Chapter **63**

Integrated Management of the Sick Child

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NATURE, CAUSES, AND BURDEN OF CHILD MORTALITY

Every year, over 10 million children under five years of age die. Most of those deaths are due to a small number of causes. In the mid 1990s, it was estimated that 70 percent of all global child deaths were due to five conditions: diarrhea, pneumonia, malaria, measles, and malnutrition (Gove 1997; Tulloch 1999). The World Health Organization (WHO) has since conducted a comprehensive review of under-five deaths using additional data and improved methods (Bryce and others 2005), and now estimates that six causes accounted for 73 percent of these deaths in 2000–2003: pneumonia (19 percent), diarrhea (18 percent), malaria (8 percent), neonatal pneumonia or sepsis (10 percent), preterm delivery (10 percent), and asphyxia at birth (8 percent). Undernutrition is an underlying cause in at least half of all under-five deaths. Few conditions, therefore, account for a large proportion of all deaths.

These deaths are not randomly distributed. They tend to occur in the poorest countries of the world, mostly in Sub-Saharan Africa and South Asia (Black, Morris, and Bryce 2003), and within any country they affect mostly the poorest families (Victora and others 2003). Fortunately, cost-effective interventions are available to prevent most of these deaths. Chapters 19, 21, 24–28, and 56 in this volume, as well as the next section in this chapter, describe these interventions in greater detail. Achieving universal coverage with these interventions would likely prevent 60 percent of those deaths (Jones and others 2003). Yet coverage levels for nearly all of these interventions remain below 50 percent (Bryce and others 2003), and children from the poorest families are least likely to be reached (Victora and others 2003).

In addition, comorbidity is common. Among children who die, a large proportion present with two or more diagnoses (Black, Morris, and Bryce 2003). Comorbidity is also highly prevalent at the community level and among children seeking health care. Nutritional factors—including underweight, micronutrient deficiencies, and inadequate infant feeding practices (see chapter 28)—play a major role in morbidity and mortality, and yet these are often overlooked by practitioners. Also, there are many missed opportunities for preventive interventions during outpatient visits—for example, immunizations and promotion of insecticide-treated mosquito nets.

POLICY SHIFT TO INTEGRATED MANAGEMENT

Until the mid 1990s, actions aimed at improving child health were organized as vertical programs, each addressing a specific disease or providing a given intervention or set of interventions (Claeson and Waldman 2000). Typical examples of these programs are the Expanded Program on Immunizations (EPI), Control of Diarrhoeal Diseases (CDD), acute respiratory infection (ARI) programs, malaria control programs, and nutrition programs that include growth monitoring, breastfeeding promotion and support, and micronutrient supplementation.

The need for an integrated approach to improve child health became evident in the mid 1990s for a number of reasons. From the perspective of epidemiology, a small number of diseases accounted for a high proportion of deaths, and those diseases were often present in the same children and had overlapping clinical signs. Integrated management was expected to increase the probability that children would receive treatment

for all major diseases and to decrease the possibility that children would receive correct treatment for one disease and die from another unrecognized illness. The important role played by nutrition across these major diseases also suggested that an integrated approach to case management was needed to ensure that health workers addressed children's nutritional needs throughout the clinical encounter.

A second set of reasons for the policy shift to an integrated approach was based on the need to promote managerial efficiency. The vertical approach required countries to appoint managers at national, provincial, and district levels to run each program. It also led to separate training activities; for example, health workers might be required to leave their posts on a number of occasions to be trained for the programs. Similar examples of duplication of effort were often found in supervision and provision of essential drugs. There was a strong logical basis for believing that integrating the management structure of child health programs would lead to improved efficiency.

A third group of reasons for the shift to integrated case management related to the need to improve the quality of case management provided by health workers. Vertical programs trained health workers to manage one disease at a time, and decisions about how best to assess and treat those diseases, as well as how to promote nutrition and educate caretakers, were often left to individual health workers. An integrated set of guidelines for managing sick children ensured that health workers, including those with low levels of training, applied the best available knowledge of case management systematically and in correct sequence.

The realization that a few diseases were responsible for most child deaths, that comorbidity was highly prevalent, that effective interventions were available, and that there were many missed opportunities for prevention led to the recognition that an integrated approach was needed. Thus, WHO and United Nations Children's Fund (UNICEF) launched the Integrated Management of Childhood Illness (IMCI) strategy in the mid 1990s (Tulloch 1999). Tanzania and Uganda began implementing IMCI in 1996. By 2003, more than 100 countries had adopted the strategy (http://www.who.int/child-adolescent-health).

INTERVENTIONS

A key aspect of IMCI was the integration of effective interventions to improve child health and nutrition into a coordinated strategy. IMCI has three components, each of which was meant to be adapted at the country level according to local epidemiology, health system characteristics, and culture.

Improving Health Worker Performance

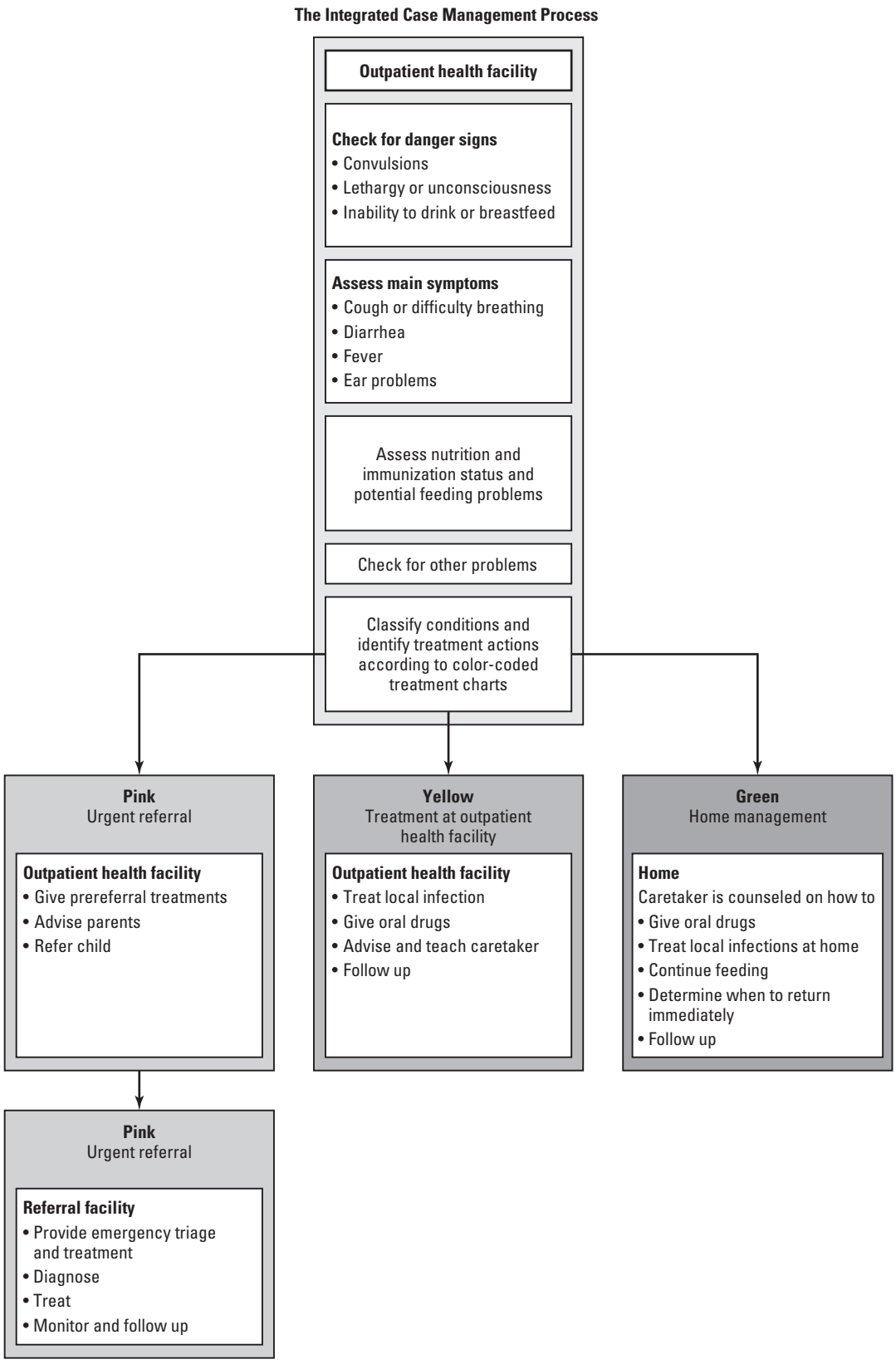
The first component of IMCI includes health worker training and the reinforcement of correct performance. Training is based on a set of adapted algorithms (Gove 1997) that guide health workers through a process of assessing signs and symptoms, classifying the illness according to treatment needs, and providing appropriate treatment and education to the child's caregiver. Figure 63.1 shows a general outline of the approach for children age two months to five years (WHO and UNICEF 2001). Sick children attending a first-level health facility are initially checked for danger signs and for the main symptoms of the key IMCI diseases: diarrhea, malaria, pneumonia, measles, and other severe infections. Next, all children are assessed for malnutrition and anemia, and vaccination status is verified. Children under two years of age, as well as older children presenting low weight for age, receive nutrition counseling. Other health problems related by caretakers are then assessed, and children are classified according to a color code: pink (immediate referral), yellow (management in the outpatient facility), or green (home management). Separate case-management algorithms are available for children under two months of age. IMCI health worker training emphasizes the integration of curative care with preventive measures, including nutrition and vaccinations. A special training module addresses how to communicate effectively with mothers. The training course was originally designed to last 11 days, including a large amount of hands-on experience.

Improving Health Systems

The second component of IMCI is aimed at providing support for child health service delivery, including drug availability, effective supervision, referral services, and health information systems. Tools were developed for implementing specific system-strengthening interventions, including a planning guide for national and district managers, an integrated health facility assessment tool, and a tool for improving referral level care. In particular, several countries—beginning in Latin America through the Pan American Health Organization (PAHO) and more recently in Africa with WHO's Regional Office for Africa—made substantial efforts to improve the management and availability of the specific drugs required for IMCI (A. Bartlett, personal communication).

Improving Family and Community Practices

The third component, known as *community IMCI*, focuses on 12 key family practices relevant to child health and development (see http://www.who.int/child-adolescent-health/PREVENTION/12_key.htm). Community IMCI supports the development and implementation of community- and household-based messages and interventions to increase the proportions of children exposed to these practices. These behaviors address breastfeeding, complementary feeding, micronutrients, personal hygiene, immunizations, insecticide-treated nets, mental and social development, continued feeding



Source: WHO and UNICEF 2001.

Figure 63.1 Schematic Outline of IMCI Case Management for Children Age Two Months to Five Years

and increased fluids during illness, home treatment of infections, care-seeking practices, compliance with health worker recommendations, and prenatal care.

This chapter addresses issues related to the integrated delivery of these interventions, most of which are covered in greater detail in other chapters in this book. These include case management of ARI (chapter 25), diarrhea (chapter 19), malaria (chapter 21), and malnutrition (chapter 28); community interventions to improve nutrition, including breastfeeding promotion and complementary feeding (chapter 56); insecticide-impregnated bednets (chapter 21); anthelmintic treatment (chapter 24); vaccinations (chapter 20); and micronutrient supplementation (chapter 28).

INTERVENTION COST AND COST-EFFECTIVENESS

One of the rationales for developing the IMCI strategy was the belief that treating the sick child in an integrated manner, by building on interventions that had already been shown to be cost-effective, would result in gains in efficiency. Two types of questions can be asked from an economic perspective. First, is treating children on the basis of the IMCI strategy cost-effective? Second, do the additional health benefits gained by switching from routine practice to IMCI justify the additional costs (if any)?

Only one publication has reported the cost-effectiveness of the IMCI strategy as a whole. Using a modeling exercise, the *World Development Report 1993* identified IMCI as being able to avert 14 percent of the global burden of disease in children under age five in resource-poor countries at a cost of only US$1.60 per capita per year, with a cost-effectiveness of US$30 to US$100 per disability-adjusted life year (DALY) averted. No details of the methods used to derive those estimates are available (World Bank 1993). It is not clear if the costs are the additional costs of moving from current practice to IMCI or the costs of undertaking care for children under age five using IMCI, nor is it clear if the effectiveness is the additional effectiveness of changing current practice or the total effect of the package.

Detailed studies of the cost-effectiveness of some of the components of IMCI are available. For example, oral rehydration therapy for diarrhea, case management for pneumonia, and childhood vaccinations have been shown to be very cost-effective when evaluated as separate interventions (see chapters 19, 25, and 26). It is likely that the combination of different sets of childhood interventions, as proposed by IMCI, would also be cost-effective, although this depends on the relationship between costs and effects when the interventions are undertaken at the same time in the same population.

No published studies of the extent and nature of efficiency gains through integration were found. WHO has recently explored some of these gains for slightly different combinations of childhood interventions in different parts of the world (see http://www.who.int/evidence/cea). This research resulted in estimates of the cost-effectiveness of single or combined interventions compared with doing nothing or with incremental intervention or current practice. Because large-scale trials on the effects of joint interventions have not yet been undertaken, the joint effects were modeled using the effectiveness of the individual interventions taken from systematic reviews. The interventions included vitamin A and zinc fortification and supplementation, oral rehydration therapy, case management for pneumonia, and supplementary feeding and growth monitoring. Costs and effects were estimated at various levels of population coverage and in various combinations.

The results showed that a childhood package consisting of vitamin A and zinc supplementation, oral rehydration therapy, and case management of pneumonia was cost-effective compared with doing nothing in most settings but that including supplementary feeding and growth monitoring was not cost-effective. Implementation of this combination at 50 percent coverage was estimated to cost, in 2000 prices, approximately US$4.10 per child (US$0.60 per capita) in poor African countries such as Tanzania. The cost-effectiveness was US$38 per DALY averted. Costs increase faster than the increase in coverage. In Tanzania, it was estimated to cost an additional US$12.10 per child under age five (US$1.80 per capita) to reach 95 percent coverage, with a resulting incremental cost-effectiveness ratio of US$60 per DALY averted.

This study is important because it is one of the few that has specifically explored the cost-effectiveness of undertaking combined interventions in the same population, and the effect of increasing coverage on costs. These absolutely critical questions for policy makers considering different intervention strategies are also critical to IMCI. However, the WHO study did not analyze the same interventions included in the IMCI package, nor did it evaluate the effect of moving from current practice to IMCI-based care.

Some information on the effect of moving from current practice is available from two studies in Kenya and Nigeria. Those studies compared the cost to the provider of traditional prescribing patterns with the costs of pharmaceuticals that would have resulted if the IMCI guidelines had been followed strictly. In Nigeria, the traditional prescribing method was five times more expensive: US$1.44 per child visit for pharmaceuticals compared with US$0.29, using 1996 estimates (Wammanda, Ejembi, and Iorliam 2003). In Kenya, also in 1996, the traditional method was almost three times costlier per child visit if the low-cost combination of drugs was assumed (US$0.44) and similar if the high-cost combination was assumed (US$0.16) (Boulanger, Lee, and Odhacha 1999). In Bangladesh, it was estimated that strict adherence to the IMCI protocol could result in US$7 million in savings at the national level simply from more rational use of drugs—almost 3 percent

of the total health budget of the government of Bangladesh (Khan, Ahmed, and Saha 2000; Khan, Saha, and Ahmed 2002).

These estimates were based on models and assumptions, sometimes using evidence from separate systematic reviews addressing the costs and effects of an intervention. It would be valuable if information on relative cost-effectiveness of different combinations of interventions at variable levels of coverage could be derived from field studies rather than developed solely by modeling. Such an approach would allow the use of comparable methods and counterfactuals across the evaluation sites to make the results more useful and generalizable to other settings. In addition to answering questions related to the cost-effectiveness of IMCI, it would clarify gains that can be obtained from delivering interventions at the same time as part of an integrated package rather than delivering them in a vertical manner. This is one of the reasons the Multi-Country Evaluation of IMCI Effectiveness, Cost, and Impact (MCE) was launched (Bryce and others 2004). Five countries are currently participating in in-depth studies—Bangladesh (in 20 catchment areas), Brazil (in 46 municipalities), Peru (in all 24 departments in the country), Tanzania (in 4 districts), and Uganda (in 10 districts). Seven other countries—Bolivia, Cambodia, Kazakhstan, the Kyrgyz Republic, Morocco, Niger, and Zambia—were assessed for the evaluation but could not be included, mostly because of insufficient implementation of IMCI.

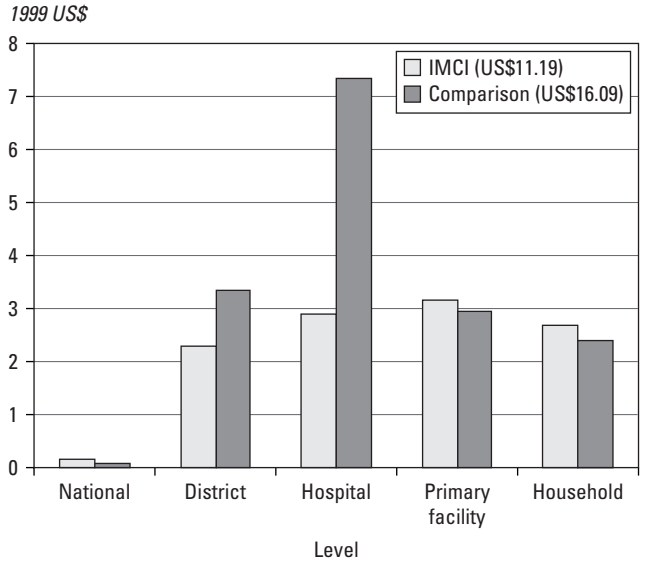
The overall objective of the MCE is to evaluate the actual changes associated with IMCI as it is implemented in different settings. All studies measured an identical set of indicators and, with minor exceptions, used identical data collection tools (Bryce and others 2004). The remainder of this section presents the main findings from two MCE countries, Tanzania and Brazil, for which evaluation results are currently available.

MCE in Tanzania

The MCE in Tanzania uses an observational design to compare two districts where IMCI has been implemented since late 1997 (IMCI districts) with two districts where implementation began in 2002 (comparison districts). The four districts had reasonably well-functioning health services, comparable levels of per capita health expenditure, high utilization rates of government health facilities, and high coverage of selected interventions (for example, EPI). Large numbers of governmental and nongovernmental health actors were also active in the districts, many of which were involved in health worker training and community activities, although their coverage was patchy. The two IMCI districts had engaged in activities designed to strengthen district management skills; the districts also had authority for priority setting and control over their health budgets. These activities of national health sector reform had not started in the comparison districts at the time of the study. In the comparison districts, a high level of coverage of IMCI training for health workers had been achieved, but there had been no increase in the provision of under-five interventions at the community level, as opposed to the facility level.

Cost data were collected for the start-up period of implementing IMCI (from 1996 to 1997)—defined as the time from the national decision to implement IMCI to the time when IMCI started to be provided in health facilities—and for the maintenance of child health services in both types of districts. Costs were estimated from the societal perspective and were collected from the national, district, hospital, health facility, and household levels. Costs at all these levels were summed to obtain the total cost to the district of providing care for children under age five. So that comparison could be made across districts, cost estimates were standardized to a hypothetical district with a population of 50,000 children under age five. This figure corresponds to a total population of around 300,000, which is roughly the average district population for Tanzania. Estimates of the additional cost to the district of implementing IMCI were based on the difference in cost of under-five care between the IMCI districts and the comparison districts, which, at the time of the study, had not yet implemented IMCI (Adam and others 2004b).

For 1999, the cost per child of caring for children under age five in IMCI districts was US$11.19, 44 percent lower than in the comparison districts (US$16.09) (Adam and others 2004b). The lower cost per child in IMCI districts was due to lower hospitalization and administrative costs at the district level. There was no statistically significant difference in costs incurred to treat children at primary care facilities and at the household level (figure 63.2).



Source: Adam and others 2004b.

Note: Standard district with 50,000 children under age five.

Figure 63.2 Cost Components of Under-Five Care per Child in a Standard District

Hospital costs were 2.5 times higher in the comparison districts, not because of differences in the cost per under-five admission, but because more children under age five were hospitalized in those districts relative to IMCI districts (6 percent in IMCI districts compared with 15 percent in comparison districts; t–test: $p < 0.001$). There are two possible explanations: (a) improved quality of care and drug availability for children under age five at IMCI primary facilities reduced the need for referral and subsequent admission to hospitals, or (b) factors other than IMCI, such as differences in quality or geographical access to the hospitals in the different settings, meant that children in non-IMCI districts were more likely to seek care at hospitals. Given that IMCI training had only started one year before data collection of hospital admissions, the second possibility may have played a bigger role in this finding. Even if one takes the most conservative assumption—that all the difference was due to other factors—and excludes the hospital component from the analysis, the total cost per under-five child in IMCI districts was still lower than in comparison districts (6 percent).

The other important difference in costs between both types of districts was found in costs incurred at the district level, which were 50 percent higher in the comparison districts. These costs were mainly linked to more frequent trips for drug distribution and general purpose supervision in comparison districts than in IMCI districts.

Similar costs of training were observed in both types of districts during the study period. This finding was unexpected given the emphasis of IMCI on training, but a wide variety of training courses were performed in comparison districts for preventive, curative, and administrative issues during the study period. These courses included training for immunization, for use of insecticide-treated bednets, and for use of district Health Management Information System forms.

At the facility level, univariate comparison between IMCI and comparison district health facilities showed a 16 percent difference in the average cost per under-five visit (including vaccination visits) at government health centers and dispensaries (US$1.40 and US$1.60 in IMCI and comparison districts, respectively; t-test: $p = 0.5$). The average number of visits per child per year was 30 percent higher in the IMCI districts (3.28) compared with comparison districts (2.49). Taken together, the lower cost per visit but higher number of visits per child per year in IMCI facilities resulted in similar overall costs per child under age five for treatment in the two types of districts. Multivariate regression analysis, however, led to a different conclusion. Taking into account differences in other determinants across facilities, in particular the number of visits per facility, the cost per visit was at least 30 percent lower in IMCI facilities (t-test: $p < 0.001$).

Sensitivity analysis showed the importance of hospitalization costs in interpreting total district costs—the difference between IMCI and comparison districts was not sensitive to variation in the other parameters, only to the assumption about rates of hospitalization. Therefore, if one assumes that hospital admission rates were not related to IMCI, there is no difference in the cost of under-five care in the two types of districts. Otherwise, the costs in IMCI districts are lower than in the comparison districts.

In the IMCI districts, IMCI was implemented concurrently with measures designed to strengthen district management, such as evidence-based planning and expenditure mapping at district level (http://web.idrc.ca/en/ev-3170-201-1-DO_TOPIC.html). In fact, it has been argued that the decision to implement IMCI in the study districts was a result of the introduction of the evidence-based planning. It is not possible to separate the effects of IMCI from district-strengthening measures. The findings of the MCE study in Tanzania, therefore, can be interpreted as the costs of IMCI in the presence of a strong health system with adequate managerial capacity.

The US$11.20 cost per child of treating children under age five using IMCI in Tanzania translates into a per capita cost of US$1.70, compared with US$2.30 for routine care. This finding is similar to previous per capita estimates of the cost of IMCI in resource-poor countries (World Bank 1993). In addition, the Tanzania evaluation had similar findings with respect to savings from drug costs to those expected based on previous studies (Khan, Saha, and Ahmed 2002; Wammanda, Ejembi, and Iorliam 2003; World Bank 1993).

The effects of IMCI can be assessed in terms of changes in intermediate outcomes, such as improved quality of care at health facilities, or in terms of final outcomes, such as changes in under-five mortality or DALYs averted. In the Tanzania evaluation, a health facility survey was carried out in 2000 to compare the quality of case management and health systems support in IMCI and comparison districts. The results indicate that children in IMCI facilities received better care than children in comparison districts. Their health problems were more thoroughly assessed, they were more likely to be diagnosed and treated correctly as determined through a gold-standard reexamination, and the caretakers of the children were more likely to receive appropriate counseling and reported higher levels of knowledge about how to care for their sick children (Tanzania IMCI Multi-Country Evaluation Health Facility Survey Study Group 2004).

Estimating the effectiveness of IMCI training in improving health workers' performance required measuring the proportion of children correctly managed in IMCI and comparison facilities. *Correct management* is defined as the correct drug being provided in the correct formulation (amount, times per day, number of days) and the health worker explaining correctly to the caretaker how the drug should be administered at home. Not prescribing an antibiotic or antidiarrheal drug for a child who did not need one was also considered to be correct performance. In Tanzania, 65 percent of children under age five

Box 63.1

Impact of IMCI on Mortality and Nutrition in Tanzania

Tanzania is the only MCE site where the evaluation has been completed. Its design included a comparison of mortality in four districts—two with and two without IMCI—over the two-year period starting in mid 2000. Demographic surveillance systems were used to compare under-five mortality rates in areas of the IMCI and control districts. Adjustments for age (zero to one and one to four years) and rainfall were made using Poisson regression models. During the IMCI phase-in period (July 1999 to June 2000), under-five mortality levels were almost identical in IMCI and comparison districts, at about 27 deaths per 1,000 child-years or approximately 120 deaths per 1,000 children between birth and the age of less than five years. The quality of health care provided in the IMCI districts was substantially higher than in the control districts (see box 63.2). Over the following two years, mortality levels became 13 percent lower in IMCI districts than in the comparison areas, corresponding to a rate difference of 3.8 fewer deaths per 1,000 children per year. Stunting rates also became significantly lower in the IMCI districts. Contextual factors, such as mosquito net use, all favored the comparison districts.

Source: Armstrong Schellenberg and others 2004.

presenting to the surveyed IMCI facilities were correctly managed, compared with 16 percent in the comparison facilities. When the information on costs and effectiveness are taken together, the cost per child correctly managed is six times less in IMCI districts (US$4.02) than in the comparison districts (US$25.70) (Bryce and others forthcoming).

Some of the differences in costs might be due to factors other than IMCI, so these ratios have to be interpreted with care. What is clear, however, is that treating children using IMCI in Tanzania was no more costly—and probably less costly—than treating children using routine care. At the same time, it resulted in higher quality of care. To the extent that this higher quality of care leads to better health outcomes, IMCI is cost-effective—it costs less (or at least no more) and results in better outcomes (see box 63.1).

MCE in Brazil

Brazil is another MCE site where IMCI is being implemented in the context of an ambitious family health program (FHP), which is supported by the Ministry of Health and the World Bank and based at first-level government facilities. IMCI implementation started in 1996 and is moving ahead in the whole country, particularly in the northeast regions. IMCI training is targeted at FHP team members.

The MCE in Brazil was carried out in four states, all in northeast Brazil, the poorest area of the country. In total, 23 municipalities with both FHP and IMCI were compared with matched municipalities with FHP but without IMCI. Early results from one component of the evaluation—the time and motion study—provide useful insights. After controlling for possible confounding factors using regression analysis, the evaluation found that IMCI-trained providers spent 1 minute and 26 seconds longer per consultation with under-five children than untrained providers did. The difference was much greater when patient load was low but decreased as the number of patients a provider saw per day increased. This finding suggests that the system's ability to absorb IMCI depends on current capacity utilization. In terms of the assessment of quality of care in the surveyed facilities, IMCI-trained health workers were shown to provide significantly better care than those who had not been trained (Amaral and others 2004; Gouws and others 2004). (See "Lessons about Implementation Success and Failure" later in this chapter for additional results on quality of care.)

These results are important for policy development relating to child health. Where current caseloads are relatively low, providers spend additional time to provide better child health services, using IMCI as the basis of part of their current activities. In this study, the mean number of consultations per provider per day was 34, and 95 percent of the providers had caseloads of fewer than 50 patients per day. If this finding is representative of the rest of Brazil, it would be possible to introduce IMCI relatively easily throughout the country without encountering capacity constraints in terms of provider time. In areas with high patient loads, however, it would be important to explore whether it is possible to maintain high quality of care under IMCI in those areas and what the alternatives should be (Adam and others, forthcoming).

Summary of MCE Results

The available results from the MCE so far show that costs of child health care in Tanzania were comparable or lower in

districts with IMCI than with routine case management. Quality of care was higher, and a 13 percent reduction in mortality was also found in the IMCI districts in the study period. This finding strongly suggests that IMCI is a cost-effective intervention compared with routine care, as it costs less and is more effective in saving children's lives.

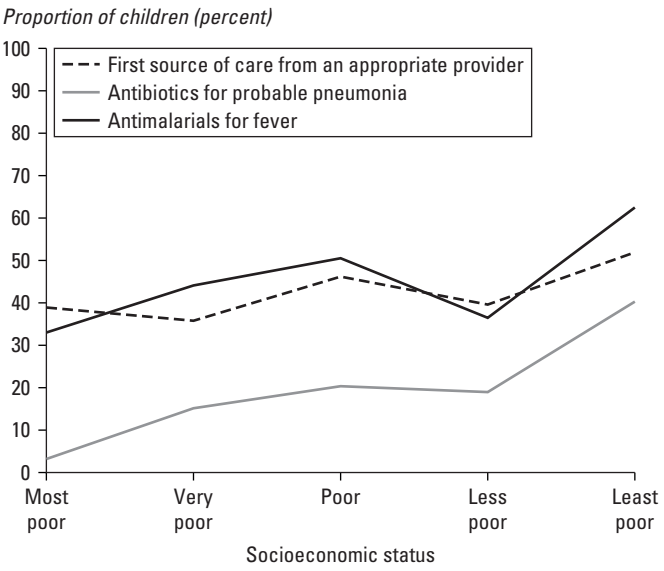
In Brazil, the MCE study also showed improved quality of care for children under age five after health workers were trained in IMCI. The results also showed that staff time constraints were unlikely to limit the application of IMCI, because, in settings with low caseloads, health workers could be expected to use the available excess capacity to provide better care for children under age five. Assuming that primary health facilities will experience savings on drug costs similar to those observed in Tanzania and previous modeling studies, one could also argue that IMCI is a good value for money in the Brazilian setting.

Equity Issues

Some of the equity implications related to care seeking and treatment have also been evaluated in the four rural districts included in the IMCI evaluation in Tanzania (Schellenberg and others 2003; Victora and others 2003). The MCE analysis found no association between sex and any indicator of morbidity, care seeking, case management, or compliance with treatment or follow-up instructions, suggesting that mothers and health workers treat boys and girls similarly (Schellenberg and others 2003). This finding is in accordance with that of Gwatkin and others (2000). Similarly, there were no statistically significant associations between socioeconomic status and reported prevalence of fever, diarrhea, severe diarrhea, or pneumonia. However, hospital admissions were almost half as common in the lowest socioeconomic status quintile as in the highest (t-test: $p = 0.0093$), suggesting that referral care is more readily accessible to the wealthy.

Positive associations were observed between socioeconomic status and care seeking from an appropriate provider (a qualified health worker practicing allopathic medicine) for fever without cough or diarrhea, for care seeking for episodes perceived as severe, and for using an appropriate provider as the first source of care. This finding is illustrated in figure 63.3, which puts households into five wealth categories. The poorest group was at least 25 percent less likely to have sought care than the least poor. Among the children who sought care, antibiotic use for probable pneumonia was less than half as common among the poorest than among the least poor. Also, children in the lowest socioeconomic group were half as likely to have been given antimalarials as those in the highest category (t-test: $p < 0.0001$).

These findings suggest that, although the prevalence of disease (self-reported) does not differ by socioeconomic status, care seeking and the probability of receiving appropriate care vary markedly, even within an apparently homogeneous rural population. This observation agrees with data on mortality and nutritional status inequalities for Tanzania (Schellenberg and others 2003). There is no evidence yet showing whether the introduction of IMCI has reduced or increased this type of inequality.



Source: Victora and others 2003, based on data taken from Schellenberg and others 2003.

Figure 63.3 Proportions of Children, by Socioeconomic Quintiles, Who Were Brought to an Appropriate Provider and Who Received Correct Care, in Rural Tanzania

IMPLEMENTATION OF PROGRAMS: LESSONS OF EXPERIENCE

The IMCI strategy was thoroughly evaluated from its onset. Only two years after the first health worker training course took place, the MCE was launched (Bryce and others 2004). MCE researchers visited 12 countries and carried out in-depth studies in five of those. The MCE and the more recent Analytic Review of IMCI (DFID and others 2003), which included visits to six countries, provide the background for this section.

Institutions and Programs

IMCI introduction was highly successful. As of December 2002, WHO's global monitoring team reported that IMCI had been introduced in 109 countries (see http://www.who.int/child-adolescent-health/overview/child_health/map12_02.jpg). Twelve countries were included in the introduction phase, in which the strategy was officially endorsed, a national IMCI coordination group was appointed, and key ministry of health staff members were trained in the IMCI clinical

guidelines. Another 50 countries were in the early implementation phase, which included development of a national plan, selection of initial districts for implementation, adaptation of the IMCI clinical guidelines and materials, training of course facilitators, and planning at the district level. Finally, 47 countries were in the expansion phase, which included scaling up IMCI activities in districts already covered and expanding to cover additional districts (WHO and UNICEF 1999).

The fact that a country has adopted the IMCI strategy, however, does not mean that a high population coverage has been reached. The best available estimates of IMCI coverage are provided by the percentage of health workers who underwent IMCI training and are managing sick children. For example, the Brazil MCE (Amaral and others 2004) has shown that IMCI is being implemented in all 27 states, but in some of those states only a few health professionals were trained. In the three states selected for the evaluation because of reportedly strong IMCI implementation, there was at least one IMCI-trained health worker in 239 out of 443 municipalities (54.0 percent), but only 23 municipalities (5.2 percent) had at least 50 percent of health workers trained after three years. In Peru, also a leading country in IMCI training, approximately 10 percent of all doctors and nurses providing child care were trained after seven years of IMCI implementation (Huicho and others 2005). Therefore, levels of training coverage in most countries appear to be low.

Lessons about Implementation Success and Failure

Both the MCE (Bryce and others 2004) and the Analytic Review of IMCI that were carried out in 2002–3 (DFID and others 2003) confirm that IMCI has been highly successful in motivating managers and health workers. The training program is highly regarded, and trainees are pleased with its logical, consistent approach to child health problems. Innovative clinical skills, such as the use of palmar pallor to diagnose anemia and the use of breathing rate for pneumonia, are often praised. Nutritional counseling, an area in which most health workers receive little formal training in school, is also greatly appreciated. When asked about the limitations of IMCI, health workers often mention the increased time required for a consultation and the difficulty of following the IMCI guidelines when there is a high patient load.

Several studies have shown that health workers trained in IMCI do perform better than those not trained. Health facility surveys carried out in Tanzania (Schellenberg and others 2003), Brazil (Amaral and others 2004), and Uganda show that IMCI training substantially improves health worker performance in assessing and managing sick children, and in counseling their caretakers. Box 63.2 summarizes MCE findings on antibiotic prescribing patterns, a critical area for managing sick children (Gouws and others 2004).

Important constraints to IMCI implementation were also identified through visits to 17 countries by the MCE and Analytic Review teams. Using the framework developed by the Commission on Macroeconomics and Health (Hanson and others 2001), the teams described shortcomings in three areas: community and household issues, health service delivery issues, and issues related to health sector policy and strategic management.

Community and Household Issues. Coverage levels for effective interventions to improve child survival are remarkably low in most developing countries. A review of the 42 countries that account for 90 percent of global child deaths showed that only two out of nine key interventions reached more than half of all children (Bryce and others 2003). This finding agrees with

Box 63.2

Improving the Use of Antimicrobials through IMCI Case-Management: Findings from the MCE

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: Gouws and others 2004.

those of the MCE, showing that the third component of IMCI—improving family and community practices—was poorly implemented. At the global level, UNICEF was primarily in charge of developing this component (see http://www.childinfo.org/eddb/imci/practices.htm), and at the country level, UNICEF often acted through nongovernmental organizations (NGOs). Coverage with these community-based programs tended to be patchy. In Peru (Huicho and others 2005) and Tanzania, the districts that were selected for implementation of the community component were not the same as those prioritized for health worker training, which were chosen by the ministry of health with WHO support. This precluded any possible synergy at the district level between improved quality of care in health facilities and community interventions, including those aimed at improving care seeking and compliance with health workers' advice.

All the countries that were visited, however, have a number of programs and projects that deliver child survival interventions at the community level. Many of these interventions are part of the key IMCI family practices, but they are being delivered in an uncoordinated manner by national, international, and nongovernmental organizations in limited geographical areas. The low population coverage of these projects makes it unlikely that they will ever result in a substantial effect on a larger scale. The notable exceptions are the EPI programs, which, despite some recent evidence of falling coverage (Bryce and others 2003), still reach the vast majority of children in developing countries.

On the basis of the experience obtained in these countries, it appears that those key family practices that are most likely to be synergistic with facility-based IMCI—improved care seeking, home management of disease, and compliance with health worker advice—are among those least likely to be supported by existing programs. Existing programs seem to favor biological interventions such as vaccines, micronutrient supplementation, and insecticide-treated materials.

The present criticism of community IMCI should not be extrapolated to community-level child health interventions in general, which can often be highly successful. These interventions are covered in chapter 56.

Health Service Delivery Issues. Given the difficulties in implementing the community component, IMCI was largely restricted in nearly all countries to training health workers in the improved management of care for young children. Even there, some difficulties were apparent.

In countries such as Peru, Brazil, and Uganda, after an initial sharp increase in the number of health workers who were trained, budgetary and other restrictions led to a decrease in the number of training courses being offered. In Peru, about 10 percent of all eligible health workers in the public sector were trained after seven years of implementation. At the current rate of training, several decades will be needed before full coverage is reached (Huicho and others 2005). Similar results were observed in Uganda (J. Nsungwa-Sabiti, personal communication).

Staff turnover is also a major problem. In Peru, between 1996 and 2001, 43 percent of IMCI-trained health workers had already been rotated since their training (Huicho and others 2005). In Tanzania, where staffing patterns appear to be quite stable in comparison with the situation in other countries, 23 percent of trained staff had moved within three years of initial training (C. Mbuyia, personal communication). Problems with turnover were also observed in Bolivia, Brazil, and Niger. These health workers did not necessarily leave government employment, but high rotation means that IMCI may not be continually delivered to the same target population over time.

Another relevant issue mentioned in several countries was that of low staff motivation, which was often associated with low salary levels. In Uganda, the performance of health workers fell dramatically in 2001 after the government discontinued cost-sharing schemes that were used to supplement drug supplies and health worker salaries at the facility level (Burnham and others 2004). In Cambodia and Tanzania, salary levels are so low that health workers need other sources of income to maintain their families. Issues related to human resources are addressed in greater detail in chapter 71.

Poor supervision was a major issue in all countries that were visited. IMCI recommends regular supervisory visits that should include systematic observation and feedback on case management. In Peru, the average number of supervisory visits was 0.19 per facility per year (Huicho and others 2005). In Bangladesh, a baseline (pre-IMCI) health facility survey conducted in 2000 found that none of the facilities in the study area had received a supervisory visit, including observation of case management, within the previous six months (S. E. Arifeen, personal communication). Common reasons given by health workers for erratic supervision activities are shortages of vehicles, fuel, and staff members.

Problems with referral were also common. The Urgent Referral category in figure 63.1 requires immediate referral to a hospital. In several countries (Bangladesh, Cambodia, Niger, Uganda, and Tanzania), it was reported that children in this category are often not taken to a hospital because of distance or lack of funds for travel and hospitalization-related expenses. For example, in a Tanzania survey, only 5 of 13 children who had been referred were actually taken to a hospital (Schellenberg and others 2003). Also, in some countries hospital staff members who had not been trained in IMCI were reluctant to admit children with danger signs identified through the IMCI algorithm. This situation highlights the need for reinforcing training of referral-level health workers using IMCI guidelines.

Another important limitation, observed in Bangladesh, Cambodia, Niger, and Uganda, is the low use of public sector health care for a variety of reasons (accessibility, official or under-the-table user fees, perceived poor quality, lack of drugs, and so on). For example, using Ministry of Health documents in Niger, the authors estimated that the average annual number of attendances by children under age five was 0.5. In Bangladesh, only 8 percent of children who were ill were taken to a qualified provider (S. E. Arifeen, personal communication). In the presence of such low utilization rates, it is unlikely that health worker training can have an effect on mortality rates, unless simultaneous community activities improve care-seeking practices.

Although equipment and vaccines that are needed for IMCI delivery were available in most countries visited, availability of drug supplies varied from country to country. Shortages were reported in Cambodia and Zambia, and other countries, such as Peru and Tanzania, reported that essential IMCI drugs were mostly available.

Health Sector Policy and Strategic Management Issues. Several of the problems described in the preceding section are directly related to health sector issues. In addition, issues related to higher-level policy and management may also represent constraints to successful IMCI implementation.

In some countries, IMCI was not fully institutionalized at national or subnational levels. For example, a national coordinator was not appointed or was appointed on a part-time basis. In Peru, IMCI was implemented side by side with CDD and ARI programs, which it was expected to replace, and in several districts the ARI coordinator's tasks were expanded to also encompass IMCI. In several countries, IMCI activities did not have a separate budget line, or they were not included in district health plans, or neither. A report on the Analytic Review of IMCI (DFID and others 2003, 39) states, "IMCI was generally introduced as a strategy, not as a program. If this was not a barrier in the pilot phase, it seemed to generate problems for rapid scaling up. In five of the six Analytic Review countries, IMCI focal persons did not have the rank or the responsibility of previous disease specific program managers within their Ministry of Health, and IMCI did not have a budget line and a strong management structure." The report also argued that decentralization, as part of health sector reform, reduced managerial capacity at the central level and had, at least in the short term, a negative effect on IMCI implementation.

Conflict between IMCI guidelines and existing policies and regulations was present in some countries, particularly the former Soviet republics of Kazakhstan and the Kyrgyz Republic, where policies for hospital admission—requiring, for example, that all children with diarrhea be hospitalized—were in conflict with IMCI guidelines. Another regrettable example comes from Brazil, where both doctors and nurses were being trained in IMCI until medical associations threatened legal action to prevent nurses from being trained in using antibiotics for life-threatening conditions. This obstruction succeeded despite an MCE health facility survey that showed that IMCI-trained nurses performed as well as doctors in managing sick children (Amaral and others 2004). In Morocco, IMCI-trained nurses are also unable to prescribe antibiotics because of central regulations.

A particular challenge came to light when the MCE team visited Cambodia and Niger and the Analytic Review team visited Mali. These countries have high levels of under-five mortality and thus the greatest need for IMCI. They also have weak health systems and low utilization rates and are therefore having difficulty implementing IMCI successfully. Just as for individuals, the *inverse care law*—which suggests that those who most need high quality care are the least likely to get it—seems to also apply to countries (Hart 1971).

However, there is a possibility that IMCI (or other approaches to managing sick children) might help strengthen selected health system functions through specific approaches, as the Analytic Review team observed in regard to drug and commodity availability, service management, and health worker motivation through IMCI in the Arab Republic of Egypt (DFID and others 2003).

Implications for Health System Development

The first component of IMCI, which involves training of health care workers, has been implemented in many developing countries and has resulted in important improvements in the quality of care delivered to children in first-level facilities in limited geographic areas. The potential population-level effect of IMCI case-management training has not been realized, however, for three reasons:

- Sufficient resources were not available for full implementation.
- Few health systems in low-income countries are capable of providing the policy, personnel, and managerial support needed to expand and sustain high levels of IMCI training coverage.
- At the time of this writing, not one country had succeeded in mounting a behavior-change program capable of improving care seeking, home management of illness, and nutrition-related practices to coverage levels that will result in population-level changes in service utilization or health status.

One implication for health system development is that support should be continued and expanded for integrated case management in first-level facilities as an essential component of an effective child survival strategy. A second implication, however, is that greatly expanded efforts must be directed

simultaneously to the development of new and innovative approaches to strengthening health systems and to reaching families and communities with known and affordable child survival interventions.

An important distinction can be made between interventions and delivery strategies (Bryce and others 2003). The same intervention (vitamin A capsules, perhaps) can be delivered through different strategies—for example, to children attending health facilities, on National Immunization Days, or directly at the household level through community networks. In spite of its community component—which in most countries has not been operational anyway—IMCI, as implemented to mid 2004, relies on health facilities as its key delivery strategy.

The first component of the IMCI strategy—a focus on improving health worker skills—was innovative to the extent that it provided clear technical guidelines and yet required country-level adaptation. Similar levels of technical clarity and country-level flexibility did not exist for the second and third components of the IMCI strategy, which focused on improving health systems to support IMCI and improving family and community practices. Within these two components, the IMCI strategy has been criticized for attempting to become a uniform global strategy, with guidelines for implementation that do not allow room for country-level modifications, especially the incremental approaches to implementation needed by weak health systems (Bryce and others 2003). The first component of IMCI can serve as a model for the types of development work that must now move forward in the health systems and family practice areas; however, in these areas, key decisions about how best to deliver interventions will need to be made at the country level and below.

One example of progress is that WHO and its partners have now developed a process for assessing country-level opportunities and requirements for achieving population-level behavior change in relation to key family practices and for developing feasible and collaborative work plans for effectively implementing child health activities at the community level (A. Bartlett, personal communication).

As the MCE and Analytic Review have shown, IMCI requires a functional health system with managerial capacity; an ability to train health workers and to keep them on the job; an efficient means of supplying drugs, vaccines, and equipment; and the capacity to maintain regular supervisory activities. It also requires appropriate care-seeking practices, leading to a reasonable level of health services utilization by children under age five. In most countries, appropriate health services utilization is unlikely to be achieved without strong family and household-level interventions such as those promoted by community IMCI.

These problems, however, are not specific to IMCI; they affect every other delivery strategy that relies heavily on health facilities, including the predecessors of IMCI, namely the CDD and ARI programs. In fact, at least in theory, the efficiency gains represented by the integration promoted by IMCI should make it easier for developing countries to implement as the key child health strategy, so a return to vertical programs is not the answer.

Given these difficulties, however, there may be a temptation to bypass health services altogether in the poorest countries by promoting the delivery of child health interventions directly to families and households. There are successful examples of such community delivery schemes—for example, projects dispensing antimalarials (Pagnoni and others 1997; Kidane and Morrow 2000) and antibiotics for pneumonia (Sazawal and Black 1992). This approach may, in fact, be the most viable short-term solution for countries with weak health services, but it should not be forgotten that most success stories represent small-scale pilot projects with strong managerial backup. In countries with weak systems, the managerial support for implementing and sustaining high-quality, community-based interventions is also likely to be lacking, so it may be naive to assume that such programs will have the effects that health services have failed to deliver. Also, just as first-level health facility care depends on referral services for backup, community delivery schemes will require operational first-level health facilities to handle complications and treatment failures.

There is no substitute for strengthening health systems in the poorest countries. In the long run, strengthening these systems will be the key intervention for reducing child mortality as well as for promoting healthy growth and development. Delivery strategies that reach communities either directly or through other mechanisms are needed in the short term, but the long-term goal of improving health services is paramount.

THE RESEARCH AND DEVELOPMENT AGENDA

This section starts by addressing health systems research issues related to scaling up child health interventions effectively. Key issues on the research agenda are how to make the best possible use of integrated case management in settings where health systems are weak and how to design alternative delivery strategies to improve child survival in such settings.

Specific issues relate to how to counteract the main constraints to scaling up IMCI that were described earlier in "Implementation of Programs: Lessons of Experience." For example, research is needed in the following areas:

- how to increase utilization in the public sector (and the role of user fees in this respect)
- how to develop viable public sector–private sector partnerships
- how to reduce staff turnover

- how to improve supervision and make it sustainable
- how to institutionalize IMCI case-management training and supervision at the district level.

In addition, research is needed on how to strengthen health systems and improve family and community practices for child survival in ways that take into account and build on features of the country context. These features include the epidemiologic profile and the characteristics of the health system. Country-level assessments and planning and support for longer-term implementation are required to achieve high and equitable coverage and population effect in different epidemiologic, health system, and cultural settings (Bellagio Study Group on Child Survival 2003). Innovative research is needed involving country-level investigators and program staff members, with international partnerships if required, to develop and evaluate different combinations of health facility–based and household-based delivery schemes. In particular, research should address how to go to scale with interventions that have been proven effective in pilot studies. From the costing perspective, research should address the issue of how to estimate the cost of scaling up using different scenarios of resource availability and constraints.

Monitoring and evaluation are key components of the required research. Tools must be developed for use at the district and national levels, and capacity to use them must be strengthened.

CONCLUSIONS: PROMISES AND PITFALLS

IMCI was introduced in the mid 1990s as an ambitious global strategy that held many promises. Cost-effective vertical interventions against the main causes of under-five mortality in the world were integrated into a single, facility-based health worker training program. The program was accompanied by efforts to improve health systems support for child health care and to promote key family practices at the community level. Integration was expected to further improve coverage levels and the cost-effectiveness of child survival interventions relative to their delivery through separate vertical programs.

IMCI case-management training was repeatedly shown to improve the quality of care delivered in first-level health facilities, and the costing data reviewed above suggest that it can do so at similar or lower costs than those of existing health services. IMCI, therefore, is able to deliver better child health care at no increase in costs.

Nevertheless, community IMCI interventions only reached meager population coverage in the countries studied, and even health worker training was never effectively scaled up in most countries as a result of health system constraints. The major effect on child survival that was initially expected as a result of IMCI implementation has not yet materialized, and country reports of the barriers to achieving and maintaining high coverage levels suggest that effects will not be seen unless IMCI in first-level facilities is buttressed by equally strong or stronger efforts to develop health system capacity and reach families and communities. In fact, progress in child survival in the late 1990s and early 21st century has been slower than in earlier decades (Bellagio Study Group on Child Survival 2003), and current trends suggest that the Millennium Development Goals are unlikely to be achieved for most countries unless major new investments are made very soon.

The Tanzania results suggest that, in a setting where IMCI was implemented in conjunction with health system strengthening and where utilization of health facilities is high, an effect on mortality and nutritional status is likely. However, experience from other countries showed that reaching high and sustained implementation was difficult.

Although IMCI has only partially lived up to initial expectations, it has many positive aspects that must be fostered. A return to isolated vertical programs for child survival will not solve the difficulties faced by scaling up IMCI effectively, and integration should continue to be a key goal of child survival strategies in the future. In fact, much of the frustration associated with reported underperformance of IMCI arises from the fact that sufficient resources—financial, human, and organizational—were not planned for or available to support its full implementation, either at national or at international levels. The meager training coverage levels observed in most of the MCE countries are clear evidence of insufficient implementation, and it is thus not surprising that coverage and effect were also less than expected.

Renewed and expanded efforts to reduce child mortality should build on the proven effectiveness of IMCI case management in first-level facilities, but they also should incorporate new knowledge. Country-specific planning is needed to reach families and communities and to build on the existing health system to achieve and sustain population-level coverage. Countries with weak health systems will require creative approaches to intervention delivery in the short term at the same time that health systems are strengthened as a long-term strategy. The poorest strata of the population are also the neediest in terms of health care and the hardest to reach. The challenge of improving equity is not unique to IMCI or to child survival; it affects virtually every intervention and delivery strategy. Unless equity considerations become a key part of policy making and of monitoring outcomes, interventions may widen instead of narrow inequity gaps (Victora and others 2003).

A continuing challenge is how to raise and sustain the standing of child survival in the international agenda. The more than 10 million annual deaths of children under age five—more than 20 deaths per minute—represent twice the number of

deaths attributable to AIDS, malaria, and tuberculosis combined (Black, Morris, and Bryce 2003). Putting child survival back on the public health and development agenda is an essential developmental step in the process of refining country-level and global child health strategies. Only through taking stock of the lessons learned in early IMCI implementation can a flexible, integrated program be developed that will improve child survival in particular and child health in general.

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