

Adopting Integrated Management of Childhood Illness Module at Local Level in Bangladesh: Implications for Recurrent Costs

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ABSTRACT

This study estimated the recurrent cost implications of adopting Integrated Management of Childhood Illness (IMCI) at the first-level healthcare facilities in Bangladesh. Data on illnesses of children who sought care either from community health workers (CHWs) or from paramedics over a four-month period were collected in a rural community. A total of 5,505 children sought care. About 75% of symptoms mentioned by mothers were directly related to illnesses that are targeted in the IMCI. Cough and fever represented 64% of all reported complaints. Referral of patients to higher facilities varied from 3% for the paramedics to 77% for the CHWs. Had the IMCI module been followed, proportion of children needing referral should have been around 8%. Significant differences were observed between IMCI-recommended drug treatment and current practice followed by the paramedics. Adoption of IMCI should save about US\$ 7 million on drugs alone for the whole country. Proper implementation of IMCI will require employment of additional health workers that will cost about US\$ 2.7 million. If the current level of healthcare use is assumed, introduction of IMCI in Bangladesh will save over US\$ 4 million.

Key words: Integrated Management of Childhood Illness; Infant mortality; Child mortality; Economics, Health; Costs and cost analysis; Cost-benefit analysis; Prospective studies; Bangladesh

INTRODUCTION

The strategy of World Health Organization/United Nations Children's Fund (WHO/UNICEF) for Integrated Management of Childhood Illness (IMCI) is aimed at reducing child mortality and morbidity in developing countries. The WHO and UNICEF jointly developed guidelines for integrated management of childhood illness at the first-level health facilities to address five leading causes of childhood deaths in the world (1). These five diseases are: pneumonia, diarrhoea, measles,

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malaria, and malnutrition. These are associated with about 70% of all childhood deaths in developing countries (2).

It has been reported that at least three of four children seeking medical care suffer from one of these five conditions. There is a considerable overlap in signs and symptoms of several major childhood diseases. A single diagnosis for a sick child is often inappropriate, because it identifies only the most apparent problem and can lead a medical care provider to overlook an associated and potentially life-threatening condition (3). Inappropriate management of childhood diseases is a wastage of scarce resources and increases the probability of mortality and morbidity of children.

The integrated management of sick children should allow more accurate identification of illness in outpatient

settings and may ensure more appropriate, combined treatment for all major illnesses (4). IMCI is also considered more efficient in identifying severe cases and helps speed up referrals of severely-ill children for better care (5). Studies conducted in rural Kenya and Ethiopia found that health workers using the guidelines could correctly identify over 90% of cases of pneumonia, malaria, malnutrition, and anaemia that had been diagnosed by an expert paediatrician with the help of a number of diagnostic tests (6,7).

The purpose of this paper is to examine recurrent costs associated with adoption of the IMCI module at the first-level health facilities in Bangladesh. Policy-makers often need information on cost to decide whether a new approach of managing child health will be feasible from financial point of view. This study estimates the recurrent costs Bangladesh must allocate every year for successful implementation of IMCI.

MATERIALS AND METHODS

Study area

The study was conducted in the experiment site of ICDDR,B: Centre for Health and Population Research, located at Matlab in Chandpur district of Bangladesh, 55 km southeast of the capital city Dhaka. Four subcentres, run by ICDDR,B in Matlab, are located in four blocks, which are basically the catchment areas defined by the Matlab Health Research Programme in its experiment site (8). Sixty Community Health Workers (CHWs) provide healthcare through bi-weekly home visits. In addition to their routine counselling and data collection, they also treat children with minor illnesses, identify and refer children with severe illnesses and malnutrition to the subcentre clinics. In each subcentre, two paramedics provide medical care. They may also refer children to the government clinics and hospitals for further management, if necessary.

In the ICDDR,B intervention area in Matlab, the health centres are run quite efficiently with relatively high population coverage. We have chosen to carry out this prospective costing study in Matlab, so that the estimates reflect the incremental cost of IMCI when implemented in fully-functional health facilities in the country.

Sampling and data collection

All children aged two months to five years visiting the subcentres or treated at home of a CHW were included in the study (cases treated by the CHWs at the homes

of children were excluded). The CHWs and paramedics collected data using three sets of structured questionnaire.

Illness questionnaire I was developed to collect necessary information for categorizing sick children into IMCI-defined illness and management groups. The CHWs used this questionnaire to obtain and record IMCI-related data. They also recorded the time spent for physical examinations and management of sick children, including counselling to mothers.

Illness questionnaire II was designed to collect data on children who visited the subcentres. This questionnaire intends to obtain all the information a paramedic collects on a regular basis and some additional information needed for classification of illnesses. Information collected through this questionnaire included: complaints of patients, duration of illness, main findings of physical examinations of patients, medical management (drug treatment and advice) given, whether or not the patients were referred to a higher-level facility for further management, etc. Weights of children visiting the subcentres were obtained from the outpatient registers.

The Prevalence of Childhood Illnesses Form was used for collecting community-level information on morbidity. The CHWs, during their regular home visits, record cases of selected morbidities of children occurring in households over the preceding two weeks. Since the ICDDR,B surveillance system monitors data collection quite closely, data are considered to be of very high quality. Therefore, the illnesses as identified in home visit should reflect underlying morbidity of children in the community. The data-collection form was designed to transfer morbidity data from the record books of CHWs.

Data were collected during July 1998-January 1999, except during the July-September 1998 period when a widespread flood occurred in Bangladesh. Data collected in the field were transferred from Matlab to Dhaka on a regular basis. Coding of data was done immediately after the filled-up questionnaire reached Dhaka, and data were entered using FoxPro in an interactive mode with consistency and bound checks.

Deriving IMCI-defined illness and management categories

Categories of illnesses under IMCI were constructed based on the primary symptoms and findings from physical examinations noted by the CHWs and paramedics. The CHWs were instructed to ask all sick children each and every question listed in the Questionnaire I, which is based

on the steps recommended by the IMCI module. Therefore, for a child who presented only with respiratory difficulty was also asked and examined for diarrhoea, fever, measles, malnutrition, immunization, and ear problem.

IMCI advocates differential diagnoses for complaints of the same problem. For example, a child presenting with cough and fever is not diagnosed to have acute respiratory infection (ARI). IMCI identifies this condition as respiratory difficulty depending on the severity and other associated findings. At the same time, IMCI recognizes the presence of fever and categorizes fever according to its severity. One important aspect of categorization of fever under IMCI is based on the risk of malaria in the high-prevalence regions of the world. Considering Matlab as a low-prevalence area for malaria, no fever cases were considered malaria.

Method of costing inputs

Using information on symptoms, physical check-ups, etc., two physicians prepared dummy prescriptions for each case based on the IMCI module. This was done without referring to drug management given to children by the CHWs and paramedics. Market prices were used for estimating the economic value of drugs rather than the cost of procuring drugs by the ICDDR,B healthcare-delivery system.

An important component of recurrent cost is personnel cost associated with implementation of IMCI. For estimating time inputs needed for IMCI, the study collected data on the time spent by the health workers

when all queries in the IMCI module were addressed, including diagnosis and management. Data on time inputs were collected at the CHW level with an assumption that the time needed to collect information was equally time-intensive at the CHW and subcentre levels. Time needed to manage a child without IMCI (current practice) was obtained through a subjective opinion survey of all the CHWs and paramedics in Matlab. In a meeting in Matlab, the CHWs and paramedics were asked about the time they normally spend in a visit on an average for a sick child. The current salary of health workers in the government sector was used for valuing the time of healthcare providers.

RESULTS

Illness pattern among children surveyed

A total of 5,505 children sought care from the CHWs (1,921) and subcentres (3,584), with a slightly higher proportion of male children (55%) visiting the health centres than females. About one-fourth of the children seeking care were aged 1-2 year(s), and about 38% were aged less than one year. The average number of symptoms reported was 1.72 per child. Three-fourths of the reported symptoms were related to respiratory ailments (cough), fever, and eye problems (Table 1). Cough was the most frequent symptom reported (38%), followed by fever (26%) and eye diseases (9%). Diarrhoea and dysentery taken together represented only 3% of the total reported illnesses. This low incidence of diarrhoea and dysentery may be due to a number of special circumstances in Matlab. First, the CHWs during

Table 1. Prevalence of reported symptoms among children seeking care from community health workers and paramedics of Matlab by sex

Illness category or reported symptoms	Male (n=2,998)		Female (n=2,507)		Total	
	No.	Symptoms/1,000 patients	No.	Symptoms/1,000 patients	No.	%
Cough	2,036	679	1,587	633	3,623	38
Fever	1,356	452	1,090	435	2,446	26
Eye problems	443	148	385	154	828	9
Runny nose	271	90	244	97	515	5
Skin problems	231	77	199	79	430	5
Oral sore	287	96	217	87	504	5
Diarrhoea/dysentery	172	57	141	56	313	3
Ear problems	156	52	168	67	324	3
Worms	59	20	58	23	117	1
Abdominal problem	64	21	48	19	112	1
Injury/burns	39	13	36	14	75	1
Others	103	34	84	33	187	2
Total	5,217	1,740	4,257	1,698	9,474	100

Source: Survey in Matlab area, Bangladesh, during 1998

their home visits treated diarrhoea cases, or the diarrhoea cases directly went to the Matlab hospital, or the people in Matlab practised home-based treatment for diarrhoea effectively reducing the need for visiting the healthcare providers. Among other broad categories, skin problems (5%), oral sore (5%), and ear problems (3%) accounted for 13% of the total illness cases.

The nutritional status of a subsample (3,259) of children, seen by the CHWs (404) and paramedics (2,855), was assessed by weight-for-age z-score (WAZ). Slightly more than half (52%) of the children were less than -2SD by WAZ. Children below -3SD weight-for-age were considered severely malnourished (20%). About 33% of the children were moderately malnourished. The higher prevalence (55%) of malnutrition was observed among boys than girls.

Referral to higher facilities

About 77% of the children seeking care from the CHWs were referred to the higher facilities for further treatment, whereas only 3% were referred by the paramedics. Had the IMCI guidelines been followed, the estimated referral cases should have been about 8% of all patients. The high referral rate at the CHW level should not be used for costing IMCI at the first-level facilities, because the CHWs in the ICDDR,B area are encouraged to refer patients to the subcentres.

Of 8% of the cases IMCI would have referred, about 78% were of urgent type, which included children with severe illnesses, such as severe pneumonia, severe persistent diarrhoea, very severe febrile diseases, severe complicated measles, mastoiditis, severe malnutrition,

or severe anaemia. These children, according to IMCI, should be recommended urgent referral after one dose of appropriate antibiotic and/or paracetamol. Referral for follow-up was recommended for children with fever for more than one week, cough for more than one month, and for nutritional assessment.

Types of illness according to IMCI classification

Table 2 presents the distribution of sick children according to IMCI categories. Respiratory ailment was the most prevalent illness category (26.2% of total cases), followed by febrile illness (20.7%). Since Matlab is an area with low risk of malaria, all febrile illnesses were considered ordinary fever. On the other hand, diarrhoea and dysentery represented only 2.5%, while ear problems accounted for 3.1% of the illnesses. One-fourth of the total illnesses were classified under 'Other' category, which included skin diseases (13%), eye problems (4.8%), oral sore (4.5%), and worm infestation (0.8%).

Drug-use pattern: current practice and IMCI

Several significant differences were observed between IMCI-recommended drug treatment and current practices of the CHWs and paramedics. Table 3 compares the drug-use pattern of the paramedics with that recommended by the IMCI module. The IMCI module recommended 'soothing syrup' for 52% of all illnesses. It used significantly less antibiotics compared to the current practice in both relative and absolute terms. IMCI would have prescribed paracetamol to only 7% of the cases, but the CHWs and paramedics prescribed it to more than half of all cases seen. IMCI recommends paracetamol only if temperature of a child is 38.5 °C or over, but the

Table 2. Distribution of children seeking medical care from community health workers and paramedics by IMCI illness category

IMCI illness category	Level of care					
	Community health workers		Paramedics		Total	
	No.	%	No.	%	No.	%
Cough or respiratory distress	1,197	25.4	2,132	26.5	3,329	26.2
Diarrhoea/dysentery	228	4.8	88	1.1	316	2.5
Febrile illness						
High risk of malaria	-	-	-	-	-	-
Low risk of malaria	1,137	24.1	1,491	18.5	2,628	20.7
Measles (with or without complications)	45	1.0	-	-	45	0.4
Ear problems	171	3.6	217	2.7	388	3.1
Malnutrition*	994	21.1	1,883	23.4	2,877	22.6
Others	944	20.0	2,231	27.7	3,175	25.0
Total	4,716	100	8,042	100	12,758	100

* Adjusted numbers of malnourished children

Table 3. Comparison of cost of drugs prescribed by paramedics and IMCI recommendation by IMCI illness category for children seeking care

Illness type based on diagnosis made by paramedics	Cost of drugs prescribed by paramedics at subcentres		Cost of drugs if IMCI-suggested prescription used	
	Total cost (Tk)	Average cost (Tk)	Total cost (Tk)	Average cost (Tk)
Respiratory ailments	66,146	40	32,112	15
Diarrhoea/dysentery	1,605	32	1,785	20
Skin problems	51,757	50	51,757*	50
Ear problems	8,043	51	2,954	14
Worm infestation	134	5	204	3
Fever	1,060	19	3,600	2
Injury	2,695	53	2,695*	53
Others	4,384	26	4,384*	26
Total	136,071		99,738	

* Drug prescribed by IMCI for these illness types are assumed to be same as the drug prescription of paramedics. The IMCI module does not have any recommendation for prescription for their categories of illnesses

normal practice of health workers in Bangladesh is to prescribe it if the temperature is 37.5 °C or over.

About 36% of the total drug cost in treating children was for 'soothing syrup', which is recommended for patients with cough or any type of difficult breathing. Although one-fourth of disease burden in this study was related to respiratory problems, the cost for treating those cases became relatively more important due to widespread use of the syrup. The IMCI module avoids the use of any antihistamine syrup for children with difficult breathing, and the market value of soothing syrup recommended (warm water, honey, lemon juice, *tulsi* leaf juice, ginger juice, etc.) is not easy to determine. It was assumed that had the time and other costs of preparing soothing syrup been considered, the cost per case would be about Tk 10 (US\$ 0.20).

The total drug cost to treat 5,505 children in the survey area was estimated at Tk 166,271 (US\$ 3,428), i.e. average drug cost per child was Tk 30 (US\$ 0.62). The estimated drug costs under current illness-management practices and under the IMCI guidelines at the CHW and subcentre levels differ quite significantly. Therefore, the average drug cost per illness episode should be derived by taking a weighted average of drug costs at the CHW and paramedic levels. The weighted average of drug cost for the current practice becomes about Tk 44, over 40% higher than the drug cost expected with full implementation of IMCI.

Country-level estimation of drug costs

Using the prevalence of childhood illnesses and health-seeking behaviour in Matlab, drug costs at the country level with and without IMCI have been estimated

(Table 4). If the current pattern of prescribing is replaced by the IMCI-recommended drug use, the cost of drugs will actually decline. This cost-saving per case was scaled up to the country level to obtain the aggregate saving in drug costs after implementation of IMCI. The drug-related cost-saving of US\$ 6.8 million was based on the assumption that the current practice of CHWs and paramedics in Matlab is representative of the medical management practice of health assistants and other health auxiliaries in rural Bangladesh. In reality, a significant proportion of childhood illnesses is managed by private-sector healthcare providers who prescribe higher amounts of drugs than that observed in Matlab (9). Moreover, the paramedics and CHWs in the ICDDR,B area follow a conservative approach of drug prescribing. Therefore, the average drug cost per 1,000 children should be higher than Tk 5,232 (US\$ 108). A second assumption used in the estimation of drug cost is that the drugs prescribed by the current practice were available in the public sector to be reallocated to IMCI.

Of US\$ 410 million that the Government of Bangladesh spent on health and family planning in 1999, US\$ 220 million was spent on health and the rest on family planning. The health expenditure is divided equally into salary and non-salary expenditure; in other words, non-salary expenditure was about US\$ 110 million. The government statistics do not provide further disaggregation of non-salary recurrent expenditure. However, informal discussions with officials of the Ministry of Health and Family Welfare suggest that about 20% of non-salary costs are allocated to drug procurement at the primary health centre level. Using this proportion, drug costs should be about US\$ 22

Table 4. Average drug cost at the first-level health facilities in Bangladesh with and without IMCI

Item	Current practice in Matlab	With implementation of IMCI
Percentage of all sick children managed by CHWs ¹	5	0
Percentage of all sick children managed by paramedics ¹	45	50
Number of sick children/month ²	240/1,000 children	240/1,000 children
Number seeking care/month ³	120/1,000 children	120/1,000 children
Average drug cost/managed case (from survey information)		
At CHW level	Tk 31	Tk 20
At subcentre level	Tk 45	Tk 30
Average drug cost per case managed	Tk 43.6	Tk 29.0
Drug cost per 1,000 children/month	Tk 5,232	Tk 3,480
Estimates for Bangladesh		
Number of children aged less than five years	15,700 thousand	15,700 thousand
Total drug cost in Tk/year	985.71 million	655.63 million
Total drug cost in US\$*	20.32 million	13.52 million
Drug cost saving (US\$) per year over the current practice	6.80 million	
Public allocation (US\$) for drugs for children	3.3 million	
Additional drug costs (US\$) for full implementation of IMCI	(13.52-3.3) million=10.23	

¹ Estimated from the relative number of cases fully managed at these levels

² Estimated from the cases of morbidity reported by CHWs during home visits

³ Calculated from the number seeking care during the survey and total number of sick children as reported by CHWs

* 1 US\$=48.50 Taka

million per year. In Bangladesh, about 15% of population are aged less than five years, and if allocation of drugs for child health is also 15% of total, US\$ 3.3 million becomes available to buy drugs for children.

Implementation of IMCI should not require any additional allocation of resources for diagnostic tests or other medical supplies. The IMCI module was designed to be implemented at the first-level facilities in the developing world where access to diagnostic facilities is either limited or absent. Since IMCI requires health workers to collect more information than the current practice, use of non-medical supplies may increase slightly.

Need for additional health personnel

Time spent by the health workers in the survey area to examine sick children and to manage them medically is the actual time they spent in implementing the quasi-IMCI questionnaire, conducting physical examinations, managing the case medically, and counselling. The average time required for a single case was 16 minutes, including the time spent for advising mothers about the drugs prescribed. There was no significant gender variation in the average time spent. Less than 20 minutes were required to manage about 87% of the cases, whereas for only 17% of the cases, the required time exceeded 20 minutes. A number of factors, including the severity

of illness, cooperation from the side of sick child during medical management, and inter-provider differences in practice pattern, may explain the variability of time spent per case.

To estimate the additional personnel cost of managing illness cases by IMCI, time spent on a child under the current practice was obtained through a qualitative approach. In a meeting of all CHWs and paramedics in Matlab in early July 1999, all the healthcare providers present were asked to report on the average time required for managing a child under the current practice (without using the IMCI module). At the group meeting, the CHWs and paramedics decided that the average time they usually spend on a sick child for physical examinations and medical management was about eight minutes.

Personnel costs with and without IMCI were calculated using the parameters and estimates of additional time requirement of medical care providers for practising IMCI (Table 5). The full-time equivalent (FTE) of health workers needed for IMCI was estimated by assuming that one working day is about six hours of effective work, and there are 240 working days in a year. To value the time of health workers, average salary and benefits were assumed to be at Tk 48,000 (US\$ 990) per year. Most time-use studies indicate that the effective work-time per day is actually less than six hours in

Table 5. Requirement of additional health workers for a switch over from current management practice to IMCI		
Parameter	Current practice in Matlab	IMCI
Time (minutes) input needed/child	8.0	16.3
Counselling (minutes)	0.4	2.5
Total time (minutes)/child	8.4	18.8
Number of sick children/month	240/1,000	240/1,000
Number of children seeking care/month	120/1,000	120/1,000
Time (minutes) needed/1,000 children/month	1,008	2,256
Number of children in Bangladesh	15,700 thousand	15,700 thousand
Time needed for Bangladesh (FTE=6 hours/day)	2,198	4,919
Time needed (FTE=4 hours/day)	3,297	7,378
FTE estimated by assuming 6 or 4 hours of work/day (240 working days in a year)		
Salary and benefits per year (Tk)	48,000	48,000
Total salary cost (Tk) when FTE=6 hours/day	105.50 million	236.11 million
Additional salary cost (Tk) for 6 hours/day	130.61 million	
	=US\$ 2.69 million	
Total salary cost (Tk) when FTE=4 hours/day	158.25 million	354.14 million
Additional salary cost (Tk) for 4 hours/day work	195.89 million	
	=US\$ 4.03 million	
Sources: Matlab survey data, 1998 Bangladesh Bureau of Statistics, 1998		

Bangladesh, but improved quality of services and better management can potentially increase the effective time of health workers. Therefore, the additional personnel cost reported here assumes the use of time at the full capacity of health workers.

If Bangladesh implements the current practice fully in all areas, the health personnel requirement will be about 2,200 full-time equivalents. In fact, the Ministry of Health and Family Welfare has already employed a sufficient number of health workers for full implementation of the current practice. However, implementation of IMCI at the community level will require additional health workers. The time requirement parameters suggest that proper implementation of IMCI will require an additional 2,700 health workers to deal with childhood illnesses (9).

DISCUSSION

This study has estimated the recurrent cost of providing curative child health services under the current practice and IMCI, with emphasis on cost items likely to change with the implementation of IMCI. Use of diagnostic services, medical and non-medical supplies, etc., which are unlikely to change significantly due to implementation of IMCI, were not included in the costing exercise. In this sense, the analysis provides the incremental recurrent cost of implementing IMCI rather

than its full cost at the first-level facilities. The incremental cost calculations are based on drug and personnel costs—two most important recurrent cost components of the health system of Bangladesh.

Cost per case under the current practice in Matlab requires Tk 44 in drugs and Tk 5 in terms of time of a health worker. If IMCI is adopted in Matlab, drug and personnel costs per case should become Tk 29 and Tk 10 respectively. Therefore, the incremental cost of implementing IMCI becomes negative, indicating that the health system will save Tk 10 per case compared to the current practice in Matlab. If we use the illness pattern of children seeking care from the public facilities, drug cost per case becomes Tk 25 with IMCI and Tk 37 without IMCI if the health workers in the public facilities follow the drug-dispensing pattern of Matlab paramedics. However, current utilization pattern of public facilities grossly underestimates the IMCI recurrent costs. The public facilities are under-used due to poor quality of services provided, frequent absence of providers, and lack of drugs at the facilities. With full implementation of IMCI, the pattern of use (although the disease pattern may remain different) of facilities by sick children should approximate the pattern observed in Matlab. In our calculations, we have assumed that the utilization pattern of public facilities will become similar to the observed use pattern in Matlab after the implementation of IMCI.

One study, carried out in the ICDDR,B extension project area, reported the use of publicly-run family welfare centres (FWCs) in Bangladesh (10). The study found that the number of children seen at the FWCs by the first-level healthcare providers, Family Welfare Visitors (FWVs), and Health Assistants (HAs) was 195 in a month, or about 122 children per month per provider (FWV spends 60% of her time at FWC, while the HA is a full-time provider). The number of children seen by a paramedic in a month at the ICDDR,B subcentres is 244, on an average—exactly double the number seen by an FWV or an HA.

If we use the illness pattern observed in the public facilities and illness-specific average cost of treatment when IMCI is followed, excluding well-baby care and preventive care visits, the drug cost per case becomes Tk 24.79—about 15% lower than the average drug cost for the disease pattern observed in Matlab. The cost of drugs given to children at the government facilities (FWCs) was only Tk 7.25 per child, although the cost would have been Tk 37 if the health workers followed the drug-dispensing pattern of Matlab paramedics. Actual dispensing of drugs for sick children from the public facilities cannot be used for estimating the incremental cost of IMCI. Leakage of drugs from the system and preference given to adults in drug dispensing bias the results.

In Matlab, the IMCI approach did not recommend any antimalarial drug (chloroquine) due to low risk of malaria in the survey area. In a high-risk area for malaria, the drug cost will be higher due to the use of antimalarial drugs for fever cases. For example, if the survey site was a high-risk area for malaria, the total drug cost will increase by 13% due to the use of antimalarial drugs, and the drug cost per malaria case would have been Tk 32 according to the IMCI module.

Another critical assumption in costing IMCI is to define the ‘usable’ part of the slack time of health workers. Given the number of patients seen in the public facilities and using the average time use per case under the current practice, it appeared that the healthcare providers used about 25% of their time in service provision. The slack time should improve with increasing use, but it may not be possible to convert all available slack time into productive hours. Two assumptions were used about the rate of use of slack time. The first approach assumes that 75% of the total working hours will become productive if the use of health facilities goes

up. The rest of slack time will be spent on administrative work, lunch, and other breaks. In this case, the incremental personnel cost in IMCI will become US\$ 2.7 million for the whole country. The second assumption considers 50% of the total time as potentially productive. With this assumption, the incremental personnel cost in IMCI becomes US\$ 4.0 million.

Compared to the amount of resources currently available, effective implementation of IMCI in the whole country will need an additional US\$ 10.2 million per year for drugs and another US\$ 2.7 million for additional health workers. The additional cost of personnel is based on the assumption that the health workers will provide curative care for six hours a day. Therefore, the estimate may be considered the lower limit of additional resources needed if IMCI is implemented in the healthcare system which has been made ‘functional’ by improved availability of drugs and healthcare providers. Using these additional cost estimates of drugs and personnel, the incremental cost of running IMCI will be US\$ 12.9 million, or about US\$ 0.81 per child per year.

Requirement of this additional resource is not due to the switch over from the current management strategy to IMCI. The current use of public healthcare facilities is so low that effective implementation will require expansion of service provision. In fact, if we consider a simple replacement of the current practice pattern by IMCI without expanding the coverage of services, the incremental cost of IMCI becomes negative. The cost of treating a case of childhood illness is lower if IMCI is used rather than the current practice. Drug-related cost-saving per year for implementing IMCI over the current practice is about US\$ 6.8 million, although an additional time requirement of health workers will cost about US\$ 2.7 million, implying a net saving of US\$ 4.1 million.

One aspect of IMCI recurrent costs not considered here is the cost of managing referral cases. Although IMCI would have referred less than 10% of the cases to the higher facilities, availability of referral services is an important component of the IMCI package. This paper did not estimate the cost of referrals due to lack of well-run referral facilities in the area. If the IMCI module is followed, about 22% of the referred cases, as found in the survey, will likely be for further assessment rather than for life-threatening conditions, and the additional cost of these cases may not be very high. The remaining 78% of referred cases (6% of all cases) may require expensive procedures and medical management

strategies. Future studies should obtain information on costs associated with referral cases in rural Bangladesh. Given the relatively poor quality and quantity of referral services available in Bangladesh, IMCI may have to proceed with its implementation without significant changes at the referral level, and, therefore, the incremental cost implications during the initial few years of IMCI may ignore the referral cost implications.

In this study, emphasis was given on the recurrent costs of IMCI, not the actual cost of adopting IMCI and its implementation from the initial start-up. The costs of developing and adopting the module and of training the health workers were not considered here. Since many of these cost items are needed only at the outset, international organizations can help mobilize these start-up costs. In fact, the recurrent cost is the most important threat to sustainability of any health programmes rather than the initial cost of start-up and implementation. The policy-makers should carefully examine how to ensure adequate funding to cover the recurrent costs, so that IMCI can continue to provide quality services to the population in the long run.

This study presents an estimate of minimum necessary recurrent cost for providing IMCI in a poor rural economy. It also illustrates a method of estimating resource requirements prior to actual implementation of IMCI, so that the policy-makers can appropriately reallocate the available resources. In many cases, developing countries readily agree to adopt new programmes proposed by international agencies without careful consideration of costs. If the planners in a country decide to adopt IMCI after examining the cost implications, it is more likely to become a successful and sustainable approach to providing child healthcare.

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