Chapter 6

Providing Interventions

No matter how thoroughly they are researched and how carefully they are designed, interventions are useless without mechanisms for delivering them. Delivery mechanisms are critical to both the effectiveness and the cost of any intervention. They vary considerably from one country to the next depending on broad factors like a country's economy, politics, and culture, but also on the presence of a well-functioning health system.

While conducting public health interventions in isolation is occasionally possible, for the most part, health interventions form a web of services that work best when they are coordinated. Screening provides no benefits without subsequent treatment, referrals are no help without access to the required care, and treatment centers will be overwhelmed if essential preventive care is neglected.

In a static world, any decisions about health system structure would involve a trade-off between specialization and integration, between care at one level versus that at another. However, the world is dynamic, and the key to progress is to think of health system development as a phased process, beginning with use of the institutions, resources, and staffing currently available to establish a platform for health care delivery that through time fills in, expands, and deepens the web of services and interventions offered.

This chapter discusses the challenge of implementing and delivering health interventions. It describes and assesses approaches to delivering care at different levels and then highlights a few elements of the health system that need to function across all these levels. It also discusses ways to integrate care for people in different parts of the life cycle.

"Programs based in communities can reduce the costs and barriers that impede people's access to services . . ."

LEVELS OF CARE

Health interventions need to reach people either by being provided at their homes, schools, and workplaces or by encouraging them to visit health facilities. Programs based in communities can reduce the costs and barriers that impede people's access to services, while general primary care can act as an interface between community health programs and individual clinical care, whether ambulatory or inpatient. District and referral hospitals are needed to provide more specialized or costly care to reinforce community and primary care services with interventions that are required when these levels cannot bring the specialized equipment or skills to bear.

Community Level

Many countries have attempted to construct links between community-based health care resources and households for a range of health programs.[1] These programs do not substitute for a health system, but they provide a channel for reaching families with information and resources. They also mobilize additional resources, such as volunteers' time, local knowledge, and community confidence and trust.

Community-level programs can include a range of interventions but generally focus on services related to safe motherhood, nutrition, and simple prevention and treatments. They commonly include the following services:

"Community-level programs . . . generally focus on . . . safe motherhood, nutrition, and simple prevention and treatments."

- prenatal care
- reproductive health and maternal nutrition
- breastfeeding
- complementary feeding
- growth monitoring and promotion
- micronutrient supplementation
- supplementary feeding with either external supplies or local supplies
- ORT
- immunization
- deworming.

These interventions collectively reduce such risk factors as malnutrition that account for as much as 40 percent of the disease burden in low- and middle-income countries.

[1] This section is based on *DCP2*, chapter 56.

Community programs are organized in a variety of ways, particularly with respect to the status and number of community workers. At one end of the spectrum are community-based programs that rely heavily on local resources and volunteer time. For example, Thailand recruited and trained 60,000 village health volunteers who were responsible for mobilizing and supervising 600,000 village health communicators, who in turn attended an average of 20 children each (box 6.1). At the other end of the spectrum, some countries recruit workers from target communities but then hire and supervise them as part of the public health workforce. In Costa Rica, for example, health workers were full-time employees, recruited and managed by the government's rural health program. Costa Rica hired two full-time health workers for every 350 children. *DCP2* assesses the evidence and concludes that an effective ratio of health workers to children is in the range of 1 to 500 for full-time, paid community workers and 1 to 10 or 20 for local, part-time volunteers.

"... an effective ratio of health workers to children is in the range of 1 to 500 for full-time, paid community workers and 1 to 10 or 20 for local, part-time volunteers."

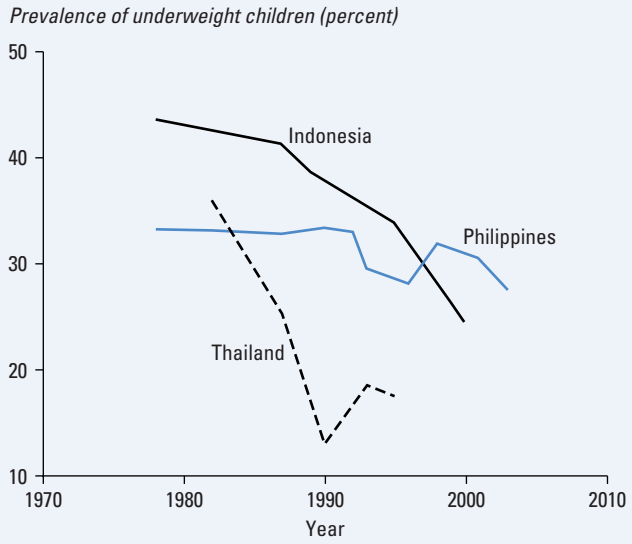
In addition to developing staffing strategies, community programs must decide whether to include food supplementation to address malnutrition. Food supplementation can help a community health program achieve its goals when integrated with other services or it can become the program's primary focus to the exclusion of other health services. In some communities, food supplementation is part of a broader program that also addresses micronutrient supplements, preschool education, growth monitoring, and sometimes improvements in local food supplies. At the other end of the continuum, the food distribution component has dominated some community programs, as occurred with India's Integrated Child Development Services Program.

Community programs also need to find a balance between health promotion activities and curative care. When primary facilities are distant or poorly supplied, community workers may be pressured into providing direct curative care, distracting them from other health promotion activities. When this happens, community systems may be coopted and "medicalized" with the addition of diagnostic and treatment modules. While such additions may succeed in giving people access to services that would otherwise be absent, they also divert community programs from the initial purpose of general health promotion. Community health workers not only can promote healthy behaviors and preventive action but can mobilize demand for appropriate services at other levels.

"Community health workers not only can promote healthy behaviors and preventive action but can mobilize demand for appropriate services at other levels."

Box 6.1 Community Health Programs in Three Countries

A sense of the potential effect of community-based programs can be seen in the prevalence of children age 2 who are underweight in Indonesia, the Philippines, and Thailand. Of the three countries, Thailand has been the most successful in implementing a community-based health program. Thailand's Ministry of Public Health spent approximately US$11 per beneficiary per year mobilizing a network of volunteer supervisors and volunteer community workers that included about 1 percent of the population. While the proportion of underweight children is influenced by a variety of societal and individual factors, the rapid reduction in the share of underweight children in Thailand that coincided with the introduction of this community-based program shows that it contributed to this effect. By contrast, Indonesia's national village program spent somewhat less (about US$2 to US$11 per child per year) and depended heavily on supplementing food. It had some impact, but it was slower and less consistent. Finally, the Philippines started a national program that was not fully implemented, spending only US$0.40 per child per year in targeted areas. Underweight prevalence among children showed little improvement during this period.



Source for figure: ACC/SCN 2004; Mason, Rivers, and Helwig 2005.
Source for text: DCP2, chapter 56.
a. −2 standard deviations.

Finally, community-based programs must seek to maintain a balance between extensive coverage and adequate supervision. A program that supervises tens of thousands of volunteers needs hundreds of supervisors. *DCP2* finds that supervision ratios in effective programs are approximately 1 supervisor for every 20 community health workers. If this supervisory responsibility is laid on primary care facilities, it

can become an excessive burden. If it is managed well, however, it can be the difference between ineffective and effective programs.

Effective health programs build on established community practices. Hence in Thailand, health services are combined with religious organizations at the village level. In Indonesia, social organizations have played an important role. In Bangladesh, NGOs that had been successful in other areas, such as food security and education, became active in health. In Costa Rica, Honduras, and Jamaica, national heath services already had a sufficient local presence to initiate community-based health programs.

"Effective health programs build on established community practices."

Organization at the local level can accomplish a good deal, but only with adequate guidance and resources from more central levels. Training, supervision, and supplies must be sustained to have a lasting effect. Generally this means linking community health workers with primary care facilities.

Thus the success of community health efforts depends critically on the context, including level of development of infrastructure, services, and socioeconomic resources. For example, in Indonesia, the weakness of the primary health care system encouraged community programs to shift toward providing individual clinical services. In Costa Rica, by contrast, community health programs could focus on prevention and health promotion as a complement to a stronger primary care system.

General Primary Care

The term primary care denotes several different, yet related, aspects of health systems.[2] In some contexts it refers to certain activities, such as immunization and prenatal care. In others it denotes a level of care with relatively low technical and skill requirements. For some countries it is a strategy for structuring and managing health care. For others it is a perspective or philosophy. The broad concept of primary care includes a range of initiatives that are associated with the Alma Ata Declaration on Primary Health Care approved by WHO in 1978. More recently, the WHO Commission on Macroeconomics and Health described the need for developing services that are close to the client. Despite the variations in the specific use of the term *primary care,* the basic notion is a common one: recognition that a certain range of health care services must act as an interface between families and community programs on the one hand, and hospitals and national health policies on the other.

"... primary care ... must act as an interface between families and community programs on the one hand, and hospitals and national health policies on the other."

Since the 1978 Alma Ata Declaration, WHO, the World Bank, and specific countries have refined and constructed alternative packages of

[2] This section is based on *DCP2,* chapter 64.

services under the umbrella of general primary care. *DCP2* notes substantial convergence in the content of general primary care over time: maternity-related care (for instance, prenatal care, skilled birth attendance, and family planning), interventions to address childhood diseases (such as vaccine-preventable diseases, acute respiratory infections, diarrhea, and malnutrition), and prevention and treatment of major infectious diseases. The list is familiar from numerous studies of cost-effective packages and priorities for the global disease burden (table 6.1).

Table 6.1 Package of Cost-Effective Interventions *(US$)*

Interventions	Cost per DALY	
	Low-income countries	Middle-income countries
Public health		
Expanded program of immunization plus (that is, including vaccine against hepatitis B and vitamin A supplementation)	15–22	32–38
School health program	25–32	48–54
Tobacco and alcohol control program	44–70	57–70
AIDS prevention program	4–6[a]	16–23[a]
Other public health interventions (includes information, communication, and education on selected risk factors and health behaviors, plus vector control and disease surveillance)	—	—
Total	18	—
Clinical services		
Chemotherapy against tuberculosis	4–6	6–9
Integrated management of the sick child	38–63	63–127
Family planning	25–38	127–190
Sexually transmitted disease treatment	1–4	13–19
Prenatal and delivery care	38–63	76–139
Limited care (includes treatment of infection and minor trauma; for more complicated condition, includes diagnosis, advice, and pain relief, and treatment as resources permit)	253–380	507–760
Total	—	168

Source: DCP2, chapter 64, table 64.2.
Note: — = not available, presumably because the authors were not able to aggregate data to country level.
a. Understates cost-effectiveness because the analysis examined the probability of transmission to others in the first year only.

Nevertheless, local health facilities that are equipped exclusively to carry out these kinds of functions may not meet local demand for other kinds of curative care or may miss important local health threats altogether. Consequently, public health experts stress the importance of having a local management team to plan local care and support services for a defined population, ranging from 10,000 to 50,000 people. With a local management team responsible for a specific population, that team can set priorities and monitor progress, as well as ensure a good fit between national priorities and local needs and demand for health promotion and treatment.

In practice, achieving this kind of planned, local effort is difficult in low- and middle-income countries for several reasons:

- Primary care facilities frequently lack the resources they need to function.
- Staff positions may remain unfilled or staff members may be absent.
- Supplies may not be delivered or may have expired.
- Facilities may not be properly maintained.
- People often seek health care from a variety of traditional healers, pharmacists, and private medical professionals in addition to public services. This fragmentation can make proper surveillance and planning difficult to manage.

With effective use of adequate financial, institutional, and human resources, general primary care can potentially address up to 90 percent of health care demand in developing countries. The direct effect of general primary care is well documented. For example, local reductions of 5 to 32 percent in mortality among children in Liberia, Niger, and the Democratic Republic of the Congo are attributed to the provision of general primary care in these locations. A well-functioning general primary care system is also integral to the success of a health system overall, because it acts as the bridge between local care and care at the next levels, such as district and referral hospitals.

". . . general primary care can potentially address up to 90 percent of health care demand in developing countries."

District Hospitals

In most countries, district hospitals account for the largest share of inpatient services.[3] They are generally designed to serve from 100,000 to as many as 1 million people with services that are more sophisticated, technically demanding, and specialized than those available at a primary care facility, but not as specialized as those provided by referral hospitals.

[3] This section is based on *DCP2,* chapter 65.

The range of services district hospitals offer includes diagnostics, treatment, care, counseling, and rehabilitation. The technical demands of these services require professionals with training and experience spanning the fields of family medicine and primary health care, obstetrics, mental illness, eye health, rehabilitation services, surgery, pediatrics, and geriatrics. They require substantial capital investment in facilities, equipment, and management. District hospitals may also provide health information, training, and administrative and logistical support to primary and community health care programs. When a district hospital's service area coincides with a local government administrative unit, it may be responsible for other public health functions throughout the district.

The strength of a district hospital is that it concentrates skills and resources in one place for conditions that are either uncommon or difficult to treat. It is also a repository of knowledge and diagnostic tools for assessing whether referral to an even more specialized facility is indicated. A district hospital can only realize these strengths if it is properly integrated with other levels of care that are also functioning well. If primary care facilities are not meeting local needs, for example, then people will bypass them and overwhelm hospitals with demands for services that could be provided more effectively and efficiently in other settings. Primary care facilities must also screen patients to identify those who do require hospital attention. Timeliness and adequate transportation are essential, as no amount of screening or referral can make a difference to a patient stranded in a distant village.

At the same time, district hospitals' concentration of resources give rise to their potential weakness. Too often, district hospitals benefit those who live nearby and are not readily accessible to the poor or to those dispersed in rural areas. District hospitals can serve populations most equitably when their concentration of resources is accessible to all, that is, when barriers created by poverty, low service quality, costly transportation, or remote geography are addressed.

"Too often, district hospitals . . . are not readily accessible to the poor or to those dispersed in rural areas."

Costs of care in district hospitals are sensitive to the salaries paid to their staff, the utilization rates, and the inclusion of additional health functions. Staff salaries generally account for the bulk of hospitals' recurrent costs even when salaries are low. When utilization rates are high, the average fixed cost per patient day will be lower. In some places, hospital utilization rates are below 50 percent and the unused capacity represents a substantial economic loss for the health system. In other cases, hospitals are overutilized, and even though this reduces average

costs, it results in more rapid depreciation of facilities. Additional functions also raise hospitals' costs. These functions might include training new health professionals and providing continuing education for them; supervising, supporting, or managing primary-level services; and designing and implementing district-wide public health campaigns.

Cost studies indicate the potential range of hospital costs in low- and middle-income countries. A Tanzanian hospital spent approximately US$4 per patient per day, but the study argued that it was underfinanced and that a little more than US$12 per patient per day would be necessary to provide care according to the provider's own standards. Researchers estimated that inpatient care in Kenya cost about US$9 per patient per day and in Bangladesh cost almost US$16 per patient per day. Costs for South African hospitals in five districts ranged from US$40 to US$97 per patient per day.

DCP2 includes an exercise to estimate the cost-effectiveness of district hospital care. Despite the exercise's admitted roughness, it gives a sense of the possible order of magnitude. Using data from a study of a Kenyan district hospital in a rural community with reasonably good access to health care, it finds that the hospital served 2,223 children, spent about US$10 per patient, and saved an estimated 215 lives at an average cost per life saved of US$104, implying a cost per DALY averted of only about US$4 to US$5.

". . . a Kenyan district hospital in a rural community . . . served 2,223 children, spent about US$10 per patient, and saved an estimated 215 lives at an average cost per life saved of US$104 . . ."

Strategies for improving district hospital care vary. In many countries, district hospitals have been turned over to local governments as part of a decentralization of public services. In others, hospitals are given greater decision-making, or even financial, autonomy. In parts of Central Asia and East Asia, particularly in the former Soviet republics and in China, public hospitals have become so dependent on fees paid by patients that they effectively function as private institutions. Most public hospitals receive budgets that are based on their staffing and size, but reforms in some places have introduced reimbursement based on the number and complexity of services provided, with mixed results. In other places, efforts focus on improving the quality of care in hospitals. One goal is to reduce hospital-acquired diseases, a serious problem in resource-constrained Sub-Saharan African countries, where blood transfusions and the re-use of needles can transmit HIV, hepatitis, and other infections. Improving blood safety would cost less than US$8 per DALY averted.

". . . in the former Soviet republics and in China, public hospitals have become so dependent on fees paid by patients that they effectively function as private institutions."

District hospitals are subject to various pressures that affect how well they carry out their role. Some of these pressures force district

hospitals to intervene as if they were primary centers, while others push them toward functioning as public health management centers. The appropriate mix will result from balancing investments in district hospitals with investments in other levels of care.

Referral Hospitals

The next level of care is the referral hospital, which provides complex clinical care to patients referred from the community, primary, or district levels.[4] Referrals explicitly link the different levels of health care in both directions. Community, primary, or district facilities direct patients to a specialized hospital for care. The referral hospital, in turn, provides support and information to assist the other levels and refers patients back to them when appropriate. For the full benefits of linkages between levels of care to be realized, referral hospitals need to provide many forms of support, including advice on which patients to refer, proper postdischarge care, and long-term management of chronic conditions. Coordinated training in the use of shared protocols is also necessary, as is technology support by skilled technicians and scientists.

"For the full benefits of linkages between levels of care to be realized, referral hospitals need to provide many forms of support . . ."

Referral hospitals can also provide important managerial and administrative support to other facilities, serving as gateways for drugs and medical supplies, laboratory testing services, general procurement, data collection from health information systems, and epidemiological surveillance. Sometimes they take on the role of managing transportation for medical supplies and staff, or even financial, payroll, and human resource management for lower-level facilities.

Other important functions of referral hospitals are research and training. In industrial countries, referral hospitals may be developing new technologies, but in developing countries they are more likely to be involved in research for piloting and introducing technologies that have been developed elsewhere, that is, assessing these technologies for their effectiveness and adaptability to a new context. Referral hospitals become the vehicle for disseminating such technologies by training new staff and providing continuing professional education for existing staff at different facilities. Research that is responsive to local disease burdens and local technology constraints fills a critical gap, because industrial countries and pharmaceutical companies do

[4] This section is based on *DCP2*, chapter 66.

not generally undertake such research if they do not foresee sufficient returns to their investments. Research activities also help attract and retain the specialists needed to treat complex cases and train new specialists.

As with district hospitals, referral hospitals in low- and middle-income countries frequently end up offering a full range of services, from the most specialized to basic ambulatory treatment. The demand for basic care results from people bypassing poorly equipped or inadequately staffed lower-level facilities.

The costs and effectiveness of referral hospitals are highly sensitive to the range of services they provide, to staff wages, and to utilization rates. In general, they tend to be more expensive than district hospitals because they treat more complex cases, have more expensive inputs, and are also engaged in teaching and research. Studies indicate that per bed day, referral hospitals can be two to five times as costly as district hospitals.

Referral hospitals tend to be located in large urban areas, exacerbating unequal access to specialized care for rural and generally poorer citizens. Because referral hospitals are by definition specialized, redressing such inequities by constructing more facilities is not feasible. Rather, equitable access to referral hospital services requires improving referral from other levels of care and reducing transportation costs and other financial barriers for the poor.

Investments in and functions assigned to referral hospitals need to be properly balanced and coordinated with investments and functional assignments to district hospitals, primary care centers, and community health workers. Just as referral hospitals cannot function efficiently without the other levels fulfilling their roles, so too community, primary, and district hospital levels cannot function effectively without the ability to refer complex cases to specialized hospitals. Lower levels of care certainly require strengthening, but this is more likely to reflect inadequate financing of the entire public health system than a grossly excessive allocation to referral hospitals.

CROSS-LEVEL SERVICES AND INPUTS

Even though different levels of the health care system are associated with distinct types of services, each level requires some capacity for common services. *DCP2* discusses a wide range of these cross-level services and related issues, three of which are discussed here.

"... 12 percent of the world's disease burden is associated with conditions that could benefit from surgery."

Surgery

Surgery has often been associated with technology-intensive interventions that can be extremely costly.[5] Furthermore, surgery is neither specific to a particular disease or risk factor nor is it exclusive to a particular level of health care. Consequently, its public health potential has often been overlooked by health policy makers. *DCP2* gives renewed attention to surgery as a cost-effective health care service for a range of common conditions.

DCP2 estimates that about 12 percent of the world's disease burden is associated with conditions that could benefit from surgery. These conditions cause losses of 21 DALYs per 1,000 people in the Americas and 38 DALYs per 1,000 people in Africa. Injuries account for about 38 percent of these surgical conditions, followed by malignancies and congenital anomalies.

Surgically treatable conditions fall into four general categories:

- surgical care to avert death or dysfunction among injury survivors
- obstetrical complications
- treatment of emergent and life-threatening abdominal conditions
- elective care of simple conditions, including hernias, club feet, and cataracts.

DCP2 defines surgery as services involving sutures, incisions, excisions, manipulation, and other invasive procedures that require local, regional, or general anesthesia. This definition focuses explicitly on the procedures and not on those who perform the surgery or the facility in which it takes place. This permits recognizing that many different kinds of health care workers can perform surgery if properly trained and that it can be done in different places if they are properly equipped. For conditions like cataracts or trachoma, surgery can be conducted via campaigns in which a cadre of workers is trained to screen, identify, and perform simple procedures using mobile facilities (box 6.2). Simple surgery can also be provided at the primary level for injuries, obstetrical complications, or congenital anomalies. District hospitals and referral hospitals can be configured to provide more complex surgical procedures as required.

"... surgeries conducted at a hypothetical community clinic serving a population of 20,000 people .... would cost an estimated US$150 to US$350 per DALY averted."

DCP2 estimates the cost-effectiveness of surgeries conducted at a hypothetical community clinic serving a population of 20,000 people. Such a facility would treat approximately 4,000 surgical cases per year and be staffed by a nurse, a skilled birth attendant, and an orderly. The

[5] This section is based on *DCP2*, chapter 67.

Box 6.2 Treating Cataracts in India

Treating cataracts is one of the best-documented cases of surgical interventions provided at the population level. India has used mobile camps to provide cheap and efficient cataract surgery in rural areas. The number of surgeries more than doubled from 1.2 million in 1991–92 to 2.7 million in 1996–97. The cost was about US$97 per patient in camps, compared with US$176 in medical college hospitals and US$54 in nongovernmental hospitals. At less than US$25 per DALY, cataract surgery in India is highly cost-effective.

Source: Adapted from *DCP2,* chapter 67.

procedures would include treating simple cuts and bruises, removing foreign materials from the body, draining abscesses, treating basic burns, assisting normal deliveries, and treating simple trauma. Such services would cost an estimated US$150 to US$350 per DALY averted. More complicated surgeries, including abdominal and thoracic surgery, head injuries, obstetrical complications, and burn care, would be handled by district hospitals at an estimated cost of US$40 per DALY averted in South Asia and Sub-Saharan Africa, US$70 per DALY averted in East Asia and the Pacific, and close to US$100 per DALY averted in the remaining regions. The cost per DALY averted of surgical services in district hospitals is lower than in primary care facilities because of economies of scale. The fixed costs of district hospital surgeries are higher, but the hospital can be configured to handle a disproportionately larger number of surgeries. Whether these economies are realized in practice depends on reaching appropriate utilization rates.

Surgery can clearly be a significant component of any public health strategy. Surgery can prevent death and chronic disability in injured patients if it is timely and appropriate; it can reduce the risk of mortality and disability from obstructed labor, prepartum and postpartum hemorrhage, and other obstetrical complications; it can resolve a wide range of emergency conditions; and it can have a substantial impact on quality of life through elective surgery for such conditions as cataracts, ear infections, club feet, hernias, and hydroceles. If the right facility is appropriately staffed and equipped, surgery can be a cost-effective and important element of a functioning health system and of a public health policy.

"... surgery can be a cost-effective and important element of a functioning health system and of a public health policy."

Emergency Medical Services

Like surgery, emergency medical services represent a cluster of interventions that are not exclusive to any particular medical condition or level of health care.[6] The defining feature is that outcomes are extremely

[6] This section is based on *DCP2,* chapter 68.

"... the disease burden that is relevant to emergency medical services ... account[s] for 36 percent of ... DALYs."

time dependent. Emergency medical services address sudden medical conditions that require immediate intervention to avoid death or disability. While emergency services are often equated with ambulances, hospital emergency rooms, advanced technology, and high costs, in practice, emergency medical services are not exclusively focused on rapid transportation and invasive procedures. Rather, good emergency care can often be achieved through improved planning, appropriate training of first responders, effective communication, and innovative approaches to transportation.

Emergencies commonly arise from sudden injuries, obstetric complications, and infections, as well as from neglecting slow and chronic conditions. Thus the disease burden that is relevant to emergency medical services overlaps considerably with conditions that have already been discussed in previous chapters, such as maternal conditions and road traffic injuries. In total, such conditions account for 36 percent of the disease burden when measured in DALYs. About one-third of these DALYs are due to injuries; another one-third are related to chronic illnesses like diabetes, CVD, and asthma; and the final one-third are associated with communicable diseases and maternal conditions.

Emergency medical services comprise a continuum of care from first contact with patients until their conditions are stabilized. This includes making a rapid assessment to determine which interventions are most appropriate, arranging for prompt transportation to a facility best suited for treating the condition, and providing immediate emergency care. Once a patient arrives at a facility, emergency care services continue until the patient's condition has been stabilized.

The character of emergency medical services varies considerably across countries and regions. In many rural, low-income contexts, traditional healers such as bone setters may provide first aid, and transportation could be by canoe or animal-pulled cart. In high-income cities, by contrast, it is often characterized by the arrival of paramedical personnel in an ambulance. The key is not to emulate some ideal technology but to improve the organization and planning for emergency care, which can be done at a reasonable cost and would improve the utilization of resources, the care received, and the outcomes.

"... emergency care requires investments be made in facilities that can treat patients once they have been stabilized."

DCP2 highlights a range of issues that hinder low- and middle-income countries from providing adequate emergency care along with some innovative approaches to dealing with these obstacles. First, emergency care requires investments be made in facilities that can treat patients once they have been stabilized. Arranging for rapid

transportation to a health facility that is ill-equipped or overburdened serves little purpose. Hence, as with so many other matters, the presence of an effective health care system is important.

Second, rapid forms of communication can make a big difference to survival. In places where traditional telephones are not available, simple radio phones or, increasingly, cell phones can be used. Communication is important for coordinating care between the site of initial care and the facility where the patient will receive treatment, and it also serves to support first responders by allowing them to consult with other medical personnel and receive expert advice at the emergency site.

Third, proper planning can reduce response times and improve care. Sometimes this is as simple as assuring that accurate maps are available and that houses are numbered and streets have signs. One study in Kuala Lumpur found that emergency response teams could not find the patient in 20 percent of emergency calls.

Fourth, transportation has to be accessible at short notice. Vehicles with stretchers are the ideal, but many other means will do. In Malawi, a bicycle ambulance originally aimed at improving emergency obstetric care found regular use in transporting patients with all kinds of emergencies, including injuries.

Studies have found that the primary factor in survival has less to do with the speed of transport than with the effectiveness of life-saving care provided by the responding team. Emergency response systems require skilled and motivated personnel with appropriate supplies, pharmaceuticals, equipment, and support staff for coordination and management. Where resources are available, such systems can rely on full-time personnel with motorized transportation. Where resources are limited, a great deal can still be done with simple, sustainable approaches. For example, recruiting and training motivated citizens who often confront emergencies, such as public transport drivers, can greatly speed responses to emergencies (box 6.3).

DCP2 reviews information on the use of trained lay responders in combination with trained volunteers. Such a program would require 7,500 lay first responders and 150 volunteer paramedics to serve a population of 1 million. The lay first responders could be trained in half a day whereas the volunteer paramedics would undergo 25 days of training. In each case, refresher courses would be required every three years to keep skills and motivation high. Such a program might be highly cost-effective, costing between US$73 and US$706 per death averted or between US$3 and US$27 per life year saved.

". . . in Kuala Lumpur . . . emergency response teams could not find the patient in 20 percent of emergency calls."

". . . the use of trained lay responders in combination with trained volunteers . . . might be highly cost-effective, costing between US$73 and US$706 per death averted or between US$3 and US$27 per life year saved."

Box 6.3 Improving Trauma Care in the Absence of a Formal Ambulance System

Background: The efficacy of a program that builds upon the existing, although informal, system of prehospital transport in Ghana was assessed. In Ghana, the majority of injured persons are transported to the hospital by some type of commercial vehicle, such as a taxi or bus.

Methods: A total of 335 commercial drivers were trained using a six-hour basic first aid course. The efficacy of this course was assessed by comparing the process of prehospital trauma care provided before and after the course, as determined by self-reporting from the drivers.

Results: Follow-up interviews were conducted on 71 of the drivers, a mean of 10.6 months after the course. Sixty-one percent indicated that they had provided first aid since taking the course. There was considerable improvement in the provision of the components of first aid in comparison to what was reported prior to the course (see table 1).

Table 1 Provision of Emergency Medical Care Before and After First Aid Course

Type of care	Provided before course (%)	Provided after course (%)
Crash scene management	7	35
Airway management	2	35
Bleeding control	4	42
Splint application	1	16
Triage	7	21

Source: Mock and others 2002.

The course was conducted with moderate amounts of volunteer labor and gifts-in-kind, such as transportation to the course. The actual cost of the course amounted to US$3 per participant.

Conclusions: Even in the absence of formal emergency medical services, improvements in the process of prehospital trauma care are possible by building upon existing, although informal, prehospital transport.

Source: DCP2, chapter 68, box 68.1.

When an ambulance is added, costs are substantially higher. The level of cost-effectiveness is nonetheless still within reason. In urban areas, the increased costs are offset by greater utilization. *DCP2* estimates that in urban areas, relying on ambulances would cost as little as US$60 per life year saved in South Asia, to about US$111 per life year saved in Latin America and the Caribbean, and US$176 per life year saved in the Middle East and North Africa. In rural areas, ambulance

services would cost between two and three times more per life year saved because of lower utilization rates.

Countries should not neglect emergency medical services. At a minimum, improved planning and communications and additional training of volunteers can make a substantial difference to survival in emergency situations. Emergency medical services are another element requiring coordination in the health care service system, linking trauma scenes and other emergency sites to appropriate interventions at various levels of care. To be cost-effective, strategies must be appropriate to local conditions, whether this involves training bus drivers in first response care, engaging bicycle taxis, or equipping professional paramedics.

Drugs

In the last 50 years, the number of effective medications for preventing and treating diseases has grown enormously.[7] Some have prevented millions of people from contracting diphtheria, tetanus, polio, and measles. Others have treated bacterial and viral infections, such as pneumonia, TB, and HIV/AIDS. A large class of drugs is now available for dealing with chronic illnesses such as diabetes, CVD, and depression. Others are essential for palliative care.

"In the last 50 years, the number of effective medications for preventing and treating diseases has grown enormously."

The supply of drugs is critical for effective health care interventions. Policies to ensure that appropriate drugs are available to those who need them must address a range of issues:

- financial issues include funding for carrying out basic research and commercial development, defining and protecting intellectual property rights, and assuring affordability
- logistical issues relate to procurement, storage, and distribution
- clinical issues pertain to ensuring appropriate prescription practices and adherence to prescribed drug regimens
- incentive issues affect the involvement of pharmaceutical companies, private health care providers, pharmacies, and publicly financed or managed health services in drug research, development, and marketing.

The availability of drugs is highly uneven and exacerbates the inequitable distribution of health care around the world. Some 30 percent of the world's population lacks regular access to essential medications, ranging from 26 percent of Southeast Asians (excluding India), 29 percent of those in the WHO Eastern Mediterranean, Region, and

"Some 30 percent of the world's population lacks regular access to essential medications . . ."

[7] This section is based on *DCP2,* chapters 4, 6, 55, and 72.

47 percent of Africans, to 65 percent of Indians. Meanwhile, the 15 percent of people who live in high-income countries consume approximately 90 percent of all medications (as measured by value).

Private pharmaceutical companies and governments in high-income countries have focused on developing drugs that address the disease burden in their own countries. Of 1,325 new medicines that became available between 1975 and 1997, only 11 were specifically developed for tropical diseases. In the past decade, a few international initiatives have sought to redress this uneven distribution of benefits from medications. Some aim to improve access to essential medications that are already available, as is the case with GAVI and the Global Fund to Fight AIDS, Tuberculosis and Malaria. The goal of others is to promote research and development of new vaccines, treatments, or easier-to-administer drug regimens. These include Doctors Without Borders' Drugs for Neglected Diseases initiative, public research into developing vaccines for malaria, and new therapies for drug-resistant TB.

The key objectives of drug policies are to increase access to effective medications, improve and ensure their quality, and promote rational prescription practices by providers and rational use by patients. WHO has assisted numerous low- and middle-income countries to adopt national drug policies that include selecting a list of essential medications, assuring their affordability, regulating their quality, encouraging regular supplies, and promoting rational use.

The essential drug list is an important element of drug policy, because it focuses attention on the least expensive alternatives for treating priority categories of disease. In this way it simplifies the process of procurement, purchase, training, and use. WHO's guidelines include a list of 320 drugs in 559 formulations. Most of the countries that have used these guidelines list fewer than 300 drugs, ranging from a low of 180 drugs in Liberia to a high of 389 in the state of Karnataka, India. Like the drug list, the list of recommended vaccines has also increased through time as new ones have become available. Most countries still adhere to the original vaccines that were promoted as EPI (against TB, diphtheria, tetanus, pertussis, polio, and measles), but since these were first promoted, WHO has recommended adding new vaccines, such as those for hepatitis B, Hib, and yellow fever in countries where it is endemic.

"The essential drug list . . . focuses attention on the least expensive alternatives for treating priority categories of disease."

Procurement processes must pay attention not only to obtaining the best price but also to assuring the quality of the drugs and the reliability of the supply. For this reason, countries have been switching from open

tender methods, which use price as the primary selection criterion and only secondarily consider quality and reliability, to restricted tender methods, which require bidders to submit information about their companies' reliability, financial stability, production quality, and past performance. Only manufacturers who are prequalified can enter the next stage at which bids are sought and the lowest bid is selected.

In general, drug prices have tended downward. This is due, in part, to the natural cycle of drug development. A new drug is usually protected by a patent, which restricts supply and keeps prices high until the patent protection expires or compulsory licensing is enacted and generic manufacturers can enter and compete. Some prices have declined dramatically as a consequence of collective negotiations, international advocacy, and public pressure, notably those of drugs to treat TB and HIV/AIDS, some of which have fallen by more than 90 percent in recent years.

Purchasing generic drugs in bulk is by far the easiest way for a country to get the most from a limited budget. When available in the appropriate forms and quality, generics are substantially cheaper than brand name drugs. A study in Malaysia found that 13 brand name drugs were from 4 to 45 times more expensive than the generic equivalents that were included in that country's essential drug list. To facilitate better negotiation and pricing, information on prices is now available internationally via Web sites. A variety of international programs have aimed to improve the affordability of essential drugs for low- and middle-income countries: the United Nations Children's Fund has a vaccine procurement program that handles 40 percent of the global demand, the Pan American Health Organization manages a revolving fund for the Latin American and Caribbean region, and the Gulf Cooperation Council Group Purchasing Program assists with tenders and logistics for six Persian Gulf states.

Procurement is only one element of the cost of supplying drugs, and the local component of drug prices can represent a sizable markup. In Sri Lanka, local costs add 64 percent to the imported price of drugs. In Kenya, the local component is more than 100 percent of the import price. Surveys suggest these levels of markups between import and retail are common. Public policy aimed at reducing this price wedge includes changing tax policies, such as granting exemptions from import duties or value added tax; implementing policies that reduce transportation costs; and introducing marketing regulations.

Once drugs have been selected and purchased, they must be appropriately stored and distributed. When drugs are distributed through

"... as many as half of failures in drug therapies occur because patients do not comply with the prescribed regimen."

public providers, the government must manage the logistics of forecasting demand, moving drugs effectively to where they are needed, making certain that they are stored in appropriate packaging at the proper humidity and temperature, and assuring the disposal of expired medications. To this end, countries have employed various methods, including distributing predefined kits of drugs on a schedule to more flexible and complex systems whereby health facilities place orders. Vaccines present their own challenges, especially the management of a cold chain to ensure that vaccines are kept at proper temperatures until used. When drugs are distributed through private pharmacies, the government's role focuses on monitoring distribution channels to ensure that packaging information is accurate, that appropriate storage is being used to maintain quality, and that expired medications are disposed.

Proper prescription and use are the next steps. To be effective, the correct drug needs to be prescribed for the patient's condition with appropriate adherence to the correct dosage and duration of treatment. *DCP2* estimates that as many as half of failures in drug therapies occur because patients do not comply with the prescribed regimen. Ensuring patient adherence is an element of the quality of health care services. It is best achieved where the health care system is sensitive and responsive to local attitudes, education, and culture; where health care workers communicate respectfully and clearly with patients; and where community support and information are available.

"Errors by medical staff or pharmacists account for the other half of failures ..."

Errors by medical staff or pharmacists account for the other half of failures in drug therapies. Ironically, overprescribing drugs is just as common in low- and middle-income countries, which can ill afford to waste medications, as it is in high-income countries. Studies of IMCI programs in various countries found that better training of health care workers resulted in health outcomes that were similar to or better than average and that costs were often lower because the training led to more rational use of drugs and reduced unnecessary prescriptions (box 6.4). Doctors who also dispense drugs regularly appear to prescribe more drugs than nondispensing doctors, confirming the general recommendation that prescribing and dispensing should be separated whenever possible.

"Overuse of drugs for infectious diseases and improper adherence ... accelerate the emergence of drug-resistant strains."

Overuse of drugs for infectious diseases and improper adherence can both be devastating to the effectiveness of health care, because they accelerate the emergence of drug-resistant strains. Cheaper drugs for malaria are already becoming ineffective, requiring recourse to costlier ACT. Drug-resistant strains of TB have emerged, requiring more frequent recourse to multidrug therapies and second-line drug regimens.

Box 6.4 Improving the Use of Antimicrobials Through IMCI Case Management

Antimicrobial drugs, including antibiotics and antimalarials, are an essential child survival intervention. Prompt and correct provision of drugs to children under age five who need them can save lives. Ensuring that these drugs are not prescribed unnecessarily and that those who receive them complete the full course can slow the development of antimicrobial resistance. Analysis of data collected through observation-based surveys at randomly selected first-level health facilities in Brazil, Tanzania, and Uganda shows that children receiving care from health workers trained in IMCI are significantly more likely than those receiving care from workers not yet trained in IMCI to receive correct prescriptions for antimicrobial drugs, to receive the first dose of the drug before leaving the health facility, to have their caregivers advised on how to administer the drug, and to have caregivers who are able to describe correctly how to give the drug at home as they leave the health facility. IMCI training is an effective intervention to improve the rational use of antimicrobial drugs for sick children visiting first-level health facilities in low- and middle-income countries.

Source: DCP2, chapter 63, box 63.2.

Many of the increasingly resistant infections are common in low- and middle-income countries but not in high-income countries, which reduces the effective demand for research into new treatments to replace the old ones.

To delay the emergence of drug-resistant strains of illnesses requires actions that, concomitantly, improve the quality of health care. Appropriate prescriptions and adherence improve cure rates and inhibit the further spread of an infection. This can be achieved through a range of educational programs for public and private providers and dispensaries. It also requires ensuring a reliable drug supply, reducing financial barriers for people in low-income households, and improving communication with patients to support better compliance. Eliminating the routine addition of antimicrobial supplements to animal feed, as recommended by WHO, is another important component of this strategy.

INTEGRATION OF SERVICES ACROSS THE LIFE CYCLE

In addition to analyzing health care by level and function, *DCP2* presents information about efforts to integrate care by stages in the life cycle. Newborns, children, adolescents, and women of reproductive age all have clusters of risks and conditions that can be addressed most

"Integrating the management of childhood illnesses involves . . . improving health workers' performance, . . . health systems, and . . . family and community practices."

effectively through access to an appropriate range of preventive measures and treatments. Chapter 4 addressed maternal and neonatal conditions. This chapter focuses on some of the *DCP2* chapters that address integrated care for specific age groups.

Integrated Management of Childhood Illness

Following the neonatal period, deaths among children to age five are concentrated among those who suffer from diarrhea, pneumonia, malaria, and other infectious diseases and from malnutrition.[8] Because comorbidity is highly prevalent and effective interventions are available, efforts have been made to integrate attention to children. The foremost initiative for this is the IMCI program, launched by WHO and the United Nations Children's Fund in the mid 1990s and implemented in dozens of countries since that time.

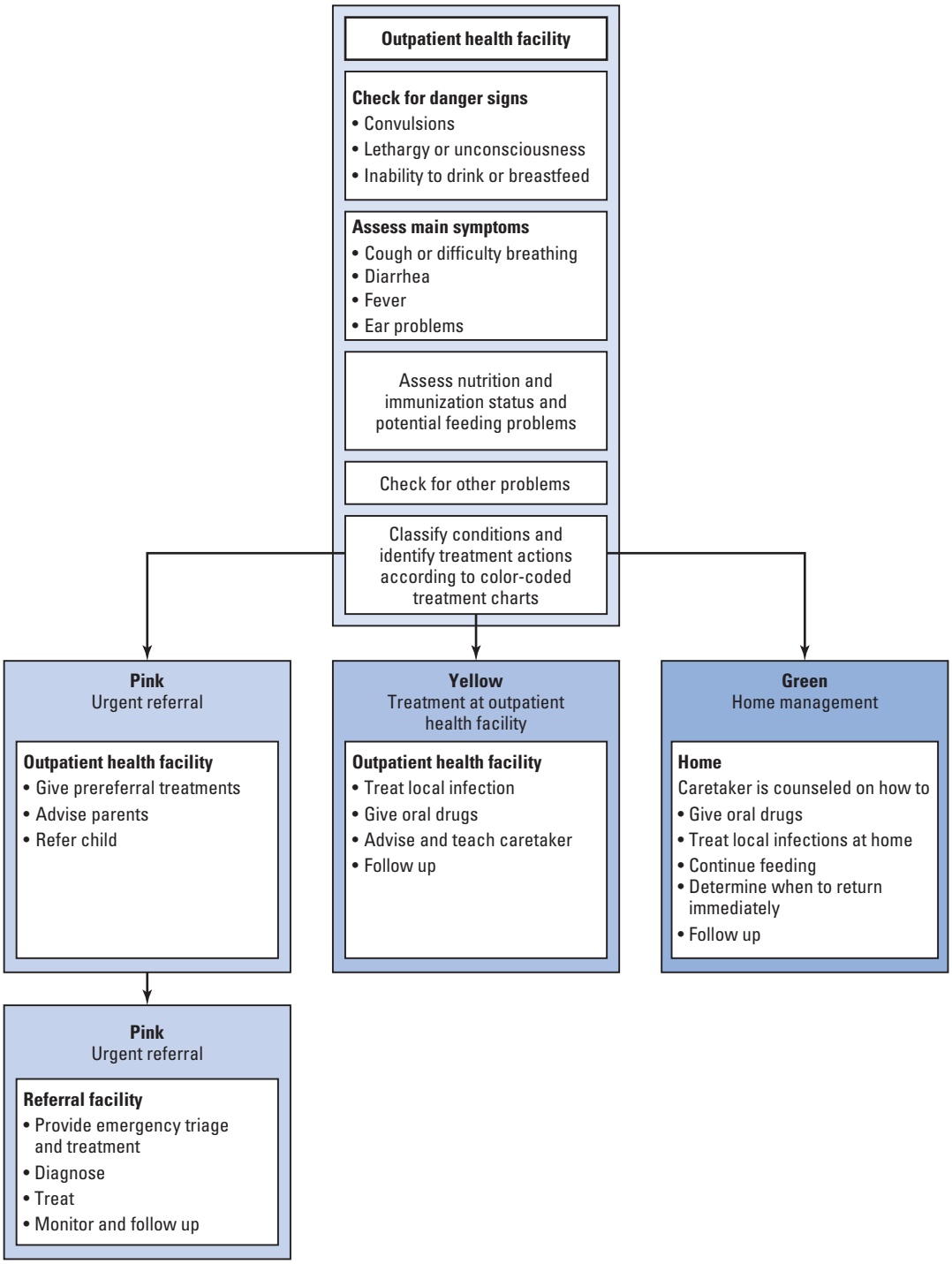
Integrating the management of childhood illnesses involves three components: improving health workers' performance, improving health systems, and improving family and community practices. The first of these includes training in the use of a treatment guide that instructs staff to look for danger signs, make thorough assessments, and then implement the appropriate case management interventions. The training also instructs health workers to integrate preventive and curative care by, for example, checking that children who are brought to a facility with a respiratory illness are current with their vaccinations and are adequately nourished. Second, integrated care of the child requires improvements in the health system to ensure that drugs are available, supervision and training are effective, referral services are functioning, and health information systems are in place. Third, improving family and community practices requires support for good breastfeeding practices, better nutrition, attention to hygiene, use of bednets, administration of fluids during an illness, and appropriate and timely care-seeking behaviors (figure 6.1).

"... in Tanzania, ... districts that implemented IMCI spent the same or less per child as districts with traditional health care programs but achieved better care and a 13 percent reduction in mortality."

Evaluations of the IMCI program demonstrate, above all, the difficulties of implementing an integrated strategy of training, health system strengthening, and community involvement in countries with limited resources and weak public institutions. Most of the countries that have formally adopted IMCI have not fully implemented it. Of its three components, the one most successfully implemented is training workers. One of the better implementations was in Tanzania, where

[8] This section is based on *DCP2*, chapter 63.

Figure 6.1 Schematic Outline of IMCI Case Management



Source: WHO, UNICEF 2001. (*DCP2*, chapter 63, figure 63.1).

districts that implemented IMCI spent the same or less per child as districts with traditional health care programs but achieved better care and a 13 percent reduction in mortality (see box 6.4). However, the promise of integrated care has not been realized in most places because insufficient resources have been applied to implementing the strategy; health systems have been unable to provide the required personnel and managerial support; and no country has fully succeeded at linking IMCI to changes in family behaviors related to caring for illnesses at home, seeking care when appropriate, and improving nutrition practices.

School Health and Nutrition Programs

Schoolchildren are another well-defined subgroup whose health conditions cluster around a manageable number of illnesses and risk factors.[9] Their school attendance creates a simple opportunity for reaching children through preexisting infrastructure. Furthermore, most low-income countries have more teachers than nurses. Thus the incremental cost per child of health interventions at schools is exceptionally low, amounting to less than US$1 per year for the simplest package. Targeting schoolchildren can be a cost-effective approach to delivering health interventions.

Health interventions at schools also complement their educational mission because good health and nutrition are prerequisites for effective learning. For example, deworming programs have been successfully implemented through schools and have subsequently improved attendance and educational achievement. Concomitantly, education is an important component of many preventive health programs, such as teaching children the importance of proper hygiene, road safety, use of bednets, and nutrition along with messages about sexuality and associated health risks.

"While traditional medical practice emphasizes treatment after diagnosis . . . mass delivery of services, such as deworming and micronutrient supplementation, is often preferable on technical, economic, and equity grounds . . ."

An important element of this approach is a focus on minimizing the need for clinical diagnosis. While traditional medical practice emphasizes treatment after diagnosis, the new approach suggests that mass delivery of services, such as deworming and micronutrient supplementation, is often preferable on technical, economic, and equity grounds to approaches that require diagnostic screening.

[9] This section is based on *DCP2*, chapter 58.

Adolescents and Young Adults

Mortality rates among adolescents tend to be low relative to those for other age groups.[10] Most of the disease burden is associated with depression, road injuries, and falls. Nevertheless, adolescence is a critical period for adopting or avoiding behaviors that increase the risk of illnesses in later years. Risk factors that often begin in adolescence include smoking, excessive use of alcohol, poor eating habits, subjection to sexual abuse, and unprotected sex.

"Risk factors that often begin in adolescence include smoking, excessive use of alcohol, poor eating habits, subjection to sexual abuse, and unprotected sex."

In Sub-Saharan Africa, the HIV/AIDS epidemic makes intervention in this age group particularly important. In this region, 63 percent of DALYs for young women age 15 to 29 are related to sexual and reproductive illnesses. Patterns of early marriage to older men and unprotected sex greatly increase a girl's chances of contracting HIV/AIDS and other sexually transmitted infections.

Interventions for adolescents are often difficult, because most risks at this age are not simple to address with preventive or curative care. They involve changing risky behaviors that may actually be encouraged by either traditional or modern mores. Generally, interventions need to give young people the information and skills for making good decisions; provide them with a range of health services that help them act on those decisions, such as contraceptives; and construct a social, legal, and regulatory environment that supports healthy behaviors and protects young people from harm, such as banning tobacco advertising.

"Interventions for adolescents are often difficult, because . . . [t]hey involve changing risky behaviors that may actually be encouraged by either traditional or modern mores."

Relatively few programs focused on adolescents and young adults have been implemented on a large scale. The most widespread programs focus on sexual and reproductive health, including prevention of HIV/AIDS. Of these, school-based programs are the most common. Nutrition, mental health, and tobacco prevention programs aimed at adolescents are more common in high-income countries. Services are often divided among various programs. For example, teen pregnancy may be addressed as part of an NGO's family planning program, while the ministry of transportation promotes road safety and a maternal health intervention promotes good nutrition.

As yet, little has been documented regarding the costs or effectiveness of national health initiatives for adolescents and young adults. In Bangladesh, the Newlyweds Program has encouraged low fertility among recently married young people. New Zealand has established a

[10] This section is based on *DCP2*, chapter 59.

program for preventing suicide among adolescents. Mongolia has introduced sex education after the third grade in response to rising STI rates attributed to early debut of sex, sexual violence, and exploitative messages in the media. South Africa's Love Life initiative has promoted sexual health and healthy lifestyles among 12- to 17-year-olds. Assessments of the South Africa program have found raised awareness of health risks, delayed debut of sex, fewer partners, more assertive behavior regarding condom use, and better communication with parents about sex.

Implementing such programs requires coordinating a complex range of interventions. In addition, the responses to the risky behaviors that are targeted may conflict with the goals of the government and the views of religious leaders, parents, or teachers. Some of the key principles in developing an integrated approach to this age group are to involve them in the process of program design, engage them as peer educators, make health services appealing and welcoming, and confront gender inequalities.

In sum, interventions are more cost-effective if they are implemented by a functioning health system and no interventions are helpful unless they are delivered. This section has discussed some of the issues that arise in organizing health care services by level, function, or around the needs of particular age groups. In general, *DCP2* shows that these facets of the health care system function best when they are linked and can provide a continuum of care with appropriate staff and in appropriate locations. This in turn requires systems for generating and exchanging information, managing quality and staff, and mobilizing and allocating funds.