Does the Integrated Management of Childhood Illness cost more than routine care? Results from the United Republic of Tanzania

Taghreed Adam,[1] Fatuma Manzi,[2] Joanna Armstrong Schellenberg,[3] Leslie Mgalula,[4] Don de Savigny,[5] & David B. Evans[6]

Objective The Integrated Management of Childhood Illness (IMCI) strategy is designed to address the five leading causes of childhood mortality, which together account for 70% of the 10 million deaths occurring among children worldwide annually. Although IMCI is associated with improved quality of care, which is a key determinant of better health outcomes, it has not yet been widely adopted, partly because it is assumed to be more expensive than routine care. Here we report the cost of IMCI compared with routine care in four districts in the United Republic of Tanzania.

Methods Total district costs of child care were estimated from the societal perspective as the sum of child health-care costs incurred in a district at the household level, primary health-facility level and hospital level. We also included administrative and support costs incurred by national and district administrations. The incremental cost of IMCI is the difference in costs of child health-care between districts with and without IMCI, after standardization for population size.

Findings The annual cost per child of caring for children less than five years old in districts with IMCI was US$ 11.19, 44% lower than the cost in the districts without IMCI (US$ 16.09). Much of the difference was due to higher rates of hospitalization of children less than 5 years old in the districts without IMCI. Not all of this difference can be attributed to IMCI but even when differences in hospitalization rates are excluded, the cost per child was still 6% lower in IMCI districts.

Conclusion IMCI was not associated with higher costs than routine child health-care in the four study districts in the United Republic of Tanzania. Given the evidence of improved quality of care in the IMCI districts, the results suggest that cost should not be a barrier to the adoption and scaling up of IMCI.

Keywords Child health services/economics; Child care/economics; Health care costs; Delivery of health care, Integrated/economics; Child, Preschool; Costs and cost analysis; Comparative study; Evaluation studies; United Republic of Tanzania (*source: MeSH, NLM*).

Mots clés Service santé infantile/économie; Puériculture/économie; Coût soins médicaux; Distribution intégrée soins/économie; Enfant âge pré-scolaire; Coût et analyse coût; Etude comparative; Etude évaluation; République-Unie de Tanzanie (*source: MeSH, INSERM*).

Palabras clave Servicios de salud infantil/economía; Cuidados del niño/economía; Costos de la atención en salud; Entrega integrada de atención de salud/economía; Preescolar; Costos y análisis de costo; Estudio comparativo; Estudios de evaluación; República Unida de Tanzanía (*fuente: DeCS, BIREME*).

Arabic

Bulletin of the World Health Organization 2005;83:369-377.

Voir page 375 le résumé en français. En la página 376 figura un resumen en español.

Introduction

More than 10 million children die each year before they reach their fifth birthday, and 70% of these deaths are caused by five conditions: diarrhoea, pneumonia, malaria, measles and malnutrition (*1*, *2*). The Integrated Management of Childhood Illness (IMCI) strategy seeks to reduce these deaths through three main components: improving the skills of health workers, improving health systems and improving family and community practices. IMCI has been shown to be associated with improved quality of care, which should result in improved health outcomes (*3*–*6*). However, concern about the costs of implementing IMCI has been given as a reason why some countries have not adopted it on a large scale (*7*, *8*). It is important, therefore, to assess

[1] Health Economist, Health Systems Financing and Child and Adolescent Health and Development, World Health Organization, 1211 Geneva 27, Switzerland. Correspondence should be sent to this author (email: adamt@who.int).

[2] Research Scientist, Ifakara Health Research and Development Centre, Ifakara, United Republic of Tanzania.

[3] Epidemiologist, Ifakara Health Research and Development Centre, Ifakara, United Republic of Tanzania.

[4] Medical Officer, World Health Organization, Harare, Zimbabwe.

[5] Research Manager, Tanzania Essential Health Interventions Project, International Development Research Centre, Dar es Salaam, United Republic of Tanzania.

[6] Director, Health Systems Financing, World Health Organization, Geneva, Switzerland.

Ref. No. **04-011544**

(*Submitted: 14 January 2004 – Final revised version received: 10 September 2004 – Accepted: 13 September 2004*)

whether IMCI does, in practice, cost more than routine care for children who are less than 5 years old, and if so, by how much.

The United Republic of Tanzania is one of more than 80 developing countries in which IMCI is starting to be implemented. The Multi-Country Evaluation of IMCI Effectiveness, Cost and Impact (known as MCE) is a set of studies in five countries that use complementary designs to assess the strategy. (For further information, see http://www.who.int/imci-mce.)

Here we present results from the cost component of the MCE study in the United Republic of Tanzania, the first such study for which detailed cost data are available. The specific objectives of the costing study were to estimate the total economic costs of start up and implementation of IMCI in a district (i.e., the full cost to society of providing IMCI-based services to under-fives) as well as estimating the incremental costs of introducing and running IMCI (additional to the cost of routine care for under-fives). This information is important for understanding the cost implications of expanding IMCI to other districts and the resource requirements necessary to sustain IMCI.

Methods

Study setting

The study compared two rural districts where IMCI has been implemented since late 1997 (Morogoro Rural and Rufiji districts, called the intervention districts) with two neighbouring rural districts (Kilombero and Ulanga, called the comparison districts) where routine case management continued using traditional disease-specific approaches to training in child healthcare and the conventional essential package of medicines and supplies (*9*). IMCI was introduced in the two comparison districts only in 2002.

Table 1 provides information on key geographical, demographic and health-facility indicators in the four districts. The majority of people in all districts are subsistence farmers. Most rural roads are unpaved and transport can be difficult in the rainy season. The public health system has a network of hospitals, health centres and dispensaries that function reasonably well and provide care for 3300–7000 people each. More than 70% of the population lives within 5 km of a health facility. Utilization of health facilities is relatively high: the routine Health Management Information System showed that there were an average of 3.0 visits per child less than 5 years old for curative care in 1999. Coverage of key interventions, such as childhood immunization, is comparable across the districts, and the districts also have comparable levels of mortality among children less than 5 years old (139 deaths per 1000 children on average). Large numbers of nongovernmental health actors are also active in the four districts, many of whom have been involved in training health workers and in community activities, although their coverage of the area was patchy.

The two districts where IMCI had already been implemented were among the first in the country to engage in activities designed to strengthen district management skills as part of the country's health sector reform. IMCI and activities to strengthen the health system had taken place in relation to improving the performance of health workers, strengthening support for the health system (for example, by enabling it to provide more interventions, more effective interventions or better quality interventions) and improving family health practices. These activities are described briefly in turn.

Improving the performance of health workers

In the intervention districts, more than 80% of health workers who were managing the care of under-fives at first-level facilities had been trained in IMCI by mid-2000. The training consisted of an 11-day course, of which approximately 30% of the time was spent on clinical practice. One follow-up visit by an IMCI supervisor occurred 1 month after training.

Table 1. **Selected features of the study districts, 1999**

Features	Districts			
	Intervention[a]		Comparison	
	Morogoro	Rufiji	Kilombero	Ulanga
Main geographical characteristic	Lowlands, highlands, and savannah	Coastal delta, flood plain and uplands	Flood plain and escarpment	Flood plain and highlands
Altitude (m)	600–2 000	0–500	200–2 000	200–1 000
Annual rainfall (mm)	600–1 600	600–1 000	1 200–1 800	1–900
Population (to nearest 1000)	541 000	205 000	292 000	180 000
Population density/km² (habitable area)	36 people	22	32	14
% population less than 5 years old	16	16	16[b]	15[b]
Mortality among under-fives in areas under demographic surveillance (5q0)[c]	142/1000	136	147	131
Total no. health facilities[d]	97 (75)	55 (91)	45 (51)	35 (59)
No. of health facilities per village	0.34	0.59	0.96	0.54
Population per facility	5 577	3 727	6 489	5 143

[a] In the intervention districts children less than 5 years old were treated under the Integrated Management of Childhood Illness strategy. Comparison districts provided routine care.
[b] Figures are from 2001.
[c] 5q0 is the probability of dying between birth and the age of 5 years.
[d] Figures in parentheses are the percentage of government health facilities.

Box 1. **Description of data collected at each level and collection tools**

National data: national costs collected included the start-up costs of IMCI in 1996–1997, annual post-implementation costs of IMCI in 1999 as well as the costs of other activities related to the health care of children less than 5 years old, such as the Expanded Programme on Immunization, nutrition programmes and malaria programmes. These data were collected by interview and record reviews that used a questionnaire designed to capture national-level costs. The questionnaire was adapted from that used by the Multi-Country Evaluation study. Data collected included the share of salaries of government and WHO country-office employees working in the area of providing health care to under-fives on a daily basis, the cost of planning and orientation meetings to introduce IMCI, the costs of training health workers in IMCI and adapting IMCI training materials, and the share of office space and equipment for staff working on under-five care at the national level.

District data: district-level start-up and post-implementation costs for care for children less than 5 years old were estimated by interviewing district personnel and reviewing records using a questionnaire adapted from the Multi-Country Evaluation study that is designed to capture district-level costs. Data collected were similar to those at the national level but also included the cost of supervising health workers at the primary facility level and the cost of distributing medicines to health facilities. The opportunity cost of supervisors' time and trainers' time was included as the share of time spent on these activities, unless they had already been included as regular district-level staff coordinating care activities for children less than 5 years old.

Hospital data: the proportion of children less than 5 years old who had been admitted to hospital during the previous year was estimated by interviewing a representative sample of households using a survey questionnaire (*21*). This information was combined with local estimates of costs per bed–day and average length of stay in hospital (*22*, and D Schellenberg, personal communication, 2002) to estimate the total cost of providing inpatient care for this age group in each district.

Primary facility data: primary health-facility costs at governmental health facilities were estimated by interviewing the health worker in charge of the facility and reviewing records using a facility cost questionnaire adapted from that used by the Multi-Country Evaluation study during a cross-sectional survey of a representative sample of 75 health facilities (*3, 10*) During the same survey the proportion of time health workers spent with children less than 5 years old and children more than 5 years was collected by observing health workers in a time and motion study. Costs collected for each visit included information on salaries, medicines, equipment, vehicles, building maintenance and utilities. Primary health-care costs at nongovernmental facilities are partly represented as out-of-pocket payments made at these facilities and collected at household level. However, it is not within the scope of this analysis to determine the extent to which these out-of-pocket payments relate to the actual cost per visit made at nongovernmental facilities.

Household data: out-of-pocket payments for services provided at facilities that were not included in the categories above, such as travel costs, fees for consultations and medicine, and time spent seeking care, were estimated by conducting interviews using survey questionnaire with a representative sample of 1321 households with 2006 children less than 5 years old (*21*).

Strengthening the health system

Activities to strengthen the health system in the IMCI intervention districts included allowing district management teams to purchase some additional medicines using district-level funds. An integrated supervision cascade was also established to allow health centres and some designated dispensaries to supervise other dispensaries located in their catchment areas. The leader of each local area for in the cascade was given a motorcycle to facilitate supervision of dispensaries.

Improving family practices

No special activities to improve key family practices relating to treatment of childhood illness at the household level had been introduced in the IMCI districts at the time of the study but a number of more general activities had taken place in all four districts participating in the evaluation including the social marketing of insecticide-treated bednets for the prevention of malaria. More details about the study setting and IMCI as implemented in the United Republic of Tanzania can be found elsewhere (*3*, *10*).

Data collection and cost analysis

Costs were estimated from the societal perspective and were collected at the national, district, hospital, health-facility and household levels. Costs include salaries, medicines, supplies, maintenance and the annualized value of capital items, such as equipment, vehicles, buildings and training. Capital items were valued at their replacement cost in 1999 and annualized on the basis of their useful life and a discount rate of 3%. Data were collected through interviews and a review of records at each of these levels.

In addition, a time and motion study was performed at the primary facility level. Providers were observed for half a day in each of the health facilities surveyed. This was done during alternating day and afternoon shifts, the first of which was selected at random. This study recorded time spent on consultations and examinations of children less than 5 years old as well as time spent on other activities during the period, including productive and non-productive time (*10*). Costs are presented in 1999 US$. Any start-up costs occurring before 1999 were inflated to 1999 values using gross domestic product (GDP) deflators, a method that is commonly used to account for inflation (*11*). Box 1 shows the costs included at each level and the data collection tools used.

Costs incurred at all levels were summed to obtain the total cost to the district of providing care for under-fives. To allow comparison across districts, cost estimates were standardized to a hypothetical district with a population of 50 000 under-fives (*12*). This corresponds to a total population of around 300 000, which is roughly the average population of a district. The incremental cost to the district of implementing IMCI is the difference between the cost of providing IMCI-based care to under-fives and the cost in the comparison districts (*12*).

Regression analysis was used to explain the variation in costs of providing care to under-fives at health facilities. The dependent variable was the total cost of providing care to under-fives at the nth health facility (any given facility in the sample). A variety of interrelated explanatory variables were included, such as IMCI (yes or no), whether the observation was made at a dispensary or health centre (coded as dispensary: yes or no), the annual number of visits by children less than 5

years old as a measure of output, and dummy variables for the availability of four-wheeled vehicles or motorcycles (as proxies for capital input).

A number of other explanatory variables were explored in this analysis including the number of dental chairs and number of microscopes (as proxies for the complexity of services delivered) as well as the surface area of the facility in m^2 (as a measure of size). However, these variables were excluded in the final model as a result of multicollinearity — that is, the model became unstable when they were all included because they are strongly correlated with one another. The dependent and independent variables were transformed to the natural logarithmic scale to address problems of heteroskedasticity (*13*).

Finally, sensitivity analysis was performed using a range of values for the uncertain variables. The variables selected for the uncertainty analysis were the useful life of capital inputs, district-level cost per child (i.e. the district component of total district cost per child), hospitalization rate, and the average number of facility visits per child per year (*10*). WHO CostIt (*14*) and Stata software (*15*) were used to analyse cost data.

Quality control and data processing

For data at the national, district and primary health-facility level, all forms were checked for completeness and consistency, and follow-up visits were made to re-collect inconsistent or incomplete data. For the household survey, a field supervisor checked all forms, sat in on selected interviews, and made random re-visits to a sample of households each day.

Two data-entry clerks double entered the household survey data into a FoxPro database. The two files were compared; any inconsistencies were checked against the original forms; and range and consistency checks were conducted regularly. Excel was used to process data on national, district and primary health-facility costs. Quality was checked visually and through range and consistency checks.

Results

For 1999, the cost per child of providing health care for under-fives in the intervention districts was US$ 11.19, which was 44% lower than the cost in the comparison districts (US$ 16.09) (*10*). The lower cost per child in IMCI districts resulted from lower hospitalization costs and lower administrative costs at the district level. There was no difference in costs incurred at primary care facilities or at the household level (Fig. 1).

District-level administrative costs were 50% higher in the comparison districts than in the IMCI intervention districts, mainly being associated with more frequent trips to distribute medicines and general-purpose supervision. Training costs were similar in both types of districts. This was unexpected given the emphasis of IMCI on training; however a wide variety of training courses were performed in comparison districts on preventive, curative and administrative issues during the study period. These courses included training in immunization, the case management of malaria and diarrhoea and the use of insecticide-treated bednets. We do not believe that the lower costs of training and supervision observed in the intervention districts implies that IMCI saves money on training and supervision but rather that it is a reflection of the fact that the comparison districts had intensive levels of training and supervision at the time.

Hospital-level costs were 250% higher in comparison districts than in intervention districts (US$ 2.89 per child per year in intervention districts versus US$ 7.33 per child per year in comparison districts), not because of differences in the cost per admission for under-fives but because more children were hospitalized in these districts relative to the intervention districts (15% in comparison districts versus 6% in IMCI districts, $P < 0.001$). Because this difference may not be entirely related to IMCI, we also calculated total costs without hospital costs; this resulted in a 6% lower cost per child less than 5 years old in districts with IMCI (US$ 8.30) than in districts without IMCI (US$ 8.76) (Table 2).

At the primary health-facility level, which included both governmental health centres and dispensaries, costs at IMCI intervention facilities were on average 16% lower per under-five visit (including vaccination visits) than in comparison facilities (US$ 1.39 versus US$ 1.62, respectively, $P = 0.5$) (Table 3). On the other hand, the average number of visits per child per year was 30% higher in the intervention districts (3.28 visits per year) than in the comparison districts (2.49 visits per year). The lower cost per visit combined with the higher number of visits per child in the intervention districts explains the similar total cost per child at governmental health facilities in the two types of district.

The two major components of the cost per visit at governmental facilities were personnel and medicines. With respect to personnel costs, the time and motion study showed that IMCI-trained health workers spent, on average, almost 2 minutes longer per consultation than those in the comparison facilities (8.2 minutes versus 6.3 minutes, $P = 0.0003$) (Fig. 2). This difference was largest in health centres, which accounted for only 18% of the total visits by children less than 5 years old. However, health centre workers did not compensate for spending longer with under-fives by spending less time with children more than 5 years old ($P = 0.4$). The increase in time spent with children in health centres appears to have resulted from a reduction in the time spent on administrative activities or non-productive time. Because more time was spent with under-fives in health centres, which received a lower proportion

Fig. 1. **Components of the annual cost per child of providing health care to children less than 5 years old in a standardized district in the United Republic of Tanzania.** Standardized districts included 50 000 children less than 5 years old

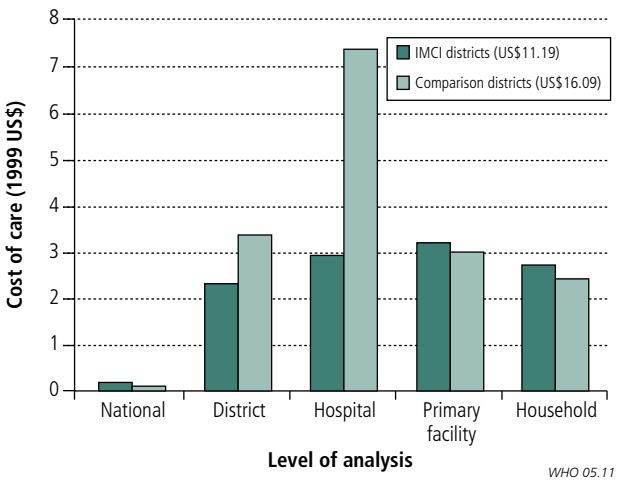


Table 2. **Differences between intervention districts and comparison districts in the United Republic of Tanzania in annual costs of health care per child less than 5 years old.** (Estimates are standardized to a district with 50 000 children less than 5 years old)

Level of analysis	Average annual cost per child in intervention districts[a, b]	Average annual cost per child in comparison districts	Difference in cost per child (intervention versus comparison)	Ratio of comparison district:intervention district
National	0.17	0.07	0.10	0.43
District	2.30	3.35	−1.06	1.46
Hospital	2.89	7.33	−4.44	2.54
Primary facility	3.16	2.94	0.22	0.93
Household	2.68	2.40	0.28	0.90
Total cost per child	11.19	16.09	−4.90	1.44
Total cost excluding hospital costs	8.30	8.76	−0.46	1.06

[a] In the intervention districts children less than 5 years old were treated under the Integrated Management of Childhood Illness strategy. Comparison districts provided routine care.
[b] All costs shown in 1999 US$.

of visits by children in this age group than did dispensaries, the overall average personnel cost per under-five visit was similar between intervention and comparison districts (US$ 0.49 versus US$ 0.57 in comparison districts, $P = 0.41$).

In terms of medicines, facilities in intervention districts spent an average of US$ 0.29 on medicines and vaccines per visit, 30% less than facilities in comparison districts (US$ 0.41), although because of the considerable variation in these costs the difference was not statistically significant (Table 3). Further analysis showed no difference in the availability or shortage of particular medicines between facilities in either type of districts. Two separate analyses of prescribing patterns, using different sources of information from both the quality of care (*4*) and costing components of the MCE study, confirmed a more rational use of antibiotics and injectables in intervention facilities, suggesting higher efficiency and better health outcomes than in the comparison facilities.

The results of the regression are shown in Table 4. By taking into account differences in the other determinants of total costs across facilities, the multivariate regression analysis increased the precision of comparison between the two types of management strategies, showing that the total cost of providing care to children less than 5 years old and the cost per visit for these children were around 30% lower in intervention facilities ($P < 0.001$).

The sensitivity analysis showed the importance of hospitalization costs in interpreting total district costs: the difference between intervention and comparison districts was not sensitive to variation in parameters other than the assumption about rates of hospitalization (*10*). If the observed difference in hospital admissions per child was not related to IMCI, then there is no difference in the cost of caring for children less than 5 years old in the two types of districts. Otherwise, the costs in IMCI intervention districts are lower than in the comparison districts.

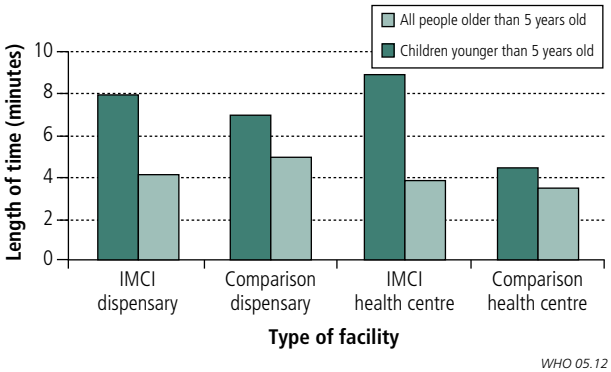
Discussion

This study is the first attempt to estimate the actual cost of IMCI during start up and compare it with the cost of routine care. There is no evidence that the implementation of IMCI was associated with higher costs when our estimate of the total economic cost of implementing IMCI plus any additional costs is compared with the costs of routine care in 1999. These findings were unexpected, since IMCI has often been assumed to be more expensive than routine care (*7*, *8*).

Hospital costs were a major determinant of the higher cost per child of caring for under-fives in the comparison districts. There are two possible explanations: either the improved quality of care and availability of medicines for under-fives at primary IMCI facilities reduced the need for referral and subsequent admission to hospital or factors other than IMCI, such as differences in the quality of hospitals or access to them, meant that children in comparison districts were more likely to seek hospital care. We think that the second explanation is more likely given the short time that IMCI had been implemented prior to the study. But even if we take the most conservative assumption — that the difference was entirely due to other factors — and exclude the hospital component from the analysis, in IMCI districts the total cost per child less than 5 years old was still slightly lower than in the comparison districts (6%).

The US$ 11.19 cost per child of treating children less than 5 years old using IMCI in the United Republic of Tanzania translates into a per capita cost of US$ 1.79 compared with

Fig. 2. **Comparison of average time spent per visit by facility type and age group in both types of districts in the United Republic of Tanzania.** In the intervention districts children less than 5 years old were treated under the Integrated Management of Childhood Illness (IMCI) strategy. Comparison districts provided routine care



WHO 05.12

Table 3. **Comparison of cost per visit by child less than 5 years old to a primary governmental facility in intervention and comparison districts in the United Republic of Tanzania.** Differences between types of facility and between intervention and comparison districts are not statistically significant at the 5% level

Costs	Type of facility				Weighted average	
	Dispensary		Heath centre			
	Intervention[a, b] (*n*=33)	Comparison (*n*=29)	Intervention (*n*=6)	Comparison (*n*=6)	Intervention	Comparison
Salaries	0.44 (0.41)[c]	0.52 (0.16)	0.79 (0.41)	0.80 (0.35)	0.49 (0.33)	0.57 (0.42)
Medicines	0.30 (0.20)	0.46 (0.48)	0.22 (0.19)	0.19 (0.11)	0.29 (0.20)	0.41 (0.45)
Other recurrent	0.30 (0.63)	0.24 (0.35)	0.09 (0.04)	0.19 (0.14)	0.27 (0.58)	0.24 (0.33)
Capital	0.25 (0.17)	0.38 (0.60)	0.80 (0.86)	0.47 (0.42)	0.33 (0.40)	0.40 (0.57)
Total	1.30 (0.92)	1.61 (1.65)	1.90 (1.45)	1.66 (0.95)	1.39 (1.02)	1.62 (1.51)

[a] In the intervention districts children less than 5 years old were treated under the Integrated Management of Childhood Illness strategy. Comparison districts provided routine care.
[b] All costs shown in 1999 US$.
[c] Figures in parentheses are standard deviations.

US$ 2.56 for routine care. These amounts are similar to previous estimates of the per capita cost of IMCI in resource-poor countries (*16*). In addition, our evaluation found that medicine costs were lower in IMCI districts, and this has also been found in previous studies (17). However, our study reaches different conclusions about staff requirements than earlier work did (*18*). In the United Republic of Tanzania, health centre staff were able to accommodate IMCI within their usual working hours by reallocating part of their non-clinical work or down time in order to provide better care for children less than 5 years old. No additional staff were required in IMCI districts during the study (*19*).

Policy implications

The effects of IMCI can be assessed in terms of changes to intermediate outcomes, such as improved quality of care at health facilities, or final outcomes, such as changes in under-five mortality or disability-adjusted life years averted. A health-facility survey was carried out in the United Republic of Tanzania in 2000 to compare the quality of case management and health systems support between IMCI and comparison districts in terms of intermediate outcomes. It indicated that children in IMCI districts received better care than children in comparison districts: they were more likely to be diagnosed and treated correctly as determined through a gold-standard re-examination and the children's caregivers were more likely to receive appropriate counselling about how to care for their sick children (*3*). In Brazil and Uganda, as well as in the United Republic of Tanzania, children receiving care from an IMCI-trained worker were significantly more likely to receive a prescription for the correct antimicrobial, to receive the first dose of medicine before leaving the health facility, to have their caregivers advised on how to administer the medicine, and to have caregivers who were able to describe correctly how to give the medicine at home (*4*).

Furthermore, IMCI was associated with a 13% reduction in mortality in the four study districts in the United Republic of Tanzania. Although it is hard to be sure that this difference was due to IMCI and not to other factors, a careful study of other interventions and issues affecting child survival in the study area suggested that the IMCI districts were consistently worse off than intervention districts as far as these issues were concerned. So it is likely that this is a conservative estimate of

Table 4. **Regression analysis of the determinants of costs at primary health-care facilities.** Dependent variable is the natural log of total costs of health care for children less than 5 years old

Variable	Description	β coefficient[a]	Standard error	Student's *t*-test	*P*-value
IMCI[b]	IMCI district = 1; comparison district = 0	-0.34	0.06	-5.22	<0.0001
Dispensary	Dispensary = 1; health centres = 0	-0.65	0.12	-5.48	<0.0001
Dummy variable for vehicle	Variable indicating availability of vehicles. Available = 1	0.69	0.14	4.94	<0.0001
Log of visits	Natural log of total visits by under-fives (for vaccination and treatment)	0.19	0.05	3.47	0.001
Constant		14.07	0.48	29.4	<0.0001
Adjusted R^2 = 0.79; F-statistic = 74.41; $P < 0.0001$; $n = 73$					

[a] All costs were in 1999 US dollars.
[b] IMCI = Integrated Management of Childhood Illness strategy.

the impact of IMCI on child survival (*20*). This suggests that IMCI is a cost-effective intervention in the United Republic of Tanzania. It is no more costly than standard care, yet it achieves a better outcome in terms of quality of care. Given the evidence that improvements in the performance of health workers and in prescribing patterns lead to reductions in mortality among children, it is also reasonable to expect that IMCI is more effective at saving lives than routine care.

However, a number of qualifications should be taken into account when interpreting our results. First, utilization rates for public health facilities in these districts were high relative to those reported from other developing countries: 41% of children having an illness in the two weeks prior to the MCE survey had been taken to a public health facility as the first point of contact for care (*21*). Second, districts differed in ways that could affect the cost of health care for children (e.g. the number and proportion of facilities managed by nongovernmental organizations and baseline rates of hospital admissions for children less than 5 years old). Third, in the intervention districts IMCI was implemented concurrently with, and as a result of, measures designed to improve district health systems management, such as introducing evidence-based planning and expenditure mapping at the district level. Our findings, therefore, can be interpreted as estimating the costs of IMCI in the presence of an improved health system with adequate managerial capacity. As health sector reform is now being scaled up in all districts in the country, our findings can be generalized to other districts that choose to implement IMCI.

In conclusion, we found no evidence that treating children using the IMCI strategy was associated with higher costs than providing routine care in the United Republic of Tanzania. Given the evidence of improvements in the quality of care in the IMCI districts, more active steps should be taken to rapidly scale up the adoption and coverage of IMCI. ■

Acknowledgements

The Multi-Country Evaluation of IMCI Effectiveness, Cost and Impact is coordinated by the WHO Department of Child and Adolescent Health and Development and is supported by the Bill and Melinda Gates Foundation and the United States Agency for International Development. The MCE Tanzania study is a collaboration between the Ifakara Health Research and Development Centre, the Tanzania Essential Health Interventions Project of the Ministry of Health, the Adult Morbidity and Mortality Project of the Ministry of Health, and the WHO Tanzania Office.

The authors thank Carolyn Kakundwa for assisting in data cleaning and analysis and the MCE study team and technical advisers for their valuable comments and support. Special thanks are due to Dr Jennifer Bryce, Dr Cesar Victora, Dr Jean-Pierre Habicht and Dr Hassan Mshinda, as well as those working in the Ministry of Health, WHO in the United Republic of Tanzania, and the TEHIP project for their overall support and guidance. Finally, we thank the mothers and children who participated in the research.

Funding: The Bill and Melinda Gates Foundation. During 1999 and 2000, JAS was funded by the Swiss Tropical Institute. From 2001, JAS was supported by the Gates Malaria Partnership at the London School of Hygiene and Tropical Medicine.

Competing interests: none declared.

Résumé

La prise en charge intégrée des maladies de l'enfance coûte-t-elle plus cher que les soins systématiques ? Résultats provenant de la République-Unie de Tanzanie

Objectif La stratégie de prise en charge intégrée des maladies de l'enfance (PCIME) est conçue pour faire face aux cinq causes principales de mortalité infantile, responsables dans leur ensemble de 70 % des 10 millions de décès d'enfants survenant chaque année dans le monde. Bien que la PCIME s'accompagne d'une amélioration de la qualité des soins, qui est la clé d'une issue plus clémente de la maladie, elle n'a pas encore été largement adoptée, en partie parce qu'elle est présumée plus onéreuse que les soins systématiques. Cet article compare le coût de la PCIME à celui des soins systématiques dans quatre districts de la République-Unie de Tanzanie.

Méthodes On a estimé les coûts totaux pour la société des soins infantiles dispensés dans les districts comme la somme des coûts des soins de santé infantiles supportés dans le district au niveau du ménage, de l'installation de santé primaire et de l'hôpital. On a aussi pris en compte les coûts administratifs et les dépenses d'appui subis par les administrations relevant de l'Etat et du district. Le coût marginal de la PCIME correspond à la différence de coût des soins de santé infantiles entre les districts bénéficiant d'une prise en charge intégrée et ceux n'en bénéficiant pas, après standardisation pour la taille de la population.

Résultats Le coût annuel par enfant de la dispensation de soins à des enfants de moins de cinq ans dans un district bénéficiant de la PCIME était de US $ 11,19, c'est-à-dire inférieur de 44 % à celui supporté dans les districts ne bénéficiant pas de cette prise en charge (US $ 16,09). Une grande partie de la différence était imputable aux taux plus élevés d'hospitalisation des enfants de moins de cinq ans dans les districts ne disposant pas de la PCIME. La totalité de cette différence ne peut être attribuée à la PCIME. Cependant, même si l'on fait abstraction des différences de taux d'hospitalisation, le coût par enfant reste inférieur de 6 % dans les districts où une PCIME a été mise en place.

Conclusion Dans les quatre districts tanzaniens étudiés, la PCIME n'entraînait pas des coûts plus élevés que ceux des soins de santé infantiles systématiques. Compte tenu de l'amélioration de la qualité des soins dans les districts bénéficiant de cette prise en charge, les résultats laissent à penser que les coûts ne devraient pas faire obstacle à l'adoption et à l'élargissement de la PCIME.

Resumen

La Atención Integrada a las Enfermedades Prevalentes de la Infancia, ¿más costosa que la atención ordinaria? Resultados de la República Unida de Tanzanía

Objetivo La estrategia de Atención Integrada a las Enfermedades Prevalentes de la Infancia (AIEPI) se ha concebido para abordar las cinco causas principales de mortalidad en la niñez, que juntas representan un 70% de los 10 millones de defunciones registradas anualmente entre los niños en todo el mundo. Aunque garantiza una atención de mayor calidad, y ello es un factor clave para conseguir mejores resultados de salud, la AIEPI todavía no ha sido adoptada de forma generalizada, en parte porque se supone que es más costosa que la atención ordinaria. Informamos aquí sobre el costo de la AIEPI en comparación con la atención habitual en cuatro distritos de la República Unida de Tanzanía.

Métodos Los costos distritales totales de la atención infantil se estimaron desde la perspectiva de la sociedad sumando para cada distrito los costos de esa atención a nivel de los hogares, a nivel de los servicios de atención primaria y a nivel hospitalario. Incluimos también los gastos administrativos y de apoyo de las administraciones nacional y distritales. El costo marginal de la AIEPI es la diferencia entre el costo de la atención infantil en los distritos con AIEPI y los distritos sin AIEPI, después de normalizar en función del tamaño de la población.

Resultados El costo anual por niño de la atención a los menores de cinco años en los distritos con AIEPI fue de US$ 11,19, un 44% inferior al costo en los distritos sin AIEPI (US$ 16,09). Gran parte de la diferencia se debió a las mayores tasas de hospitalización registradas entre los menores de 5 años en los distritos sin AIEPI. No toda esa diferencia puede atribuirse a la AIEPI, pero, aun excluyendo las diferencias en las tasas de hospitalización, el costo por niño fue un 6% inferior en los distritos con AIEPI.

Conclusión La AIEPI no entrañó un mayor costo que la atención infantil ordinaria en los cuatro distritos estudiados en la República Unida de Tanzanía. Dada la evidencia que demuestra la mejor calidad de la atención en los distritos con AIEPI, los resultados indican que los costos no deben suponer un obstáculo para adoptar y extender masivamente la AIEPI.

Arabic

References

1. Gove S. Integrated management of childhood illness by outpatient health workers: technical basis and overview. *Bulletin of the World Health Organization* 1997;75 Suppl 1:S7-24.
2. Tulloch J. Integrated approach to child health in developing countries. *Lancet* 1999;354 Suppl 2:S16-20.
3. Tanzania IMCI multi-country evaluation health facility survey study group. Health care for under-fives in rural Tanzania: effect of integrated management of childhood illness on observed quality of care. *Health Policy and Planning* 2004;19:1-10.
4. Gouws E, Bryce J, Habicht JP, Amaral J, Pariyo G, Schellenberg JA, et al. Improving antimicrobial use among health workers in first-level facilities: results from the Multi-Country Evaluation of the Integrated Management of Childhood Illness strategy. *Bulletin of the World Health Organization* 2004;82:509-15.
5. Oluwole D, Mason E, Costello A. Management of childhood illness in Africa: early evaluations show promising results. *BMJ* 2000;320:594-5.
6. Patwari AK, Raina N. Integrated management of childhood illness (IMCI): a robust strategy. *Indian Journal of Pediatrics* 2002;69:41-8.

7. Khan MM, Ahmed S, Saha KK. Implementing IMCI in a developing country: estimating the need for additional health workers in Bangladesh. *Human Resources for Health Development* 2000;4:73-82.
8. Kolstad PR, Burnham G, Kalter HD, Kenya-Mugisha N, Black RE. Potential implications of the integrated management of childhood illness (IMCI) for hospital referral and pharmaceutical usage in western Uganda. *Tropical Medicine and International Health* 1998;3:691-9.
9. Victora CG, Habicht J-P, Bryce J. Evidence-based public health: moving beyond randomized controlled trials. *American Journal of Public Health* 2004;94:406-15.
10. Adam T, Manzi F, Kakundwa C, Schellenberg J, Mgalula L, de Savigny D, et al. *Analysis report on the costs of IMCI in Tanzania.* Geneva: World Health Organization; 2004.
11. The World Bank. *World development indicators 2001.* Washington, DC: The World Bank; 2001.
12. Adam T, Bishai D, Khan M, Evans D. *Methods for the costing component of the multi-country evaluation of IMCI.* Geneva: World Health Organization; 2004.
13. Gujarati DN. *Basic econometrics.* 3rd ed. New York: McGraw-Hill; 1995.
14. Adam T, Aikins M, Evans D. *CostIt.* Available from: http://www.who.int/evidence/cea
15. Stata Corporation. *Stata statistical software: release 7.0.* College Station, TX: Stata; 2001.
16. The World Bank. *World development report 1993: investing in health.* New York: Oxford University Press; 1993.
17. Wammanda RD, Ejembi CL, Iorliam T. Drug treatment costs: projected impact of using the integrated management of childhood illnesses. *Tropical Doctor* 2003;33:86-8.
18. Boulanger LL, Lee LA, Odhacha A. Treatment in Kenyan rural health facilities: projected drug costs using the WHO-UNICEF integrated management of childhood illness (IMCI) guidelines. *Bulletin of the World Health Organization* 1999;77:852-8.
19. Khan MM, Saha KK, Ahmed S. Adopting integrated management of childhood illness module at local level in Bangladesh: implications for recurrent costs. *Journal of Health, Population, and Nutrition* 2002;20:42-50.
20. Armstrong Schellenberg JRM, Adam T, Mshinda H, Masanja H, Kabadi G, Mukasa O, et al. Effectiveness and costs of facility-based Integrated Management of Chilldhood Illness (IMCI) in Tanzania. *Lancet* 2004;364:1583-94.
21. Schellenberg JA, Victora CG, Mushi A, de Savigny D, Schellenberg D, Mshinda H, et al. Inequities among the very poor: health care for children in rural southern Tanzania. *Lancet* 2003;361:561-6.
22. Alonso Gonzalez M, Menendez C, Font F, Kahigwa E, Kimario J, Mshinda H, et al. Cost-effectiveness of iron supplementation and malaria chemoprophylaxis in the prevention of anaemia and malaria among Tanzanian infants. *Bulletin of the World Health Organization* 2000;78:97-107.