

INTERNATIONAL PROGRAMS IN BLOOD PRESSURE CONTROL¹

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The scope of the world hypertension problem places a premium on the need to devise preventive measures and to make better use of what we now know about controlling hypertension. This article reviews a number of research findings in the field and describes current work of the World Health Organization directed at achieving more effective hypertension control.

Introduction

In contrast to many diseases causing cardiovascular difficulties—such as ischemic heart disease, rheumatic fever, and Chagas' disease—hypertension is an almost universal problem, one common in tropical, subtropical, and temperate areas as well as in both developed and developing countries.

This article does not seek to provide an exhaustive review of the literature on the epidemiology of hypertension. Nevertheless, it is worth noting that hypertension afflicts an estimated 10 to 15 per cent of all adults in the developed countries of Europe and North America. Data on the prevalence of hypertension in developing countries—reported in a number of publications and through the WHO Collaborative Program on Hypertension Control—invariably show similar figures (1). In comparing such data, however, care must be taken to consider possible differences in the definition of hypertension employed, the variability of blood pressure reading, and a lack of the common

denominators that help to ensure statistical comparability.

The very complex problem of hypertension involves two crucial needs. One need is for research into the origins and causes of hypertension—in order to seek ways to prevent this condition. The other is for more experience on how to apply available knowledge—in order to control the disease with the therapeutic and health care arsenal available today.

Research

Contradictory research data now exist on the relative importance of genetic and environmental factors, and there are a number of peculiar and intriguing points about blood pressure that warrant further investigation. For example, "pockets" of people whose blood pressure does not increase with age have been identified in several parts of the world. If such groups of people rarely have hypertension, coronary attacks, and strokes, this may mean that these are not inevitable conditions—and that it is possible to investigate factors responsible for their prevention.

Polynesians in the Pacific region have an old tradition of migration that continues today. The first wave of polynesians, the New Zealand Maori, came to New Zealand from the Central Pacific some time in the fourteenth century. In 1946 there were about 2,000 such islanders in New Zealand;

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in 1977 there were 60,000. People from Samoa, the Cook Islands, Niue, Tokelau, and Tonga (see Table 1) now make up an important, though still relatively small segment of New Zealand society (2-4).

The Tokelau Island Migrant Study, initiated in 1966, has afforded an excellent opportunity to study Tokelauans moving from their native environment, which poses a low risk of high blood pressure, into highly urbanized life in New Zealand. This study may well represent a nearly unique "experiment of nature" (2).

The study has shown blood pressure to be higher among Tokelauans in New Zealand than among those remaining in Tokelau. The fact that these differences were observed in both children and adults strongly suggests that environmental factors were playing an important role.

Physical factors—such as caloric intake, salt consumption, physical activity, and physique—may be basic determinants of hypertension. But psychosocial factors may also account for much of the phenomenon; for example, migration often exposes settlers to situations and relationships that they are not prepared for, and this may initiate changes in the body's control of blood pressure that could cause the pressure to increase. In reality, both sets of factors (physical and psychosocial) probably contribute to hypertension.

Cook Island studies carried out in 1964

revealed very different patterns of blood pressure among two groups of islanders, the Pukapuka and the Rarotonga. But blood pressure was not the only important difference—weight differed as well. There was also a considerable difference in the two population's diets and salt intakes; the Pukapukans ordinarily used little salt, while the Rarotongans, who were moving toward a more modern form of diet, had a much higher salt intake (3).

Sociocultural differences between the two groups were also considerable. Rarotongans who lived in Avarua, the main town in the group of islands, were being exposed to the ideas, customs, foods, and goals of an industrial society—things that contrasted sharply with the subsistence-oriented lifestyles of the Pukapukans.

Mortality data have shown Maori men and women in New Zealand to have even higher rates of hypertensive heart disease than Europeans. A still more striking finding (see Table 2) was that Maori women suffer four times higher mortality from coronary heart disease than their European counterparts (4).

The World Health Organization (WHO) through its expert and advisory committees and collaborating centers, is playing an active role in testing all this information with the aim of developing a potential tool for early prevention of cardiovascular disease.

Most epidemiologic studies from different countries support the observation that both moderate and severe elevations of blood pressure increase the risk of morbidity and mortality from coronary, cerebrovascular, and kidney disease (5). These studies also show that modern antihypertensive drug therapy can effectively reduce high blood pressure and, consequently, the excess risk. The most significant investigation in this field is the well known Veterans Administration Cooperative Study (6, 7).

One of the central problems in controlling hypertension is posed by the question

Table 1. Hypertension observed among several Pacific population groups.

	Prevalence per 1,000 population	
	Males	Females
New Zealand Maoris	287	318
Carterton Europeans	265	224
Rarotonga, Cook Islands	343	365
Pukapuka, Cook Islands	46	82
Tokelaus	79	151

Sources: Prior et al. (2) and Prior (4).

Table 2. Mortality from hypertensive heart disease observed among women of Maori and European extraction in New Zealand.

Recorded year of death	Deaths per 100,000 among 3 age groups		
	45-54 years	55-64 years	> 65 years
<i>European females:</i>			
1955-59	8	36	246
1960-64	5	17	170
1965-69	3	10	125
<i>Maori females:</i>			
1955-59	71	203	319
1960-64	62	121	269
1965-69	64	129	194

Source: Prior (4).

"At what levels of blood pressure elevation should pharmacological treatment of hypertension be initiated?" The question can be answered only by extensive therapeutic trials on great numbers of subjects. Nine such trials—financed by national agencies for medical research in Australia, France, Great Britain, and the United States—are now underway in various parts of the world. In an effort to coordinate these research activities, WHO and the International Society of Hypertension (ISH) are providing liaison for the ongoing trials. (The activities of the Mild Hypertension Liaison Committee have already been reported in two WHO/ISH documents—8, 9.)

According to available national statistics (see Figures 1 and 2), mortality from cerebrovascular disease has been on the wane in many countries (10). One reason for this may be that potent modern treatment has been given effectively to large numbers of several hypertensive patients running a high risk of stroke. However, the decline in mortality started long before new antihypertensive drugs were introduced, raising the possibility that this downward trend may in fact result from a complex of intervening factors.

Epidemiologic analysis of the situation in various countries in the early 1970s showed that then-available knowledge was being

applied to only a small fraction of the tremendous number of hypertensives around the world. Indeed, as Figure 3 shows, it became evident that only about half of the hypertensive subjects in the general popula-

Figure 1. Mortality from cerebrovascular disease in the 55-64 age group of five countries, 1955-1970 (10).

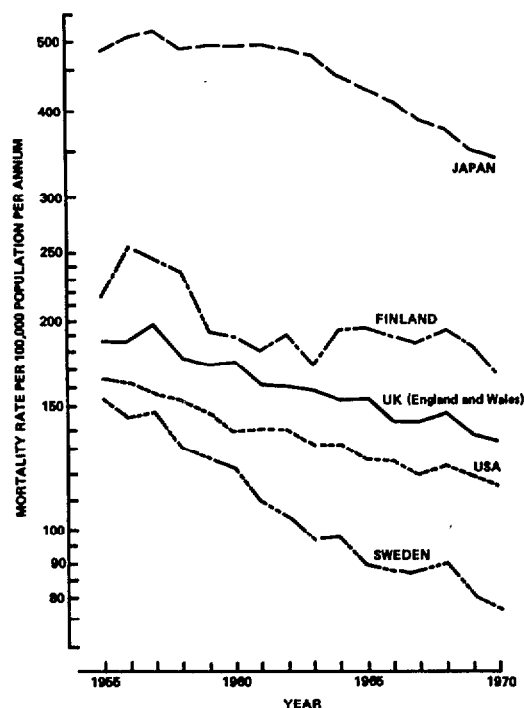
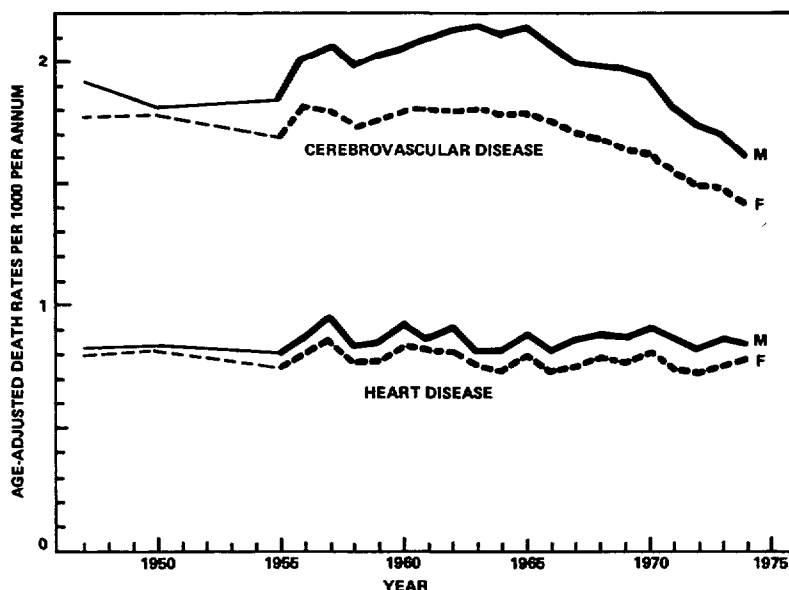


Figure 2. Trends in cardiovascular disease mortality among men and women in Japan, 1950-1975 (10).



tion of most developed countries were aware of their high blood pressure, only about half of those aware of the problem were being treated, and only about half of those treated were considered adequately treated (1). This situation existed despite the fact that the risks of high blood pressure were recognized, and despite the fact that the benefits of consistently and markedly lowering elevated blood pressure were well-known to health professionals. As Figure 4 shows, more recent data have refined this rough quantification by "halves" without detracting from the validity of the underlying concept (11-13).

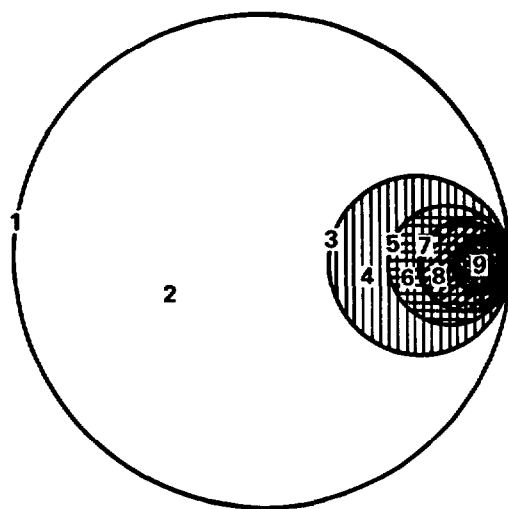
Hypertension, considered from the point of view of health care epidemiology, has until now involved a double paradox. That is, although high blood pressure can be measured easily, hypertension has often remained undiagnosed; and although relatively simple and efficient treatment has been available, the patients all too often have remained untreated. Since the number of hypertensive subjects worldwide is enor-

mous, these hypertension paradoxes clearly pose one of the priority health care problems on the international scene.

WHO Control-Related Activities

The World Health Organization's commitment to promote control of hypertension began in 1958, when an expert committee (14) urgently recommended doing studies to determine the condition's actual frequency in representative and comparable population samples. Then in 1961 another WHO expert committee (15) clarified some aspects of the arterial hypertension problem—clarification that was needed in order to provide a basis for control measures. The procedure for classifying hypertension was outlined; standard methods of measuring blood pressure were defined; guidelines for defining public health, health manpower, and general health education problems related to hypertension control were laid down; and the main objectives of research on hypertension control

Figure 3. Typical patterns of hypertension and hypertension treatment for a developed country in the early 1970s. The areas of the circles shown correspond to the actual proportions observed in several population-based studies (1).



1. THE WHOLE COMMUNITY
2. NORMOTENSIVE SUBJECTS
3. HYPERTENSIVE SUBJECTS
4. UNDIAGNOSED HYPERTENSION
5. DIAGNOSED HYPERTENSION
6. DIAGNOSED BUT UNTREATED
7. DIAGNOSED AND TREATED
8. INADEQUATELY TREATED
9. ADEQUATELY TREATED

were indicated. Two years later, in 1963, WHO gave the methods for assessing hypertension in a given population a more detailed review (16), particularly from the standpoint of international comparability.

During a 1970 WHO seminar that was reviewing the impact stroke has on the health of populations (17), it became apparent that many cases of stroke could be prevented if greater vigor and attention were devoted to treating hypertension. This conclusion, together with a strong recommendation to initiate "model programs in the context of their local health services to produce practical methods for both case-finding and delivery of adequate continued treatment," gave rise to a more specific and program-

oriented WHO commitment to study and promote the control of hypertension in entire populations.

The framework and objectives of a WHO project along these lines were set forth at a meeting held in Geneva in 1971 (18). That same year investigators from 15 centers in various countries around the world met in Göteborg, Sweden (19), and adopted the protocol for a cooperative project. A community approach to hypertension control was chosen, and in 1972 a number of centers initiated pilot community hypertension control programs to study the feasibility and effectiveness of the design. By the end of the same year, the first preliminary information generated by the study was reviewed (20). In 1976 the Pan American Health Organization (the WHO Regional Office for the Americas) and eight countries of the Region initiated an inter-country hypertension control program based on these WHO guidelines (13).

The WHO Hypertension Control Project

WHO is currently conducting this cooperative pilot project through a network of centers covering practically all parts of the world. As Figure 5 indicates, these centers are operating in Argentina, Barbados, Bolivia, Brazil, Chile, Cuba, Ecuador, Peru, and Venezuela in the Americas; in Ghana, Nigeria, and Senegal in Africa; in Czechoslovakia, Finland, France, the German Democratic Republic, Italy, Portugal, Sweden, Yugoslavia, and the U.S.S.R. on the European continent; and in China, Israel, Japan, and Mongolia in Asia.

It remains to be seen whether such pilot programs are feasible, effective, and efficient. Because the effects of any single program may not reach a significant level within a limited period of time, cooperation among several centers has been regarded as desirable in order to obtain comparable data and, hopefully, cross-center analysis of the results.

Figure 4. Observed patterns of hypertension in the early to mid-1970s (11-13).

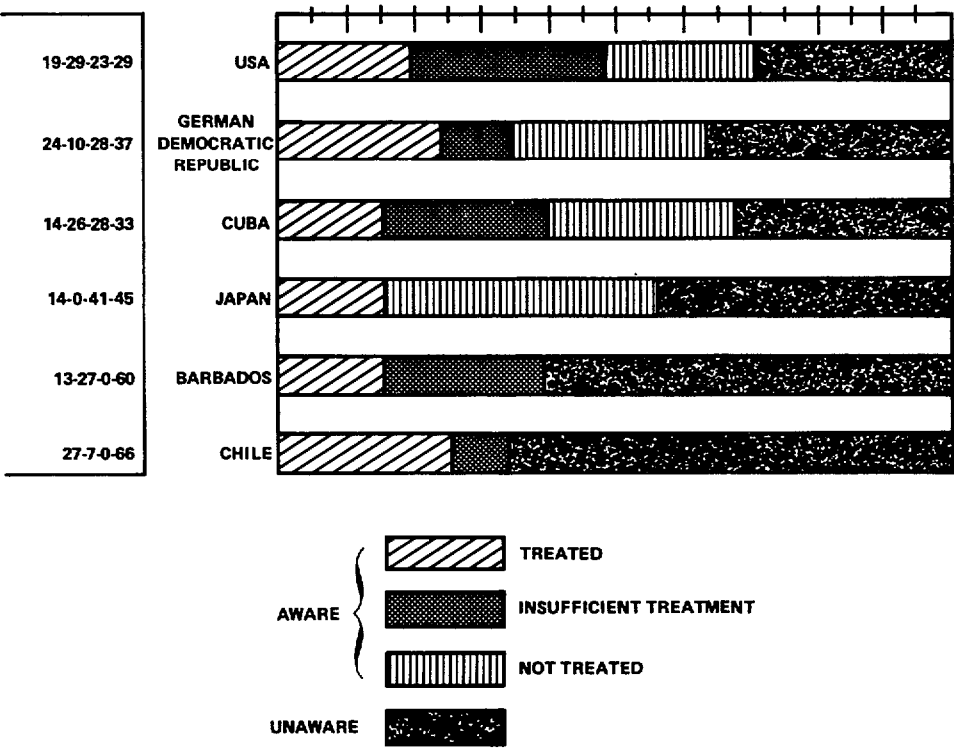
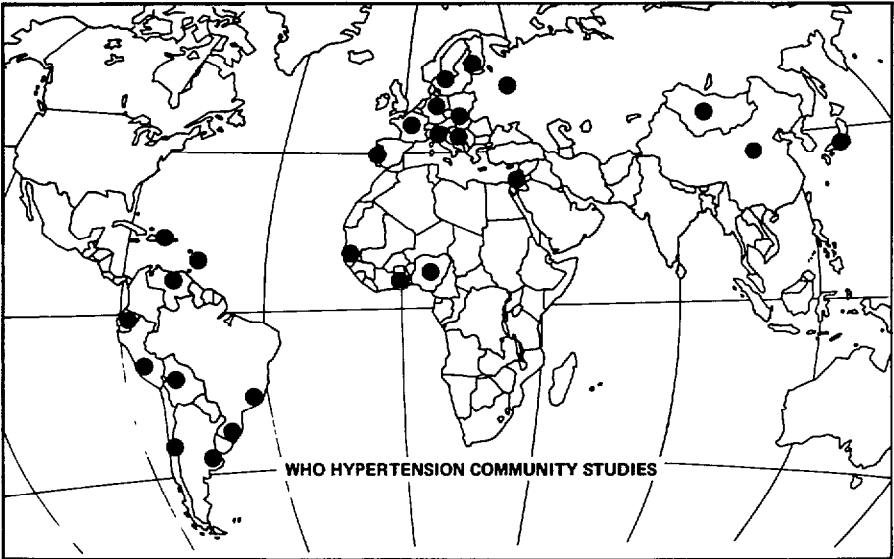


Figure 5. Location of centers for WHO hypertension pilot programs around the world.



In view of the aims of the study, the control programs need to be organized so as to respect and take advantage of the existing systems of medical care delivery. Each program should be seen as intensifying, improving, and extending current activities in this field.

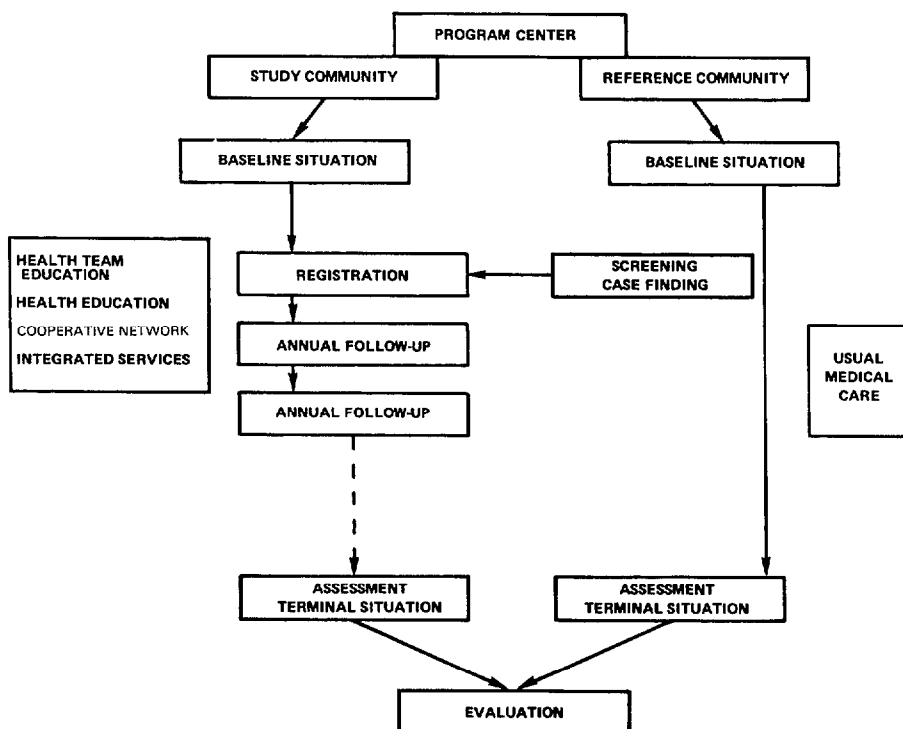
The general operational plan for the study of community hypertension control is shown in Figure 6 (5). The first step is establishment of a program center, an organizational element needed to implement a community control program. The program center begins its work by selecting the community to be studied, a choice that should be based on both practical and theoretical considerations. After designation of the study community, and also a reference community, samples are drawn up and a baseline survey is made to assess the epidemiologic situation in both communities.

Those people in the study community found to have blood pressures in the hypertensive range are registered.

Next, a search for previously undetected cases of hypertension is attempted. If appropriate, cooperative liaison is established with the physicians and medical institutions in the area; and, if necessary, facilities for better medical care are created. The physicians in the program community are contacted and provided with up-to-date guidelines for therapy. When indicated, special training in hypertension is offered to the physicians in the study community, and information on hypertension is provided to the general population. Registered hypertensive subjects are followed up, and once a year findings are again recorded.

While all this is being done in the study community, the reference community continues to receive the usual medical care

Figure 6. The general plan of operation for the WHO study of community hypertension control.



(i.e., care without registration of hypertensives, case-finding efforts, special health care programs, or special educational programs). At the end of the study period (five years) a final survey is made in both the study and reference communities and a final analysis is performed.

Data from these final surveys in both communities are compared to the baseline data for those communities. Changes in both communities should be expected (see Figure 7). Therefore, evaluation of the control program's effect needs to be based on the difference observed between the "spontaneous" change occurring in the reference community and the "spontaneous *plus* program-induced" change occurring in the study community.

The project involves centers providing three different kinds of cooperation: the full cooperation provided by centers that are following the WHO protocol by conducting initial and follow-up surveys of a reference community; the cooperation pro-

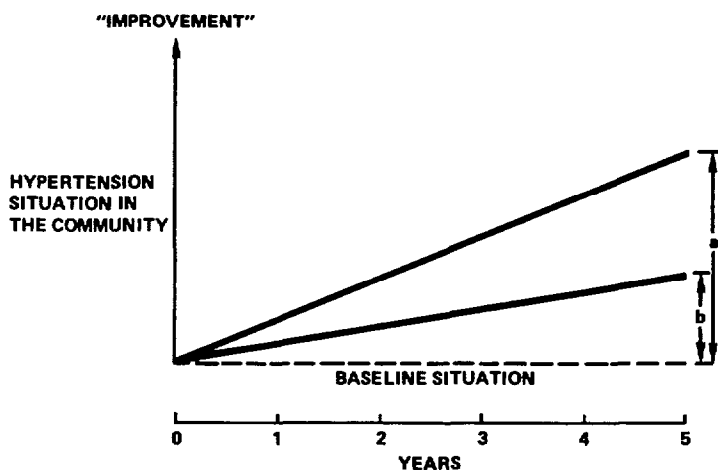
vided by centers that have encountered difficulties in establishing a reference community and that are testing only the feasibility of the community control program; and the cooperation provided by other centers that are contributing to the project by exchanging information about methods of controlling hypertension in the community.

In this world project, the case registry is regarded as an operative control instrument. The purpose of making such a registry is to define the initial situation before intervention begins and to provide a basis for monitoring case follow-up activities. At present almost 30,000 hypertensive subjects are included in the project.

Preliminary Results

Of the participating centers, five have now completed their five-year study programs and have begun their evaluations. The other will reach the end of their study

Figure 7. This chart shows the basic principle to be applied in evaluating the effects of program intervention on hypertension.



- a = "IMPROVEMENT" IN STUDY COMMUNITY
- b = POSSIBLE SPONTANEOUS "IMPROVEMENT" IN REFERENCE COMMUNITY
- a-b = "IMPROVEMENT" DUE TO THE EFFECT OF INTERVENTION IN PROGRAM COMMUNITY

programs in anywhere from one to four years.

Although some interim analysis of data is available, we are not yet in a position to define anything more than some of the patterns that seem to be emerging. Both data analysis and program evaluation conducted to date have pointed to some methodological weaknesses that merit discussion in the light of the aims of the study. Case registration, for example, is providing data on certain items that are less amenable to cross-center analysis than others. Care must be taken here, because data without adequate standardization and quality control, when compared for all centers, might give misleading results.

It must also be kept in mind that the registry information obtained does not necessarily reflect all that is happening in the study population; i.e., the program may have an influence on unregistered hypertensives. In addition, changes observed in the population may not be due solely to the program, since an increasing frequency of antihypertensive treatment has been found to occur in many places independently of special control programs. Furthermore, the well known phenomenon of "regression toward the mean" tends to produce a decline in the blood pressure of any group selected for casually elevated blood pressure values.

The WHO protocol specifies that an annual follow-up form should be filled out for each registered hypertensive subject. While the ratio of total forms received to total forms expected (up to the fourth annual follow-up) has been satisfactory in some centers, in others the ratio has been shrinking rapidly. Although this phenomenon still requires considerable further analysis, one fact is worth pointing out now. That is, the programs showing the lowest rates of attrition seem to be those that are most closely integrated with existing health services, that involve the active participation of local health centers, that utilize

auxiliary personnel, and that include an element of health education and community participation.

This is the case, for example, in the county of North Karelia, Finland, where the population of hypertensives under control has increased from 1.9 to 9.7 per cent of the total population in five years and where the rate of attrition has been extremely low. At the other end of the spectrum, the least effective results seem to be coming from centers where the programs are both vertical and lacking in community-based logistical support.

An interim analysis of registration data, keeping in mind the forementioned possibility of considerable bias, seems to indicate some general trends. There is a moderate decline in the average blood pressure of treated groups—a decline that might be considered insufficient when treating an individual patient, but not so insufficient when working with a collective population. On the other hand, this decline in the treated group's blood pressure cannot be fully ascribed to treatment. Obviously, the decline does not have the value of random drug trial results, because treatment was not given at random. This, however, was not the aim of the study. Another trend is that all centers have shown the percentage of treated persons to be increasing with each follow-up; this probably reflects a bias due to missing information about persons who are not treated.

Concluding Remarks

Despite these problems with data analysis and evaluation methodology, there are good grounds for optimism regarding hypertension control and prevention of complications. For whatever the ultimate findings of the WHO program are, one key objective—to help promote worldwide awareness of the need for a systematic approach to the hypertension problem—has already been attained.

It seems clear, however, that this systematic approach must be community-oriented, and that a certain organizational threshold of health services must be reached before a community hypertension control program can succeed. We also believe that it is time to recognize that hypertension clinics acting as the centralized agents of vertical programs are inadequate—because they ignore the need for a comprehensive approach to medical care of the patient. Finally, and most important, we believe a key prerequisite for successful implementation of a community hypertension control program is that full consideration be given to the existing system of health services in each country or area involved.

As Dr. Héctor Acuña, Director of the Pan American Health Organization, said in his message for World Health Day 1978: "In many countries of the Americas, chronic diseases are now contesting the place traditionally held by communicable diseases as the major cause of death and disability. . . . Nationwide control programs based on population studies should be carried out at the community level through the existing structure of the medical services." This, in essence, is why the World Health Organization, the Pan American Health Organization, and a significant share of their Member Governments have joined together in the present pilot effort to combat hypertension.

SUMMARY

The complex problem of hypertension affects virtually all developed and developing areas. Its importance has created an urgent need to find ways the disease might be prevented and ways to better apply what we now know about hypertension control.

Recent research has turned up a number of interesting findings—including the fact that certain "pockets" of people do not tend to experience increasing blood pressure with age. The World Health Organization (WHO) is now playing an active role in testing all available information with the aim of developing a potential tool for early prevention of cardiovascular disease.

Regarding hypertension control, WHO is currently sponsoring a large number of coordinated pilot programs in member countries. These programs are designed to investigate whether application of available control measures in specified communities will reduce the impact of hypertension in those communities. At present almost 30,000 hypertensive subjects are participating in these programs. It is still too early to say how greatly these programs will influence levels of hypertension in the communities involved; but it is clear that they have already contributed to growing world awareness of the need for a systematic approach to hypertension control.

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NUTRITION*

"Nutrition Made Simple by the Caribbean Food and Nutrition Institute" has been a recent series in *Nyam News*, newsletter of that organization. Vitamins—fat-soluble vitamins A, D, E, and K and water-soluble vitamins B₁, B₂, C, and niacin—and minerals are discussed in the February and March issues. Subsequent issues answer questions such as, Does diet affect the brain? Does breastfeeding keep a woman from becoming pregnant? What is the nutritional contribution of green paw-paw?

**Nyam News*. January-March, 1979.