Are health interventions implemented where they are most needed? District uptake of the Integrated Management of Childhood Illness strategy in Brazil, Peru and the United Republic of Tanzania

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Objective To describe geographical patterns of implementation of the Integrated Management of Childhood Illness (IMCI) strategy in three countries and to assess whether the strategy was implemented in areas with the most pressing child health needs.
Methods We conducted interviews with key informants at the national and district levels in Brazil, Peru and the United Republic of Tanzania, and an ecological study of factors associated with health worker training in IMCI. Explanatory factors included district population, distance from the capital, human development index, other socioeconomic indicators and baseline mortality rates in children younger than five years.
Findings In line with recommendations by WHO, early implementation districts were characterized by proximity to the capital and suitable training sites, presence of motivated health managers and a functioning health system. In the expansion phase, IMCI tended to be adopted by other districts with similar characteristics. In Brazil, uptake by poor and small municipalities and those further away from the state capital was significantly lower. In Peru, there was no association with distance from Lima, and a non-significant trend for IMCI adoption by small and poor departments. In the United Republic of Tanzania, the only statistically significant finding was a lower uptake by remote districts. Implementation was not associated with baseline mortality levels in any country studied.
Conclusion Whereas clear and reasonable guidelines are provided for selection of early use districts, no criteria for promoting IMCI expansion had been issued, and areas of greatest need were not prioritized. Equity analyses based on the geographical deployment of new programmes and strategies can contribute to assessing whether they are reaching those who need them most.

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Introduction

There is ample literature on how the availability and quality of health care varies inversely in relation to an individual's health needs, a principle that was convincingly stated by Julian Tudor Hart's "inverse care law" in 1971.[1] The sociological literature also suggests that new technologies or behaviours — including those related to health care — are initially adopted by a small group of innovators and later diffused to other social groups.[2] Those with access to new health technologies are usually members of the upper social strata, who already have access to better care. Thus, it has been postulated that the health gap between the rich and the poor may widen, at least temporarily, when effective new interventions are introduced.[3]

In this paper we investigate a related issue at the geographical, rather than the individual level. We examined which factors were associated with the uptake, at district level, of a new strategy for improving the health of children. Our general hypothesis was that health interventions, programmes and strategies are often deployed without explicit attention to the question of which areas of the country are most likely to gain from their implementation.

The Integrated Management of Childhood Illness (IMCI) strategy was developed in the mid-1990s by WHO, the United Nations Children's Fund (UNICEF) and their technical partners.[4] IMCI was proposed as a strategy to unify the vertical child health programmes that were prevalent at that time, such as the Control of Diarrheal Diseases or Acute Respiratory Infections programmes. IMCI has three main components: improving the performance of health workers in first-level facilities through a training course addressing leading causes of infant and child mortality; ensuring health systems support for child health (including drug and vaccine supply, supervision and health information systems); and the strengthening of family practices needed to prevent disease, to stimulate appropriate utilization of health services, and to improve home

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care for sick children.[4] The IMCI case management guidelines were designed to address major causes of child mortality — pneumonia, diarrhoea, malaria, measles and malnutrition in countries with mortality rates in children younger than 5 years (U5MRs) of 40 per 1000 live births or greater.[5,6]

IMCI was introduced at the country level in 1996, and since then more than 100 countries have adopted the strategy.[6] In each country, IMCI was designed to evolve over three phases, namely the introduction, early implementation and expansion phases.[7] In the introductory phase, countries held orientation meetings, trained key decision-makers in IMCI, defined a management structure for preparing for IMCI planning and early implementation, and built government commitment to move forward with the IMCI strategy. In the early implementation phase, countries gained experience while implementing IMCI in limited geographical areas. They developed their national strategy and plan, adapted the IMCI guidelines to their national context, developed management and training capacity in a limited number of districts and started implementing and monitoring IMCI. The end of this phase was marked by a review meeting with the objective of synthesizing the experiences gained during early implementation and planning for expansion. In the expansion phase, countries were encouraged to increase both the range of IMCI interventions and IMCI coverage.[8] In practice, the range of interventions was seldom expanded.

The WHO document entitled *IMCI planning guide: gaining experience with the IMCI strategy in a country*[8] proposed a series of possible criteria for selecting two or three districts for early implementation in a country. The criteria included good physical access to central-level staff; committed staff at the district level; availability of a training site; availability of drugs; existence of referral care; and availability of funds to support IMCI, e.g. from a donor institution. Additional selection criteria were also proposed, including the districts having similar child-feeding practices and a common language, the need for diversity (for example, including periurban as well as rural districts) and the advantage of selecting districts that are already being targeted by external donors.

As the above list shows, selection criteria for early-use districts were mainly pragmatic and managerial. The purpose was to select a couple of demonstration districts with several facilitating factors (e.g. proximity, good staff, available funding and referral capabilities) where IMCI could be shown to work, with a view to later expansion to other districts.

The final section of the IMCI planning guide addresses the selection of districts for the expansion phase: "factors to consider in assessing district capacity or readiness to support the IMCI strategy are: a well functioning district management team, inclusion of IMCI activities in the district health plan, availability of local training faculty (for example in a training institution) and the presence of a nongovernmental organization or other donor that is ready to technically and financially support IMCI implementation in the district."[8] As for the early implementation phase, these criteria primarily represent predictors of successful implementation rather than indicators of need for IMCI, such as high mortality or prevalence of malnutrition.

In 1997, the multi-country evaluation of IMCI effectiveness, cost and impact (MCE-IMCI) was launched; it included in-depth studies in Bangladesh, Brazil, Peru, Uganda and the United Republic of Tanzania.[9] The objectives of the evaluation incorporated an assessment of the potential effects of IMCI on inequalities in child health. This entailed a study of the geographical spread of IMCI within countries, to determine whether or not the programme was reaching the areas with the most pressing child health needs.

Of the five countries included in the evaluation, it was possible to obtain data on IMCI uptake at the district level in Brazil, Peru and the United Republic of Tanzania. This paper presents the results of this investigation.

Methods

In each country, two complementary approaches to data collection and analyses were used. Desk reviews and interviews with key informants were used to investigate the introduction, early implementation and expansion phases of IMCI with emphasis on which administrative units (e.g. districts, states, municipalities or departments, henceforward referred to as "districts") were prioritized, and why.

The second approach included statistical analyses of district characteristics associated with IMCI implementation during the expansion phase. An ecological design (a type of analysis in which the study units are geographical areas) was used to compare the spatial distribution of IMCI implementation with potential explanatory variables, including sociodemographic factors, health infrastructure and pre-implementation child health and nutritional status.

The outcome variable was implementation of the case-management training component of IMCI. Because the other two components of IMCI were less strongly implemented in most countries,[6] and are also more difficult to measure, training coverage indicators were used in these analyses. The actual indicators used varied from country to country depending on the nature of the data available. Table 1 summarizes the main characteristics of the design in each country.

An attempt was made to collect information on the same explanatory variables in each of the three countries, but the nature of data available varied from country to country. The information obtained included general characteristics of the district (population, distance from the capital or largest city and urbanization rate), socioeconomic variables (literacy, income and gross domestic product (GDP)), environmental variables (water supply) and U5MR. For each of the three countries, we also attempted to obtain information on the Human Development Index, a composite indicator of GDP per capita, education (weighted average of adult literacy rate and gross school enrolment ratio) and life expectancy at birth.[10] Whenever possible, we used baseline values for all explanatory variables, that is, pre-IMCI implementation levels.

Details on the methods used in each country are presented below.

Brazil

In Brazil, the analyses were restricted to 443 municipalities with populations between 5000 and 50 000 inhabitants in three states in the north-east region of the country: Ceará, Paraíba and Pernambuco.[11] These were leading states in IMCI implementation. Municipalities were restricted to those with this population range because the study involved fieldwork[12] — which would be difficult in large cities — and because a greater impact was expected in smaller cities where IMCI coverage could be scaled up rapidly.

Table 1. **Summary of study characteristics in the three sites**

	Country		
	Brazil	**Peru**	**United Republic of Tanzania**
Study units	443 municipalities in three states in the north-east region	All 24 departments in the country	82 of 118 districts in the country, and all 21 regions of the country
Population range of study units (approximate)	5 000–50 000	80 000–7 000 000	300 000–2 500 000 (regions)
Outcome: Integrated Management of Childhood Illness (IMCI) implementation variable	Whether or not there were any IMCI- trained health workers in the municipality	Percentage of doctors and nurses working in government facilities who were trained in IMCI	Ranked date of first IMCI training course in district; mean rank of all districts in each region
Reference period for the outcome	1999–2002	1996–2000	1995–2005
Statistical method	χ^2 test	Pearson correlation coefficient	Spearman rank correlation coefficient

Based on data available at state level, municipalities were classified as to whether they had "strong IMCI" (training coverage over 50% in 2000 and over 60% in 2001 and 2002), "some IMCI" (at least one trained health worker in the period 2000–02), or "no IMCI." If state-level data were not available, municipal departments of health were contacted by telephone to provide information on IMCI training. Only 23 municipalities were classified as having strong IMCI, 216 had some, and 204 none. Owing to the small number of municipalities with strong IMCI, the first two categories were merged and the outcome variable was dichotomous (any IMCI training versus no IMCI training).

Data for 2000, derived from the National Demographic Census, were available on the following indicators,[13] unless otherwise stated:

- human development index: calculated by the United Nations Development Programme office in Brazil;[14]
- per capita monthly income: average household per capita monthly income (in Brazilian reais);
- literacy rate: percentage of individuals aged 15 years or more who were literate.
- population: number of inhabitants;
- distance from the state capital in kilometres: distance by road between the seat of the municipality and the centre of the state capital;
- urbanization (%): percentage of individuals living in urban areas;
- water supply (%): percentage of households with piped water inside the house;
- U5MR (per thousand), based on indirect mortality estimates made available by the United Nations Development Programme.[14] These estimates refer to the mid-1990s.

Peru

The ecological analyses combined information from the 34 health districts with data from the 24 departments (political divisions) of Peru, covering the period from 1996 to 2000. Indicators related to coverage of IMCI training were collected by the research team which visited all health districts.[15,16] These data were reviewed for consistency and checked against information available at the Ministry of Health and at the United Nations Children's Fund (UNICEF) and Pan American Health Organization (PAHO) country offices.[15,16] Information from the 34 health districts was aggregated into 24 departments to match the geographical basis of information on explanatory variables.

Because all health districts had started training of health workers, it was not possible to categorize IMCI implementation as a yes/no variable, as was done in Brazil. The outcome variable therefore was the percentage of doctors and nurses employed by the Ministry of Health in each department, who were trained on the clinical IMCI course, between 1996 and 2000.

The following explanatory variables were obtained from official sources and from the 1996 and 2000 Demographic and Health Surveys[17,18] and are defined as for Brazil, unless otherwise stated:

- human development index, 2000;[7]
- per capita gross departmental product (US$), 1996;[19]
- literacy rate (%);
- population (number of inhabitants);
- distance from the national capital (Lima) in kilometres;
- urbanization (%);
- water supply (%): percentage of households with piped water inside the house, 1996;[17]
- indirect U5MR estimate, ca 1995.[18]

Because of the small number of departments, we used a non-parametric approach (Kruskal–Wallis test) to assess the associations between quartiles of the explanatory variables and training coverage. Pearson correlation coefficients were also calculated.

United Republic of Tanzania

The United Republic of Tanzania was a global leader in IMCI implementation and the first district-level training course took place in November 1996; by April 2004 half of all districts had started IMCI training, and when the present data were collected in mid 2005, only 14 (17%) districts had yet to start training.

The data available in the United Republic of Tanzania were more limited than for Brazil or Peru. There are 118 districts in the country, of which 82 (69%) had complete information on child mortality, literacy and IMCI implementation date. Other indicators were available only for the 21 regions, each including two to six districts and having populations that ranged from approximately 300 000 to 2.5 million.

Because data on coverage of IMCI training by district were not available, the variable representing IMCI uptake was the date of the first training course in each district. This was obtained through a review of records, and interviews with the national IMCI team that included

staff from the Ministry of Health and the WHO country office. Districts were then ordered according to the date of the first training course. The first district to start training was given the rank of "1," and the analyses were based on these ranks. For regional-level analyses, the outcome was the median rank, in terms of the date of the first training course, of all districts belonging to each region. All analyses were repeated using mean instead of median ranks and the results were virtually unchanged.

The following explanatory variables were available at district level, based on the 2002 census,[20] unless otherwise stated:

- literacy rate: percentage of the population aged 5 years or more who can read and write in at least one language;
- total population;
- distance from the largest city (Dar es Salaam) in kilometres, estimated using a geographical information database (MapInfo Professional version 7.8);
- U5MR: deaths in children younger than 5 years per 1000 live births, estimated from the 2002 census using indirect methods; the estimate is for the 5-year period from 1995–99.

All variables available at the district level were also available at the regional level. In addition, the following variables were available only at the regional level:

- human development index;[21]
- average annual contribution to the national GDP, expressed as a percentage of the regional over the national GDP.[22] As regions varied in population size, the ratio of this percentage to the percentage of the national population living in the region was calculated, and this variable is referred to as the "GDP/population ratio";
- per capita income in Tanzanian shillings;[22]
- urbanization: percentage urban population;[22]
- water supply: percentage of the population with safe water.[21]

Because the outcome was a ranked variable, we used Spearman rank correlation coefficients in the analyses. Analyses were repeated using Pearson correlation and the results were virtually unchanged.

Table 2. **Brazil: percentage of municipalities with Integrated Management of Childhood Illness (IMCI) according to quartiles of geographical, socio-economic and environmental variables, and to baseline mortality levels**

Variables (quartiles)	Number	Municipalities with IMCI (%)	*P*-level
Human development index			0.01[a]
>0.64	106	59.4	
0.61–0.64	114	57.9	
0.58–0.60	110	56.4	
<0.58	113	42.5	
Per capita income (Brazilian reais)			0.02[b]
>91	111	66.7	
78–91	111	52.2	
67–77	111	46.8	
<67	110	50.0	
Literacy rate (%)			0.59[b]
>64	112	52.7	
61–64	110	59.5	
56–60	111	50.9	
<56	110	52.7	
Population (inhabitants)			<0.001[a]
25 001–50 000	106	70.7	
15 001–25 000	111	62.2	
10 001–15 000	111	52.2	
5 000–10 000	109	31.2	
Distance from the state capital (km)			<0.001[b]
>318	110	33.6	
195–318	111	52.2	
95–194	111	69.4	
<95	111	60.4	
Urbanization (%)			0.46[b]
>62	111	58.6	
48–62	110	60.4	
38–47	111	50.9	
<38	111	45.9	
Water supply (%)			0.14[b]
>46	110	58.2	
36–46	112	58.0	
26–35	110	44.5	
<26	111	54.9	
U5MR[c] (per 1 000)			0.17[b]
>93	112	49.1	
77–93	105	49.5	
64–76	116	62.1	
<64	110	54.5	

[a] χ^2 test for linear trend in proportions.
[b] χ^2 test for heterogeneity.
[c] U5MR, mortality rate in children younger than 5 years.

Results

For each country, we provide a brief history of IMCI implementation, followed by the statistical analyses of factors associated with its uptake.

Brazil

The IMCI introduction phase started with a meeting held in Brasília in March 1996. There was a broad consultative process involving staff from the Ministry of Health, representatives from governmental and nongovernmental institutions, the Brazilian Society of Paediatrics, public universities, and state and municipal health departments. Generic IMCI materials were adapted and training materials were prepared.

The first training course took place in June 1997. At that time, the estimated infant mortality rate (IMR) in

Brazil was 34 per 1000. IMCI training was initially targeted at four of the country's 27 states: Ceará, Pernambuco and Sergipe, in the north-east region (estimated IMRs in 1997 of 45, 54 and 49, respectively), and Pará state in the Amazon region (IMR, 32). Therefore, three of the four states where IMCI was initially implemented had a higher IMR than the national rate. These states were known for having strong vertical child health programmes, including Control of Diarrheal Diseases and Acute Respiratory Infections. Interviews with key informants confirmed that the presence of a strong health team at the state level was a prerequisite for inclusion in the early implementation phase.

Training courses were rapidly expanded to other states in the country, including those in the south and south-east where IMRs were below 20 per 1000. Nevertheless, training coverage in most states has remained very low. A detailed discussion of IMCI implementation is available elsewhere.[23]

The analysis presented in Table 2 covers 443 municipalities in three states leading in IMCI implementation in the north-east region (Ceará, Paraíba and Pernambuco). IMCI was less likely to be implemented in municipalities with low scores on the Human Development Index, low per capita income, small populations, and that were far from the state's capital. Indicators of literacy, urbanization, water supply and baseline U5MR were not associated with IMCI implementation.

Table 3. **Peru: mean Integrated Management of Childhood Illness (IMCI) training coverage by departments, according to quartiles of geographical, socioeconomic and environmental variables, and to baseline mortality**

Variables (quartiles)	Number of departments	Mean training coverage	*P*-level[a]
Human development index			0.19
>0.66	6	8.3	
0.59–0.66	6	26.7	
0.51–0.58	6	24.2	
<0.51	6	20.6	
Per capita gross departmental product (US dollars)			0.16
>1 759	6	20.4	
1 102–1759	6	9.0	
707–1101	6	23.4	
<706	6	26.9	
Literacy rate (%)			0.96
>95	6	20.7	
92–95	6	21.4	
82–91	6	16.7	
<82	6	21.0	
Population (inhabitants)			0.06
>1 148 000	6	8.0	
696 000–1 148 000	6	22.1	
384 000–695 000	6	29.6	
<384 000	6	20.0	
Distance from the state capital (km)			0.67
>1 109	6	9.8	
850–1109	6	13.5	
422–849	6	14.7	
<422	6	12.0	
Urbanization (%)			0.74
>81	6	13.8	
60–81	6	27.8	
41–59	6	18.3	
<41	6	19.8	
Water supply (%)			0.29
>63	5	13.1	
56–63	7	23.2	
42–55	6	12.4	
<42	6	29.5	
U5MR[b] (per 1 000)			0.69
>93	6	25.6	
81–93	6	20.7	
59–80	6	15.8	
<59	6	17.7	

[a] Kruskal–Wallis test.
[b] U5MR, mortality rate in children younger than 5 years.

Peru

Peru was one of the first countries in the Americas to introduce IMCI, starting in 1996. Six districts were identified for the early implementation phase. Junin, Pasco and Huanuco were chosen because of high IMRs and high rates of acute respiratory infections, diarrhoeal diseases, malaria and malnutrition in children younger than 5 years.[17] An additional criterion was that they were not being covered by other major health projects in progress at that time, such as the Proyecto Salud y Nutricion Basica and Proyecto 2000. The first of these projects was run by the Ministry of Health in collaboration with the World Bank, to modernize the health sector with the aim of improving quality of care and coverage of primary-level health services with a focus on maternal and child health and nutrition.[24] The second project — Proyecto 2000 — was implemented by the Ministry of Health and USAID with the objective of improving the health and nutritional status of pre-school children and women of reproductive age through the promotion of utilization of maternal and perinatal health services, home care and healthy community practices.[25]

The other three early-implementation districts — Ferreñafe in Lambayeque Department, Caylloma in Arequipa Department and Callao — were proposed by the staff in charge of the Programa de Salud Basica para Todos (PSBT).[26] This Ministry of Health programme, which aimed at improving access to

health services and quality of health care, provided, at least initially, most of the funding for IMCI implementation. The PSBT officers chose Ferreñafe and Cailloma because these were the poorest areas in their respective departments. Callao, one of the most advanced departments in terms of integrated health care and located just outside Lima, was chosen because it provided the opportunity for close follow-up of IMCI implementation. By mid-1997, a high-level decision at the Ministry of Health led to the incorporation of six additional districts (Andahuaylas, Ayacucho, Ica, Puno, Tacna and Ucayali), chosen because they were priority areas for Proyecto 2000. Of the 12 areas chosen for initial IMCI implementation, five (Apurimac, Ayacucho, Pasco, Puno and Ucayali) had IMRs above the national average of 58.3 per 1000 live births, whereas seven had mortality rates below the national average.

By late 1996, 53 national facilitators had been trained in IMCI. As early as 1997, the Ministry of Health declared its commitment to expanding the strategy to all 34 health districts, but the rate of training of health workers fell well short of achieving this target.[15,16] The rate of training peaked in 1999, and fell thereafter. Details of IMCI implementation at district level in this period have been published elsewhere.[15,16]

Table 3 and Table 4 show the results of the quantitative analyses. There were no significant associations between coverage of training and any of the indicators under study. Coverage tended to be somewhat lower in departments with higher values of the Human Development Index, larger populations and poorer water supply.

United Republic of Tanzania

A detailed account of IMCI implementation in the United Republic of Tanzania is available elsewhere.[27] The introductory phase started with a planning meeting in November 1995, at which the first IMCI national plan of action was prepared and seven "early use" districts were identified. These districts were intended to start IMCI implementation and provide lessons that could be used in expansion to the rest of the country. These districts were selected on the basis of four criteria: being easily accessible to the central level; the leadership skills of the District Medical Officer; existence of a functioning Control of Diarrhoeal Diseases Programme; and availability of a donor willing to support implementation. These districts, and the respective donors, were Morogoro and Rufiji (International Development Research Centre (IDRC)/United Republic of Tanzania Essential Health Interventions Project (TEHIP)), Muheza and Korogwe (Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ)), Igunga (World Bank), Mpwapwa (WHO) and Magu (UNICEF).

Table 4. **Pearson correlation coefficients (*r*) between the cumulative percentage of doctors and nurses trained in Integrated Management of Childhood Illness (IMCI) between 1996 and 2000 and explanatory variables (ca 1995), for the 24 departments of Peru**[a]

Explanatory variable	Pearson correlation coefficient (*r*)	*P*-level
Human development index	−0.278	0.19
Per capita gross departmental product (US$)	−0.140	0.51
Literacy rate (%)	−0.096	0.66
Population (inhabitants)	−0.294	0.16
Distance from the capital (km)	−0.060	0.78
Urbanization (%)	−0.024	0.91
Water supply (%)	−0.309	0.14
U5MR[b] (per thousand)	0.169	0.43

[a] Positive coefficients indicate that IMCI was more strongly implemented in areas with high values of the explanatory variable.
[b] U5MR, mortality rate in children younger than 5 years.

The early implementation phase started in October 1996 and involved activities at the central level, including training of trainers who were then deployed in the seven early-use districts. In June 1998, there was a desk review of initial implementation, and the expansion phase was launched. This involved the appointment of a full-time National IMCI Coordinator and stepwise expansion of IMCI training to all facilities within the initial districts, to new districts within the same region and to new districts in other regions. The expansion phase also incorporated implementation of the other two IMCI components: strengthening of health systems and improving family and community practices.

Interviews with key informants at the national level suggest that implementation depended largely on the attitude of the individual district health management team, and rather less on the availability of a donor, and was unlikely to be associated with the level of socioeconomic development.

This view is supported by the data shown in Table 5. Owing to lack of data, fewer variables are available at the district than at the regional level. The only significant correlation was the earlier introduction of IMCI in districts that were close to Dar es Salaam. None of the other correlations, including that with baseline U5MR, were statistically significant.

Discussion

The strong inverse association between the geographical availability of health resources and measures of population need for health care is well recognized.[28] Much less is known, however, about how new health programmes are spread out on a geographical basis, or about the factors associated with their uptake at district level.

The present analyses have certain limitations. Detailed information on IMCI implementation, and particularly on coverage of training for health workers, was very difficult to obtain. In Brazil and Peru, this required repeated contacts with, and sometimes visits to, numerous administrative units, because there was no up-to-date central registry of training coverage. In the United Republic of Tanzania, it was only possible to obtain information on the date of the first training course in each district — admittedly a poor proxy for training coverage.

The countries for these analyses were selected from the five (Bangladesh, Brazil, Peru, Uganda and the United Republic of Tanzania) included in a multi-country evaluation.[6] However, in Bangladesh, IMCI was being implemented only in one pilot district and in Uganda, data on IMCI introduction or

implementation in most districts were unavailable. Ideally a larger number of countries would have been included in this study. However, as noted above, few if any countries have information systems that routinely report on IMCI introduction or coverage, and obtaining the information used in these analyses was a time-consuming effort.

The need to develop a strong information system side-by-side with rolling out training activities is a priority for effective scaling up. Information on explanatory variables, such as the Human Development Index, was also impossible to obtain in the United Republic of Tanzania, even at the regional level.

Another drawback was that, except for in Brazil, the number of study units available for analyses was limited, resulting in relatively low statistical power for detecting significant associations. Also, several likely determinants of implementation are hard to measure. For example, key informants in all countries mentioned that motivation of the district health team was a major determinant of IMCI uptake. This important variable is difficult if not impossible to measure in large-scale studies.

Use of the WHO-recommended criteria for selecting districts for early implementation, as described in the first section of this paper, resulted in the selection of early-use districts that were close to the national capital or main city, with a good track record in previous vertical child health programmes, managed by motivated teams and with funding available. While this makes sense for the selection of early-use districts, these characteristics are likely to be found in districts where the U5MRs are lower than the national average. The WHO guidelines did not identify mortality levels or population size as criteria for the selection of districts at this stage. These observations are being made with the benefit of hindsight. In practice, IMCI training materials were developed first,[4] and implementation guidelines a few years later.[7,8] The thinking of the global team in charge of IMCI development and implementation has evolved over time; there was a substantial time lag between the development of new concepts and guidelines and their application at country level and below.

IMCI should not be singled out as the only strategy without explicit pro-equity implementation guidelines. Antenatal and delivery care, immunizations and many other child survival interventions are inequitably distributed within low- and middle-income countries.[28–30] Vaccination initiatives have recently incorporated the "reach every district" approach to achieve universal coverage and thereby reduce inequities;[31] countries are being encouraged to focus first on low-coverage districts, which will often be the poorest. The need to match delivery of child survival interventions with population health needs in a geographical area is also reflected in the programme management guidelines for child survival, which WHO is currently developing.[32]

In spite of the lack of specific recommendations regarding equity, in both Brazil and Peru — but not in the United Republic of Tanzania — national-level IMCI planners partially addressed equity concerns when selecting early-use districts. In Brazil, three of the four states initially selected were in the area of the country with the highest mortality rate; however, the two states with the highest mortality rates, Alagoas and Maranhão, were not included. In Peru, as described above, there was also an attempt at targeting health districts with high death rates.

The statistical analyses presented in Tables 2–5 go beyond the early-use districts, to reveal which administrative units were most likely to take up IMCI during the expansion phase. In Brazil, these are not the same types of geographical units (states) as were included in the early phase, but represent the spread to municipalities within three states. Because decentralization is an ongoing process in the three countries under study, districts or municipalities were reasonably independent in their adoption of new strategies such as IMCI, and the influence of the national- (or in Brazil, state-) level administration was relatively limited.

Unfortunately, it was not possible to obtain comparable data on all explanatory factors under study. In Brazil, IMCI was less likely to be implemented by poor and small municipalities, and by those that were distant from the state capital. The association with population size in Brazil may be, at least in part, artefactual: larger cities have more health workers and there is thus a greater chance that at least one of them would have been trained in IMCI. Key informants mentioned that small and remote municipalities were less likely to have qualified workers because most training took place in the capital, and because these municipalities were not willing to release one of their few health workers (sometimes the only one) for the extended period necessary for the training. Other informants also mentioned that IMCI-trained health workers were more likely to get jobs in larger and wealthier municipalities; it was even mentioned that some mayors were unwilling to allow their workers to be trained because this would lead to their eventual departure.

Table 5. **Spearman correlation coefficients (rho) between ranked dates of Integrated Management of Childhood Illness (IMCI) introduction and explanatory variables (ca 2000)**[a]

Explanatory variables	Regional level analyses ($n=21$)[c]		District level analyses[b] ($n=82$)[d]	
	rho	*P*	rho	*P*
Human development index	−0.021	0.93	–	–
GDP/population ratio	0.120	0.61	–	–
Per capita income	0.249	0.29	–	–
Urbanization (%)	−0.114	0.63	–	–
Water supply (%)	−0.168	0.48	–	–
Literacy rate (%)	0.011	0.97	−0.034	0.77
Population (inhabitants)	−0.261	0.25	−0.149	0.20
Distance from Dar es Salaam (km)	0.271	0.25	0.244	0.03
U5MR[e] (per thousand)	−0.007	.975	−0.112	0.32

[a] Data for 82 districts and 21 regions of the United Republic of Tanzania. Positive coefficients indicate that IMCI tended to be introduced later in areas with higher values of the explanatory variable.
[b] Data not available.
[c] Data were missing for up to six districts for one or more variables.
[d] Data were missing for up to one region for one or more variables.
[e] U5MR, mortality rate in children younger than 5 years.

In Peru, coverage of IMCI training was not significantly associated with any of the indicators under study, but tended to be somewhat higher in poorer and smaller departments, and in those with lower coverage of safe water supply. This may reflect the tendency, mentioned by the key informants, to target IMCI at the poorest districts.

Finally, in the United Republic of Tanzania the only significant finding at the district level was the delayed introduction of IMCI in remote districts. A similar but non-significant association was found in the regional-level analyses.

In a perfect world, IMCI would be more strongly implemented in districts with high U5MRs and lower standards of living, and among these, priority would be given to districts with a large population of children younger than five years old. This was not the case in any of the three countries studied. In Brazil, there was a weak, non-significant inverse association — in fact, IMCI implementation at municipal level tended to be pro-rich rather than pro-poor. In Peru, implementation was slightly pro-poor, but no significant associations were present. In the United Republic of Tanzania, there were no clear patterns but, as in Brazil, distance from the main city was inversely associated with implementation.

When data from the interviews with key informants are compared, the need to prioritize poor districts with higher mortality was mentioned quite often in Peru, to a certain extent in Brazil, and less so in the United Republic of Tanzania. When 124 countries with available data were ranked in ascending order of income inequality in 2005, the United Republic of Tanzania was considerably more equitable (ranked 64th) than Peru (ranked 100th) or Brazil (ranked 117th).[33] The existence of wider inequalities in South America is supported by additional results from the present analyses. The correlation coefficients for the literacy and U5MR indicators were –0.710 ($P < 0.001$) in Peru; –0.454 ($P < 0.001$) in Brazil; and –0.280 ($P = 0.23$) in the United Republic of Tanzania, all suggesting inverse associations, although less strong in the United Republic of Tanzania. This may explain why greater attention — at least at the discourse level — is given to inequalities in the two South American countries. For example, Peru introduced *Haemophilus influenzae* type b vaccine in 1998 in the high mortality departments, whereas the vaccine was only introduced in the more developed areas in 2004 when high coverage had already been reached in the initial implementation departments.[34]

Until recently, equity considerations were seldom addressed in international child health initiatives aimed at low- and middle-income countries.[29] Results from the present analyses show that criteria for selecting districts for the early implementation phase of IMCI — which are somewhat pro-rich — need to be counterbalanced by pro-poor criteria for the expansion phase. WHO should work together with countries to guide selection of the districts in which programmes and strategies are deployed, to ensure that high-risk geographical areas are not left behind. Admittedly, this is easier said than done, but unless pro-active efforts are made to deploy interventions where they are most needed, inequalities in child health may widen as a result of new programmes. ■

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Résumé

Les interventions sanitaires sont-elles mises en œuvre là où elles sont le plus nécessaires ? Application à l'échelle du district de la Prise en charge intégrée des maladies de l'enfant au Brésil, au Pérou et en République unie de Tanzanie

Objectif Décrire comment se répartit géographiquement l'application de la Prise en charge intégrée des maladies de l'enfant (IMCI) dans trois pays et déterminer si cette stratégie est mise en œuvre dans les zones où les besoins des enfants sont les plus pressants.

Méthodes Nous avons mené des entretiens avec des informateurs clés aux niveaux du pays et du district, au Brésil, au Pérou et en République unie de Tanzanie, ainsi qu'une étude écologique des facteurs intervenant dans la formation à l'IMCI des agents de santé. Parmi ces facteurs, figuraient la population du district, la distance par rapport à la capitale, l'indice de développement humain et d'autres indicateurs socioéconomiques, ainsi que les taux de mortalité de référence chez les enfants de moins de cinq ans.

Résultats Conformément aux recommandations de l'OMS, les districts ayant bénéficié précocement de la mise en œuvre de l'IMCI présentaient les caractéristiques suivantes : proximité avec la capitale, disponibilité de sites de formation appropriés, présence de cadres sanitaires motivés et d'un système de santé opérationnel. Dans la phase d'expansion, l'IMCI a été préférentiellement adoptée par des districts présentant des caractéristiques similaires. Au Brésil, sa mise en œuvre par les municipalités pauvres ou de faible importance et par celles situées à plus grande distance de la capitale de l'État était nettement plus limitée. Au Pérou, aucune association entre la distance à Lima et le taux de mise en œuvre n'a été constatée et une tendance non significative à l'adoption de l'IMCI par des services de faible importance et disposant de ressources limitées a été relevée. Pour la République unie de Tanzanie, le seul résultat statistiquement significatif était une moindre mise en œuvre dans les districts isolés. On n'a relevé d'association entre la mise en œuvre de cette stratégie et les taux de mortalité de référence dans aucun des pays étudiés.

Conclusion Si des directives claires et raisonnables ont été fournies pour la sélection des districts devant bénéficier parmi les premiers de l'IMCI, aucun critère pour guider l'élargissement de cette stratégie n'a été publié et aucun classement par priorité des zones où s'expriment les plus grands besoins n'a été établi. Des analyses sur le plan de l'équité du déploiement géographique des stratégies et programmes récents pourraient aider à déterminer si ces interventions atteignent ceux qui en ont le plus besoin.

Resumen

¿Se implementan las intervenciones sanitarias donde más se necesitan? Implantación distrital de la estrategia de Atención Integrada a las Enfermedades Prevalentes de la Infancia en el Brasil, el Perú y la República Unida de Tanzanía

Objetivo Describir la distribución geográfica de la implementación de la estrategia de Atención Integrada a las Enfermedades Prevalentes de la Infancia (AIEPI) en tres países y evaluar si dicha estrategia se aplicaba en las zonas donde más acuciantes eran las necesidades de salud infantil.

Métodos Realizamos entrevistas con informantes clave a nivel nacional y distrital en el Brasil, el Perú y la República Unida de Tanzanía, así como un estudio ecológico de los factores asociados a la formación de los trabajadores sanitarios en materia de AIEPI. Entre los factores explicativos figuraban la población del distrito, la distancia hasta la capital, el índice de desarrollo humano, otros indicadores socioeconómicos y las tasas de mortalidad basales de los menores de cinco años.

Resultados En consonancia con las recomendaciones de la OMS, los distritos de implementación temprana se caracterizaban por que estaban cerca de la capital y disponían de centros de formación idóneos, de administradores sanitarios motivados y de un sistema de salud operativo. En la fase de expansión, la AIEPI solía ser adoptada por otros distritos de características similares. En el Brasil, la implantación en los municipios más pobres y pequeños y en los más alejados de la capital del Estado fue significativamente menor. En el Perú no se observó ninguna relación con la distancia a Lima, y la tendencia de adopción de la AIEPI por los departamentos pequeños y pobres no era significativa. En la República Unida de Tanzanía, el único dato estadísticamente relevante fue la menor implantación en los distritos alejados. La implementación no se asoció a niveles de mortalidad basal en ninguno de los países estudiados.

Conclusión Si bien se facilitan directrices claras y razonables para la selección de los distritos de implementación temprana, no se suministraron criterios para promover la expansión de la AIEPI, y no se priorizaron las áreas más necesitadas. Los análisis de la equidad basados en el despliegue geográfico de nuevos programas y estrategias pueden ser una ayuda para evaluar si se está llegando o no a quienes más los necesitan.

ملخص

هل نُفِّذت التدخُّلات الصحية في المواقع الأكثر احتياجاً لها؟

المناطق تنفِّذ استراتيجية التدبير المتكامل لأمراض الطفولة في البرازيل والبيرو وجمهورية تنزانيا المتحدة

الهدف: وصف جغرافيٌّ لأنماط تنفيذ استراتيجية التدبير المتكامل لأمراض الطفولة في ثلاثة بلدان، مع تقييم ما إذا كانت هذه الاستراتيجية قد نُفِّذت في أكثر المواقع احتياجاً لصحة الأطفال.

الطريقة: أجرينا مقابلات مع المعنيِّين الرئيسيِّين على المستوى الوطني وعلى مستوى المقاطعات في كلٍّ من البرازيل والبيرو وجمهورية تنزانيا المتحدة، إلى جانب دراسة بيئية للعوامل التي رافقت تدريب العاملين الصحيِّين على استراتيجية التدبير المتكامل لأمراض الطفولة. وقد اشتملت العوامل التفسيرية على عدد سكان المقاطعة، وبُعْدِها عن العاصمة، ومَنْسَب التنمية البشرية ومؤشِّرات اجتماعية واقتصادية أخرى والمعدلات الأساسية للوفيات لدى الأطفال بعمر دون خمس سنوات.

الموجودات: في المرحلة الباكرة لتنفيذ الاستراتيجية، كانت المقاطعات المنفِّذة لها هي الأقرب للعاصمة، والتي تتمتَّع بمواقع تدريبية ملائمة، وتتمتَّع بمديرين صحيِّين ينعمون بالحوافز، وتتمتَّع بنظام صحي فعَّال، وهذه الخصائص تتماشى مع توصيات منظمة الصحة العالمية. وفي مرحلة التوسُّع بالتنفيذ، مالت المقاطعات التي لديها خصائص مشابهة لتبنِّي استراتيجية التدبير المتكامل لأمراض الطفولة. وفي البرازيل كان تنفيذ الاستراتيجية أقل بكثير لدى البلديات الصغيرة والفقيرة والبعيدة عن العاصمة. وفي البيرو لم يكن هناك أية علاقة بين بُعد المقاطعات عن العاصمة ليما وبين تنفيذ الاستراتيجية، ولم تُبْدِ المديريات الفقيرة أو الصغيرة اهتماماً ملحوظاً باستراتيجية التدبير المتكامل لأمراض الطفولة. أما في جمهورية تنزانيا المتحدة فإن واحدة فقط من بين الموجودات ذات الأهمية الإحصائية كانت انخفاض مستوى تنفيذ الاستراتيجية في المقاطعات البعيدة. ولم يترافق تنفيذ الاستراتيجية بتوثيق للمستويات الأساسية لمعدلات الوفيات في أي من البلدان الثلاث المدروسة.

الاستنتاج: رغم توافر دلائل إرشادية معقولة وواضحة لاختيار المقاطعات التي تنفِّذ الاستراتيجية باكراً، فإنه ليس هناك أية معطيات لتعزيز توسيع هذه الاستراتيجية، ولم توضَّح المناطق ذات الأولوية الأكثر احتياجاً. ويمكن لتحليل المساواة والعدالة المُرْتَكِز على الانتشار الجغرافي للبرامج الجديدة أن يساهم في تقييم ما إذا كانت هذه البرامج والاستراتيجيات تُتاح لمن هم الأكثر حاجة إليها.

References

1. Hart JT. The inverse care law. *Lancet* 1971;1:405-12.
2. Rogers EM. *Diffusion of innovations*. 4th ed. New York: Free Press; 1995.
3. Victora CG, Vaughan JP, Barros FC, Silva AC, Tomasi E. Explaining trends in inequities: evidence from Brazilian child health studies. *Lancet* 2000; 356:1093-8.
4. Tulloch J. Integrated approach to child health in developing countries. *Lancet* 1999;354 Suppl 2;SII16-20.
5. World Health Organization. *IMCI information packet*. Geneva: Department of Child and Adolescent Health and Development, WHO; 1998. WHO document WHO/CHS/CAH/98.1D.
6. Bryce J, Victora CG, Habicht JP, Black RE, Scherpbier RW. Programmatic pathways to child survival: results of a multi-country evaluation of Integrated Management of Childhood Illness. *Health Policy Plan* 2005;20 Suppl 1:i5-17.
7. World Health Organization. *Planning for the implementation of IMCI in countries*. Geneva: Department of Child and Adolescent Health and Development, WHO; 1999. WHO document WHO/CHS/CAH/98.1C.
8. World Health Organization. *IMCI planning guide: Gaining experience with the IMCI strategy in a country* (draft). Geneva: Department of Child and Adolescent Health and Development, WHO; 1999. WHO document WHO/CHS/CAH/99.1.
9. Bryce J, Victora CG, Habicht JP, Vaughan JP, Black RE. The multi-country evaluation of the integrated management of childhood illness strategy: lessons for the evaluation of public health interventions. *Am J Public Health* 2004;94:406-15.
10. United Nations Development Programme. *Human development data*. New York: UNDP; 2005; Available from: http://hdr.undp.org/statistics/

11. Amaral J, Leite AJ, Cunha AJ, Victora CG. Impact of IMCI health worker training on routinely collected child health indicators in Northeast Brazil. *Health Policy Plan* 2005;20 Suppl 1:i42-8.
12. Amaral J, Gouws E, Bryce J, Leite AJ, Cunha AL, Victora CG. Effect of Integrated Management of Childhood Illness (IMCI) on health worker performance in Northeast-Brazil. *Cad Saude Publica* 2004;20 Suppl 2: S209-19.
13. Instituto Nacional de Geografia e Estatística. 2005 Available from: www.ibge.gov.br/home/estatistica/populacao/censo2000/
14. United Nations Development Programme. *Atlas do Desenvolvimento Humano do Brasil*. Brasília: UNDP; 2000.
15. Huicho L, Davila M, Campos M, Drasbek C, Bryce J, Victora CG. Scaling up integrated management of childhood illness to the national level: achievements and challenges in Peru. *Health Policy Plan* 2005;20:14-24.
16. Huicho L, Davila M, Gonzales F, Drasbek C, Bryce J, Victora CG. Implementation of the Integrated Management of Childhood Illness strategy in Peru and its association with health indicators: an ecological analysis. *Health Policy Plan* 2005;20 Suppl 1:i32-41.
17. Encuesta Demografica y de Salud Familiar. *ENDES III*. Lima, Peru: Instituto Nacional de Estadística e Informática; 1996.
18. Encuesta Demografica y de Salud Familiar. *ENDES IV*. Lima, Peru: Instituto Nacional de Estadística e Informática; 2000.
19. *Compendio Estadistico 1996-1997*. Lima, Peru: Instituto Nacional de Estadística e Informática; 1996-1997.
20. *2002 Population and Housing Census*. Dar es Salaam: National Bureau of Statistics; 2002.
21. *Poverty and human development report 2002*. Dar es Salaam: Research and Analysis Working Group; 2002.
22. *Regional socio-economic profile*. June 2003. Dar es Salaam: National Bureau of Statistics; 2003.
23. Amaral JL, Leite AM, Cunha ALA. *Implementation of IMCI in Brazil – Documentation Report*. Fortaleza, Brazil: Universidade Federal do Ceará; 2005.
24. *Proyecto Salud y Nutricion Basica. 2006*. Available from: http://www.minsa.gob.pe/psnb/
25. *Proyecto 2000*. Available from: http://www.minsa.gob.pe/p2000/
26. *Programa Salud Basica para Todos*, 2006. Available from: http://www.minsa.gob.pe/psbpt/
27. Mbuya CML, Kasale H, Reid G, de Savigny D, Armstrong-Schellenberg J, Victora CG, et al. *IMCI implementation: a report on experiences in Morogoro and Rufiji Districts in Tanzania. Preliminary Report*. Dar es Salaam: Tanzania Ministry of Health, Tanzania Essential Health Interventions Project; 2003.
28. Gwatkin DR, Bhuiya A, Victora CG. Making health systems more equitable. *Lancet* 2004;364:1273-80.
29. Victora CG, Wagstaff A, Schellenberg JA, Gwatkin D, Claeson M, Habicht JP. Applying an equity lens to child health and mortality: more of the same is not enough. *Lancet* 2003;362:233-41.
30. Victora CG, Fenn B, Bryce J, Kirkwood BR. Co-coverage of preventive interventions and implications for child-survival strategies: evidence from national surveys. *Lancet* 2005;366:1460-6.
31. World Health Organization. *Draft global immunization strategy*. Geneva: WHO; 2005.
32. World Health Organization. *Mid-level managment (MLM) training course for child health programme managers (draft)*. Geneva: Department of Child and Adolescent Health and Development, WHO; 2006.
33. United Nations Development Fund. *Human Development Report 2005*. New York: United Nations Development Fund; 2005.
34. Ministerial R. *307-2005/MINS*. Lima: Ministry of Health; 2005.