Integrated Management of Childhood Illness (IMCI) in Bangladesh: early findings from a cluster-randomised study

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Summary

Background **We report the preliminary findings from a continuing cluster randomised evaluation of the Integrated Management of Childhood Illness (IMCI) strategy in Bangladesh.**

Methods **20 first-level outpatient facilities in the Matlab sub-district and their catchment areas were randomised to either IMCI or standard care. Surveys were done in households and in health facilities at baseline and were repeated about 2 years after implementation. Data on use of health facilities were recorded. IMCI implementation included health worker training, health systems support, and community level activities guided by formative research.**

Findings **94% of health workers in the intervention facilities were trained in IMCI. Health systems supports were generally available, but implementation of the community activities was slow. The mean index of correct treatment for sick children was 54 in IMCI facilities compared with 9 in comparison facilities (range 0–100). Use of the IMCI facilities increased from 0·6 visits per child per year at baseline to 1·9 visits per child per year about 21 months after IMCI introduction. 19% of sick children in the IMCI area were taken to a health worker compared with 9% in the non-IMCI area.**

Interpretation **2 years into the assessment, the results show improvements in the quality of care in health facilities, increases in use of facilities, and gains in the proportion of sick children taken to an appropriate health care provider. These findings are being used to strengthen child health care nationwide. They suggest that low levels of use of health facilities could be improved by investing in quality of care and health systems support.**

Introduction

Mortality in children younger than 5 years (under-5 mortality) remains high in Bangladesh at 85 in 1000 livebirths, despite declines over the past decade.[1] Pneumonia, diarrhoea, malnutrition, and measles account for more than half (52%) of these deaths.[2] In 1998, the Government of Bangladesh adopted Integrated Management of Childhood Illness (IMCI) strategy to reduce these deaths and improve child health and development.

The IMCI strategy was designed to include coordinated activities within three components: (1) improving health worker skills; (2) improving community practices related to child health and development; and (3) strengthening of health system supports for child health activities.[3] IMCI has been introduced in more than 100 countries (http://www.who.int/child-adolescent-health), but evaluations of IMCI effectiveness in Brazil, Peru, Tanzania, and Uganda showed substantial obstacles to achieving and sustaining high coverage.[4] Although training of health workers in IMCI case management has been shown to lead to substantial improvements in several settings,[5,6] national training coverage has stagnated at less than 10% in most countries because of health system constraints and insufficient investment.[7] In many countries, only the health worker training component of IMCI was implemented, without complementary efforts to improve careseeking and other family practices or concrete activities designed to strengthen the health system.[7] For example, in Peru, activities to strengthen family practices were mostly implemented in districts other than those where strong programmes of IMCI case management training had occurred.[8] There is now widespread recognition that IMCI is unlikely to result in improvements in child survival unless facility-based training activities are accompanied by effective efforts to strengthen health systems and reach children and mothers in the community. Sustained improvements in health services can happen only in the context of appropriate political structures and policies.

Bangladesh provided a natural opportunity to add a fifth country to the multi-country evaluation of IMCI in which the effect of IMCI could be assessed in close-to-ideal conditions.[4] The evaluation was planned and is being undertaken through active collaboration between the Government of Bangladesh, the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B), and WHO. The overall aim is to assess the health and economic effects of IMCI under conditions where all three components of IMCI are implemented concurrently in a population at high levels of quality and coverage. The design of the assessment rests on the assumption that the full implementation of IMCI will result in a 20% decline in under-5 mortality (excluding perinatal deaths, against which IMCI has little effect), which is the primary objective at the facility catchment level (cluster level). Measurable effect is expected within 2 years after full implementation of the strategy has been

achieved.[4] Because the intervention was allocated at the level of health facility (and respective catchment areas), a cluster design was necessary for the study.

This paper describes the methods used to collect baseline and monitoring information for the evaluation, including formative research to guide the design and delivery of the interventions. Results focus on the extent to which the three components of IMCI have been implemented to date, the coverage levels achieved, and the effects of IMCI on interim outcomes that include quality of care, careseeking, and use of Government of Bangladesh health facilities. However, mortality outcomes are not addressed in this interim paper. Except for use of facilities, which is a cluster (facility-catchment) level outcome, all other outcomes are reported at the level of the individual. Throughout the paper, particular attention is given to issues relating to health systems.

Methods

Setting and population

The study is being implemented in areas of Matlab upazilla (sub-district) not covered by child and reproductive health services provided by the ICDDR,B: Centre for Health and Population Research. The total population of the study area is about 350 000. The sampling frame included 20 of the 24 first-level outpatient facilities in the study area and their catchment areas. The remaining four units were excluded because substantial portions of their catchment populations received child health services from ICDDR,B and not from government facilities. Random allocation was based on clusters where the 20 facility/catchment area units were first paired in terms of facility type, geographical distribution, baseline mortality levels, and catchment population size. Baseline mortality was obtained through a census and demographic survey of all households in the study area. The units in each pair were randomly selected for either IMCI or comparison, thus ensuring balance in terms of these characteristics. Randomisation was done by blindly drawing a card with unit names from each pair and assigning it to IMCI, the other being assigned to comparison. The selection sequence was concealed until the groups were assigned.

The sample size was designed to include the number of facilities (and catchments) necessary to detect a 20% fall in under-5 mortality over and above the expected long-term reduction in deaths, to be measured in 2007. We estimated the under-5 mortality rate expected at the end of the project (93·5 per 1000 livebirths) and SD of catchment under-5 mortality estimates (9·0) with data from the Matlab Health and Demographic Surveillance System.[9,10] We used standard sample size formulas for a difference in means, regarding each facility and its catchment area as one unit and assuming the measure of under-5 mortality in that area to have a normal distribution. The estimation was done iteratively, based on the t-distribution, significance level of 5% and 90% power. The *t*-distribution was used instead of the normal distribution, because we expected a small sample size. The final calculations indicated a need for 6·16 units in each group. These calculations used $\alpha=2\cdot26$ and $\beta=1\cdot38$ from the *t*-distribution for 9 degrees of freedom. Degrees of freedom=$n-([s-1]+m+t)$, where $n=14$ (total units), $s=4$ (number of strata), $m=1$ (mean effect), and $t=1$ (treatment effect). We increased the sample size estimate by 1·5 times to account for any inaccuracy in the SD estimate, resulting in at least ten units in every group.

Procedures

A baseline household health and morbidity survey was done in mid-2000 on a systematic sample of 2066 under-5 children identified in a comprehensive census of the area to provide baseline data about child mortality. Standard indicators from the multi-country evaluation were measured with an adapted version of the generic survey instrument (http://www.who.int/imci-mce). Questions were included to elicit accounts of health careseeking during the illness episode. All data collectors were trained in the use of this instrument and completed forms were reviewed and edited immediately by supervisors.

A baseline survey of health facilities was done in 19 of the 20 study health facilities between August and October, 2000. One facility was not assessed because it was not functioning at the time of the survey. Generic WHO/multi-country evaluation instruments and procedures for the evaluation of quality of care and costs (http://www.who.int/imci-mce) were adapted for use in the Bangladesh context. Summary indices showing the completeness of the health worker's assessment of the child and correct case management were constructed with these data. Observations of case management were used to calculate indices, ranging from 0 to 100, for both assessment and treatment or counselling. These indices have been shown to be valid and reliable measures of quality of care.[11] Data collectors were trained in IMCI and in the use of the survey forms, including field practice. Completed forms were reviewed and edited daily by supervisors.

We did formative research to inform intervention design and to understand more fully the specific barriers to full implementation and use of the interventions likely to be encountered in Bangladesh by children and families. A range of complementary methods were used, including key informant interviews, detailed narratives of home-based treatment and sequences of health seeking behaviours from mothers, free-listing and rating exercises, and hypothetical case scenarios. Examples of the types of topics addressed in several sub-studies included careseeking for pneumonia, local feeding practices, and reasons for successful and unsuccessful referral from first-level to referral-level facilities.

Continuous monitoring was a key part of the study design, providing information on the progress of implementation and allowing mid-course corrections and refinements. Study staff systematically recorded details of all implementation activities, including costs.

The baseline survey has been repeated in the study population once every 6 months since January, 2002. In this paper we report on four survey rounds, the last of which was completed in December, 2003. Data were obtained from a random sample of under-5 children, with some differences in the sampling schemes and sample sizes of the survey rounds. In the first round of data collection, the same households surveyed at baseline were visited and all under-5 children in those households were included (final sample 2082). In the second survey round, the same under-5 children identified in the first round were visited. The completed sample was smaller (2009) since some children were now older than 5 years and others had left the area. Since the cohort was getting older, and the actual sample size was smaller than required (2200), the sampling scheme was changed from round 3 onwards. For the first round in each calendar year, a fresh sample of 2200 households from the original household census was drawn, half in IMCI and half in comparison areas. Data collectors located the sampled households and selected one under-5 child or, if a child was not found there, selected a family with a under-5 child nearest to the index household. If there was more than one child in a household, only one was randomly selected by listing the children in order of age and then using a table of random numbers to select one child from the list. We also decided to visit the same children in the second round in the same calendar year. Consequently, the sample size was 2200 in round 3 and 1838 in round 4. Children reported to be sick during the initial survey visit were revisited at home once every 2 weeks until the end of the illness; this follow-up of episodes had not been done in the baseline survey. Additional variables were added in these survey rounds to track exposure of children and families to IMCI interventions.

The quality of care portion of the health facility survey was repeated in all 20 facilities between August and October, 2003, using the original survey instruments with minor modifications to address methodological limitations identified in the baseline survey.

The ten IMCI facilities were provided with structured formats for monthly reports on use of facilities. Existing reporting forms provided the information for the comparison facilities. The quality and completeness of this information was checked during routine facility visits by study physicians. The information in these reports included total numbers of visits by sick under-5s in the IMCI facilities (grouped by IMCI disease classification and severity). Records of sick children referred from these facilities were obtained by the study physicians and were linked to records at the referral facilities. Finally, sick child registers from the IMCI facilities for the period January, 2002, to June, 2003, were coded and computerised. These registers provided more information on illness severity and area of residence of sick children seeking care.

The IMCI interventions and delivery strategies were developed through extensive consultations and strong collaboration with programme managers, policy makers, government officials, and researchers. Training to improve skills of health workers was done between November, 2001, and April, 2004. 35 health workers managing children in both first-level and referral-level facilities in the intervention areas were trained in the Bangladesh adaptation of the IMCI case management guidelines by use of the standard 11-day course curriculum recommended by WHO,[12,13] and a 3-day training course on how to counsel mothers on breastfeeding.[14] Although the strategy was to train all eligible workers, staff turnover prevented 100% training coverage. The health worker was expected to receive a follow-up visit after training by teams of specially prepared supervisors, including referral facility doctors. These visits included the observation of case management with immediate feedback, as well as systematic discussions of barriers to full implementation of the IMCI case management guidelines at the health facility level.[15]

The Government of Bangladesh routinely provides essential drugs needed for child health care in both intervention and comparison facilities. To improve health system supports for child health, the government and the ICDDR,B study team worked together to make additional drugs available in the intervention facilities, through a combination of direct purchase and the establishment of a facility-level drug tracking and reporting system. IMCI job-aids such as weighing scales, a timer for use in determining respiratory rates, thermometers, chart booklets, and locally adapted cards for use in counselling mothers were provided to all IMCI facilities. The routine recording forms used in IMCI facilities were modified to reinforce correct health worker performance after IMCI training.

The referral system and services in IMCI facilities were strengthened through the development and distribution of specific guidelines on when, how and where to refer, the provision of a structured referral form for the transfer of patient information from first- to referral level, and an orientation of first-level and referral-level health workers on the use of these tools.

IMCI facilities were supervised jointly by staff from the Government of Bangladesh and ICDDR,B, with a target of one visit per month to every facility. Visits were guided by a supervisory checklist, and included the review of completed case recording forms to assess correct treatment (especially for severe cases unlikely to be observed during the visit), observations of case management with immediate feedback, checking the

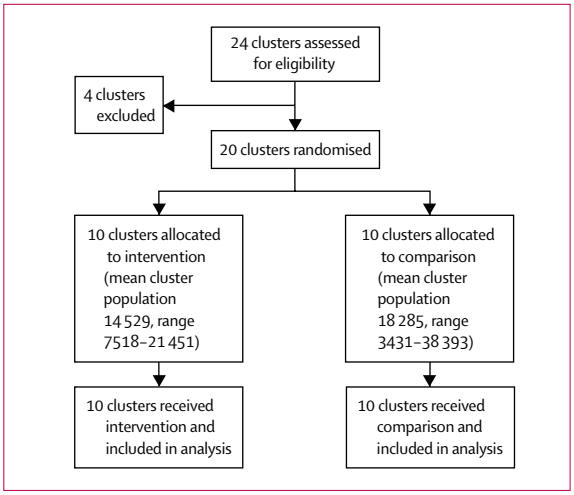

Figure 1: **Study profile**

status of drugs and supplies, and supportive interaction with health workers to identify unanticipated barriers to IMCI implementation.

All existing Government of Bangladesh community-based health workers in the catchment areas of the intervention facilities were participating in the implementation of an community education and counselling strategy developed to improve childcare practices. Based on the results of the baseline surveys and formative research, special emphasis was given to messages related to pneumonia and malnutrition, and to three practice areas: careseeking for sick children; illness management in the home; and responsive feeding. Nutrition workers from a large World Bank funded national nutrition programme were the primary workforce used in these activities. Other activities focused on increasing access to community-based health care by involving local village practitioners. These interventions were phased in during 2003.

In comparison areas, we attempted to limit possible Hawthorne effects by maintaining normal schedules for supervisory visits.

The study was approved by the ethics review committees of ICDDR,B and WHO. All participants of the health facility and household surveys provided informed verbal consent.

Statistical analysis

Generic WHO/multi-country evaluation indicators and analytical plans guided the analysis for this paper. (http://www.who.int/imci-mce). STATA (version 7) was used for all the analysis in this report (http://www.stata.com). Standard STATA commands such as svymean, svytab were used for adjusting the health facility and household data for clustering at the facility/catchment level. We used the STATA command loneway to estimate the intraclass correlation coefficient using the ANOVA estimator.

Role of the funding source

The Bill and Melinda Gates Foundation and the US Agency for International Development had no role in study design, data collection, data analysis, data interpretation, or writing of the report. The corresponding author had full access to all the data in the study and had final responsibility for the decision to submit for publication.

Results

Figure 1 shows the study profile. Documentation of IMCI implementation indicated that training coverage rose steadily from March, 2002, to April, 2004. By the latter date, 94% of all health workers managing children in the IMCI facilities had received training in IMCI case management and breastfeeding counselling, and 65% of those had received a follow up visit after training in their facilities.

Within the strengthening of health systems component, documentation reports indicated that all planned logistical support was available in the intervention facilities as of March, 2002, including adequate supplies, equipment, and job aids. The frequency of supervisory visits as of September, 2003, was lower than planned, with only an average of 6·3 facilities receiving a visit every month rather than all ten. The implementation of the drugs and logistics indenting system has ensured that no stocks of drugs ran out in the 2 years since initiation of implementation. The supervisors were able to review the information in the registers and forms, identify problems, and provide feedback. Data (not shown) from observed management of sick children during supervisory visits was available from the IMCI facilities for the last quarter of 2002, and first three quarters of 2003. Although the mean index of assessment was uniformly high (90–96) during this period, the mean index of correct treatment and counselling was 31 in the fourth quarter of 2002, increasing to 81 in the first quarter of 2003, 91 in the second quarter of that year, and 95 in the third quarter. We believe that this improvement is related to the systematic feedback given to the workers by the supervisors.

Implementation of the community component of IMCI began later than did the training and health system components. Training of 127 nutrition workers in the IMCI intervention areas on counselling, education, and problem solving began in May, 2003, and was completed in June, 2003, and that of 102 regular government health and family planning workers was completed by October, 2003. During October to December, 2003, the nutrition workers were also trained to hold education meetings with groups of women in the community. Specific operational guidelines were produced for these activities. BRAC (formerly known as Bangladesh Rural Advancement Committee), the largest non-governmental organisation in Bangladesh, was

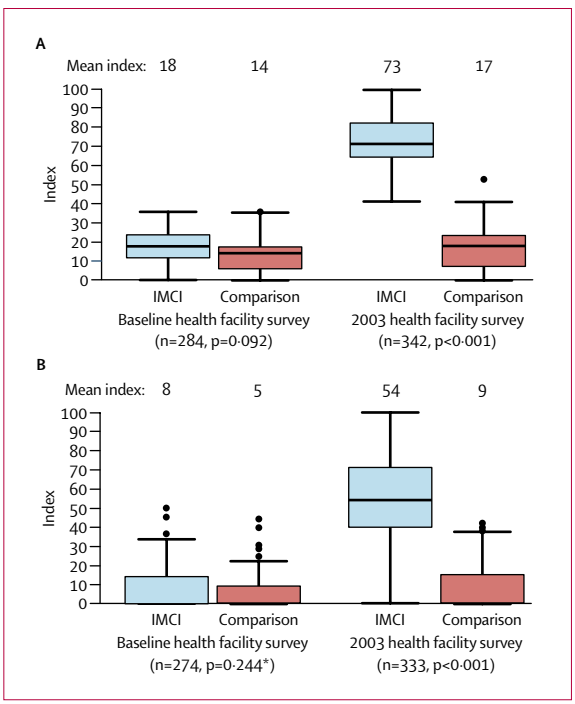

Figure 2: **Index of correct assessment (A) and of correct treatment and counselling assessment (B) in ten IMCI (only nine at baseline) and ten comparison facilities**
p values based on *t* tests. *p=0·2117 using Mann-Whitney tests since distribution is skewed.

enlisted to provide field support because the nutrition workers in Matlab are under their operational control. Unfortunately, complications related to the transition between two government funding cycles resulted in the nutrition programme activities being stopped during April to October, 2003. This difficulty led to poor functioning of nutrition workers and very low intervention coverage. For example, in the round 4 household survey, only 11% of mothers of under-5 children reported being in contact with the nutrition worker in the previous 6 months. The proportions receiving education on feeding (8%) and careseeking (4%) were even smaller.

In the baseline survey, the quality of assessment and management of sick children attending the health facilities was uniformly poor in both intervention and comparison areas (unpublished data). Very few children were checked for the presence of cough, diarrhoea, and fever, and only a fifth were correctly classified. No child with pneumonia or anaemia was appropriately treated, and only about a tenth of children who needed an oral antibiotic were prescribed one correctly. Additionally, of the eight sick children who needed a referral in the baseline health facility survey, four were referred. The findings also show that the providers made very little effort to explain the child's condition and counsel the caregiver on treatment and management of the illness. Consequently, only about one in ten caregivers of children who were prescribed oral rehydration solution or an oral antibiotic knew how to administer the treatment (unpublished data).

About 18 months after the introduction of IMCI in the intervention areas, sick children visiting the IMCI facilities were receiving significantly better care than those visiting comparison facilities in terms of the clinical assessments and management of their presenting illnesses (figure 2). The quality of care in comparison facilities did not improve over this period. The intraclass correlation was 0·29 at baseline and 0·87 in 2003 for the index of assessment, and 0·14 at baseline and 0·60 in 2003 for the index of management.

Results from the tracking system for use of facilities show that attendance for child health care at IMCI facilities increased greatly after the introduction of IMCI, while attendance at comparison facilities fell (figure 3). Use of facilities increased from 0·6 visits per child per year in the last half of 2001 to 1·9 visits per child per year 21 months after IMCI implementation. This trend was confirmed by information collected through the repeated household surveys. The proportion of children who were ill in the 2 weeks before the survey whose caretakers reported that they had been taken to a health facility or a health worker increased steadily in the IMCI area over the four rounds of monitoring (10% in IMCI *vs* 6% in comparison areas in round 1 [p=0·0806]; 16% *vs* 8% in round 2 [p=0·1010]; 16% *vs* 5% in round 3 [p=0·0187]; and 19% *vs* 9% in round 4 [p=0·0534]). The greatest part of this increase was due to the proportion of children who were taken to the IMCI facilities, which rose from 4% of ill children in round 1 to 16% in round 4 (data not shown). At baseline, 63% of the sick children received care outside their home, but most children were taken to untrained village doctors (41%) or traditional healers (12%), and only 8% of ill children were taken to a health facility or health worker (unpublished data). The

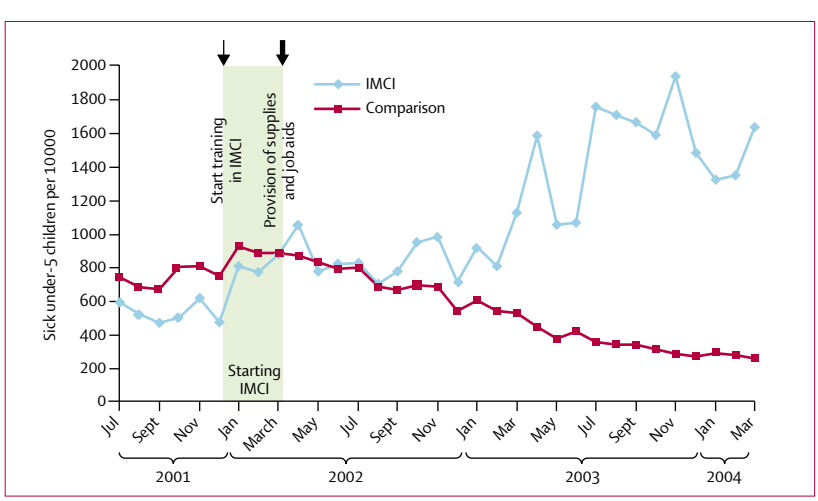

Figure 3: **Use of 1st level facilities by sick children younger than 5 years**
Thin arrow=training in IMCI started. Thick arrow=provision of supplies and job aids.

	Comparison area				IMCI area			
	Round 1	Round 2	Round 3	Round 4	Round 1	Round 2	Round 3	Round 4
Sex								
Boys	289 (4·2%)	307 (7·2%)	277 (4·7%)	169 (8·3%)	230 (11·3%)	192 (15·6%)	228 (15·4%)	184 (22·3%)
Girls	257 (7·0%)	269 (8·6%)	234 (5·6%)	168 (9·5%)	191 (8·4%)	184 (17·4%)	205 (17·6%)	175 (16·0%)
p	0·07	0·49	0·32	0·63	0·30	0·69	0·49	0·07
Perceived severity								
Mild	32 (0·0%)	18 (5·6%)	40 (5·0%)	29 (10·3%)	20 (0·0%)	8 (0·0%)	20 (10·0%)	33 (12·1%)
Moderate	255 (4·7%)	292 (6·5%)	285 (3·9%)	206 (5·3%)	212 (8·0%)	211 (12·3%)	250 (13·6%)	200 (17·0%)
Severe	259 (7·0%)	266 (9·4%)	186 (7·0%)	102 (15·7%)	186 (13·4%)	157 (22·9%)	163 (21·5%)	126 (24·6%)
p	0·18	0·30	0·16	0·04	0·02	0·01	0·10	0·05

p values based on χ^2 tests adjusted for cluster-effect and trend across the ordered categorical variable (perceived severity).

Table: **Numbers (%) of children with any illness in previous 2 weeks seeking care from health facilities or health workers, by sex of child and perceived severity of illness**

possibility that sick under-5s in the comparison area might be taken to IMCI facilities, and vice versa, is a concern. However, household data from the four rounds showed that careseeking from IMCI facilities by sick children living in comparison areas remained at less than 1% (data not shown).

Differences in use of health facilities or health workers for the care of ill children are summarised in the table. No aggregate statistically significant differences in careseeking were noted between boys and girls. In the comparison area, there is no obvious pattern of better careseeking for illness perceived to be severe. In the IMCI area, children with severe illness were more likely to be taken to a health facility or a health worker.

Data on use of facilities show a fourfold increase in the number of children with severe illness seeking care from IMCI facilities, from 37 children in the first quarter of 2002 to 126 in the second quarter of 2003. However, only 94 of these 126 children accepted referral. Although the referral rate from first-level to referral-level facilities also increased, rates of compliance with the recommended referral were low. In the first quarter of 2004, although 106 children were referred to the Matlab referral facilities (an additional 14 were referred to their facility of choice outside Matlab), only 15 (14%) of them went to the Matlab referral facility. Routine information system data in the comparison facilities did not enable the identification of severe cases and referrals made. The qualitative sub-study investigating reasons for referral failure identified several factors limiting compliance, including restrictions on travel outside the immediate community and competing demands at home, perceptions about disease severity and need for referral, fear of hospital, perceptions about the quality and costs at the referral facility, convenience and costs of transportation, and completeness and appropriateness of the information provided at referral.

Discussion

Our results show that the introduction of IMCI is associated with improvements in the quality of health care for children in first-level facilities, a more than threefold increase in use of first-level facilities for the care of sick children, and steady increases in the proportion of sick children reported by their caretakers to have been taken to a health facility or health worker for care. Differences between the IMCI intervention and comparison areas were even more pronounced for children assessed by health workers or perceived by caretakers to have severe illness. No differences in careseeking practices were noted between the sexes, despite other reports of gender inequalities in Bangladesh for many child health indicators.[16–20] It should be noted that the timing of the data for use of health facilities presented here does not fully capture the impact of the community intervention, which started in earnest in late 2003. Consequently, we expect that use of these facilities will continue to increase as the community interventions reach higher levels of coverage.

These positive effects of IMCI are tempered by other findings reported here. Qualitative sub-studies showed low rates of referral completion among children with severe illness sent to local hospitals for care. Despite increases in use of health facilities and improvements in careseeking, the estimated number of visits by under-5s to first-level facilities for illness care in this area of Bangladesh remained at about two per child per year, and only 19% of children reported by their caretakers to have been ill in the 2 weeks before the survey were taken to an appropriate care provider. Even the careseeking rate documented in the most recent round of monitoring was substantially lower than that observed in the Tanzania multi-country evaluation site, where 41% of children who were sick in the previous 2 weeks were taken first to trained providers at baseline.[21] However, in Tanzania the improved quality of care did not result in increased use of health facilities, perhaps because baseline rates of use were much higher in Tanzania than in Bangladesh. Higher proportions of sick children in the study area and in Bangladesh must receive basic but effective treatments for common life-threatening illnesses if rapid reductions in mortality rates are to be achieved.

This study has limitations characteristic of large-scale assessments of public health programmes.[22] In these studies interventions are made available to the health services, and although their delivery or rates of compliance are not under the direct control of the investigators the results are likely to show a positive bias, or "best practice". This is true of the way IMCI is being implemented in the study intervention areas in Bangladesh, although all aspects of implementation reflect agreement between the study team and the Government of Bangladesh that the set of interventions and delivery strategies being assessed fall well within the policies and resource availability that would determine how IMCI was scaled-up to nationwide coverage.

A second limitation derives from the fact that these results are reported before the larger study is complete. The evaluation design is prospective, and full results on mortality effects and cost effectiveness will be available only in 2007. This delay shows the time needed after implementation to allow IMCI to have a biological effect, as well as the time needed for measurement of the final indicators of effect.[4] However, in view of the importance to public health and policy of these interim findings on the quality of care, use, and careseeking, it is important that these results be made available now—especially since another study within the multi-country evaluation has shown a plausible association between IMCI case management training and child mortality and nutritional status.[23]

This study highlights the importance of qualitative research and monitoring to ensure continued improvement of interventions and delivery strategies. The active collaboration between researchers and the GOB permitted flexibility in our setting, leading to implementation strategies that evolved over time in response to identified problem areas. The implication for country teams implementing IMCI is that they must have the authority and understanding to deviate from current guidelines by identifying critical problem areas, and the creativity to design approaches appropriate to the local social and health context.

Our experience to date suggests that full implementation of the IMCI strategy, with interventions directed at improvement of health worker skills, health system support for child health care, and family and community practices, is feasible and can lead to changes in careseeking practices and increases in the use of public health facilities. Achieving and expanding on this success, however, requires full and active collaboration among multidisciplinary teams of scientists and government health decision makers and a willingness to improve key elements of the health system. In the context of this study, existing supervisory staff were trained and supported to provide more frequent supervision and to incorporate activities into each visit that targeted quality of care. The standard information system forms used by the Government of Bangladesh were modified to further reinforce correct functioning in health workers Essential drugs and equipment needed to provide quality health care to children are being provided and maintained. Levels of intervention coverage are high, if not universal, and sustained over the study period. The result has been improved health care for all children. The study team continues to work closely with the Government of Bangladesh to incorporate lessons and experiences from the multi-country evaluation study into nationwide implementation of IMCI. Tools and methods developed and implemented in Matlab form an integral part of the IMCI intervention already implemented in 21 of 460 *upazillas* in Bangladesh by the Government of Bangladesh.

Contributors

S E Arifeen, R E Black, C G Victora, and J Bryce contributed to the study conception and design. S E Arifeen coordinated fieldwork and supervised intervention implementation and field data collection with L Blum, D M E Hoque, E K Chowdhury, and R Khan. L Blum and R Khan were responsible for the design, data collection, analysis, and write-up of the formative research. D M E Hoque contributed to the intervention description. S E Arifeen and E K Chowdhury assessed data. S E Arifeen, L Blum, and J Bryce wrote the first draft of the article. All authors critically revised the first draft for content and contributed to the final draft.

Conflict of interest statement

Cesar G Victora and Jennifer Bryce work as part-time consultants for the WHO, one of the institutions involved in implementing IMCI worldwide. No other conflict of interest declared for any other author.

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