

Human Resources Planning: Issues and Methods

Riitta-Liisa Kolehmainen-Aitken

Senior Program Officer
Management Sciences for Health

July 1993



Data for Decision Making Project
Department of Population and International Health
Harvard School of Public Health
Boston, Massachusetts

Table of Contents

Executive Summary	1
Introduction	3
Key Issues in HRH Development	5
Imbalances in HRH	5
Economic Aspects of HRH Development	10
Obstacles to HRH Development	12
Lack of Priority to HRH issues	12
Lack of Coherent Policies	13
Lack of Appropriate, Ongoing Processes for Planning	13
Insufficient Planning and Management Capacity	14
Inappropriate or Poorly Developed Methods	15
Inadequate Information	17
Analytic and Planning Methods	19
Supply and Requirement Projections	19
Modelling	22
Determination of Staffing Standards	23
Determination of Staff Mix	25
Improving Efficiency and Productivity	25
Recommendations for DDM	27
Tools in Need of Development	27
Tools to Be Promoted	30
Bibliography	32

Executive Summary

During the past half century, the focus of development of human resources for health (HRH) has evolved from increasing the numbers of conventional health personnel, through efforts to improve the education of all health workers, to current attempts to increase their effectiveness and the quality of their work. Since 1976 the official policy of the World Health Organization (WHO) has been to encourage the integration of health services with development of health personnel. This concept, known as coordinated health and human resources development, stipulates that planning, production, and management functions for HRH should be a unified process, that human resources must serve the needs of the health system, and that the health system must serve the needs of the people.

A major goal of this work was to identify the important issues in HRH development as well as the factors that impede progress. Developing countries have experienced imbalances in the numbers and types of health personnel trained as well as in their function and distribution and in the quality of their training in relation to future responsibilities. Furthermore, insufficient attention to the economic aspect of HRH planning has led, in some cases, to the training of more high-level personnel (e.g., physicians) than the economy of a developed country can support. Since the cost of training a medical auxiliary is a small fraction of the cost of training a physician, improved HRH management and planning could lead to more effective allocation of human and financial resources.

Among the obstacles to HRH development in many countries are misplaced priorities, lack of coherent policies and appropriate planning processes, inadequate management capacity, poorly developed methodology, and lack of essential information. Decision makers may be overwhelmed with routine health statistics yet unaware of or unable to use results of HRH research. Thus there is need not only for research in this area but, more importantly, to make data from HRH studies accessible to those responsible for HRH planning. An analytic approach to HRH development should consider supply and requirement projections as well as determination of proper staffing standards and mix. Use of modelling may facilitate making HRH projections that account for interactions among many variables. Although most of the work with modelling thus far has been done in developed countries, notably the United States and Great Britain, this technique has potential applicability as a planning tool in developing countries.

Recommendations for future work include increasing the visibility of HRH on national policy agendas and developing tools to improve the productivity, efficiency, and allocation of personnel. In particular, DDM collaboration with others active in this field would facilitate both the development and implementation of HRH models and of a tool kit for HRH planning, training, and management.

Introduction

Development of human resources for health (HRH) has undergone eight overlapping phases since the end of World War II (Fulop and Roemer, 1982). From the late 1940s to the late 1960s, the focus was on increasing the quantity of conventional health personnel. This phase overlapped in the 1950s to mid-1960s with two other phases: efforts to improve the educational levels for all types of health personnel and to seek cross-national equality in the training of health personnel. The fourth phase, an attempt to seek geographic coverage of countries with health personnel, focused on conventional health personnel in the 1950s and on multipurpose auxiliary personnel in the 1960s and 1970s. Measures to increase efficiency in the production and use of health personnel were emphasized throughout the period up through the 1980s.

National planning of health personnel received increasing dominance in the 1960s to mid-1970s, but with a growing recognition that technical planning procedures alone had little impact on decision makers. The "health-for-all" movement increasingly brought forth the question of relevance of health personnel to national needs. While the integration of health services with development of health personnel had been implied since the 1950s, only in 1976 did it become the official policy of the World Health Organization (WHO). The concept was slightly modified in 1989 and is now referred to as coordinated health and human resources development or COHHRD (WHO, 1990a). It includes three fundamental principles. First, the planning, production, and management functions for HRH must go together. Second, human resources are to serve the needs of the health system. Third, the health system must serve the people's needs.

This paper is based on a literature review, supplemented by the author's own experience in the field. The citations on the development of HRH were identified through a computer search done at the Francis A. Countway Library of Medicine (Harvard Medical School, Boston, MA), complemented by a manual search of the most relevant publications in the last two years. With a few exceptions for especially notable citations, the search was limited to items published in the last 15 years.

Since the development of HRH is a vast area, encompassing the planning, production, and management of human resources, this paper concentrates on those aspects of HRH development for which some data that can be useful for decision

making are already available in most countries. Such important areas as analyses of function and task and assessment of supervision and performance are thus only mentioned in passing.

This position paper is intended to:

- Identify key issues and the main obstacles hindering improvements in the development of human resources for health (HRH).
- Identify and assess HRH analytic and planning methods or techniques in use or under development.
- Make recommendations on which methods or techniques should be developed further for DDM use, and which should be promoted through the DDM project.

Key Issues in HRH Development

Two categories of issues have proved to be particularly significant in HRH development. The first includes the various kinds of imbalances that have developed in many countries. The second set of issues, economic aspects of HRH, was long ignored. In recent years, however, it is gaining an increasingly prominent role on the policy agendas of many countries.

Imbalances in HRH

The supply of human resources for health in almost all countries has grown substantially in the last 40 years. This growth, however, has not necessarily been accompanied with a corresponding improvement in health status or a lessening of inequities in access to health care. The 1986 Acapulco Conference, "Health Manpower out of Balance," arranged by the WHO, identified five different categories of HRH imbalances (Bankowski and Fulop, 1986). These were the discrepancies between numbers, types, functions, distribution, and quality of health workers on the one hand and, on the other, a country's needs for their services and its ability to employ, support, and maintain them. In the following discussion, these five are discussed in turn.

Numbers of Health Staff

The last 30 years have seen a general increase in the ratio of health staff to population in all countries, although the rates of growth have been considerably slower in the developing countries (WHO, 1985a; Berman and Ormond, 1988). The number of medical graduates, in particular, grew rapidly in the 1960s and 1970s, especially in the developing world (Mejia, 1980; Frenk et al., 1991). Higher education was viewed as a vehicle for social mobility, thus creating pressure to expand the opportunities for medical education. Many new medical schools were founded, and the capacity of existing ones was expanded. Between 1955 and 1975, the number of medical schools in developing countries grew by 139%, while in developed countries, it grew by 37%. Some countries exhibited even higher rates: in Brazil, for instance, the medical schools grew by 230% (Mejia, 1980).

One result of such increases in opportunities for medical education has been a growing unemployment among physicians. In 1984 it was reported that in Latin

America and the Caribbean, the physician workforce would double in about 10 years, while the employment capacity of the health sector under present arrangements would remain stagnant or even decrease (Vidal, 1984). Almost a third of all physicians in 16 major Mexican cities are currently unemployed or underemployed (Frenk et al., 1991). India has gone from having barely perceptible unemployment for physicians in 1970 to having more than 40,000 unemployed in 1987, when it was reported that declared vacancies could absorb only 20-25% of the annual graduates (Bankowski and Fulop, 1986). Associations of unemployed physicians have been formed in Argentina, Bolivia, Chile, Mexico, and several other countries.

The supply of dentists has also risen rapidly. However, the dentist-to-population ratios vary greatly, depending on the level of development of the country. Countries such as Egypt, with only 20 dentists per 100,000 population, still report unemployment, since the low income level of the general population, coupled with the economic crisis, do not allow many dentists to make a living from private practice.

While almost all countries have seen growth in the number of nurses in recent decades, most developing countries still appear to have shortages of nursing personnel. The numbers, functions, and distribution of nurses are highly dependent on a country's health care organization as well as on specific cultural factors. This situation contrasts with that for physicians and dentists who, in most countries, can engage in private practice. It is estimated that about 30% of nurses work part-time (Bankowski and Fulop, 1986).

Much concern has been expressed over the years about the "brain drain," i.e., the migration of highly trained health professionals from low-income to high-income countries (Mejia, 1981; Joyce and Hunt, 1982; Onuigbo, 1983; Mburu, 1984; Ojo, 1990a; Ortin, 1990). The migration flows of physicians were highest in the 1970s, before the worldwide economic recession and changes in U.S. immigration laws made migration of doctors to this country more difficult. Recently, many countries have experienced a return migration, the re-entry of their own medical graduates to an already saturated job market. Where public sector jobs are still available, internal brain drain to the private sector is becoming a growing problem (Kolehmainen-Aitken et al., 1990).

In some countries, such as the Philippines and Swaziland, the shortage of nurses has been aggravated by the high levels of external migration. Ortin (1990) reported that about 60% of the Philippines' total supply of nurses had left for other countries, and that "Apparently, the demand for nurses abroad has increased and nursing schools have become such a lucrative business that neither politicians nor businessmen have tried to make the Department of Education, Culture and Sports to enforce its moratorium on opening new nursing schools."

Little information is available in the published literature about changes in the

numbers of other health staff, such as laboratory or radiography staff. The number of community health workers is likely to have grown with the increased emphasis on primary health care after the Alma Ata conference on primary health care. However, the data bases on staff of this level are particularly poor in many countries. In addition, the heterogeneity of this cadre makes comparisons between countries very difficult.

Types of Health Staff

Optimal staffing of modern health services requires many different types of staff. These include:

- Clinical workers, such as doctors and nurses;
- Technical staff for diagnostic services, such as laboratory and radiography; pharmacy staff;
- Environmental health workers, such as health inspectors;
- Preventive and promotive staff, such as many community health workers; administrative staff, etc.

The types of health staff in a particular country should be dictated by the kinds of health services provided and the level of technology available. Regrettably, HRH planning efforts have generally concentrated on policies and plans for individual staff categories, rather than on fostering the development of appropriate, efficient staff mixes for different levels of care.

Poor countries have tended to focus particularly on producing physicians, rather than other categories of health workers, such as medical auxiliaries. While developing countries had six times fewer physicians in 1975 than did the developed countries, they had 12 times fewer professional nurses and midwives, and up to 38 times fewer medical assistants (Mejia, 1980). At the Acapulco conference (Bankowski and Fulop, 1986), Prof. Ramalingaswami commented, "We see a curious picture of manpower patterns and mixes in different parts of the developing world a combination of overproduction of certain categories of health manpower and underproduction of certain others, of overproduction and underutilization, of gross shortages of manpower at the same time as unemployment."

The conference considered the excessive ratio of higher to lower categories of health staff to be one of the key HRH issues. There are too many physicians in comparison with medical auxiliaries, too many dentists in comparison with dental assistants, too many pharmacists in comparison with pharmacy assistants, and so on.

The inclusion of a category for community health workers in a national staffing

structure presents policy makers with many controversial issues that are exemplified by the following questions:

- What capabilities should the community health workers be expected to have?
- What kind of organizational structures should be in place to support them?
- Should they be volunteers or government public service employees?
- How should they be compensated?
- What should be their relationship with the villages and with other health workers?
- What kind of continuing education opportunities should be provided for them?

The recent experience of various countries with community health workers has been described (Bhattacharji et al., 1986; Heggenhougen et al., 1987; Bastien, 1990; Christensen et al., 1990; Robinson and Larson, 1990; Xuegui Kan, 1990; Gagnon, 1991.) The International Development Research Centre (IDRC) publishes an ongoing series reporting on low-cost rural health care and staff training. (IDRC, 1980-84) Heggenhougen et al. (1987) did a detailed study of community health workers in Tanzania, with a briefer look at five other African countries. They noted that "community health workers cannot be little supermen and superwomen who provide and promote comprehensive health activities while health and other sectors proceed unchanged as before." Heggenhougen et al. (1987) saw community health workers as an extension of the formal health services and emphasized that the success of any program for use of community health workers depends on having an established policy, backed up by actual political commitment and support.

Functions of Health Staff

In many developing countries the functions that health workers are expected to perform are described by job titles or job descriptions. Such purely descriptive statements, however, give little guidance about the desired performance or the skills, knowledge, and attitude considered essential for the job. A closer scrutiny of actual job performance will frequently reveal glaring discrepancies between the expected and the actual functions and tasks of health workers (Sketchley et al., 1986).

The top-heavy staff structures referred to above result in doctors being forced to undertake tasks that a nurse or a paramedical worker could do equally competently

and at lower cost. Conversely, staff shortages can force health workers to undertake functions for which they have been inadequately prepared. The result is a qualitative mismatch between job requirements and worker training. An example of this imbalance is the fact that because physicians are unavailable in rural areas of many countries, local nurses assume clinical responsibilities for which they have not been trained.

Distribution of Health Staff

Geographical and institutional maldistribution of health workers is a reality in most countries. For example, in the major human resources planning effort in Indonesia in the 1980s, uneven distribution of health staff was placed first on the list of problems identified (Hapsara, 1984). Rural areas are underserved in comparison with urban areas; health centers are consistently less adequately staffed than hospitals, and so on (Ojo, 1990b).

The recent encouragement of private sector initiatives has many repercussions for the equity of staff distribution. This situation has rarely received the attention it deserves in the debate on private versus public sector medical care. Private health care facilities almost always have staffing levels far higher than public ones and can afford to pay salaries high enough to attract staff away from public sector facilities. Segall provides an excellent example of how Zimbabwe barely averted a major HRH problem at independence (Segall, 1983). A proposal had been made to develop three major private hospitals (involving some 500 new beds) in Harare and Bulawayo. These three projects alone would have absorbed as many nurses as were needed to staff six district hospitals or 175 rural health centers. Furthermore, the proposal was made at a time when a serious shortage of nurses required for the expansion of rural health services had been projected. Similar concerns existed in Botswana when the country developed its first human resources plan in the late 1980s (Wheeler and Ngcongco, 1990).

Many countries have tried to improve the inequitable distribution of their staff by offering material and career-development incentives to attract health workers to less attractive areas. However, as Mejia (1980) pointed out, this effort has rarely met with success.

Quality of Health Staff

The major determinants of the caliber of health staff are the quality of their training and supervision and the relevance of that training to the situations in which they will work. Inadequacy supervision, to which lower-level staff and those working in peripheral settings are often subjected, is a major cause of deteriorating technical skills.

Health training is not a standard product, applicable unchanged to every country. A common mistake made by many developing countries in their search for improved quality has been to tailor their training programs after those of developed countries. The end product is a health worker who is ill-suited for the needs of his or her own country, its disease patterns and resource constraints. Such staff members are of poor quality for the requirements of the work setting in which they are expected to function. This problem is not limited to the education of physicians; it extends to the training of nurses as well. The qualifications of nurses and the requisite training to achieve ever higher qualifications tend to produce a workforce more comfortable in a hospital than in a health center, behind a desk, rather than next to the patient's bed. These problems were all highlighted in the 1986 Acapulco conference. Rispel and Schneider (1991) have commented on the implications of this issue in South Africa.

Economic Aspects of HRH Development

Staff salaries alone consume 60-80% of the government's recurrent health budget in most countries. In some countries, for instance Peru in the 1990s, the proportion has risen to over 90%. This leaves scant financial resources to devote to the purchase of drugs and supplies, transport for supervisory visits, and other operating expenditures.

Prof. Abel-Smith (in Bankowski and Fulop, 1986) emphasized that the health staff affordable in any country depends ultimately not on the need for their services but on the resources available to support them. These resources include not only the funds for paying their salaries, but also the cost of the pharmaceuticals, health technology, continuing education opportunities, etc. that the staff require. This holds true for both the public and the private sectors. Yet, the economics of HRH planning have largely been neglected. Until recently, most HRH plans were devoted to estimating how many health workers were needed to meet the requirements of the population, without attention to whether the country could afford to continue to pay for such staff.

One of the consequences of ignoring the economic side of HRH planning has been the training of more high-level health staff, e.g., physicians and dentists, than the country can support. Underemployed physicians are a costly resource, not only in terms of their training costs, but also in the excessive and unnecessary services they are likely to provide to earn a living. Furthermore, when a disproportionate share of finite financial resources is devoted to training more high-level staff than the country can afford to employ, resources are drained away from training and employing the allied health staff who are essential to the productivity of the higher-level staff.

In 1978 Abel-Smith and Leiserson estimated that the cost of medical education

per student in many developing countries was approximately U.S. \$60,000. This figure was about six times more than what had commonly been estimated at the time. The cost of training a medical auxiliary was then about U.S. \$8,000. Thus for equivalent cost, one could train either one physician or eight auxiliaries. When the lifetime cost of salaries is added to the large difference in training costs, it becomes clear that much more attention should be given to the opportunity costs of different categories of health staff. In 1980 Meija wrote, "In countries where cost containment is an imperative and this is the case in most countries including some of the richest consideration will need to be given to intensifying the production of those categories of workers upon whose labor the productivity of the physician largely depends and whose training and utilization are much less costly than that of physicians."

The period of economic hardship that many developing countries are experiencing has coincided with ambitious goals for development of primary health programs. Stagnant or declining government health budgets are inadequate for an increasing population, which in many countries is undergoing a demographic and epidemiological transition. Questions of the productivity and efficiency of the health service are thus rising to the fore. The literature review revealed little work in this area that was applicable to the context of developing countries. This observation was confirmed by Lewis et al. (1991), who studied the productivity and quality of public hospital medical staff in the Dominican Republic and commented, "Little is known about the relationship between productivity of medical staff and quality of services provided in developing countries."

The study of one large public hospital done by Lewis et al. (1991) showed that only 12% of contracted physician time was accounted for by patient-care activities. This figure indicated a serious underutilization of available physician staff in comparison with the hours paid. Berman (1986) used cost analysis to identify sources of inefficiency at individual rural health units in Indonesia. He demonstrated that increasing productivity is a potentially important source of health care financing, and that significant improvements in efficiency should be possible without major changes in health system administration (Berman and Sakai, in press). Similar results were obtained in the Papua New Guinea Rural Health Services Cost Study (Mitchell et al., 1988). Several important causes of inefficiency were identified. They included the distribution of staff between facilities, allocation of staff time between various program components, procurement policies, etc.

Obstacles to HRH Development

Lack of Priority to HRH Issues

With the exception of community health workers, health care personnel require the longest preparation time of all human resources. They are essential to the functioning of the health system and cannot be stored or substituted. They are also very costly. As emphasized above, staff salaries consume the bulk of recurrent health expenditures in most developing countries. HRH problems usually develop over a long period of time and are difficult to correct. Mejia and Fulop (1978) pointed out that the imbalance between the supply of and demand for HRH is the result of a lack of coordination between the providers of health services and the trainers of health staff. Each group tends to proceed independently from the other, and the health system as a whole suffers as a result.

Despite the concerns expressed above, HRH planning continues to have a low priority in most countries. Either it is not addressed at all in a systematic manner, or the plans that are formulated are divorced from the development of the overall health system. The result is acute shortages of services and staff in some geographic areas, and costly surpluses in others. The unrealized expectations of workers trained in excess of a country's ability to absorb them or fully to utilize their skills have caused them to migrate or, at the very least, led to serious loss of morale and motivation. The failure to give sufficient priority to HRH issues is not limited to developing countries. In the North American context, Fottler et al. (1990) pointed out that "while more health care organizations recognize the growing importance of their human resources, few are conceptualizing the impact of their organizational strategy through human resource practice initiatives."

The WHO has defined HRH management as consisting of activities that mobilize and motivate people and allow them to develop and reach fulfillment in and through work, aimed at the achievement of health goals (WHO, 1985b). Personnel management systems require systems and procedures by which necessary and affordable staff are selected, recruited, inducted, and deployed for defined work in the health care system.

Developing countries have provided little information on their strategies for management of health personnel. Empirical information, however, brings out

very similar concerns from many countries. These include wastage of human resources, ineffective use of personnel, low productivity, and low motivation. Simmonds (1989) commented that the morale of health personnel is fast becoming the major factor affecting the sustainability and quality of health care worldwide. The WHO expert committee on the management of human resources for health (1989) noted that the concern to improve personnel management through a systematic application of sound managerial principles and techniques is relatively new, especially in developing countries. It is only recently that the public health sector is beginning to confront questions of goal attainment, organizational effectiveness, and cost-efficiency. It has been argued that outright waste of all national health resources is as high as 50% (WHO, 1986). The WHO expert committee emphasized that if even half of that waste is due to low productivity and poor utilization of staff, better personnel management could result in substantial improvements.

Lack of Coherent Policies

The concept of coordinated health and human resources development (COHHRD) implies that human resource planning, training, and management are carried out in close coordination with the development of the health system which, in turn, is aimed at the objective of health for all (WHO, 1990a). This concept was first formally considered in the international fora in the mid-1970s and has subsequently been promoted by the WHO and accepted, in principle, by most countries. It is realized, however, in very few of them. Fulop and Roemer (1982), in their review of the international development of HRH policy, pointed out that the traditional separation of the education of health personnel from the health services has been a major hindrance to the development of coherent HRH policies.

Decentralization of health services complicates the formulation of coherent policies and plans since the control over funding of services and determination of staffing levels is handed over to peripheral personnel (Kolehmainen-Aitken, 1992). In some countries, the fragmentation of the health system between a large number of different types of providers, e.g., government, social security institutes, armed forces, mission agencies, etc., is another hindrance to formulation of a coordinated national policy on human resources.

Lack of Appropriate, Ongoing Processes for Planning

Many countries have considered HRH planning to be a linear process with a distinct beginning and end, rather than a cyclical one where each planning phase feeds into the next. Thus, planning, when done at all, has been a major effort, more concerned with the formulation of the plan than with its implementation. Such plans often set unrealistic or rigid standards or ignore the ability of the

health care system to pay for the planned increases in staff. As a process, such planning is costly and thus often unsustainable because it involves large numbers of individuals over a concentrated period of time. It also gives insufficient attention to monitoring and evaluating the plan and to mechanisms that allow for midterm corrections.

Hornby et al. (1980) pointed out that HRH planning has also traditionally suffered from being concerned merely with numbers of different kinds of staff, while ignoring qualitative aspects. Appropriate planning requires a broader perspective that includes such qualitative issues as relevance of training to health service needs, allocation of tasks and functions, productivity, motivation, etc.

Insufficient Planning and Management Capacity

Ongoing HRH planning requires skilled staff and an organizational base from which the HRH process can be influenced. Hall (1991) listed the diversity of talents and expertise required for an HRH planning team. They include:

- Health and human resources planning;
- Economics, policy and statistics;
- Public health administration;
- Social sciences;
- Hospital and facility planning;
- Educational planning and training;
- Expertise in specific health disciplines, such as medicine, nursing, environmental science, etc.

Planning for HRH thus calls for a team approach. However, personnel with many of the required areas of expertise are still in short supply in most developing countries. This fact was recognized by Hornby et al. (1980) more than a decade ago, when they stated, "One of the factors that has hindered the growth of manpower planning is the lack of trained planners. Since manpower is needed at all levels of the health services, there must be an awareness of the need of planning, and there must be planning itself at all levels national, regional and local although the details of planning will be different at each level."

A human resources development unit should be the organizational base from which the country's HRH development process is directed. Such planning units do not exist in most developing countries. Even where they have been established, their function has often been limited to directing the training of health

personnel, and their staffs have been inadequately prepared for their professional roles. Such a planning unit requires a permanent administrative nucleus whose core is a HRH planner with full responsibility for the planning process and the coordination of the planning team. Besides technical planning skills, the planner needs interpersonal skills that allow him or her to function as a coordinator, facilitator, sponsor, negotiator, and diplomat (Hall and Mejia, 1978). The unit might be located within the health bureaucracy itself or in an interministerial steering committee. An institutional base for personnel management should either be incorporated into the unit's structure, where appropriate, or at the very least, must work very closely with those responsible for HRH management.

Inappropriate or Poorly Developed Methods

The WHO defines HRH planning as "the process of estimating the number of persons and the kinds of knowledge, skills and attitudes they need to achieve predetermined health targets and ultimately health status objectives." When alternate projection methods are used, their different results make interpretation difficult. For instance, in 1991 Khan and Sithole used three different methods to project staff needs for oral health care in Zimbabwe. All three methods yielded different results, but even the lowest projection was beyond the resources of the country.

Few HRH plans have been integrated with a thorough economic analysis or have critically assessed the productivity and efficiency of health staff. Most methodological attention has been devoted to improving the techniques of assessing HRH supply and requirements. Unfortunately, this focus has meant that analytic methods for improving the efficiency, productivity, and distribution of human resources or for calculating the cost implications of HRH development have received much less attention despite the fact that internal inefficiency remains one of the main problems in the health sector of developing countries (Akin et al., 1986). It is a particularly significant constraint in times of economic crisis and not unique to developing countries. Birch et al. (1986) criticized HRH planning for physician manpower in the United Kingdom for reluctance to analyze substitution possibilities and failure to consider the implications of alternative levels of funding for the use of physicians.

Many of the methods used for the appraisal of efficiency and productivity in developed countries originated in health care organizational structures that are substantially different from the prevalent modes in the developing world. These methods are either too complex to be transported to developing countries or have data requirements that exceed what is generally available. (See, for instance Golladay et al., 1974; Hancock et al., 1987; Eastaugh, 1990; Ashby and Altman, 1992). Most analyses of productivity that have so far been undertaken in developing countries concentrate on measuring the quantitative supply of

staff and services and ignore efficiency, appropriateness, and effectiveness of the services produced.

Various methodologies have been developed for estimating the supply of and requirements for health staff over a certain length of time. One example of a planning approach that was used in the late 1960s and 1970s in the developing countries was developed by CENDES in Venezuela (1965). It sought to optimize the allocation of human resources, according to the relative impact of each activity on mortality and morbidity. Many South American countries, e.g., Chile, El Salvador, Peru, and Venezuela, used the CENDES method, though it was later criticized for its rigidity. The same criticisms have been leveled at many other supply and requirements methodologies. (See, for example, the critique of Lave et al. [1975] in the North American context.

In many developing countries, the health sector is served by a number of providers: the government, private sector, social security administration, etc. A number of the current methods for assessing supply and requirements have proved unsuitable for the degree of control that a particular government can exert over development of health care resources. Little guidance has been available to health managers on how to choose the planning methodology that best fits the needs of their own particular planning environment.

The current HRH supply and requirement methods have been criticized as particularly inappropriate or inadequate for planning primary health care staff (Bui Dang Ha Doan, 1981). Methods of supply projection require trend extrapolation, which is relevant only if it is based on large numbers. Projecting the supply of staff categories with use of small numbers or such unstable events as retirements and emigration can lead to substantial error in projections. Estimating HRH requirements, in turn, is based on the acceptance of norms or standards. Standard-setting remains a subjective process, whether it is done through a Delphi process or by use of often-limited statistical data sets, since no optimally "correct" standards exist.

The disappointment with the application of various methodologies at the level of individual developing countries led WHO a decade ago into an attempt to develop "crash" HRH planning methods. One such method was described by Galan Morera et al. (1980). The WHO-supported health personnel projections project commenced in 1981. It was aimed at developing simple methodologies for projecting personnel supply and requirements and generating indicators for monitoring development of health personnel. Country activities took place in Democratic Yemen, the Gambia, Hungary, Indonesia, Mozambique, Philippines, Swaziland, Zambia, and Zimbabwe (Shipp, 1989). The experience from this project showed that health personnel projections are indeed a valuable contribution to decisions on policy formulation, strategy, programming, and implementation. For the production of realistic projections, however, the inclusion of those

with operational experience in health service and in health training proved vitally important.

Functional and task analyses have sometimes been considered too complex and costly for use in some low-income countries. However, the information generated is of great value to HRH planning, training, and management. Such analyses have been undertaken, for instance, by the primary health care planning group in Sierra Leone (1983). Recent interesting work has been done by Sidney J. Fine (1989) and by Frank I. Moore of the University of Texas in San Antonio.

Inadequate Information

Decision making for HRH development occurs at three different levels:

- The policy-making and planning level;
- The managerial level;
- The operational level.

Many types of data are necessary to support these decisions. They include HRH managerial and operational information, epidemiological and health-related information, and literature on all aspects of the HRH development process (WHO, 1990b). The experience of the WHO health personnel projections project showed that in most countries data on training were generally very good, while data on personnel ranged from gross totals of a few categories of staff to very detailed surveys of all staff. Information on the number of planned new health facilities was generally available. The data that proved most incomplete and of uncertain accuracy were data on health activities.

Some of the necessary data are available in raw form through routine health information systems. Statistics on health personnel, for instance, are commonly found in scattered files, registers, and records. The repositories of these data are various types of institutions, both within and outside of ministries of health. Such data are often inaccurate or out of date, and they are seldom linked together and used to monitor employment, utilization, distribution and costs of staff. Even when data are compiled for statistical purposes, they are rarely analyzed to assess how HRH relate to the health requirements of the community or to recognized trends or emerging problems.

Data limitations are a particularly severe constraint to planning for the category of community health workers. These workers are usually not paid through the government payroll. Most governments thus have little incentive to maintain accurate data on their numbers and characteristics (Kolehmainen-Aitken, 1990). Many studies have sought information on traditional healers. Their numbers are usually large (Taylor et al., 1968), and the potential utility of such information

must be weighed against the high cost of gathering it.

Many decision makers are swamped with inappropriate routine statistics that have not been analyzed so that they are useful for decision-making. Furthermore, managers are often not fully aware of the usefulness of information that can be obtained through HRH research. Such research can be relatively inaccessible to the managers because it is normally conducted at an academic institution and the results are published in a research journal; moreover, the data are frequently presented in a manner that does not lend itself to easy application for decision making. Few useful reviews of HRH research exist. A recent exception is Phillips' 1992 review of research undertaken in the United Kingdom from 1986 to 1992.

Analytic and Planning Methods

An approach to reviewing national HRH development overall is delineated by Fulop and Roemer (1987). Below, the main analytic and planning methods for more detailed HRH studies are reviewed. The description aims to guide the reader toward the most important references; it is not intended as an exhaustive list of all possible methods. An attempt is made to assess the types and availability of data required for application of these methods and to describe existing field experience with their use.

Supply and Requirement Projections

The following description of methods for projecting supply and requirements is largely based on an excellent work in progress by Hall (1991) entitled, *Human Resources for Health: A Tool Kit for Planning, Training and Management.* It updates the earlier classic WHO book on HRH planning, written by Hall and Mejia in 1978. The mathematical techniques used in personnel projections were also described by Hornby et. al. (1980) and by the Pan American Health Organization (PAHO) (1983).

Supply of Health Personnel

Four different concepts have to be distinguished in estimating workforce supply:

- Active supply consists of health workers who are currently economically active in the health care sector.
- Inactive supply refers to qualified staff who are not active in health at the present moment.
- Potential supply includes that proportion of personnel in the inactive supply who could potentially be recruited back into health work.
- Projected supply refers to a projection of the probable active supply of health workers in a future year.

The methodology for projecting supply of health staff can seem deceptively easy. The data required are the numbers of current staff, the numbers of future additions to the staff (graduates from training programs, immigrants, etc.), and

the numbers of those leaving the profession. The formula is then simple: the projected supply equals current staff plus gains minus losses. These estimates, however, can be complicated by many factors: some health staff work only part-time, data on migration flows are frequently not available, the nature of the work changes, and so on.

Workforce gains can either be approximate or detailed. Approximate estimates can be made by extrapolating from present trends in annual changes in numbers or by making conservative assumptions about net increases and decreases in supply. More precise estimates require input/output tables. These calculate the gains on the basis of such variables as intakes to training programs; losses during training or before entry into the workforce; numbers of graduates and/or other entrants to the workforce (e.g., immigrants); and losses from retirement, death, or change of occupation. These analyses have been facilitated greatly by the use of spreadsheets on microcomputers, which allow the testing of alternate assumptions regarding policies affecting intakes, retention, or losses.

Three types of methods are used to estimate workforce losses: the cohort method, the observed-changes method, and two life-table methods (the simple-life-table method and the working-life-table method).

The cohort method compares the number of health workers who graduated or were licensed in a particular year with those who are still active in the profession. The results are expressed in cohort-specific loss rates over time. These rates may differ by sex, specialty, etc. The cohort method requires reasonably accurate data on the current supply of active workers and collapses together all types of losses (deaths, retirements, career change, etc.). The implied assumption that the past cohort-specific rates of loss will continue unchanged may turn out to be unrealistic. Still, if data are available, the cohort method is probably the best for most situations.

The observed-changes method is based on a time series of the estimated supply of active health workers. It is a simpler but less precise method than the cohort analysis. It may be acceptable when the age structure of the population as well as the production and loss of health workers are all reasonably stable from year to year.

Both life-table methods construct life-tables for the health worker category concerned. In the first, the simple-life-table method, an assumption is made that the only losses from the workforce are those due to death. This is the most inaccurate of the methods, and it will considerably overestimate the supply, since retirements and other losses are not counted. The working-life table method, on the other hand, takes into account all losses. It is the most accurate of the methods, and thus requires good information on workforce entries and losses.

Requirements for Health Personnel

There are five main generic methods for estimating the requirements for health staff:

- The personnel-to-population ratios method;
- The health-needs method;
- The service-demands method;
- The managed health-care systems method.

Although it has been used quite frequently, the personnel-to-population ratios method has serious limitations. It discourages any further analysis of productivity issues. Commonly, the ratios that have been selected are inappropriate or unrealistic. They may have been adopted from the experience of another country or a better-served region. Hall (1991) pointed out that this method is best used in a country with acceptable health conditions, a stable health sector, and a limited capacity for planning.

The health-needs method translates expert opinion about people's health needs to staff requirements. It requires the determination of disease-specific mortality and morbidity rates; norms for the number, kind, frequency, and quality of services to be provided; and staffing standards that convert the services into time required by a certain category of health worker to perform the services. The total personnel hours required to meet the health needs of a projected population in a target year can then be calculated. An example of this method is the Graduate Medical Education National Advisory Committee (GMENAC) study of requirements for medical and surgical specialties in the United States (U.S. Department of Health and Human Services [DHHS], 1981b). The health-needs method requires sophisticated data systems and survey capabilities, and a high level of planning expertise. These frequently are not readily available in developing countries. This method is best reserved for a country with a sound planning capacity, an active government policy toward health, a dominant public sector, and a relatively high public awareness of health issues (Hall, 1991).

The service-demands method considers the numbers and kinds of health services people will use at an anticipated cost of obtaining them, rather than their professionally determined need for such services. Current utilization rates can be used to measure the met (or effective) demand, and other estimates can be made of the unmet demand. In addition to population projections by major determinants of demand, this method requires moderately detailed data on the utilization of services and the characteristics of the population to be served, again complicating its use in many developing countries. The service-demands method tends to produce economically realistic projections, but it may neglect political or societal

reasons for improved quality and quantity of services, thus perpetuating existing inequities. In addition to the United States, the service-demands method has been used, for instance, in Taiwan, Peru, and Chile (Baker and Perlman, 1967; Hall, 1969; Hall et al., 1975). Hall (1991) considers the service-demands method especially applicable in a country with a dominant private sector and a passive government attitude toward delivery of health services.

The service-targets method sets "service production targets," such as number of prenatal visits to be provided per pregnant woman, and it estimates how many full-time equivalent health staff of a particular type will be required to meet the target per year. Various techniques have been used to set the targets, e.g., past trends, projected economic demand, or "needs" for priority services (Hall and Mejia, 1978). This method requires only moderate data and planning capabilities and facilitates the study of productivity, utilization of services, and costs. It has been used more often for preventive than for curative services and is most applicable to countries with a dominant public sector and an active government health policy. Hall (1992) reported that it is now the most commonly used method in developing countries. It has recently been applied, e.g., in China (World Bank, 1990) and Botswana (Wheeler and Ngcongco, 1990) as well as in the Gambia, Indonesia, and Namibia (Hall, 1992).

The managed health care systems method assumes a known client population and reasonably good access to care. The experience of a managed health care system (e.g., a system meeting the needs of 100,000 people with X doctors, Y nurses, Z beds, etc.) is applied to another part of the country. Two examples of the use of this methodology in the United States are the study by Steinwachs et al. (1986) on requirements for primary care physicians and the one by Weiner et al. (1987) on requirements for pediatricians. Both studies compared the average experience of three health maintenance organizations to GMENAC projections. This method is best used in a country that has both a well-established and managed health care system and the prospects of extending the experience of one managed system to other populations (Hall, 1991).

Modelling

Models allow us to ask "what if?" questions about what might happen under various assumptions about the future. They may be constructed to simulate behavior in the whole health sector or in a subsector, or they may be made program- or disease-specific. "What if?" questions may apply to the supply of or requirements for health services and/or essential resources. Models may be deterministic or stochastic. The former have predetermined inputs and outcomes, whereas the latter take into account the assumed interactions between different variables. The development of microcomputers has greatly facilitated modelling in recent years.

The use of modelling in HRH planning is a relatively recent phenomenon, and most work has concentrated on human resource supply and requirement models that take into account the likely level of financial resources. Two types of projections are produced. The baseline projection estimates the supply of health workers and the requirements in the target year to provide the same level of health service utilization as in the base year. The alternative projections test different sets of assumptions about the way the health sector might or should evolve.

To bring together those interested in modelling, WHO set up an informal network for "Health monitoring, evaluation and future studies." While WHO itself does not undertake HRH modelling, the network tries to keep track of others' work in this area. Recently, the Division of HRH at WHO, Geneva has funded the work of Dr. Thomas L. Hall (University of California, San Francisco) to create supply-and-requirement models for developing countries.

Most of the experience with modelling so far has occurred in developed countries. In the United States the major practitioner is the Bureau of Health Professions in the Health Resources and Services Administration (DHHS), which has developed a demand-based model for forecasting human resource requirements (DHHS, 1981a). In the United Kingdom, the Advisory Committee for Medical Manpower Planning has modelled the supply of doctors for a 30-year period (1980-2010) (Birch et al., 1986). The Institute of Manpower Studies at the University of Sussex has recently released SUSSEX, a self-contained HRH planning software package for use on IBM-compatible microcomputers. Starting from current staff strength, SUSSEX can simulate staff movements, such as resignations, retirements, and promotions. It allows the setting of staffing targets and shows how many recruits or promotions will be needed to meet those targets. Quantitative comparisons can be made of the effectiveness of different policy choices, and the sensitivity of the results can be tested. One major drawback of SUSSEX is its cost. A single user license costs £5,000 plus a 17.5% value-added tax, a price far beyond the means of most planning establishments in developing countries.

Determination of Staffing Standards

As emphasized earlier in this report, staffing standards for health facilities or programs should reflect both the services delivered and the level of technology available. They are thus likely to vary over time. Various methods have been used to determine staffing standards, and no single "best" method exists. Available methods include:

- Standards obtained from external sources;
- Standards based on expert opinion;

- Standards based on experience;
- Standards based on functional and task analysis;
- Indicators of staffing needs.

The usefulness of reference standards obtained from external sources is subject to two major conditions. They must be developed in circumstances similar to those of the health system that wishes to use them, and they should result in cost-effective services. Standards based on expert opinion are likely to be more suited to local conditions. However, since most experts are specialists, there is a danger that the resulting standards are too high, calling for higher staffing densities and more qualified personnel than the system can afford. Furthermore, such senior staff may well overlook opportunities for innovation in health service delivery.

Empirically developed standards are based on actual experience and thus reflect local realities. Their development, however, is costly and time-consuming. Quantitative data on performance are collected from selected health facilities that are operating well; these data are analyzed to provide the basis for the development of new staffing standards. Functional and task analysis can provide a detailed understanding of the requirements of each major function of the health system. Staffing standards can then be developed to meet these requirements. Data on tasks and functions seldom are readily available but must be collected. These methods can thus be very time consuming and costly and usually require skills not widely available in developing countries.

The development of indicators of staffing need (ISN) methodology is relatively recent. Variants of this methodology have been used in Botswana (Wheeler and Ngcongco, 1990), Indonesia (Wheeler and Ngcongco, 1990), and Papua New Guinea (Kolehmainen-Aitken and Shipp, 1990). The ISN method bases the facility staffing standard on the existing workload. It considers the main components of the work of each category of staff and establishes a standard workload for each. This standard workload is the amount of work that one staff member could undertake in a year, if one full-time equivalent was devoted to that component. The ISN method calculates the staffing standard for each component of work by dividing the annual workload data by the standard workload. The total staffing standard for a facility is then obtained by summing together the staffing requirements of each separate component.

The standard workloads can be developed by use of the various other methods described above, e.g., expert opinion, empirical data, etc. However, the ISN method differs from the other methods in that it uses such data to estimate the amount of staff time each component takes, rather than merely the number of staff that each facility requires. Besides the calculation of the desirable staffing standard by staff category and facility, the ISN method also allows staffing

comparisons to be made between facilities and regions. It is particularly useful in situations where substantial staffing inequities exist or where there is a need to document low staff productivity.

Determination of Staff Mix

The determination of optimal staff mix for the context of a developing country has received attention only recently. Four main methods have been used (WHO/Geneva and WHO/SEARO, 1990). These are:

- The health-needs method;
- Functional and task analysis;
- Consensus expert panels;
- Operational research methods.

Statistical correlations and linear programming models have been used in some situations, though the literature on this seems to be almost exclusively from the developed countries. One exception is the study by Vargas-Lagos (1991), which used multiple regression to examine how health resources should be allocated among physicians, nurses, and other medical inputs in 45 developing countries.

Two groups have worked on staff mix determination in the United States. Golladay et al. (1976) investigated efficient utilization of health workers, focusing on physicians and physician extenders. The National Ambulatory Care Survey of the National Center for Health Statistics (DHHS) has also addressed this issue.

Many management systems have been designed to assist hospital managers in developed countries in making decisions on the number and mix of nursing staff for different shifts. Kirk (1988), in a book of practical management tools for health care staffing and budgeting, provided such guidance for deciding the daily staffing pattern. Jenkins-Clarke (1992) reported that 23 different nurse management systems are currently available in the United Kingdom and that they can be divided broadly into four categories: dependency-driven, task-oriented, care-plan given, and ward-based. As is evident, these systems differ depending on the way nursing is organized in the particular facility. Jenkins-Clarke commented that the reliability of all nurse management systems is being questioned in the United States, while in the United Kingdom the criticism has tended to be confined to certain aspects of a particular system.

Improving Efficiency and Productivity

Methods to assess alternative staff mixes and to analyze health care cost and staffing against established standards can all be used to evaluate the efficiency and productivity of health staff and to develop norms for productivity. The literature, however, reveals very little work in this area that would be relevant to a developing country. Much of the work done in the United States requires data resources that are beyond the means of most third-world countries (See Golladay et al., 1976; Eastaugh, 1990; Pope, 1990; Altman, 1992.) Jenkins-Clarke (1992) provided a useful critique of various systems used in the United Kingdom for managing nursing workloads. She pointed out that the present systems have fundamental weaknesses in reliability and consistency.

Two interesting papers on rural health services in developing countries, whose results can and have been used for improved management, are those by Berman and Sakai (in press) and Thomason and Kolehmainen-Aitken (1991). The former article estimates the current average level of efficiency for key inputs in functioning health units in Indonesia and then demonstrates the range of efficiency by using data on real resources and costs. The latter paper uses indicators of staffing need, together with data from a rural health cost study, to examine staff productivity in Papua New Guinea. Both papers make use of unit costs (defined as the total cost of an activity divided by the number of units of output produced), a data item that is often not readily available but that can be calculated by collection of data on health service inputs and outputs.

Recommendations for DDM

An unresolved issue for the Data for Decision Making (DDM) project is whether the project should be proactive in developing tools for application at the country level or should simply react to requests from the offices of the U.S. Agency for International Development in individual countries. The HRH recommendations discussed below are predicated on the assumption that the DDM project will adopt at least a limited proactive role in tools development.

Only limited DDM resources can be devoted to the development and application of HRH tools. Great selectivity must therefore be exercised to choose carefully those tools that will be developed with project resources and those whose use will be promoted through project activities. All tools should target priority concerns. Their development or promotion should be feasible with the resources and time frame available. Their future application at the country level should be sustainable, given the financial and human resources of developing countries. Where new tools are to be developed or refined, DDM should not duplicate existing efforts, but rather seek to collaborate with persons or institutions undertaking tool development outside the DDM orbit. It is with these criteria in mind that the following list of recommendations has been developed. It is recognized that the tools are not clearly distinct entities. Rather, there is great overlap between them, and a tool developed for one purpose may very well be valuable for other uses.

Tools in Need of Development

Most countries with which DDM is likely to collaborate face a tough economic reality. There is thus little room for large increases either in staffing health facilities or in the numbers of students to be trained for health professions. Therefore, priority in development of new HRH tools should go to creating and refining methods that would either improve the cost-benefit from existing resources or direct future use of resources so that national health requirements are met in the most cost-effective manner.

Four sets of “tools” should be considered:

- Tools that improve the allocation of HRH at both the macro and the micro level;
- Tools for analysis of productivity and efficiency;
- Tools to identify and monitor changes in HRH;
- Tools for increasing the prominence of HRH on national policy agendas.

HRH Allocation Tools

Logical and data-based approaches to allocating human resources are rarely encountered, either in ministries of health or at the level of individual facilities. The development of such a set of tools should receive priority. Such tools should be aimed at developing an affordable and balanced staffing structure for the country's health services.

At the level of a national ministry of health, HRH allocation tools should guide several different types of decisions. For instance, how can the size and composition of the current HRH labor force best meet the country's current requirements and future development plans, within its ability to pay for the staff? Is the present distribution of staff equitable and cost-effective, either geographically or between facilities or providers? Would directing more staff to certain types of health programs that seem to be particularly understaffed be cost-beneficial? How large a proportion of a country's human resources should the private sector be allowed to absorb, either now or in the future?

At the level of an individual facility, HRH allocation tools should help the decision maker improve on two different sets of decisions. The first concerns the mix of staff at different levels and types of service:

- Which would be the most cost-beneficial and cost-effective staff mix in rural health centers of country X: e.g., staffing them with one medical assistant and two nurses, or only two nurses?
- When would the addition of a new health worker be advisable?
- What category of health worker would most improve cost-effectiveness and cost-benefit?

The second set of decisions concerns the determination of staffing

levels at individual facilities so that they correspond to the workloads and health needs in the best way possible.

It is clear from the preceding list of questions that tools for HRH allocation have a strong economic component. Their development would best be undertaken as an interdisciplinary activity between economists and human resource planning specialists. The ISN method is one example of a tool that could be developed further by linking its development with that of tools for economic analysis.

Productivity and Efficiency Analysis Tools

Productivity and efficiency of existing health staff are key areas for DDM to focus on. First, their improvement can free additional resources for alternative high-priority uses in times of economic crisis. Second, prior experience with productivity and efficiency analyses already exists among DDM-associated staff. The tools to be developed should ascertain the determinants of productivity and efficiency, assess their present level, develop productivity norms, and help evaluate which changes in determinants are likely to yield the greatest gains in health worker productivity and efficiency. The work started by Dr. Peter Berman (Department of Population and International Health, Harvard School of Public Health) in Indonesia provides a good basis for further work in this field.

Tools for Identification and Monitoring of Changes in HRH

Many countries remain ignorant of looming human resource problems until a crisis point has been reached. In countries where the Harvard Consortium has a leading role, the DDM project should assist in the development of tools that allow the decision makers to identify and monitor changes in the size and composition of the human resources for health. These would include decision-linked HRH data bases for national and provincial management levels, indicators of imbalance in the supply and composition of human resources, and national norms for HRH staffing and productivity.

Tools for Increasing the HRH Prominence on National Policy Agendas

The previous discussion has stressed that human resources are not conspicuous items on the policy agendas of most developing countries. The Harvard Consortium of the DDM project should cooperate

with its focus countries to develop tools that would increase the importance given to HRH issues in national development. Such tools might include standing advisory committees, expert panels, or a permanent high-level coordinating body, bringing together the users and producers of HRH. Such a body would be particularly valuable for promoting coordinated development of health-care personnel and other human resources by addressing concrete HRH problems. To succeed, the body should have a strong support staff and sufficient authority to ensure the formulation, implementation, coordination, and evaluation of national policies affecting the development of human resources for health.

Tools to Be Promoted

Tool Kit for HRH Planning, Training, and Management

Dr. Thomas L. Hall, a noted expert on HRH development, is working to develop a "tool kit" for HRH planning, training, and management. It is a computer-based document, intended for planners, educators, and managers. Some financial support for this work has come from WHO/Geneva. The contribution of multiple authors is encouraged, and the intention is to incorporate international expertise from around the world. The tool kit serves the following functions:

- Reference manual;
- Source of template tables, forms, and questionnaires;
- Collection of curricular material content for the design and implementation of HRH training programs.

As of November 1991, the parent document consisted of some 200 pages covering approximately 100 distinct topics. The sections on planning were approaching completion, while those on training and management were still in the early stages of development. When completed, the tool kit is intended to cover close to 300 topics and will probably total at least 1000 pages. Each topic is presented in an outline form, and pages can easily be made into overhead transparencies.

The tool kit is a rich source for HRH material. The DDM project should both promote its use in appropriate country contexts and seek to contribute its experience to the further development of the tool kit in the future. The WHO holds the copyright to the tool kit but, since it

may be freely reviewed, abstracted, reproduced, or translated, there should be no obstacles to its promotion at the country level.

Small-Area Analyses

Small-area analyses refer to the collection of detailed indices of health system performance from a circumscribed geographic area. The population must be large enough to generate sufficient data for comparative indices (at least 10,000-100,000, depending on the index). Data are collected on staffing densities, productivity, health service utilization, costs, etc.; the reasons for differences and similarities are then analyzed. The DDM project should promote the use of small-area analyses in project countries. These analyses can yield much useful information for decision makers on quality and determinants of health system performance.

Development of HRH Models

Modelling human resources for health in developing countries is still in its infancy, although a limited human resources component has been included in some economic models. Early in 1993 the WHO provided some funding to Dr. Thomas L. Hall for the development of a prototype HRH model that could be tested in developing countries. The DDM project should maintain contact with Dr. Hall, and if appropriate, test the prototype model at the country level.

Expertise in modelling is available at the Institute of Manpower Studies at the University of Sussex in the United Kingdom. Dr. Ian Secombe of the institute has indicated its interest in helping to apply to other countries some of the lessons learned by his group. Dr. Secombe has welcomed the opportunity of discussing with the DDM project staff ways in which the institute and the DDM project might work together. As the needs of project countries are clarified and when the role of HRH modelling has been assessed, DDM's purposes may be well served by pursuit of these discussions.

Bibliography

Abel-Smith B., Leiserson, A. 1978. *Poverty, development and health*. Public health paper no. 69. Geneva: World Health Organization.

Akin, J., Birdsall, N., de Ferranti, D. 1986. *Financing health services in developing countries: an agenda for reform*. A World Bank Policy Study. Washington, D.C.: World Bank.

Altman, S.H. 1992. "The trend in hospital output and labor productivity, 1980-1989". In Evarts, C.M., Bosomworth, P.P., Osterweis, M., eds. *Human resources for health: defining the future*. Washington, D.C.: Association of Academic Health Centers.

Ashby, J.L., Altman, S.H. 1992. "The trend in hospital output and labor productivity, 1980-1989". *Inquiry* 29:80-91.

Baker, T.D., Perlman, M. 1967. *Health manpower in a developing economy*. Baltimore: Johns Hopkins Press.

Bankowski, Z., Fulop, T. 1986. "Health manpower out of balance: conflicts and prospects". *Highlights of the Acapulco Conference, 7-12 September 1986*. Geneva: World Health Organization.

Bastien, J.W. 1990. "Community health workers in Bolivia: adapting to traditional roles in the Andean community". *Social Science and Medicine* 30:281-287.

Berman P. 1986. "Cost analysis as a management tool for improving the efficiency of primary care: some examples from Java". *International Journal of Health Planning and Management* 1:275-288.

Berman, P., Ormond, B. 1988. "Changes in health care demand and supply accompanying economic development". *Research in Human Capital Development*. 5:147-172.

Berman, P., Sakai, S. 1993. "The productivity of manpower and supplies in public health services in Java". In Lee, K., Mills, A., eds. *Health economics research in developing countries*. Oxford: Oxford University Press.

Bhattacharji, S., Abraham, S., Muliyl, J., Job, J., John, K., Joseph, A. 1986. "Evaluating community health worker performance in India". *Health Policy and Planning* 1:232-239.

Birch, S., Maynard, A., Walker, A. 1986. *Doctor manpower planning in the United Kingdom: problems arising from myopia in policy making*. Discussion paper no. 18. York, U.K.: University of York: Center for Health Economics.

Bui Dang Ha Doan. 1981. "Projection of supply and requirement of health manpower with particular reference to primary health care manpower". *World Health Statistics Quarterly* 34:74-90.

Center for Development Studies (CENDES), Central University, Venezuela. 1965. *Health planning: problems of concept and method*. Scientific publication no. 111. Washington, D.C.: Pan American Health Organization.

Christensen, P.B., Karlqvist, S. 1990. "Community health workers in a Peruvian slum area: an evaluation of their impact on health behavior". *Bulletin of PAHO* 24:183-196.

Department of Health and Human Services, Health Resources Administration. 1981a. *The health professions requirements model structure and application*. DHHS publication no. (HRA) 81-15. Washington, D.C.: U.S. Department of Health and Human Services.

Department of Health and Human Services, Health Resources Administration. 1981b. *The report of the Graduate Medical Education National Advisory Committee*. Vol. 1-7. DHHS publications no. (HRA)81-651, (HRA)81-657) Hyattsville, MD: U.S. Department of Health and Human Services.

Eastaugh, S.R. 1990. "Hospital nursing technical efficiency: nurse extenders and enhanced productivity". *Hospital and Health Services Administration* 35:561-573.

Fine, S.J. 1989. *Functional job analysis scales: a desk aid*. Revised edition. S.A. Fine Associates, 1229 N. Jackson, Milwaukee, WI 53202.

Fottler, M.D., Phillips, R.L., Blair, J.D., Duran, C.A. 1990. "Achieving competitive advantage through strategic human resources management". *Hospital and Health Services Administration* 35:341-364.

Frenk, J., Alagon, J., Nigenda, G., Munoz-del Rio, A., Robledo, C., Vasquez-Segovia, L.A., Ramirez-Cuadra, C. 1991. "Patterns of medical employment: a survey of imbalances in urban Mexico". *American Journal of Public Health* 81:23-29.

Fulop, T., Roemer, M.I. 1982. *International development of health manpower policy*. Geneva: WHO offset publication no. 61.

Fulop, T., Roemer, M.I. 1987. *Reviewing health manpower development: a method of improving national health systems*. Public health paper no. 83. Geneva: World Health Organization.

Gagnon, A.J. 1991. *The training and integration of village health workers*. Bulletin of the Pan American Health Organization 25(2):127-138.

Galan Morera, R., Levine, A., Ray, D.K. 1980. "Crash" health manpower planning: a method for developing countries. World Health Forum 1(1,2):34-44.

Golladay, F.L., Manser, M.E., Smith, K.R. 1974. "Scale economies in the delivery of medical care: a mixed integer programming analysis of efficient manpower utilization". *The Journal of Human Resources* 9:50-62.

Golladay, F.L., Smith, K.R., Davenport, E.J., Hansen M.F., Over, A.M., Jr. 1976. "Policy planning for the mid-level health worker: economic potentials and barriers to change". *Inquiry* 13: 80-89.

Hall, T.L. 1969. *Health manpower in Peru: a case study in planning*. Baltimore: Johns Hopkins Press.

Hall, T.L. 1991. *Human resources for health: a tool kit for planning, training and management*. Geneva: World Health Organization.

Hall, T.L. 1992. *Personal communication*. From Dr. T.L. Hall, University of California, San Francisco.

Hall, T.L., Mejia, A. 1978. *Health manpower planning: principles, methods, issues*. Geneva: World Health Organization.

Hall, T.L., Reinke, W.A., Lawrence, D. 1975. "Measurement and projection of the demand for health care: the Chilean experience." *Medical Care* 6:516-517.

Hancock, W.M, Pollock, S.M., Kim, M-K. 1987. "A model to determine staff levels, cost and productivity of hospital units". *Journal of Medical Systems* 11:319-30.

Hapsara. 1984. "Health manpower projections: the Indonesian experience". *World Health Statistics Quarterly* 37:240-55.

Heggenhougen, K., Vaughan, P., Muhondwa, E.P.Y., Rutabanzibwa-Ngaiza, J. 1987. *Community health workers: the Tanzanian experience*. Oxford: Oxford University Press.

Hornby, P., Ray, D.K., Shipp, P.J., Hall, T.L. 1980. *Guidelines for health manpower planning*. Geneva: World Health Organization.

International Development Research Centre. 1980-1984. *Salus: low-cost rural health care and health manpower training*. Serial Publications. Ottawa: International Development Research Center.

Jenkins-Clarke, S. 1992. *Measuring nursing workload: a cautionary tale*. Discussion paper no. 96. York, U.K.: University of York, Center for Health Economics.

Joyce RE, Hunt CL. 1982. "Philippine nurses and the brain drain". *Social Science and Medicine* 16:1223-1233.

Khan, A.A., Sithole, W.D. 1991. "Oral health manpower projection methods and their implications for developing countries: the case of Zimbabwe". *Bulletin of the World Health Organization* 69:339-346.

Kirk, R. 1988. *Healthcare staffing and budgeting: practical management tools*. Frederick, MD: Aspen Publishers, Inc.

Kolehmainen-Aitken, R.-L. 1990. "Aid post and hospital orderlies: a vanishing breed?" *Papua New Guinea Medical Journal* 33:187-193.

Kolehmainen-Aitken, R.-L. 1992. "The impact of decentralization on health workforce development in Papua New Guinea". *Public Administration and Development* 12:175-191.

Kolehmainen-Aitken, R.-L., Shipp, P.J. 1990. " 'Indicators of staffing need': assessing health staffing and equity in Papua New Guinea". *Health Policy and Planning* 5:167-176.

Kolehmainen-Aitken, R.-L., Mondia, P. Marjen, C. 1990. "A survey of Papua New Guinean private medical practitioners". *Papua New Guinea Medical Journal* 33:195-202.

Lave, J.R., Lave, L.B., Leinhardt, S. 1975. "Medical manpower models: need, demand and supply". *Inquiry* 12:97-125.

Lewis, M.A., Sulvetta, M.B., La Forgia, G. M. 1991. "Productivity and quality of public hospital medical staff: a Dominican case study". *International Journal of Health Planning and Management* 6:287-308.

Mburu F.M. 1984. "Scholarship, freedom and brain drain in Africa". *Social Science and Medicine* 19:1127-1129.

Mejia, A. 1980. "World trends in health manpower development: a review". *World Health Statistics Quarterly* 33:112-126.

Mejia A. 1981. "Health manpower migration in the Americas". *Health Policy and Education* 2:1-31.

Mejia, A., Fulop, T. 1978. "Health manpower planning: an overview". In Hall, T.L., Mejia, A., eds. *Health manpower planning: principles, methods, issues*. Geneva: World Health Organization.

Mitchell, M., Donaldson, D., Thomason, J. 1988. *Papua New Guinea Rural Health Services Cost Study*. Boston: Management Science for Health.

Ojo, K. 1990a. "International migration of health manpower in sub-Saharan Africa". *Social Science and Medicine* 31:631-637.

Ojo, K. 1990b. "The crisis in the distribution of health personnel in Nigeria". *Health Policy and Planning* 5:60-66.

Onuigbo, W.I. 1983. "Tracing the brain drain with reprint requests". *Social Biology* 30:423-425.

Ortin, E.L. 1990. "The brain drain as viewed by an exporting country". *International Nursing Review* 37:340-344.

Pan American Health Organization. 1983. *Methods for projecting the supply and requirements for health manpower*. Washington, D.C.: Pan American Health Organization.

Primary Health Care Planning Group. 1983. *Work Study Project. Sierra Leone. Final charts*. Unpublished report.

Phillips, V. 1992. *Health and social services manpower: a review of research 1986-1992*. London: London School of Hygiene and Tropical Medicine, Department of Public Health and Policy.

Pope, G.C. 1990. "Physician inputs, outputs and productivity, 1976-1986". *Inquiry* 27:151-160.

Rispel, L., Schneider, H. 1991. "Professionalization of South African nursing: who benefits?" *International Journal of Health Services* 21:109-126.

Robinson, S.A., Larsen, D.E. 1990. "The relative influence of the community and the health system on work performance: a case study of community health workers in Colombia". *Social Science and Medicine* 30:1041-1048.

Segall M. 1983. "Planning and politics in resource allocation for primary health care: promotion of meaningful national policy". *Social Science and Medicine* 17:1947-1960.

Shipp, P.J. 1989. *Health personnel projections: the methods and their uses. Report of a WHO project: studies on country experiences.* Publication no. WHO/EDUC/89.198. Geneva: World Health Organization.

Simmonds, S. 1989. "Human resource development: the management, planning and training of health personnel". *Health Policy and Planning* 4:187-196.

Sketchley, J., Mejia, A., Aitken, I.W., Boyer, M., Guzman, E.I. 1986. *Work improvement in health services: workshop on work study for better decisions.* Geneva: World Health Organization and BLAT Center for Health and Medical Education.

Steinwachs, D.M., Weiner, J.P., Shapiro, S., Batalden, P., Coltin, K., Wasserman, F. 1986. "A comparison of the requirements for primary care physicians in HMOs with projections made by the GMENAC". *New England Journal of Medicine* 314:217-222.

Taylor, C.E., Dirican, R., Deuschle, K.W. 1968. *Health manpower planning in Turkey: an international case study.* Baltimore: Johns Hopkins Press.

Thomason, J.A., Kolehmainen-Aitken, R-L. 1991. "Distribution and performance of rural health workers in Papua New Guinea". *Social Science and Medicine* 32:159-165.

Vargas-Lagos, V. 1991. "How should resources be reallocated between physicians and nurses in Africa and Latin America?" *Social Science and Medicine* 33:723-727.

Vidal, C. 1984. "The development of human resources in the Americas - Part I. Education". *Medica y Salud* 18:19.

Weiner, J.P., Steinwachs, D.M., Shapiro, S., Coltin, K.L., Ershoff, D., O'Connor, J.P. 1987. "Assessing a methodology for physician requirement forecasting". *Medical Care* 25:426-436.

Wheeler, M., Ngcongco, V.N. 1990. "Health manpower planning in Botswana". *World Health Forum* 11:394-404.

World Bank. 1990. *China: long-term issues and options in health transition.* Report no. 7965-CHA, June 25, 1990. Washington, D.C.: World Bank.

World Health Organization/Southeast Asian Research Organization.

1990. *Development of methodology to determine the optimum mix of human resources for health*. Report of a National Workshop, Yangon, Myanmar, 13-17 February 1990. Geneva: World Health Organization.

World Health Organization. 1985a. *Health manpower requirements for the achievement of health for all by the year 2000 through primary health care*. Report of a WHO Expert Committee. WHO technical report series 717. Geneva: World Health Organization.

World Health Organization. 1985b. *Report of the First Interregional Consultation on Strengthening Health Manpower Management Systems, Bangalore, 28 Nov. - 2 Dec., 1983; and Report of the Second Interregional Consultation on Strengthening Health Manpower Management, Tashkent, 22-26 April, 1985*. Unpublished WHO document HMD/85.4. Geneva: World Health Organization.

World Health Organization. 1986. *Executive Board, seventy-seventh session, Geneva, 8-17 January 1986, summary records*. WHO document EB77/1986/REC/2. Geneva: World Health Organization.

World Health Organization. 1989. *Management of human resources for health*. Report of a WHO Expert Committee. Technical report series 783. Geneva: World Health Organization.

World Health Organization. 1990a. *Coordinated health and human resources development*. Report of WHO Study Group. Technical report series 801. Geneva: World Health Organization.

World Health Organization. 1990b. *The role of research and information systems in decision making for the development of human resources for health*. Report of a WHO Study Group. Technical report series 802. Geneva: World Health Organization.

Xuegui Kan. 1990. "Village health workers in China: reappraising the current situation". *Health Policy and Planning* 5:40-48.