum, Sudan	20	-
Tunis, Tunisia	23	Case management
Tunis, Tunisia	12	Health education
WESTERN PACIFIC		
Suva, Fiji	21	-
Port Moresby, Papua New Guinea	35	-
Nuku'alofa, Tonga	19	-
Hanoi, Viet Nam	40	Included training in basic epidemiology
TOTAL	854	

In many of these regional and national activities extensive use was made of the two ARI modules on case management, namely, "Management of the Child with Cough" and "Management of the Child with Ear, Nose and Throat Infection". *During 1988, work began on a revised version of these modules (combining the two into one), which will be completed and field-tested by mid-1989. The revised module will be based on the new ARI Treatment Chart (see section 2.2) and will form part of the new programme managers' course.*

2.6 Monitoring and evaluation

Most of the activities undertaken during 1988 in the area of monitoring and evaluation were of a developmental nature; they included an analysis of available data and a search for information needed to develop appropriate and reliable instruments for these activities.

2.6.1 Health facility practices

Some countries that have initiated control activities have set up a simple system for collecting data to monitor operations based on registry records. From an analysis of such data made in collaboration with consultants who visited a number of these countries in 1988, the following general situation has emerged as regards the quality of case management in health facilities:

- Fast breathing and/or chest indrawing is reported in an impossibly high proportion (up to 60%) of children with ARI symptoms attending outpatient health facilities. The most likely explanation for such high rates seems to be over-recognition of these two signs, so that a large number of coughs and colds are classified as pneumonia and given antibiotics.
- In some 10-20% of cases that are classified as "mild", i.e., no pneumonia (cough or cold), antibiotics are inappropriately administered; they are also given for a large number of conditions other than ARI for which they are not indicated.
- Not infrequently, cases classified as severe pneumonia are not referred to a district hospital, but are treated as outpatients.
- Pneumonia in neonates is managed in the same way as pneumonia in older children.

These shortcomings, all of which result in a substantial misuse of antibiotics, point up the fact that better training and supervision of health staff are required to ensure proper implementation of the technical guidelines on case management. They also indicate that current clinical practices should be assessed during the planning of national programmes.

During 1988, the Programme began preparing a health facility survey instrument to systematically measure the practices of health staff as regards the diagnosis and treatment of ARI in children. It will evaluate the extent to which health providers conform to national case management guidelines in assessing ARI patients, administering antibiotics, and providing advice on the home care of children. This survey instrument will be developed further in 1989.

2.6.2 Knowledge, beliefs, and practices of families relevant to ARI in children and their treatment

In order to develop suitable messages and health education materials on the home management of ARI, it is important to gather information on the knowledge, beliefs, and practices of mothers and other caretakers. It is particularly important to assess the relationship between the signs that mothers recognize as severe and the occurrence of pneumonia, in order to promote early recognition of pneumonia and care-seeking. In the health messages themselves, the terminology used for the signs and symptoms of ARI must be easily understandable. In 1988 the Programme identified the main issues involved in developing an instrument to collect this information. With the collaboration of social scientists, it plans in 1989 to start developing such an instrument and to pursue related behavioural research.

2.6.3 Community-based morbidity and treatment surveys

If there is to be a single indicator to measure the performance of an ARI control programme, it is likely to be a "correct use indicator", i.e., the proportion of pneumonia cases in children managed according to standard treatment guidelines. Since ARI cases seen in health facilities represent only a fraction of actual cases occurring in the community, the best way to measure this indicator will be through a community-based morbidity and treatment survey. To be reliable, the survey instrument must be able to identify with a sufficient degree of accuracy the incidence of pneumonia in a selected sample of children, which may be difficult. One approach would be to include in the survey only children who have signs of pneumonia on the day of the home visit (point prevalence); however, the high sample size required by this methodology may make it unpractical. Another approach is to include all cases reported by their mother to have had the signs of pneumonia in a recent period (one, two, or more weeks) prior to the home visit. The main objection to this approach is the uncertainty surrounding the ability of mothers to recognize accurately the signs of pneumonia in children and to remember when they occurred. A draft survey instrument is being prepared and will be field-tested in 1989. It will include questions on pneumonia morbidity (using one or both approaches), and on drug use and care-seeking behaviour for all ARI.

2.6.4 Mortality surveys

Mortality surveys to measure ARI deaths give rise to even more serious constraints than morbidity surveys, since problems related to maternal recognition of the signs of pneumonia are augmented when mothers need to recall events that happened during the past 12 months. One obvious issue which requires further study is the definition of death from pneumonia, either as a direct or as an associated cause. Studies of this question, as well as attempts to develop simpler techniques to measure overall childhood mortality, will be initiated in 1989 in collaboration with the London School of Hygiene and Tropical Medicine.

2.7 Surveillance of bacterial resistance to antimicrobial agents

Since community-acquired, bacterial pneumonia in children is mostly caused by *Streptococcus pneumoniae* and *Haemophilus influenzae*, a logical concern is that the standard antimicrobial treatment (co-trimoxazole, ampicillin, amoxycillin, or procaine penicillin) might become ineffective in places where the proportion of strains resistant to these antibiotics is increasing. There is, therefore, a clear need to establish national surveillance systems capable of monitoring the resistance of these two organisms to antimicrobial agents.

In 1987 the Programme initiated such a system, globally, on a pilot basis with the participation of the Statens Serum Institut, Copenhagen, Denmark, and the Public Health Laboratory, John Radcliffe Hospital, Oxford, UK. Unfortunately, this effort was not successful as very few of the 12 national laboratories which agreed to participate had the technical capability to isolate the required strains.

During 1988 the Programme reviewed this effort in collaboration with two consultants and decided to focus its future efforts on strengthening national capabilities in the expectation that the aggregation of reliable national data will provide information for a global assessment of the problem.

For this purpose, it entered into collaboration with the Centers for Disease Control, Atlanta, USA, in the preparation of a manual which will describe the epidemiological and microbiological methods required for the surveillance of antibiotic resistance. An area of technical uncertainty was identified, namely, the adequacy of using nasopharyngeal strains for this purpose. It was decided, nevertheless, to proceed with preparation of those chapters of the manual dealing with epidemiological and microbiological techniques applicable to invasive strains isolated from sterile body fluids, such as blood, pleural fluid, and cerebrospinal fluid. In the meantime, a thorough review will be undertaken of existing data to determine whether strains isolated from the nasopharynx have the same sensitivity spectrum as invasive strains, in which case nasopharyngeal swab cultures (which are much easier to obtain) could be used for surveillance purposes. Recent studies done in Gambia, Pakistan, and Papua New Guinea suggest that there is quite a close correlation in types and

drug sensitivity between nasopharyngeal and invasive strains from the same patient. Detailed analyses of these data are being carried out, but further research on this question will probably be needed.

2.8 Programme status

The major targets of the Programme for countries with infant mortality greater than 40 per 1000 for the years 1989 and 1995, and an estimation of their level of achievement when the Programme started in 1984 and at the end of 1988, are presented in Table 4. Methods for measuring these targets will be developed in 1989-1990 (see section 2.6). Additional, and perhaps revised, targets will be developed as the Programme progresses.

Table 4: Major ARI programme targets for countries with infant mortality greater than 40/1000,^a 1989 and 1995

Category of target	Status in		Targets for	
	1984	1988	1989	1995
No. of operational ^b programmes	0	16	22	88
Percentage of the population with access to a trained, ^c regularly supplied source of free or affordable antibiotics	10	20	25	50
Percentage of cases of childhood pneumonia treated with antibiotics	8	16	20	40
No. of facility-based staff trained ^c in case management	1 000	5 000	7 500	50 000

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

^b Operational = having a well formulated plan (targets, specified activities, 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 a part of the country, and a funded budget.

^c Trained = having received training in assessment and treatment of pneumonia at a course using either the WHO guidelines or some other acceptable system. Training included demonstration and treatment of cases.

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3. RESEARCH

3.1 Research policy and management

During 1988 the research activities of the Programme underwent an expansion. An initial step was the development of guidelines for the management of ARI research activities (3). This was followed by efforts to promote and support specific projects. In addition, the results of ARI intervention projects supported by the Programme during the past five years were summarized.

3.2 Biomedical and epidemiological research activities

An important step in preparing to promote and support this type of research was deciding which research topics should be given highest priority. This was done at a meeting organized by the Programme in Hanover, Federal Republic of Germany, in May 1988, attended by experts in various fields of ARI research. A summary report of the meeting is available to interested researchers (4). It was agreed that the ARI Programme should focus its research on the problem of acute lower respiratory infections (ALRI), and in particular pneumonia, in young children in developing countries.

Priority biomedical and epidemiological research on ALRI is being divided into three broad areas as follows:

(a) Case management

Research in this area includes studies to establish more precise clinical criteria for the detection of ALRI or the classification of its severity by health workers, or for the diagnosis of sepsis (pneumonia, meningitis, septicaemia) in very young infants; and clinical trials to compare the effectiveness of co-trimoxazole and ampicillin in the outpatient treatment of pneumonia to determine the efficacy of simplified antibiotic regimens (shorter duration of treatment, fewer doses per day), and to assess whether co-trimoxazole given to treat pneumonia is also effective in reducing parasitaemia with *Plasmodium falciparum*. The latter is of practical importance because it is frequently difficult to distinguish pneumonia from malaria in young children, and febrile children treated with co-trimoxazole for suspected pneumonia would not then require an additional antimalarial drug in a falciparum-malarious area.

(b) Epidemiology, etiology, and risk factors

Research in this category includes population-based studies to define the epidemiology and etiology of ALRI in preparation for trials of vaccines for *S. pneumoniae*, *H. influenzae*, and respiratory syncytial virus; etiological studies on ALRI in very young infants or malnourished children; and studies to define risk factors, including maternal behaviour, that influence the incidence, severity or outcome of ALRI, especially those that might be suitable targets for interventions aimed at reducing disease incidence or severity.

(c) Vaccine development

In this area, research is concerned with developing improved and simplified tests to diagnose invasive disease (e.g., pneumonia, meningitis) due to *S. pneumoniae* and *H. influenzae*; and evaluating candidate vaccines to prevent disease caused by these bacterial pathogens and by respiratory syncytial virus. The most likely candidate vaccine to be field-tested in the near future by the Programme is one of the currently available conjugated *H. influenzae* b vaccines.

In the short term, highest priority will be given by the Programme to research on case management. Although vaccine-related research is also of high priority, it will require a longer-term effort. It is also important to note that, within WHO, the support of laboratory-based research to develop new candidate vaccines for pneumonia is primarily the responsibility of the Programme for Vaccine Development; evaluations of candidate vaccines in volunteers or field trials, however, will be undertaken by the ARI Programme.

The Programme also plans to support health systems research to examine the feasibility, cost, and effectiveness of strategies to promote early recognition of pneumonia and proper care-seeking behaviour.

Initial efforts to develop research projects in priority areas have included the recruitment of short-term professional staff to develop research guidelines and sample protocols, to visit and evaluate potential research sites, and to assist interested researchers in planning projects to be considered for financial support. Small task forces composed of experts from outside WHO will be created to help the Programme establish research priorities and recommend strategies, review proposed research projects and advise on their support, and monitor the progress and results of supported studies. A preliminary, informal meeting of experts was held in November 1988 to help plan this work.

3.3 Services-related case management research

During the revision of the Programme's case management guidelines and ARI Treatment Chart (see section 2.2) a number of important research questions relating to the case management strategy were identified as needing rapid resolution. Investigations were initiated during 1988, as commissioned studies, on the following topics:

(a) Measurement of the respiratory rate

This measurement is central to the case detection of pneumonia, yet opinion remains divided on the advisability of a 30- versus a 60-second measurement and on the recommended state of the child (breast-feeding, awake, or asleep) during the measurement. Difficulties in keeping a child calm and still for a full 60 seconds have been reported by health workers, who sometimes had to perform multiple counts. On the other hand, in very young infants, a 30-second measurement may underestimate the respiratory rate during brief apnoeic periods and overestimate it during the tachypnoea which may follow such pauses. Preliminary investigations undertaken with support from the Programme in 1988 at San Lazaro Hospital in Manila (see section 2.3[a]) indicated that a full minute's reading could be achieved under study conditions (though sometimes with difficulty) and suggested a need for it in very young infants. Given the importance and time-consuming nature of the measurement, further studies are planned in 1989 using continuous monitoring techniques to analyse the natural variability of respiratory rate by age, the effects of the state of the child and various respiratory manoeuvres (such as yawning or coughing) on respiratory rate counts, and the accuracy of measurements taken at intervals of 30 and 60 seconds.

(b) Pneumonia in the neonatal period

The guidelines for case detection and treatment of very young infants by first-level health workers rely on different clinical signs than those recommended for older infants and young children (see section 2.2 [b]). Reliance on cough with tachypnoea or chest indrawing to detect pneumonia in very young infants is inadequate. Neonates with pneumonia may not cough and their normal respiratory rate often exceeds 50 breaths per minute. Those with a serious bacterial infection may present only with non-specific clinical signs, which make it difficult to distinguish pneumonia from sepsis and meningitis. Studies are thus being planned to test the ability of first-level health workers to observe accurately a series of clinical signs and to decide on that basis whether infants under 2 months of age have a serious bacterial infection, as determined by a physician's assessment and chest X-ray. If possible, the minimum number of signs needed to detect such cases will be determined.

(c) Wheeze

At the first-level health facility, recognition of wheezing and observation of the clinical response to bronchodilator therapy may obviate the need to refer children who wheeze because of asthma or bronchiolitis and can be managed at home on bronchodilator therapy (see section 2.2 [d]). A research project carried out at El Chatby Hospital in Alexandria, Egypt, demonstrated that nurses previously untrained in diagnostic medicine could be taught to identify wheeze without the use of a stethoscope, administer nebulized salbutamol by footpump or metered-dose inhaler, and assess response to therapy. Final results from this study are pending. Further studies are planned to assess the flow rates achieved with various footpumps and to determine the best ways of administering bronchodilators at first-level facilities where wheezing is a problem.

3.4 Intervention studies

A meeting of principal investigators and consultant epidemiologists was held in April 1988 to analyse the results of seven ARI intervention studies (5). These sought to determine the feasibility and mortality impact of the case management strategy implemented through the health care system, including community health workers. The protocol was based on the standard procedure for management of a child with a cough (see section 2.2) and included educating families to recognize the signs of pneumonia and, in most studies, active case-finding through home visits by health workers. An initial summary of the results of these studies was published in the 1987 Programme Report (6). The results of an eighth study were analysed after the meeting.

Six of the eight studies compared mortality results in an intervention area with those in a concurrent control area (Abbottabad, Pakistan; Bagamoyo District, United Republic of Tanzania; Bohol, Philippines; two studies in Haryana State, India; and Jumla, Nepal). The other two studies (Kathmandu Valley, Nepal, and Kediri, Indonesia) compared pneumonia mortality in children before and after implementation of the intervention. All the studies analysed the impact of the intervention in children below the age of 5, except the first study in Haryana, in which only infants were observed. The results of these studies can be summarized as follows:

- (a) The study in Abbottabad demonstrated that a community-based ARI case management intervention with active case-finding can have a significant impact in reducing both ALRI-specific and total mortality in children under 5.
- (b) In the first study in Haryana, where the intervention was confined to low-birth-weight infants, a large decline was found in ALRI-specific infant mortality and the pneumonia case-fatality rate. In the second study, ARI case management, as well as improved immunization coverage and access to oral rehydration therapy, were provided to all children under 5 years in the intervention area, resulting in a substantial reduction in under-5 ALRI-specific mortality compared with a control area.
- (c) In the Kediri project, an epidemic of measles occurred during the first six months of the baseline year which prompted a measles immunization campaign. It was thus not possible to attribute the significant reduction in overall mortality and in ALRI-specific mortality found during the first intervention year solely to the case management intervention. However, the impact of this intervention was clear in infants under 6 months of age who had not been immunized against measles, in whom there was a significant reduction in the ALRI-specific mortality rate. A comparison of ALRI deaths during the second half of the baseline year, during which few deaths from measles occurred, and the second half of the intervention year also showed a significant reduction in ALRI-specific mortality. The second year of intervention will be completed in June 1989.
- (d) The studies in Bagamoyo and Kathmandu Valley showed a fall in both total mortality and mortality from ALRI in children under 5; however, these projects combined ARI case management with other interventions in such a way that their specific impacts cannot be easily separated.
- (e) In Bohol, a reduction of borderline statistical significance was seen in under-5 ALRI mortality not associated with measles.

- (f) Preliminary results from the Jumla project suggested a reduction in mortality. However, a more recent statistical analysis of data collected two years after the start of the intervention has shown no reduction in either total or ALRI-specific mortality. The significance of this result is uncertain, however, given the low coverage of the intervention, particularly the failure of mothers to seek care for children with signs of pneumonia (more than 80% of cases of clinical pneumonia were found only as a result of bi-weekly scheduled home visits). In addition, few deaths occurred in children with signs of pneumonia who had received three or more doses of co-trimoxazole, an indication that case management was effective when delivered. The project has yielded valuable data as regards the rapidity with which many episodes of pneumonia lead to death, the importance of measuring respiratory rate (rather than relying on a maternal report of fast breathing), and the significant proportion of ALRI deaths that occurs during the first three months of life. A third year of intervention is under way during which an increased effort is being made to identify and treat cases early.

Taken together, these studies have shown that it is possible to transmit to health workers the knowledge and skills required to assess and manage ARI cases, particularly pneumonia in children, including those living in underprivileged and poorly-served areas. They also indicate that an ARI case management strategy, as generally delivered in these studies, i.e., with household visits for case-finding and provision of therapy by community workers, can have a substantial impact on ALRI-specific and total childhood mortality. It is now necessary to evaluate ARI programmes implemented within the national health infrastructure in order to determine their potential effectiveness.

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4. INFORMATION SERVICES

Interest in acute respiratory infections in children has increased considerably during recent years, as a result of the promotional activities of the WHO ARI Programme and other agencies and institutions.

The global newsletter "ARI News", produced by the Appropriate Health Resources and Technologies Action Group (AHR TAG) in London, UK, with support from the Swedish Agency for Research Cooperation with Developing Countries (SAREC), the Pan American Health and Education Foundation (PAHEF), UNICEF, and WHO, remains the main vehicle for the dissemination of information on acute respiratory infections to the staff of ministries of health, hospitals, peripheral health facilities, and teaching institutions in developing countries. In 1988, three issues in English (25 000 copies of each) were distributed: number 10, containing a review of the management of the child with wheeze; number 11, devoted to neonatal pneumonia; and number 12, presenting information on the relationships between nutrition and ARI. Issue number 2 of the French version (5000 copies) was printed and distributed with the support of the International Union against Tuberculosis and Lung Disease. The Pan American Health Organization translated into Spanish issues 7, 8, and 9 and published them in one volume ("Noticias sobre IRA", Volume 3), of which 40 000 copies were printed. Volume 4, comprising numbers 10 and 11, was translated into Spanish and 40 000 copies will be printed in 1989.

The Programme continued to distribute documents, publications, and reprints of papers published in scientific journals and periodicals, free of charge, to about 800 addresses on a computerized mailing list and to a increasing number of individual requesters. The mailing list includes institutions, public health managers, teachers of paediatrics, and scientists in developing countries who are interested in ARI. A full list of publications is available from the Programme (7).

A "Bibliography on Respiratory Infections in Children" is published every six months in English by the Pan American Health Organization with the collaboration of the US National Library of Medicine. Two numbers of volume 7 were issued in 1988, each in 4000 copies, of which 3000 were distributed free of charge to developing countries and through the Programme's mailing list.

During 1988, ARI staff participated in eight scientific meetings and international courses and made presentations on the objectives and activities of the Programme. These included the BOSTID (US National Research Council) Symposium on Etiology and Epidemiology of ARI in Young Children in Developing Countries, held in Los Angeles, USA, in October, which reviewed the results of research projects supported by BOSTID in 11 developing countries on the epidemiology and etiology of ARI.

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5. PROGRAMME MANAGEMENT AND RESOURCES

5.1 Organization

In August 1987, the ARI Programme at WHO headquarters was placed administratively under the responsibility of the Director of the Diarrhoeal Diseases Control (CDD) Programme. At that time the ARI staff at the global level was limited to one medical officer (Programme Manager) and one secretary. During 1988 the organizational structure was enlarged with the creation of three new professional posts (to be filled in 1989) and two secretarial posts, bringing the number of staff at the global level to seven.

All the regional offices have designated a responsible officer for ARI activities within their programme of Disease Prevention and Control, with the exception of the Region of the Americas where ARI, together with EPI and CDD, forms part of the Maternal and Child Health Programme.

The scientific and technical review of Programme activities is the responsibility of a Technical Advisory Group (TAG) composed of six leading experts in public health and six scientists from outside WHO. The Group has met every two years since 1983. The next (fourth) meeting will take place in Geneva on 6-10 March 1989.

The status and plans of the Programme were presented to the donor community at the CDD Meeting of Interested Parties (MIP) on 1 July 1988. The MIP warmly endorsed the Programme's plans and 1988-1989 budget, and decided that in future (i) the MIP would serve as the donor forum for the CDD and ARI programmes, and (ii) the funding mechanisms adopted by the donors for the CDD Programme would apply also to the ARI Programme (8).

5.2 Resources

The resources made available to the Programme from 1982 until 31 December 1988 under all sources of funds are shown in the Annex. As of 31 December 1988, 14 agencies and organizations had made extrabudgetary contributions to the Programme, six of which contributed for the first time in 1988.

The Programme's budget for the 1988-1989 biennium is US\$5 980 000. The financial position as at 1 January 1989 is shown in Table 5.

Table 5: Financial position of ARI Programme as of 1 January 1989

	US\$
Balance available on 1 January 1988	266 866
Amount received since 1 January 1988	3 404 900
Amount pledged since 1 January 19887	718 224
Total available and pledged	4 389 990
Estimated obligations 1988-1989	5 980 000
Estimated shortfall 1988-1989	1 590 010

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ACUTE RESPIRATORY INFECTIONS PROGRAMME
FINANCIAL RESOURCES: 1982-1989
Status at 31 December 1988

SOURCE	1982-1983	1984-1985	1986-1987	1988-1989	
				Available	Pledged
				US\$	US\$
REGULAR BUDGET					
Global and Interregional Regions	296 800	560 206	624 365	448 100	
	342 100	466 536	560 311	724 100	
TOTAL REGULAR BUDGET	638 900	1 026 742	1 184 676	1 172 200	
OTHER SOURCES					
Australia				124 670	
Federal Republic of Germany				31 928	
Finland				115 275	
Italy				362 000	
Japan			145 000	80 000	
Netherlands			175 951	153 846	
Sweden	75 000	141 336	547 140	327 871	357 724
United Kingdom				914 300	
United States of America					60 000
Pan American Health Organization			68 800		
United Nations Development Fund				99 500	300 500
Arab Gulf Programme for United Nations Development Organizations (AGFUND)	40 000	280 000			
Kellog Foundation		34 000	68 000		
Sasakawa Health Trust Fund	91 050	294 804	156 300		
Interest				23 310	
Sub-total	206 050	750 140	1 161 191	2 232 700	718 224
TOTAL	844 950	1 776 882	2 345 867	3 404 900	718 224