

Chapter 7

Pillars of the Health System

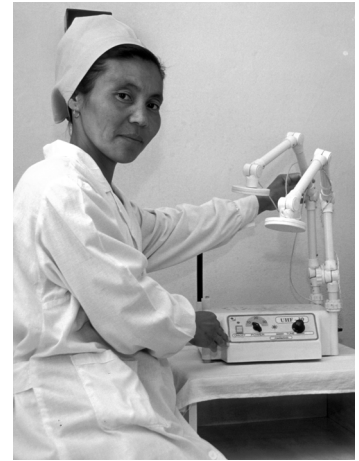
A health system is more than a mix of facilities and medical consultations. It is a structure within which people, institutions, and organizations interact to mobilize and allocate resources for preventing and treating diseases and injuries. This structure has to rest on certain fundamental pillars if it is going to work. These pillars are essential elements that enable the health care system to function. They include everything from a well-managed civil service to an extensive communications system. This section highlights four of these pillars: information, management, human resources, and financing.

INFORMATION, SURVEILLANCE, AND RESEARCH

The importance of collecting, processing, and using data in the campaign to improve health cannot be stressed enough.¹ As noted in chapter 1, much of the progress in extending and improving the quality of human life is due to technical progress, including advances in knowledge about diseases and about appropriate, cost-effective responses. To the extent that the generation and application of information and knowledge can be facilitated and become more systematic, accelerating progress in improving human health and eliminating health inequities should be possible.

Information and Surveillance

Health sector decision makers—whether health care workers in small clinics, managers of major hospitals, directors of drug safety, local



¹ This section is based on *DGP2*, chapters 4, 5, 6, 53, and 54.

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“Health service statistics are fundamental to managing public health services, identifying health trends, and allocating resources efficiently.”

political officeholders, or ministers of health—ask a number of questions that must serve as the starting point for any discussion of information. For example, is the recent surge in flu cases the beginning of a new epidemic? Are we reaching 90 percent of children under five with the recommended vaccines? What are likely to be the major causes of death in the next 10 to 20 years? What social behaviors are contributing the most to the spread of STIs? Where is the public sector’s health expenditure going? What interventions are effective against a particular disease? Are more cost-effective methods available?

The information for answering such questions generally comes from the following six major sources:

- *Vital events registration* provides data on births and deaths, as well as on marriages, divorces, and migrations. The data on births, deaths, and migration are particularly critical for good health policy analysis, as without them tracking the population and calculating such basic indicators as disease incidence rates are impossible. However, these basic data are poorly recorded in most of the world: fewer than half of all births and only a third of all deaths are reported to national registration systems.
- *Health service statistics* comprise information on consultations by patients, services provided, and diagnoses. Health facilities routinely gather much of this information for local use, but it is rarely collected in standardized formats or reported to a national health database. Health service statistics are fundamental to managing public health services, identifying health trends, and allocating resources efficiently.
- *Public health surveillance* comprises a wide range of efforts to track and respond to disease trends. One common approach is to identify a list of notifiable diseases that health care providers are required to report to national authorities, generally infectious diseases that might be rare, but that require an immediate response. In another kind of surveillance known as sentinel surveillance, samples of health care providers or facilities agree to report all cases of particular conditions. This kind of arrangement is good for large public health programs, but is not effective at detecting rare or new health threats. Surveillance can be based on health care providers reporting cases with particular symptoms or laboratory tests with particular diagnoses. In general, surveillance works best when a wide range of sources are integrated in a system that includes detection, monitoring, analysis, and response.

- *Census data* that are accurate and collected regularly provide the basis for calculating important ratios and designing reliable samples.
- *Household surveys* are an effective way to obtain information about population demographics, social characteristics, and dynamics on a regular basis between censuses. They can also be expanded to gather important information about behaviors or particular health conditions.
- *Resource tracking* involves measuring and managing human resources, facilities, commodities, and finances. It relies on a variety of reporting methods and data collection efforts. Collecting information about health care professionals generally requires more than tracking public health sector employment to include activities by health care professionals with private practices. Similarly, financial flows in the health system cannot be fully understood without combining public budget information with data on private health spending, including out-of-pocket spending on consultations and drugs, health insurance premiums, and pharmaceutical research and development expenditures.

Timeliness and appropriate reporting intervals are important for all data collection systems. Surveillance for outbreaks of infectious epidemics needs to be rapid and constant to provide early warning. By contrast, surveillance for changes in behavioral risk factors may merit longer intervals.

When building health information systems, seeking highly detailed information on health status and health services at every possible site is tempting, but this does not necessarily yield data that are reliable and amenable to analysis. A sample of preselected sites that are reliable in relation to the accuracy and completeness of the information gathered can often provide better data than haphazard attempts at universal reporting. If an appropriate sampling method has been used to select these sites, the information they provide will permit accurate extrapolations to the population at large. Many countries have therefore started to improve their vital registration systems by focusing on a sample of preselected districts to provide good quality data for national analyses and decision making, while at the same time working to expand and improve vital event registration in other districts so that the system will eventually be universal.

Standardization will also enhance the value of data collection efforts. Setting common standards for data collection facilitates recording,

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communicating, and analyzing information. It also permits more efficient training and hardware and software development. For example, the U.S. Centers for Disease Control and Prevention developed standards for automatic reporting of diagnostic laboratory results for notifiable diseases and disseminated related software that is used in many countries. The key in such initiatives is to develop standards in an open process, engaging other countries and international agencies both to improve the standards and to encourage widespread adoption.

Technology is reshaping and expanding methods for collecting, storing, and processing information. For example, cheaper, faster, and simpler techniques for obtaining and analyzing tissue samples permit diagnosing diseases and collecting epidemiological information in a much wider range of places and circumstances than was previously possible, and new communication technologies allow the rapid transmission of newly collected data if the requisite hardware and skilled staff are available to use them properly.

Indeed, *DGP2* argues that the principal barriers to improving information systems in low- and middle-income countries have less to do with the technologies and more to do with the required investments in training and coordinating people. The expertise required to operate and use an effective health information system goes beyond knowledge of survey design, sampling, hardware, and software to include skills required for management, medical research, and field epidemiology and knowledge of such fields as economics and sociology. International initiatives can play a valuable role in developing such expertise. For example, the U.S. Centers for Disease Control and Prevention and WHO coordinate a program to train field epidemiologists in more than 30 countries.

In controlling disease, examples of specific instances underscore the importance of having skilled people supported by good communication. The severe acute respiratory syndrome (SARS) epidemic broke out in China in November 2002 and spread to Canada, Hong Kong (China), Vietnam, Singapore, and other countries within five months. Success in controlling this first new pandemic disease of the 21st century depended on a combination of open collaboration among scientists and politicians of many countries and the rapid and accurate communication of surveillance data within and among countries. The global pandemic ended in July 2003 after more than 8,000 patients in 26 countries and 5 continents had been affected and 774 deaths had been confirmed. The successful containment of SARS, for which no cure or vaccine is yet available, is attributable to the organized work of

“The successful containment of SARS, for which no cure or vaccine is yet available, is attributable to the organized work of competent, dedicated health workers with access to good communications . . .”

competent, dedicated health workers with access to good communications (see *DCP2*, chapter 53, for more details).

To be effective, health information has to be integrated in ways that facilitate analysis and are linked to responses and actions. For example, WHO's Regional Office in Africa is working with a number of countries to link epidemiological and laboratory data to decision making under an integrated disease population surveillance strategy that successfully responded to the health threat of Ebola in Uganda (box 7.1). Surveillance in the Philippines regularly detects outbreaks including cholera and typhoid (box 7.2). More recently, the type A H5N1 avian influenza threat in Southeast Asia is under very close scrutiny by several countries and the WHO and plans are being developed for its containment of a new pandemic should inter-human spread begin.

Finally, health information systems cannot be established and operated without funds. A good, comprehensive information system can cost as little as US\$3 per person in certain countries, but even these limited financial resource requirements may be prohibitive in low-income countries where the entire public health budget is of a similar order of magnitude (table 7.1). Fortunately, many international programs have recognized this problem and are financing health information activities as components of loans and grants.

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Box 7.1 Controlling Ebola in Uganda

In October 2000, an outbreak of Ebola hemorrhagic fever was identified in Gulu district in northern Uganda. Rapid reporting and recognition of the problem and the subsequent response led to successful containment of the epidemic. Public health surveillance was difficult because Gulu was a politically unstable area and because people reacted to infection by seeking traditional healers or fleeing, which spread the epidemic further. Hospitals were also desperately short of supplies to control the spread of infection from so many patients simultaneously affected. The Ugandan government mobilized the military to help with locating cases and invited WHO, the U.S. Centers for Disease Control and Prevention, and other international teams to assist. Ugandan health workers cared for the sick at great risk to themselves. With 425 cases identified, it was the largest Ebola outbreak ever recorded. Only 53 percent of the patients died, a proportion far less than the 88 percent reported in previous epidemics.

The successful containment of the epidemic testifies to the Ugandan Ministry of Health's investment in developing competent, motivated health workers through its Public Health School Without Walls, an active partnership with Makerere University, the Rockefeller Foundation, the U.S. Centers for Disease Control and Prevention, and WHO, along with the successful implementation of an integrated strategy for disease surveillance strategy.

Source: Adapted from *DCP2*, chapter 53.

Box 7.2 The Philippines National Epidemic Surveillance System

In the late 1980s, the Philippines Department of Health (PDOH), relying on its integrated management information system, detected less than one outbreak per year in a population of more than 60 million people. In 1989, the PDOH designed the National Epidemic Surveillance System, a hospital-based sentinel surveillance system that encompasses both the flow of data and the personnel requirements needed to make the surveillance system work effectively. After the pilot study demonstrated promising results, the PDOH created personnel positions and a supervisory structure for sentinel physicians, nurses, and clerks in regional epidemiology and surveillance units (RESUs) integrated into the public health system. In 1995 alone, the system detected and formally investigated about 80 outbreaks, including 25 bacteriologically confirmed outbreaks of typhoid and 5 of cholera. As the Philippines developed HIV serological and behavioral risk surveillance, the RESU staff members conducted surveys in their communities. By integrating surveillance functions based on the skills of the workforce, PDOH was able to avoid the duplications, inefficiencies, and sustainability problems of multiple vertical systems (White and McDonnell 2000).

Source: DCP2, chapter 53, p. 1004.

Table 7.1 Cost of Essential Health Information System Subsystems

Health information system subsystem	Total cost (US\$ million)		Per capita cost (US\$)	
	Low-income countries	High-income countries	Low-income countries	High-income countries
Health service statistics	4.8	25.9	0.16	1.66
Public health surveillance (included with health service statistics)	0	0	0	0
Census	7.5	30.0	0.25	1.0
Household surveys	0.6	1.0	0.02	0.03
Vital events surveillance	1.5	6.0	0.05	0.20
Resource tracking	1.5	3.0	0.05	0.10
Total	15.9	65.9	0.53	2.99

Source: DCP2, chapter 54, p. 1024.

Note: Table is based on a population of 30 million. Household survey costs are based on the experience of the demographic and health surveys during 2001–2003 (Macro International, personal communications). Costs vary by sample size and by length of the survey instrument; Macro International estimates an average cost of US\$100 per survey participant. A sample of 6,000 is assumed for the low-income setting, and a sample size of 10,000 is assumed for the high-income setting. Cost estimates for vital events monitoring are based on demographic surveillance sites. In the high-income setting, the annual costs are assumed to quadruple. Resource-tracking costs are based on the experience of national health accounts (Abt Associates, personal communications) and the Egyptian Budget Tracking system. Similar costs are estimated for human resources and commodities.

Box 7.3 The Tanzania Essential Health Interventions Program

TEHIP is a partnership between Tanzania's Ministry of Health and the International Development Research Centre of Canada. The project was established to determine the feasibility of an evidence-based approach to health planning at the district level. Testing the premise of the World Bank's (1993) *World Development Report 1993: Investing in Health*, TEHIP enabled district health planners in two of Tanzania's 117 districts to collect and use burden-of-disease and cost-effectiveness data to get the best value for money from national investments in health. Interventions included door-to-door collection of data and training or technical support for managers in the analysis and use of the data for decision making. TEHIP districts allocated services to high-burden diseases, resulting in a tripling of clinic utilization rates and increased treatment effectiveness. With a per capita increase in spending of only US\$0.80, district health managers achieved a 47 percent reduction in child mortality rates.

Source: DCP2, chapter 54, p. 1026.

Health information is also valuable in improving the efficiency of health services. For example, a study in rural Mali found that the cost of childhood immunization programs in areas covered by community-based information systems was only US\$1.47 per child, compared with US\$2.79 per child for areas without such systems. Similarly, in South Africa's Eastern Cape Province, improved pharmaceutical tracking and management reduced situations where facilities ran out of essential drugs by 39 percent, improving treatment for thousands of patients by improving access to required medications.

The Tanzania Essential Health Interventions Program (TEHIP) provides evidence on the cost-effectiveness of health information systems. This program provided training to health care workers and managers in the use of information to determine priorities and better manage existing interventions (box 7.3). TEHIP cost approximately US\$0.80 per person in the districts where it was implemented. Looking only at the resulting reduction in mortality among children under five, the program cost US\$68.50 per DALY averted. Because adults' health also improved and morbidity declined, a fuller accounting would have shown the health information system initiative to be even more cost-effective.

Research and Development

Health information systems must be useful to decision makers if they are to influence clinical choices, health system management, and public

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policy. However, they also need to furnish information and generate questions for the fundamental research that generates new understanding of disease; improved techniques for prevention, diagnosis, and treatment; and better methods for delivering and organizing health care services.

Health research is a global endeavor. Countries are increasingly recognizing that their own health research efforts are enhanced through more interaction with researchers in other countries, studies with multiple sites, and teamwork and joint training. There are five chapters in *DCP2* devoted to the fact that science, new product development, and analytic capacity are essential for economic and social progress. *DCP2* argues that thinking of research as a national or local function makes little sense, and that a global health research system with a global agenda should be conceived instead.

DCP2 identifies areas for future research that require a wide range of tools, from field epidemiology to genomics and from the behavioral sciences to biochemistry. The research agendas discussed throughout *DCP2* and summarized in chapter 5 include priorities that are already on the global health agenda and promising topics that should be added to it.

Infectious diseases dominate the priorities that are already on the global health agenda. Many of the research goals address HIV/AIDS, malaria, and TB. These involve research on the epidemiology and risk factors associated with these diseases, with the development of new or better diagnostics, vaccines, and treatments. They also entail research on behavior change and counseling programs and how best to extend effective interventions in low-income and institutionally weak contexts. The absence of a marked departure from previous research priorities for these conditions attests to the complexity of these diseases and their importance in the poorest countries.

Research into the basic science of existing infectious diseases and how they evolve is also necessary to prepare for and respond to emerging infectious diseases. Since 1970, 32 new infectious diseases have been reported, including hepatitis C, Legionnaires' disease, Ebola, Nipah virus, SARS, and particular strains of Avian flu and cholera. Concerns have also arisen about the possible use of infectious diseases for terrorism and warfare.

In addition to infectious diseases, another significant part of the global research agenda focuses on maternal and neonatal conditions, an area that necessarily includes significant attention to extending basic

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health care services. Research on the financing, provision, management, and delivery of health services is central to extending cost-effective interventions. Without progress in this area, meeting international health targets, such as the MDGs pertaining to reducing maternal and child mortality, will be impossible.

Regarding priorities as they relate to developing countries that do not yet figure prominently on the global health research agenda, *DCP2* emphasizes such conditions as CVD, neuropsychiatric disorders, obesity, diabetes, and cancers, which already cause a large and increasing share of the disease burden in developing regions. *DCP2* identifies research priorities for these conditions that focus on gaining a better understanding of the causes of noncommunicable diseases, particularly the effect of diet, lifestyle, obesity, and consumption of tobacco and alcohol; the transfer of knowledge about effective interventions from one context where they have succeeded to other places; and the development of new approaches for managing chronic conditions such as diabetes and depression in ways that improve patients' quality of life and prevent or mitigate further deterioration of their health.

With the growth of basic knowledge of disease and health interventions, opportunities for studying how to adapt successful programs and policies to new contexts increase. For example, many of the successful interventions against noncommunicable diseases that have been developed in high-income countries appear to be feasible in low- and middle-income countries, yet differences in culture, resources, and institutions complicate the transfer of this knowledge. Research can bridge this gap and bring the benefits of these interventions to new places.

Finally, health care systems themselves are an important object of research. Identifying institutional arrangements that are more efficient at channeling resources into effective health interventions can reduce waste and improve health. Research may indicate better ways to train and motivate health care workers and design policies to retain highly skilled staff. It can also assess different ways of mobilizing and allocating public financial resources for health and enhance understanding of how incentives encourage or discourage medical innovation.

DCP2's broad review of global health problems indicates an increasing convergence of some health problems between rich and poor countries. Some of this convergence is due to today's more interdependent world, where the speed of travel and commerce implies that the outbreak of an infectious epidemic in one place is of concern to everyone, but it is also due to the shared burden of noncommunicable diseases

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Box 7.4 A Paradigm Shift for Global Research Collaboration

The recent global responses to SARS and avian flu represent an important paradigm shift in global research collaboration in that they required national surveillance at the epidemiological and laboratory levels; unprecedented sharing of information at all levels of the health system; and collaboration by clinicians, epidemiologists, bench scientists, and those responsible for veterinary surveillance for the rapid development of effective intervention strategies. These cases demonstrated that reliable and accurate information is essential for early warning and for making effective health policy. They also underscore the high priority that must be given to creating national health surveillance systems and competent laboratory networks that are part of a global epidemiological surveillance system.

Source: Adapted from *DCP2*, chapter 4.

and injuries. The benefits of research on these conditions cannot be confined by artificial borders, and findings in poor countries are as valuable as findings in richer ones.

Adoption of this global perspective on health research requires promoting and supporting scientific capacity in all countries, making innovative use of technology and institutions to share and build new knowledge, setting global priorities to guide investments in research and development, and supporting the freedom of scientific inquiry (box 7.4).

MANAGEMENT OF HEALTH SERVICES

While countries often focus on increasing the quantity of health care—for instance, the number of immunizations or consultations or the rates of coverage—health care can be useless, wasteful, or even harmful if it is not appropriate for the particular condition and consistent with the best medical knowledge.² Thus paying attention to the quality of health care is not a luxury that only high-income countries can afford, but another pillar of the health service system that has a profound impact on the cost-effectiveness and equity of interventions. Indeed, quality of care is a key element of the intangible technical progress that explains so many of the health improvements of the past 50 years. While more resources will support improvements in quality, such improvements are possible even with few resources.

Poor quality care is endemic in many health systems, whether in low-, middle-, or high-income countries. In a study of pediatric care in

² This section is based on *DCP2*, chapters 70 and 73.

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Papua New Guinea, only 24 percent of health center workers were able to indicate correct treatment for malaria, and clinical encounters observed by investigators met minimal examination criteria in only 1 percent of cases. In Pakistan, only 56 percent of providers demonstrated the ability to diagnose viral diarrhea and only 35 percent adhered to treatment standards. In Indonesia, one study attributed 60 percent of infant deaths to poor practices in health care services, compared with 37 percent attributed to economic constraints. In the United States, the Institute of Medicine has documented serious shortcomings in medical care that account for more than 40,000 deaths each year, including large numbers of mistaken diagnoses, cases of improper care, and harmful errors in health care provision.

The problem of poor health care quality is not the fault of isolated health professionals or solely attributable to limited resources. Rather, quality problems are systemic and are consequences of gaps in knowledge and inadequate communication, training, supervision, and incentives. These problems persist when organizations providing healthcare are unable to monitor the quality of care and take corrective action. Sometimes these failures are related to incentives that encourage inappropriate care, as when dispensing drugs is an important source of income for health care providers. At other times, poor quality may be unrelated to incentives and merely reflect practices that do not draw upon modern evidence. Redressing this problem requires attention to measuring health outcomes and relating them to clinical practice so that problems can be identified and strategies for correction implemented. For low- and middle-income countries this is, in some ways, an optimistic finding. In general, quality can be improved much more quickly than other factors that promote good health such as income, education, new technology, or infrastructure.

To assess the quality of health care services, data are generally collected on the structural features of health care delivery, processes, and health outcomes. Structural features that are expected to improve quality include the amount and types of health infrastructure, equipment and supplies, and staffing. Such structural indicators can be relatively easy to collect, but they have also proven to be weak predictors of quality and health outcomes. Although good structural features may be necessary, they are not sufficient for good quality care.

Processes, by contrast, are the ways in which personnel apply modern knowledge to the diagnosis, prevention, and treatment of diseases and disability. The quality of health care processes can be measured by

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“Although processes are often more difficult and costly to measure than structural features, they tend to be more closely related to health outcomes.”

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observing staff to see whether they respond according to scientifically validated protocols when diagnosing and treating patients. The process of interaction between caregivers and patients can also influence whether patients follow prescribed medication and advice, and thus influences health outcomes. Although processes are often more difficult and costly to measure than structural features, they tend to be more closely related to health outcomes.

The U.S. Institute of Medicine’s definition of the concept of quality encompasses the following six elements:

- patient safety
- effectiveness (scientifically proven appropriate care)
- patient centeredness (respect and responsiveness)
- timeliness (minimal delays and barriers to getting access to care)
- efficiency (minimal waste of equipment, supplies, ideas, and energy)
- equity (care provided consistently across genders, ethnic groups, locations, and socioeconomic classes).

A range of policy interventions can affect these six dimensions of good quality care. These interventions include direct efforts to identify appropriate care and verify whether individual providers or groups of providers are following evidence-based standards of practice. Direct interventions have included training with feedback from peers who observe consultations and processes in a health care setting.

Policies aimed at improving the quality of health care have also included indirect interventions to change providers’ behavior by altering the structural conditions or financial incentives in the health care system or its organization. Performance-based remuneration is one way that providers can be induced to provide better quality care. Relatively small incentives (3 to 10 percent of a provider’s total compensation) appear to have significant effects on providers’ behavior in Cambodia, Haiti, and Nicaragua, as well as in the United States. Mexico and Uganda have successfully used performance-based professional recognition without remuneration to promote better processes.

Other indirect measures include setting legal standards for care. Accreditation, periodic recertification of knowledge and competency, and administrative regulations can establish minimum standards by controlling entry into practice and establishing conditions for license renewal. However, despite barring unqualified persons from practice, such measures have not generally had a significant impact on improving

the quality of care among those who are permitted into practice. Malpractice litigation can induce better quality care, but uncertainties and perverse incentives in the judicial process make this a blunt and costly mechanism for public policy. Professional oversight, peer review, and inspections are better ways to get information about the quality of care but are more effective at providing information on processes than at improving providers' behavior and practice. Training in the use of evidence-based protocols and guidelines has shown promise in high-income countries. For example, in the Netherlands, implementing patient management guidelines improved health outcomes for people with asthma and chronic obstructive pulmonary disease.

Targeted education and professional training is the most direct way to affect the practice of medicine. Great hopes have been attached to continuing medical education, but it appears to have little impact on health outcomes unless it is attached to strategies that encourage changes in practice based on the knowledge received.

One of the biggest challenges for public policy is to improve the quality of care that private practitioners provide. This is critical in many countries in which private practitioners account for the bulk of primary health care. For example, in India, private health professionals are the first to see most patients with symptoms of TB, and unless the public sector can find ways to improve case identification, screening, and referral among private practitioners, TB control will remain out of reach.

Health sectors have used organizational changes to improve the quality of health care provision, including adopting such modern management techniques as total quality management, collaborative improvement models, and plan-do-study-act cycles from other sectors. When effective, these policies result in increased coverage rates, better prescribing patterns, and increased adherence to clinical guidelines (box 7.5).

Measures that improve the quality of care have costs: the direct costs of human and physical resources and the costs of implementing organizational changes. *DCP2* assesses the cost-effectiveness of improving the quality of care for treating pneumonia and diarrhea. It finds that the cost-effectiveness of improving quality depends substantially on how far current practice is from the optimum and how prevalent the disease is. When current practices are poor and prevalence is high, the cost-effectiveness of improving adherence to good protocols for treating pneumonia is between US\$132 and US\$800 per life saved. For

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“... the cost-effectiveness of improving adherence to good protocols for treating pneumonia is between US\$132 and US\$800 per life saved. For improvements in the correct treatment of diarrhea with ORT, the cost-effectiveness ranges from US\$14 to US\$500 per life saved.”

Box 7.5 Improved Quality Reduces Maternal and Childhood Mortality in Peru

Recognizing the failure of previous training attempts to improve the quality of health services, the Ministry of Health, with support from the U.S. Agency for International Development and the participation of local institutions, developed an innovative program in Peru. The program was implemented by multidisciplinary teams in approximately 2,500 health facilities, including 88 hospitals. The program focused on (a) standardizing care, (b) assuring the availability of supplies, (c) making better use of existing information systems, (d) promoting broad staff participation in implementing local action plans, and (e) measuring patients' satisfaction and addressing complaints. The main training activity showed how to use a participatory problem-solving technique.

By the end of the three year program (1996–99), demand for health services had increased considerably, motivation and satisfaction on the part of patients and health workers had increased, and revenue collected at the facilities had risen. Areas with the quality improvement program experienced a 25 percent reduction in maternal mortality rates between 1997 and 1999, but no change occurred in other areas and the inequitable regional distribution of maternal mortality had not narrowed.

Source: Adapted from *DCP2*, chapter 65.

improvements in the correct treatment of diarrhea with ORT, the cost-effectiveness ranges from \$14 to \$500 per life saved. In other cases, interventions are cost saving, for example, reducing overprescription or avoiding unnecessary treatments (see, for example, box 6.4).

HUMAN RESOURCES

Technical progress is often associated with sophisticated new equipment, such as MRI devices and CT scanners, or with new drugs, such as vaccines and anticoagulants, but technical progress is also embodied in improved skills to prevent, diagnose, and treat illnesses and injuries.³ Thus investments in the people who provide health care services are critical for achieving progress against disease and injury. Low- and middle-income countries face particular challenges in their efforts to mobilize and retain a skilled workforce in the health sector in all areas, from recruitment and training to payment policies, retention, rewards, motivation, and deployment. Unless countries can substantially increase the number and skills of health care workers, reaching the

³ This section is based on *DCP2*, chapters 3, 71, and 73.

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MDGs for health and nutrition will be difficult. Reducing maternal and neonatal mortality, in particular, requires substantial increases in skilled birth attendance; increasing the coverage of immunization programs may require more staff; and preventing and treating TB, HIV/AIDS, and malaria also demand skilled cadres.

Part of the problem facing many low- and middle-income countries is an inadequate supply of health professionals. For example, while high-income countries average 283 physicians per 100,000 people and the global average is 146 physicians per 100,000 people, Peru has 10, Papua New Guinea has 7, and Nepal has 4, and 10 countries in Sub-Saharan Africa have fewer than 3 doctors per 100,000 people. Nurses are also scarce. While high-income countries have an average of 750 nurses per 100,000 people and the global average is 334, Papua New Guinea has 67, Peru has 6, and Nepal has 5 and 11 countries in Sub-Saharan Africa have fewer than 20 nurses per 100,000 people.

The relatively few health care professionals in many low- and middle-income countries are not distributed evenly across the population. In general, deploying doctors, and even nurses, to remote rural areas is difficult and health professionals tend to be concentrated in major urban areas. Public health systems find themselves competing to retain skilled staff against the pull of private practice and hiring by international agencies and aid programs. Many health professionals emigrate to higher-income countries with better pay and working conditions.

Health professionals who remain in their countries use a range of strategies to cope with low-paying jobs and poor working conditions. In many countries, absenteeism is a serious problem, often resulting from health care workers pursuing other remunerative activities within or outside the health sector. Among doctors, in particular, dual employment is common: they receive a salary from the public sector, but also earn fees through private practice. Those who remain at their public jobs may demand informal and illegal charges to supplement their low incomes. In addition, low productivity is compounded by lack of skills, poor supervision, little continuing education, dilapidated facilities, and lack of basic medical supplies.

Countries are grappling with these human resource issues in a variety of ways, including innovative staffing, changes in financial and non-financial incentives, and organizational reforms. *DGP2* observes the great variety of these reforms, assessing the interventions themselves and also their degree of implementation and suitability to context.

Countries that seek to address shortages of skilled health care workers by training more doctors and nurses sometimes find that shortages persist because of high rates of attrition. To discourage health care workers from leaving for private practice or emigrating to countries with better pay, some countries have altered the skill mix in training programs to reduce the portability of professional degrees. Training can be adequate for particular domestic health care needs without necessarily being recognized internationally as an accepted medical program. In this way, countries can reduce the risk of losing trained staff to emigration.

Many innovations in human resource management in low-income countries involve creating new health professions, that is, categories of health care workers who perform a variety of functions that have traditionally been reserved for physicians or nurses. Professional associations often resist this process to protect their standards and positions, yet studies in developing countries have shown that in some cases nurses can perform many functions in primary care settings as safely and effectively as doctors. As a direct response to internal and external migration, Zimbabwe has introduced a new cadre known as primary health care nurses, who have fewer qualifications than general nurses. Malawi has created the profession of clinical officers, who do not receive a full medical education, but still obtain extensive training that permits them to carry out a number of medical procedures, including surgery and anesthesia. Emergency cesarean sections conducted by clinical officers are somewhat riskier than those doctors perform, but the risks are substantially lower than no timely treatment at all. Insisting on fully qualified doctors where they can be hired and retained and perform procedures is clearly preferable, but where no medical services exist, training and deploying less-skilled workers can make a substantial difference.

The creation of new kinds of health care workers is a common theme in *DGP2*. Chapter 68 discusses how emergency care services can be extended to more people, addressing a substantial disease burden from trauma, by recruiting, training, and supporting bus and taxi drivers. Chapter 56 discusses the role that community health workers can play in monitoring children's growth and providing nutritional education and in screening and referral for many common conditions. Chapter 26 discusses the need for skilled birth attendants without full medical degrees. In some places, paying attention to the skills and technical methods that are needed rather than the title of the health care worker can mean the difference between providing a service or not.

“... nurses can perform many functions in primary care settings as safely and effectively as doctors.”

Countries have also made changes in financial and nonfinancial incentives. Raising salaries is often costly, as payroll expenses account for 50 to 80 percent of recurrent costs, but when financial incentives are targeted toward specific aims, they can be effective. For example, Thailand improved service provision in rural areas by paying bonuses to doctors willing to work in more remote locations and providing nonfinancial incentives, including different contractual relationships, housing, peer review, and professional recognition.

Other efforts have included increasing salaries by linking pay to performance. Some of these involve public administration reforms in which periodic performance reviews trigger pay raises or bonuses. In other cases, direct payments are linked to the numbers of services provided or the achievement of performance targets. China has had some success with improving treatment of TB patients by paying village doctors for each case identified and treated (box 7.6). In other cases, pay linked to performance may actually be harmful. For example, incentives to generate additional revenue at hospitals in Shandong province succeeded, in part, through the provision of unnecessary care.

“China has had some success with improving treatment of TB patients by paying village doctors for each case identified and treated . . .”

Box 7.6 Incentive Payments in China

In China, village doctors play an essential role in patient diagnosis, treatment, and surveillance. In the 1980s, most practiced privately because commune-based insurance schemes had collapsed and local governments were not providing salaries. Their reliance on payments for drugs and services made the provision of free TB treatment problematic, even if they received free drugs. An incentive scheme was created, whereby village doctors received US\$1 for each patient enrolled in the treatment program, an additional US\$2 for each sputum examination carried out in the county TB dispensary at 2 months, and a further US\$4 for each patient completing treatment. A reporting system monitored performance, and quality of treatment and reported information were checked through random visits and examinations. The program was highly successful, achieving within 2 years a cure rate for new cases of 95 percent.

Incentive payments have also been very widely used in China in hospitals and even public health programs, and research suggests their deleterious effects when their ability to skew behavior is not controlled. In Shandong province, changes in bonus systems for hospital doctors, from a system tied to quantity of services provided to one tied to revenue generated, found that the switch to a revenue-related bonus was associated with a significant increase in hospital revenue, but a separate study found that around 20 percent of hospital revenue was generated by the provision of unnecessary care.

Source: DCP2, chapter 3, box 3.4.

Nonfinancial incentives can be as effective as financial incentives in altering staff behavior. Such incentives include giving productive workers access to special training and promotion opportunities, recognizing good performance publicly, awarding bonuses to be used for improving local working conditions, delegating responsibilities, and providing education for dependents and housing.

Many countries have used organizational reforms to alter the entire framework within which they recruit and employ human resources. Decentralizing health functions to local governments is a major trend worldwide. It is almost always introduced as a general political reform within which the health sector, like other public service sectors, has to find an accommodation. Decentralization can exacerbate problems of paying and retaining health workers unless an adequate assignment of revenues accompanies the assignment of responsibilities to local governments. Countries have also initiated broad civil service reforms to improve the salaries, supervision, and retention of public sector workers. Unfortunately, research has shown that few civil service reforms of this nature have led to decisive improvements. Efforts in Uganda and Zambia to separate health workers from the general civil service encountered substantial political resistance and were not implemented.

Finally, many governments are contracting health services from NGOs or private providers. Some of these efforts have been quite successful, leading to improved service coverage and quality. South Africa had successful experience with contracting out the management of several hospitals to a private company, and Cambodia has successfully used performance contracts with NGOs to provide primary health care services. In other cases, however, the same weaknesses of public administration in supervising public workers have simply transferred to weaknesses in the supervision of contracts, leaving NGOs or private providers to absorb resources without fulfilling their responsibilities.

Traditional planning models for human resources have tended to be mechanistic, assuming that people trained as doctors and nurses could be easily deployed to wherever they were needed. These models have ignored the wide range of opportunities available to health care workers within their own countries as well as overseas. Addressing human resource management requires understanding that it operates in a competitive market. Health care professionals continue to be motivated by their vocation, but are also swayed by financial and nonfinancial incentives, working conditions, and access to opportunities for professional advancement. Innovative staffing arrangements hold promise

“Addressing human resource management requires understanding that it operates in a competitive market.”

for meeting some of the need for trained health care workers. Experiments in personnel management and organizational reform may result in better ways to recruit, retain, and deploy health care workers in the future.

FINANCING

Financing is another major challenge facing low- and middle-income countries.⁴ The challenge is twofold: to mobilize sufficient funds for operating the health system and to apply those funds well. However, mobilizing funds to finance public health interventions is difficult both because some health care is costly and because raising revenues in low- and middle-income countries is not easy.

Financing health expenditures is expensive. In 2001, the world spent about US\$3 trillion on health, but these expenditures were not distributed evenly around the globe. Only 12 percent of the total was spent for people in low- and middle-income countries even though they account for 84 percent of the world's population and 92 percent of the disease burden. Low-income countries spent approximately US\$25 per capita in 2001, while middle-income countries spent an average of US\$176 per capita and high-income countries spent an average of US\$1,527 per capita, but these are only averages. The world's poorest countries, such as Ethiopia and Nepal, spend the least on health, some US\$2 or US\$3 per capita at best, while Canada, Japan, the United States, and Western Europe spend between US\$2,000 and US\$5,000 per capita.

Health spending is strongly correlated with national income. Countries that are wealthier not only spend more on health but also spend a greater proportion of their income on health. Thus, on average, countries in Sub-Saharan Africa spend about 4.5 percent of their national income on health compared with average expenditures of 7.7 percent by high-income countries. In addition, countries that are wealthy finance a larger share of their health expenditure through public mechanisms. Tax revenues and social insurance premiums pay for 70 percent of health expenditures in high-income countries, but account for an average of 50 percent of health expenditures in low-income countries. In addition, whereas health insurance finances a substantial share of private health expenditures in high-income countries, such expenditures are overwhelmingly out-of-pocket in low-income countries.

“... mobilizing funds to finance public health interventions is difficult both because some health care is costly and because raising revenues in low- and middle-income countries is not easy.”

“... whereas health insurance finances a substantial share of private health expenditures in high-income countries, such expenditures are overwhelmingly out-of-pocket in low-income countries.”

⁴ This section is based on *DCP2*, chapters 11, 12, and 13.

“Tax revenues account for 14.5 percent of GDP in low-income countries, compared with 26.5 percent in high-income countries.”

Raising additional revenues to increase public spending on health is difficult in low- and middle-income countries. Tax revenues account for 14.5 percent of GDP in low-income countries, compared with 26.5 percent in high-income countries. Payroll taxes designated for health and pension benefits, that is, social security taxes, are even more constrained in low-income countries because the share of formal employment tends to be small. Social security taxes represent less than 1 percent of GDP in low-income countries, but amount to 7.2 percent of GDP in high-income countries.

Sales taxes on particular commodities, such as alcohol and tobacco, can be seen both as health interventions and as sources of revenues. *DCP2* shows that raising the price of alcohol and tobacco is highly cost-effective for discouraging high-risk drinking and smoking and, consequently, reducing the disease burden associated with these behaviors. At the same time, taxes on alcohol and tobacco can increase government revenues. Some countries earmark these taxes for use in health campaigns to encourage people to stop smoking or to drink more responsibly.

Public financing plays an important role in health services, especially in high-income countries, and even in the United States where public health insurance for the elderly (Medicare), the poor (Medicaid), and the military (Veterans Administration) accounts for more than half of all health expenditures. The rationale for publicly financing health is strong. Economists have shown that markets for health care services do not function well if left to themselves. For example, consumers cannot easily shop around for the best quality and lowest-price health care services as they might do for other kinds of services. Furthermore, private markets are unlikely to allocate sufficient resources to preventive measures that have a large effect on a population’s collective health status, such as vaccinating children or controlling environmental risks. Public financing also gives society a public policy tool that can be used to create incentives to improve health care quality, contain costs, redress inequities, or improve access. Notably, public financing is an essential feature of most, if not all, public health successes around the world (see chapter 2 in this volume and *DCP2*, chapter 8). Public involvement in health care is not a panacea, but it is the main way that many countries have chosen to address health care, and *DCP2* argues a case can be made for public financing of at least some health services in all countries.

In low- and middle-income countries, where public spending is low, access to care often depends on a household’s ability to pay for it. This

“ . . . public financing is an essential feature of most, if not all, public health successes around the world . . . ”

is the case when seeking treatment not only from private health care providers, but also in many cases from public health care providers. Public health services sometimes charge fees to recover a portion of their costs, but even in systems where public services are ostensibly free, patients and their families may be coerced into paying informally for access to services or be required to provide their own food, bedding, and even medical supplies.

DCP2 cannot resolve the debate about charging for health care services in low- and middle-income countries. Some chapters argue that the negative consequences of discouraging people from getting treatment offset the benefits of raising revenues through fees. Some chapters even make the case for negative prices, that is, paying people to encourage them to obtain treatment or preventive care and point to a number of successes. For example, in Tajikistan, poor patients with TB were given food supplements if they complied with their drug treatment regimen, resulting in better adherence. In another successful program in Mexico, the government pays a stipend to poor families on the condition that their children are fully immunized, are brought to clinics for regular checkups, and maintain good school attendance. However, fees also have an impact on the productivity of health care services in those places where they work to assure drug availability or reduce absenteeism, and in such cases may help sustain services that the poor use. Overall, *DCP2* takes a pragmatic stance, encouraging countries to eliminate financial barriers to care wherever possible and to assure that when fees are charged, they demonstrably improve the productivity and quality of health care available to the poor.

DCP2's prescriptions for financing health vary considerably between low- and middle-income countries. In low-income countries, the absolute levels of income and tax revenues severely constrain the possibilities for financing adequate and universal health care. In the past decade, a variety of studies have estimated the costs of providing basic health care. These exercises have estimated that providing a basket of health care services that could make a substantial difference to a population's health costs between US\$12 and US\$50 per capita per year. While these sums are within reach of most middle-income countries, they are not feasible in low-income countries without large amounts of external assistance.

Thus the problem low-income countries face is multifaceted. On the one hand, they need to raise domestic revenues, an approach that can at most generate an additional 1 or 2 percent of GDP. On the other

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“... providing a basket of health care services that could make a substantial difference to a population's health costs between US\$12 and US\$50 per capita per year.”

hand, low-income countries need to use what resources they have from both domestic and foreign sources as effectively as possible. It is this latter strategy—deriving the greatest health gain from new and current health expenditures—that motivated the Disease Control Priorities Project.

In middle-income countries, the problems of financing are different and the economic and institutional resources for addressing them are stronger. Middle-income countries can finance most of their health expenditures with domestic sources, but they face a range of options for shaping the structure of health care financing, with important implications for equity and productivity. Choices of different financing mechanisms also have important implications for who will bear the costs of health care: the population at large may share spending, thereby providing effective insurance to those unlucky enough to become ill, or it may fall most heavily on those who are sick.

Some countries are choosing to finance health services with general tax revenues, while others are relying on payroll taxes and social insurance schemes. Middle-income countries often use both approaches for different population groups. Initiatives to promote health insurance coverage through voluntary schemes are also under way. Strong arguments can be made in favor of pooling the financial risk associated with paying for health care among the widest population possible, effectively paying for the health care of the poor and the sick with taxes and premiums paid by those who are healthier and wealthier. *DCP2*, chapter 12, appraises these different approaches.

Development assistance plays a much larger role in the health policy of low-income than of middle-income countries. In low-income countries, development assistance to the health sector accounted for an average of 20 percent of all health spending, compared with about 3 percent in middle-income countries. In 13 Sub-Saharan African countries, external financing represented more than 30 percent of all health spending. Overall, international development assistance declined in the 1990s and represented only 0.25 percent of the gross national income of the world's wealthy countries despite their public commitments to contribute 0.70 percent of their total income to international development assistance.

Despite this overall trend, development assistance to the health sector has increased during the past decade, though it is still too low to reach international health targets. International aid to health grew from an estimated US\$6.7 billion in 1997–99 to around US\$9.3 billion in 2002.

“In low-income countries, development assistance to the health sector accounted for an average of 20 percent of all health spending, compared with about 3 percent in middle-income countries.”

This includes funds from bilateral development agencies and multilateral development banks, but also increasingly from private foundations, such as the Bill & Melinda Gates Foundation, and from new global initiatives, such as the Global Fund to Fight AIDS, Tuberculosis and Malaria and GAVI. However, between US\$60 billion and US\$70 billion of development assistance for health is needed each year to meet the health targets set by the MDGs, significantly more than current levels.

As with domestic resources, much of the debate about international development assistance is how to make it effective. *DGP2* discusses a range of initiatives aimed at making development assistance more effective by redirecting it toward cost-effective measures, but also by reducing transaction costs, improving coordination, and increasing country ownership. Some of the more promising innovations involve performance-based programs that disburse funds against results, such as reaching immunization coverage targets. Other initiatives have engaged host country governments with international agencies and domestic stakeholders in developing and following coordinated sectorwide plans tied to poverty reduction and improved health status targets. The new funds created by global initiatives concentrate attention on particular diseases and challenges in low-income countries. Global action is also being taken to encourage research and development of vaccines and drugs not only through direct funding, but also by establishing advance purchase commitments.

Decisions about how to finance health care strongly influence how the health system will function in any country, but low- and middle-income countries can do more with the funds they have by allocating resources to cost-effective interventions and by mobilizing additional funds to support health improvements. In the case of low-income countries, meeting today's health challenges requires wealthy countries to fulfill their commitments to increase international development assistance to health, even as it requires low-income countries to face the challenges of absorbing these funds and using them in ways that will effectively improve the health of their populations.

