Effectiveness and cost of facility-based integrated management of childhood illness (IMCI) in Tanzania


Record Status
This is a critical abstract of an economic evaluation that meets the criteria for inclusion on NHS EED. Each abstract contains a brief summary of the methods, the results and conclusions followed by a detailed critical assessment on the reliability of the study and the conclusions drawn.

Health technology
The study considered the Integrated Management of Childhood Illness (IMCI) strategy. This strategy was designed to address major causes of child mortality at the community, health facility and health system levels. The intervention appears to have focused on preventing childhood mortality and improving treatment for sick children. The programme was managed by district health staff under routine circumstances. For the implementation of the IMCI strategy, an 11-day training programme was developed. This involved health workers in first-level health facilities providing case-management to children.

Type of intervention
Other (the IMCI was stated to be an integrated care strategy that appeared to focus on the prevention of childhood mortality and improvement of treatment for sick children).

Economic study type
Cost-effectiveness analysis.

Study population
The study comprised children aged less than five years from Tanzania.

Setting
The setting was primary, secondary and community care. The economic study was carried out in Tanzania.

Dates to which data relate
The effectiveness data were collected between July 1999 and June 2002. The resource use and cost data were collected from 1996 to 2002. The price year may have been 1999.

Source of effectiveness data
The effectiveness data were derived from a single study.

Link between effectiveness and cost data
The costing appears to have been undertaken prospectively on the same patient sample as that used for the effectiveness study.

Study sample
The authors reported that sample size calculations were performed to detect a 20% reduction in mortality. However, no information about the required sample size was provided. Four neighbouring rural districts were non-randomly chosen.
The IMCI programme was implemented in two of them, while the other two were chosen as the comparison districts. In total, 75 facilities were selected from these districts. The first 6 sick children aged 2 to 59 months who attended on a specific day, and whose mothers consented to participate, were included in the study in order to perform a health-facility survey. In addition, two representative clusters of approximately 2,300 rural households from the four districts were selected, one in 1999 and the other in 2002, to perform a household survey. A total of 2,006 children under the age of five years were available for the 1999 household survey, representing 93% of eligible households (6% of the residents were away and 1.0% refused to take part in the survey). For the 2002 household survey, 1,932 children were identified, representing 94% of eligible households (6% of residents were away and 0.4% households refused to take part in the study).

**Study design**
This was a non-randomised controlled trial that was carried out in multiple centres (at least 75 health care facilities were involved in the study).

**Analysis of effectiveness**
All of the children considered in the study appear to have been included in the analysis. The primary outcomes were:

- the quality of care (e.g. the percentage of children checked for the presence of cough, diarrhoea and fever; the percentage of children correctly classified; the percentage of children needing oral antibiotic or oral antimalarial drugs, and who were given a correct prescription);
- indicators of feeding, nutrition, carers' knowledge and home management of disease; and
- the mortality rates per 1,000 children younger than 5 years.

The quality of care was measured through a health-facility survey. Indicators of feeding, nutrition, etc. were measured through a household survey. The mortality data were collected from the census. Adjustments for age (<1 year versus 1 to 4 years) and rainfall (estimated from remote sensing data) were also made, to check whether any apparent effect of the intervention was due to contextual factors. Poisson regression models were used for this. The between-district differences were tested by t-test-based methods of adjusted residuals. P-values from Poisson regression ignoring between-district variation were also calculated.

**Effectiveness results**
In the IMCI facilities, 95% of children were checked for cough, diarrhoea and fever, compared with 36% in the comparison districts, (p<0.001).

Sixty-three per cent of sick children were correctly classified in IMCI districts, compared with 38% in the comparison districts, (p<0.001).

The availability of drugs for essential oral treatments was similar in IMCI and comparison areas at the time of the survey, (0.93 versus 0.95; p<0.47).

The proportion of children needing oral antibiotics and/or oral antimalarials, and who were prescribed them correctly, was 73% in the IMCI districts versus 35% in the comparison districts, (p<0.0001).

Seventy-two per cent of carers in the IMCI facilities whose children had been prescribed oral rehydration solutions, oral antibiotics or oral antimalarials, compared with 56% of carers in the comparison districts, reported correctly at the facility exit on how to give the treatment, (rate ratio 1.3; p=0.02).

Supervisory visits that included observation of case management were more common in IMCI districts (51%) than in comparison districts (21%), (p=0.07).

The mortality rates over the 2 years from July 2000 to June 2002 were 13% lower in the IMCI districts than in the
comparison districts (rate ratio 0.87). This corresponded to a rate reference of 3.8 fewer deaths per 1,000 children-years. An adjustment for the difference between the areas in 1999 gave a ratio of 0.86, almost identical to the unadjusted value. An adjustment for age and estimated rainfall had no effect on the estimated rate ratio. With allowance for variation between districts, and use of a normal approximation based on the log rate ratio, the 95% confidence interval (CI) for the difference in the mortality rate was -3 to 30, (p=0.28 by t-test). Ignoring between-district variation, the 95% CI for the 13% reduction in mortality associated with IMCI was 5 to 21, (p=0.004 from likelihood-rate chi test).

**Clinical conclusions**
The study showed that the introduction of facility-based IMCI was associated with improved quality of care and lower mortality rates in children younger than 5 years.

**Measure of benefits used in the economic analysis**
No summary measure of benefit was used in the economic analysis. Therefore, a cost-consequences analysis was conducted.

**Direct costs**
The direct costs included in the study appear to have been those of the health care system and the patient. Among the costs included were:

- the costs of drugs and vaccines;
- training costs attributable to the care of children under 5 years;
- the annualised cost of capital items;
- the opportunity cost of staff time spent in consultation with children under 5 years, and in attending meetings and undertaking supervisory visits; and
- the household costs, which included travel and out-of-pocket expenditure to obtain care for children under 5 years, but did not include the time of seeking care.

Although the cost estimation was based on a time horizon longer than 2 years, no adjustments for inflation were reported to have been performed. The resource quantities were not reported separately from the unit costs. The resource quantities appear to have been collected from actual data, although information about the sources of the unit costs was not reported in this paper. The authors referred to Adam et al. (2003), and Adam et al. (2005) for more detailed information on the costs (see 'Other Publications of Related Interest' for bibliographic details). The price year may have been 1999.

**Statistical analysis of costs**
The costs were treated deterministically.

**Indirect Costs**
No indirect costs were included in the study.

**Currency**
US dollars ($) and Tanzanian shillings (Tsh). The conversion rate from Tanzanian Tsh to US$ was not reported, although it could be inferred from the cost data reported in the paper.
Sensitivity analysis
No areas of uncertainty were identified or investigated.

Estimated benefits used in the economic analysis
See the 'Effectiveness Results' section.

Cost results
The total cost per child younger than 5 years was $11.19 (Tsh8,695) in the IMCI districts and $16.09 (Tsh12,503) in the comparison districts.

The cost per child younger than 5 years was recalculated without the hospital component. Similar costs per child were observed in the IMCI district ($8.30 or Tsh6,452) and comparison area ($8.76 or Tsh6,810).

Synthesis of costs and benefits
Not applicable.

Authors' conclusions
The results of the study showed evidence of an improvement in case management and a reduction in the mortality rates with the facility-based Integrated Management of Childhood Illness (IMCI) programme, obtained at similar cost to conventional treatment, thereby suggesting that this programme is highly cost-effective.

CRD COMMENTARY - Selection of comparators
The rationale for the choice of the comparator was clear. The absence of the IMIC programme represents standard practice in rural Tanzania. However, the meaning of standard practice was not defined clearly.

Validity of estimate of measure of effectiveness
This was a non-randomised controlled trial that may have been appropriate for the effectiveness analysis, given that IMCI implementation had started in two of the four districts. Therefore, the authors placed much emphasis on documenting and assessing the effect of contextual factors (malaria control efforts, vaccination programmes, and coverage of vitamin A implantation) that might confound the observed effectiveness results. However, as the authors reported, confounding factors cannot be ruled out in a non-randomised design with a small number of units. Appropriate statistical tests on the effectiveness data appear to have been performed. The authors reported that process measures were monitored to improve the internal validity of the study. However, some of the effectiveness data relied on the mothers' recall, which might have biased the results obtained. The authors reported that the lack of statistical significance in the difference in mortality rates between IMCI and comparison districts after adjustment for confounding factors might have been due to the fact that the study was designed to detect a 20% difference, while the difference detected was smaller.

Validity of estimate of measure of benefit
No summary measure of health benefit was used in the economic analysis. Therefore, a cost-consequences approach was adopted. Readers are referred to the comments in the 'Validity of estimate of measure of effectiveness' field (above). The lack of a general measure of benefits means that it would be difficult to make comparisons with other studies analysing different health interventions, which are necessary to help decision-makers in the allocation of health care resources.

Validity of estimate of costs
The authors stated that a societal perspective was adopted, but no indirect costs were included in the study. The
perspective finally adopted appears to have been that of the health care system and the patient. This may be explained by local circumstances whereby the carers' lost productivity may not be generally taken into consideration. It is not possible to state whether all the categories were included, as the authors referred the readers to two other studies for more detailed information on the costs. Although the resource use data appears to have been collected prospectively, the resource quantities were not reported separately from the unit costs. This hinders reflation exercises in other settings. Moreover, the price year was unclear. No statistical or sensitivity analyses on the costs were performed to investigate uncertainty surrounding the cost estimation.

Other issues
The authors did not compare the study results with those from other studies. The issue of generalisability of the study was not explicitly addressed, although the authors mentioned that districts considered in the study may be typical of rural Tanzania. This suggests that the results of the study may be generalisable to a typical rural Tanzanian setting.

Implications of the study
The authors commented that, although the evidence did not come from a randomised controlled trial covering a large number of districts, the study findings on mortality rates and trends in the presence of facility-based IMCI appear to support going to scale in Tanzania with this intervention. They supported a widespread implementation of the IMCI strategy, and suggested that every country in Africa that has started to implement the strategy has a high enough level of coverage to achieve a measurable effect on child mortality.

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Other publications of related interest


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