

Community-Directed Interventions for Priority Health Problems in Africa: Results of a Multicountry Study

The CDI Study Group

Abstract

Objective

Community directed treatment with ivermectin has been instrumental to the success of onchocerciasis control in Africa. A three-year multicountry experimental study was undertaken with the objective of determining the extent to which this same community directed approach could effectively and efficiently provide integrated delivery of other health interventions.

Methods

The study was undertaken in 35 health districts in 7 research sites in Cameroon, Nigeria and Uganda. Each site included four trial districts and one comparison district. All districts had established ivermectin treatment programs. Four other established interventions, i.e. Vitamin A supplementation, ITNs, home management of malaria, and DOTS for tuberculosis, were progressively added to the Community Directed Intervention (CDI) process in the trial districts. At the end of each year, quantitative evaluations of intervention coverage and provider costs were undertaken, as well as qualitative assessments of the CDI process.

Results

CDI achieved significantly higher coverage than currently used delivery approaches for all interventions except DOTS. For the malaria interventions, the coverage more than doubled with CDI. District level costs for providing the five interventions were less in the CDI districts but there was no difference in cost at the first line health facility level. Process evaluation showed the importance of participatory processes, recurrent problems with supplies of intervention materials, commitments of communities and community implementers to the CDI process, and the importance of intangible incentives rather than external financial incentives in motivating community implementers.

Discussion

CDI is an effective and efficient model for integrated delivery of appropriate health interventions at the community level in Africa that builds upon core principles of primary health care.

Introduction

Ensuring that available health interventions reach the people who most need them is one of the major challenges for achieving the Millennium Development Goals (1). Many simple, affordable and effective disease control products have had only limited impact on the burden of disease due to inadequate distribution in poor and remote communities(2). The creation of several global health initiatives has improved the delivery of selected health interventions, but for many priority interventions, e.g. against malaria, the coverage is still unacceptably low, especially in Africa (3-5). There is therefore an urgent need for more effective strategies to improve access(2). The proliferation of health initiatives has also contributed to fragmentation of the overall health effort and there are increasing calls for their integration within the Primary Health Care system (6, 7). Greater integration is particularly relevant for the delivery of interventions at the community level in which the community itself participates (6, 8). There is little scientific evidence, however, on how to achieve this within the context of Primary Health Care (9) and there is an urgent need for more research on effective and integrated delivery strategies for community-based interventions (2, 6, 10).

One such strategy is the Community Directed Intervention (CDI) strategy in which communities themselves direct the planning and implementation of intervention delivery (11). Adopted by the African Programme for Onchocerciasis Control (APOC) in the mid-1990s, CDI has helped ensuring and sustaining delivery of annual ivermectin treatment among over 75 million Africans, many living in remote areas (12, 13).

This success of CDI has stimulated national and international policy interest in how the CDI approach and the established African network might be applied to other interventions (14, 15). The Board of APOC, on which Health Ministers of 19 African countries are represented, requested the WHO Special Programme for Research and Training in Tropical Diseases (TDR) to undertake a study on the use of the CDI approach for other diseases. In response to this request, a multicountry study was launched in 2005 with the objective of determining the extent to which the CDI approach could effectively and efficiently provide integrated delivery of other health interventions of differing degrees of complexity. The present article provides a synthesis of the main findings of the study; more detailed results are available from the TDR study report(16)

Methods

Community-directed Intervention process

A community-directed intervention (CDI) is a health intervention that is undertaken at the community level under the direction of the community itself. The health services and its partners introduce in a participatory manner the range of possible intervention(s), and the means by which the community-direction concept can ensure community ownership from the onset. From then on, the community takes charge of the process, usually through a series of community meetings for collective discussion of roles and responsibilities of the community in the CDI process; community decision-making on how, when, where and by whom the intervention will be implemented, how the implementation will be monitored and what, if any, support (financial or otherwise) will be provided to implementers; and collective selection of community implementers. Health workers provide training of community implementers and monitoring but the community directs the intervention process (16).

Study design

The study was a three-year multicentre experimental study of delivery strategies for established community-based interventions in a health district. The study was designed to evaluate the process, effectiveness and efficiency of progressively adding established health interventions of different complexity to the CDI process already used for the delivery of ivermectin. The following additional interventions were selected for the study:

- Vitamin A supplementation (VIT.A)
- Distribution and retreatment of insecticide-treated nets (ITNs)
- Tuberculosis: case-detection and referral, and directly-observed treatment short-course (DOTS)
- Home-management of malaria (HMM).

The five interventions were hypothetically ranked in terms of complexity as follows, with reference to factors such as presumed level of effort and skill needed for delivery:

Ivermectin < Vit A < ITN < DOTS ~ HMM

The study involved multi-disciplinary research teams from 7 sites in 3 African countries (table 1), selected by an independent expert committee on the basis of scientific merit and relevance of proposals received from 32 research teams from 12 African countries. Each selected research site encompassed five health districts where Community-directed treatment with ivermectin had already been implemented for several years and where all four other intervention programmes were implemented through the normal health system channels. Each site randomly designated four health districts to be CDI intervention districts while one was randomly designated as a comparison district where the four additional interventions continued to be delivered the conventional way.

In order to test the overall effort needed for combined delivery of interventions through CDI, the research was undertaken in three one-year phases (Figure 1). In Year 1, one additional intervention besides ivermectin treatment was delivered through the CDI process in each CDI district. In Year 2, one more intervention was delivered through CDI and during Year 3 the remaining two interventions were added to the CDI process.

Evaluation methods

The study used quantitative survey methods for the evaluation of effectiveness and efficiency and qualitative methods for process evaluation.

Effectiveness

For evaluation purposes, 10 communities were randomly selected in each district. A total of 5 households were randomly selected from each community, giving a total of 50 evaluation villages and 250 evaluation households per study site. The effectiveness of the CDI process for delivering the different interventions to their target population was assessed using the standard coverage indicators listed below. For each indicator, all persons concerned (or their caretakers in the case of under five children) in the selected households were interviewed using a standard questionnaire.

Vit A:

- % of children 6 to 59 months who received Vit A during the last treatment round;

ITNs:

- % of households that have at least one ITN;
- % of <5 year old children sleeping under an ITN the night prior to study interview;
- % of pregnant women sleeping under an ITN the night prior to study interview;

HMM:

- % of <5 year old children who had fever in the last two weeks and received appropriate treatment, i.e. treatment at the correct regimen with a nationally recommended antimalarial drug within 24 hours of onset of fever;

DOTS:

- Treatment completion rate, i.e. the percentage of patients registered between 6 and 18 months before the survey, who had completed treatment according to their treatment card (all TB patients from the study communities who were registered in a health facility serving the district between 6 and 18 months before the evaluation, were followed up to determine their treatment status from their treatment card).

Ivermectin distribution:

- % of total population treated with ivermectin during the last year.

Provider costs

The cost of delivering the five interventions was assessed through the collection of provider cost data at district level, first line health facility level, and community level. At the district level, programme officers responsible for delivery of each of the five interventions were interviewed regarding eight cost items: staff salaries, allowances for volunteers, consultant fees, training, mobilization, transportation, maintenance and utilities cost, and supervision and monitoring cost. Where resources were shared, the interviewee was requested to allocate a percentage of the total costs of each individual (recurrent and capital) input to the study interventions. At the first line health facilities level, information for seven of the same cost items was obtained from the officer-in-charge of the facility (consultant fees were not regarded as relevant at this level). Where possible, cost estimates were checked with records but these were often not available. At the community level, the provider costs were defined as

the monetary value of the time the community implementers devoted to the delivery of the interventions in terms of foregone employment (opportunity costs). The reference point for the calculation of this opportunity cost was the national minimum wage for an equivalent 8 hour day. Finally, all costs were converted to 2005 US dollars after correcting for inflation using the national consumer price index for each country, and using the 2005 official exchange rate between the national currency and the US dollar.

Process evaluation

At the beginning of the project, a conceptual framework was hypothesized to describe qualitatively which factors in the CDI process would impact the successful implementation of CDI interventions(16). Qualitative social science research instruments were subsequently designed to evaluate these factors. The instruments included: in-depth interviews with community implementers (584 interviews in year 3) and health workers (371), focus group discussions with community groups (278), key informant interviews with NGO partners (147), focused discussions during stakeholder briefings and structured observation using checklists (445). All qualitative data were processed using AtlasTi 5.2 software. Coding of textual data was performed using a cross-site code-list developed on the basis of the conceptual framework. Single site data were merged into a cross-site database. At the final analysis workshop, research teams produced detailed reports of the CDI process in their study area, drawing from the evaluation data collected. Through a process of collective brainstorming, sharing of site reports and in-depth analysis of the cross-site database, team members then identified the factors they had observed to make a difference, positively or negatively, in programme implementation. Factors affecting the outcome of each component of the process were then rated according to their importance to outcomes.

Research ethics

The common study protocol, including the informed consent forms, was approved by WHO's Research Ethics Review Committee and by the participating country's National Ethical Review Committee or appropriate Institutional Review Board. Informed consent was obtained from all persons who voluntarily agreed to be interviewed.

Results

Effectiveness of CDI

During the first year of the study there were major shortages of intervention materials that prevented implementation of interventions in several districts, and complete coverage evaluations were therefore only undertaken in years 2 and 3. Table 1 shows that in both years the coverage for Vitamin A, ITN and HMM was significantly higher when delivered through the CDI process. The increase in coverage was particularly striking for the malaria interventions, for which the coverage was very low in the comparison districts but which nearly doubled when delivered through CDI.

These averages, however, still do not reflect the full potential for HMM delivery in the context of CDI. During the study period Cameroon set forth a new malaria treatment policy, which stipulated that Coartem® be prescribed only after a patient was positively diagnosed with malaria, effectively inhibiting the incorporation of HMM into CDI. However, in Nigeria and Uganda, where no such policy restrictions were in place, the percentage of children receiving appropriate antimalarial treatment in Year 3 was 77% in the CDI study districts (Figure 2) — two and a half times higher than in the comparison districts and largely exceeding the Roll Back Malaria target of 60% for the year 2005(17).

Contrary to the findings for the other interventions, the DOTS treatment completion rate was not higher in CDI study districts than in comparison districts. DOTS was the intervention that the health system was most reluctant to include in the CDI approach. Most district TB control officers did not believe community members could be entrusted with handling the drugs. Hence, DOTS was only fully implemented through CDI in one of the seven study sites.

In response to concerns raised by APOC's board, the evaluation also considered how the inclusion of other interventions in CDI would impact annual ivermectin treatment. The results indicate that the impact had, in fact, been positive and that ivermectin treatment coverage was 10% higher in districts where multiple interventions were delivered through CDI.

Cost of CDI

At district level, cost analysis suggests that it is relatively cost efficient to deliver health care interventions through the CDI process (Figure 3). In the CDI districts, the median costs per district of implementing and delivering the five study interventions was a little above US\$ 15,000, while in the comparison districts it was about US\$ 30,000. There was little difference in the relative allocation of costs between CDI study sites and comparison districts. In both CDI and comparison districts, staff salaries was the major cost (51.2% vs. 48.6% respectively). Maintenance, training, and social mobilization accounted each for some 10% to 17% of costs in both groups of districts. The cost of transport was less than 3% in the CDI districts while it accounted for about 8% in the comparison districts.

At the first line health facility level CDI did not achieve a significant cost savings. While slightly lower in the CDI districts (median US\$ 1,025) than in the comparison districts (median US\$ 1,170), the difference was not statistically significant. Here, too, the major cost item was salaries.

The median opportunity cost for community implementers per community was US \$65 in the CDI communities and US \$44 in the comparison communities, (where implementers were involved in carrying out ivermectin distribution only. However, there was a wide range in estimated opportunity cost per community (Figure 3), and the difference between CDI and comparison districts is not statistically significant.

Critical Process factors in CDI

Implementation of CDI involved five major processes at different levels of the health system. These processes were extensively evaluated and the main findings are summarized in Figure 4.

Stakeholder consultation and mobilization were among the factors most critical to the success of the process. Because the interventions being addressed by CDI had not been run in an integrated manner before, many stakeholders had a strong sense of ownership or vested

interests in particular delivery approaches that they perceived as meeting their own programme targets. These views had to be harmonized at different levels.

The case of Vitamin A provided a vivid example of the challenges involved. Vitamin A distribution was linked to National Immunization Day campaigns in which considerable sums are invested, providing local health staff and politicians with an opportunity to 'buy' political capital. Despite national decisions to include Vitamin A in the study, it was initially difficult to persuade district health staff and NGO stakeholders to incorporate Vitamin A into CDI delivery, or to relinquish Vitamin A supplies. During the first year of the study, Vitamin A could therefore not be delivered through CDI in several study sites. In the second year, national levels were targeted for an issue-specific advocacy effort, emphasizing the potential value of the new approach in light of the eventual phasing-out of immunization day campaigns. The result was a clear policy directive to the study areas that Vitamin A should be delivered through CDI, at least for the term of the study, and this resolved the problems.

The CDI process is embedded in the health system and is therefore also subject to health system constraints. A major challenge concerned the health system's procurement of needed intervention materials to support the increased demand generated by CDI's integrated approach. This was problematic especially during the first year of the CDI study. The most common procurement problem was a shortage of ITNs and antimalarials. Recurrent shortages created problems for community implementers: *"I had difficulties, people who would not get nets due to shortage of nets accused me of keeping their nets"* [community implementer, Kaduna].

A key step in the CDI process was the community selection of community implementers in a manner that best suited their interests. All research teams observed that when the whole community participated in the selection process and definition of tasks, they subsequently also gave greater support for the volunteers to carry out CDI. And the implementers thus selected tended to be appropriate and motivated for the task.

In the CDI process, there is no external provision for material incentives to implementers; rather communities decide what incentives to provide. Expectations of monetary incentives existed among community volunteers, influenced by the fact that other health efforts frequently involved such rewards. But, as also observed previously (18, 19), material

incentives, while an issue, usually were not perceived by implementers as carrying the same weight as non-material incentives that remained a powerful driver in the CDI process. These included: community recognition, status, feeling of making a contribution, pride in the services provided, knowledge gained and positive feedback from individual community members. A key motivational factor for CDI implementers was the community's confidence: *"I cannot let down my community since they chose with trust"* [community implementer, Uganda].

The true embedding of CDI in communities also related to broader changes in the ways communities and health service related to each other, e.g. broader 'systems' effects. Communities became increasingly aware of public health issues, health commodities and their rights to access as a result of the CDI process. This awareness, in turn, reinforced their commitment to it and other health measures. Once aware of the extent of their rights and responsibilities, they were more assertive about receiving adequate services from health authorities.

Over the course of the study, more women attended meetings, spoke out and were selected as CDI implementers, particularly as a result of growing awareness of their potential role in malaria treatment. Over time, women became more outspoken, participated more actively, and demanded that responsibilities be assigned to them.

Community-based organizations, including women's groups, became more involved over time. For instance, in one Nigerian site, the market women's association now plays an active role in CDI activities, such as mobilizing their members to obtain CDI services. Interest in community development stimulated initially by CDI, was observed to expand gradually to other development efforts.

Health workers became more engaged in outreach activities as a result of CDI. Health workers came to see community implementers as partners, involving them in other outreach activities as well, for example in prevention of sexually transmitted infections. Health workers also reported that they enjoyed the stimulation of training and supervising CDI implementers.

Discussion

The ultimate aim of CDI is to improve the delivery of public health interventions and to help ensure that these interventions reach the populations that need them. The test of CDI effectiveness, therefore, is whether it can improve and sustain the coverage of the target populations with the interventions over time. In the course of the years studied, the CDI approach was shown to be much more effective than currently used delivery approaches for all studied interventions except DOTS. The impact was especially dramatic for malaria interventions, where CDI delivery more than doubled the coverage of ITNs and appropriate malaria treatment in children. Annual ivermectin treatment coverage was also positively impacted, possibly because of an increase in momentum and greater community commitment to the total CDI package.

With respect to costs to the health system, CDI appeared more efficient than conventional delivery systems. With cost-savings at district level, and without any increase in implementation costs at the first line health facility level, the CDI process achieved higher coverage of health interventions of varied complexity.

When given the necessary training and support, community implementers demonstrated that they could effectively implement each of the five study interventions, irrespective of their level of complexity, and were indeed eager to use the approach and sustain it over a period of time. Although they expressed desire for financial incentives, community implementers perceived intrinsic incentives (e.g. recognition, status, knowledge and skills gain, etc.) as more powerful factors in the delivery of CDI interventions. The major observed constraints were social constraints (acceptability and appropriateness of the intervention) and health system constraints (e.g. shortage of supplies, reluctance to abandon vertical delivery, reluctance of health workers to empower community implementers for TB DOTS administration; and, in some isolated cases, health policies restricting distribution of antimalarials by anyone other than certified health services staff).

Integrated delivery of different interventions through the CDI process proved feasible and cost-effective in conditions where adequate supplies of drugs and other intervention materials were made available. Communities, health workers, policy-makers and other stakeholders

displayed significant support and their buy-in increased significantly over time. Since intervention coverage also increased over time and with the number of interventions included in CDI, the results of the study are promising with respect to the sustainability of CDI.

Based on the outcome of the study, the board of APOC has recommended that CDI approaches be adopted for integrated, community level delivery of appropriate health interventions in the 16 African countries with experience in community-directed treatment for onchocerciasis control (20). This may include the interventions tested in this study, especially for malaria, or other packages of interventions, chosen on the basis of the lessons learned. This APOC endorsement represents significant potential for extending CDI programmes elsewhere insofar as programmes for community-directed treatment with ivermectin cover some 75 million people to date and are projected to cover 100 million by 2010 (13, 21, 22).

The evidence from the current large scale study shows that CDI provides an effective platform for integrated delivery of health interventions in a model that builds upon core principles of primary health care, notably active community participation in the organization and delivery of interventions, and a structured and systematic partnership of communities and health systems.

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Members of the CDI study group:

University of Buea, Cameroon

Dr S. Wanji
 Dr P. Enyong
 Dr N. Tendongfor
 Dr N. Zakariaou
 Mr N. Celestin
 Ms L.V. Moukam
 Ms L. Yolande
 Mr N. Theobald
 Mr D. Fabrice
 Mr M. Ibrahim
 Mr A.L. King

University of Yaoundé I, Cameroon

Professor I. Takougang
 Dr J.P. Wabo
 Ms T.M. Darios
 Ms N. Henriette
 Dr L.N. Ndeffo
 Dr F. Innocent
 Dr J.J. Keuzeta
 Mr D. Medard
 Mr P. Tatah

University of Ibadan, Nigeria

Professor O. Oladepo
 Dr F. Oshiname
 Dr A. Ajuwon
 Dr A. Jaiyeoba
 Dr O. Alaba
 Dr K. Olayinwola
 Mr S. Otusanya
 Mrs A. Oyeyemi
 Mr M. Titloye

Professor J.D. Adeniyi
 Dr O.S. Arulogun
 Professor D. Soyibo
 Dr O.A. Lawanson
 Dr B.A. Adeniyi
 Dr C.P. Babalola
 Dr T.T.A. Elemile
 Dr O.S. Ndekwa
 Dr J.A. Oso
 Mrs L. Andah
 Dr A.I. Aiyede
 Mr N. Afolabi

Corresponding author:

Dr. J.H.F. Remme
 120 Rue des Campanules
 01210 Ornex
 France
 E-mail: hansremme@Gmail.com
 Tel: +33 60045457404

Sight Savers International, Kaduna, Nigeria

Dr E. ElHassan
 Mr S. Isyaku
 Mrs S. Sanda
 Dr F.N.C. Enwezor
 Mr O. Adekeye
 Mr F. Agbo
 Dr M.K. Ogungbemi
 Mr D. Lawong
 Mr F. Folurunsho
 Ms F. Ibrahim
 Mrs A. Gwom

University of Yola, Nigeria

Professor O. Akogun
 Dr J.A. Badaki
 Mr D.O. Echeta
 Ms A.O. Adesina
 Mr S. Njobdi
 Mr J. Manabete
 Mr K. Shitta
 Ms U. Ahmed

Ministry of health, Uganda

Dr R. Ndyomugenyi
 Mr A.T. Kabali
 Mr B. Kiberu
 Mrs Z. Mugaba

Scientific advisors

Professor M. Homeida, Sudan
 Dr M. Amayunzu, Kenya
 Dr W. Brieger, USA
 Professor O. Kale, Nigeria
 Dr S. Zimicki, USA
 Dr U. Amazigo, Burkina Faso

Study monitor

Dr J. Okeibunor, Nigeria

Research coordination

Dr J.H.F. Remme, WHO/TDR, Geneva (retired)
 Dr J. Sommerfeld, WHO/TDR, Geneva

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Tables and Figures

Table 1: Study sites and study population

Country	Institution	Study regions	Study districts / Local Government Areas	Population of study districts
Cameroon	University of Buea	Western Province	Dschang, Foumbot, Bafang, Bangangté and Mbouda	219,865
Cameroon	University of Yaoundé	Littoral Province	Yabassi, Nkondjock, Pouma, Ndom and Ngambe	96,855
Nigeria	University of Ibadan 1	Oyo State (north-western)	Iwajowa, Iseyin, Kajola, Ibarapa North and Ibarapa Central	488,759
Nigeria	University of Ibadan 2	Oyo State (north-central)	Oyo East, Saki West, Irepo, Atiba and Atisbo	562,816
Nigeria	Sight Savers international	Kaduna State	Lere, Jemaa, Kachia, Kaura and Kauru	164,681
Nigeria	University of Yola	Taraba State	Pantisawa, Garbachede, Pupule, Bali and Yakoko	556,055
Uganda	Ministry of Health	Western, eastern and northern Regions	Arua, Sironko, Kyenjojo, Kanungu and Nebbi	265,663
TOTAL			35 districts	2,354,694

Reproduced from reference 16

Table 2: Coverage rates from the year 2 and year 3 evaluations, comparing for each intervention the coverage in districts with conventional delivery with districts where the intervention was delivered though CDI for one year or two years

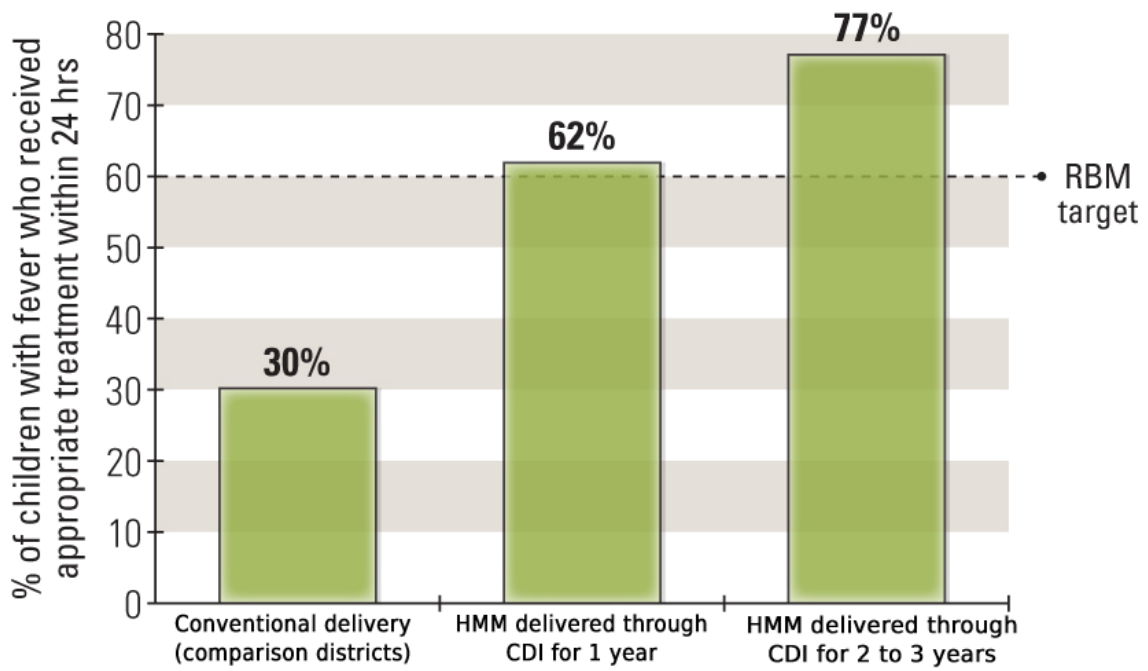
Interventions Indicators	Evaluation results for year 2				Evaluation results for year 3			
	Comparison districts - conventional delivery only	CDI Districts with conventional delivery in year 2	CDI Districts with delivery through CDI in year 2	P-value (χ^2 -test)	Comparison districts - conventional delivery only	CDI Districts with conventional delivery in year 2; CDI in year 3	CDI Districts with delivery through CDI in years 2 and 3	P-value (χ^2 -test)
Vitamin A supplementation								
No. of children	618	1274	1659		620	1330	1414	
No. treated	536	1103	1513		502	1178	1274	
% treated	86.7 %	86.6 %	91.2 %	<0.001	81.0 %	88.6 %	90.1 %	< 0.001
Households (HH) with ITN								
No of Households	280	577	598		343	652	643	
No of HH with at least 1 ITN	44	135	49.5		105	339	363	
% HH with at least 1 ITN	15.7 %	23.4 %	50.0 %	<0.001	30.6 %	52.0 %	56.5 %	<0.001
Children sleeping under ITN								
No. of children	452	892	979		506	1088	944	
Slept under ITN last night	41	95	343		82	390	315	
% slept under ITN last night	9.1 %	10.7 %	35.0 %	<0.001	16.2 %	35.8 %	33.4 %	<0.001
Pregnant women under ITN								
Total no. pregnant women	63	135	163		60	115	138	
No. slept under ITN last night	5	6	61		20	65	67	
% slept under ITN last night	7.9 %	4.4 %	37.4 %	<0.001	33.3 %	56.5 %	48.6 %	0.014
Home management of malaria								
Total children with fever	230	485	420		231	477	435	
No. appropriately treated	49	135	200		66	262	302	
% appropriately treated	21.3 %	27.8 %	47.6 %	<0.001	28.6 %	54.9 %	69.4 %	<0.001
DOTS								
No. TB patients on register	43	179	70		40	145	96	
No. completed treatment	35	146	58		36	127	88	
% treatment completion	81.4 %	81.6 %	82.9 %	0.97	90.0 %	87.6 %	91.7 %	0.59

Data source: reference 16

Figure 1: Study design for each study site

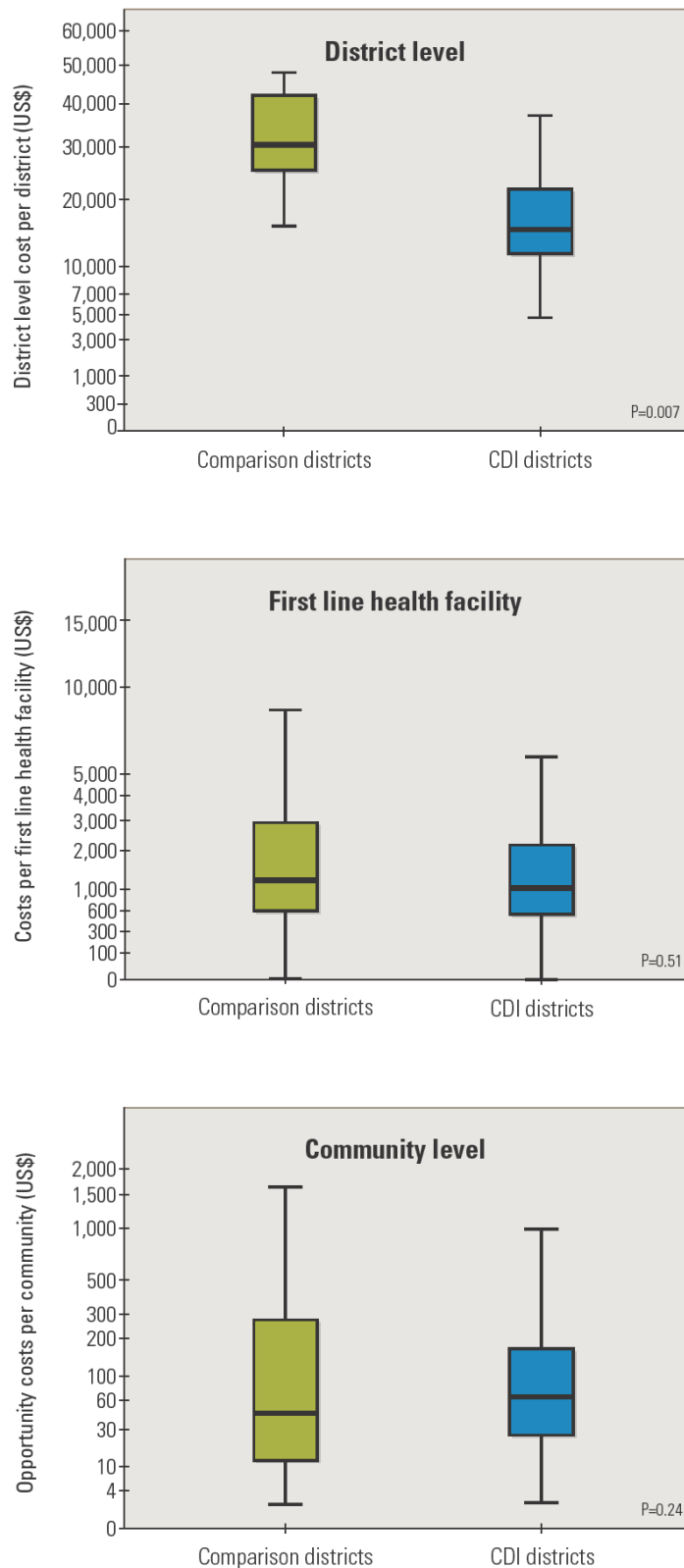
Study Phase	Interventions delivered through the CDI process				Comparison district
	CDI District 1	CDI District 2	CDI District 3	CDI District 4	
Year 1 (2005)	CDTi + Vit A	CDTi + DOTS	CDTi + ITN	CDTi + HMM	Conventional, non-integrated delivery of the five interventions
Year 2 (2006)	CDTi + Vit A + ITN	CDTi + DOTS + HMM	CDTi + ITN + Vit A	CDTi + HMM + DOTS	Conventional, non-integrated delivery of the five interventions
Year 3 (2007)	CDTi + Vit A + ITN + DOTS + HMM	CDTi + DOTS + HMM + ITN + Vit A	CDTi + ITN + Vit A + DOTS + HMM	CDTi + HMM + DOTS + ITN + Vit A	Conventional, non-integrated delivery of the five interventions

Figure 2: Appropriate treatment of fever in Nigeria and Uganda in year 3



Reproduced from reference 16

Figure 3: Annual provider costs for delivery of the 5 study interventions at different levels of the health system



P-values represent statistical significance of difference between Comparison and CDI districts (Mann-Whitney U-test)

Reproduced from reference 16

Figure 4

Evaluation of the CDI process: main findings

Stakeholder processes

- Stakeholder identification and consultation at all levels of the health system was critically important for the success of CDI.
- By the final year of the study, stakeholder consensus regarding inclusion of additional interventions within the CDI process was achieved at national, sub-national, district and community levels.
- The degree of consensus increased over time reflecting the maturing of the CDI process.
- Seeing results reinforced the commitment of stakeholders to CDI.

Health system dynamics

- Year 1: The CDI approach was generally appreciated in the context of the positive experience with ivermectin treatment. Availability, procurement, supply and distribution of intervention materials proved difficult for most interventions.
- Year 2: The participatory consultation and sensitization process, and the improved availability of intervention materials, led to an increased commitment of the health system to the CDI process at all levels in all seven sites. Training for health staff at first-line health facilities played a crucial role. It takes more than one year to properly set up a CDI process.
- Year 3: Health systems in all sites were beginning to provide an enabling environment for CDI processes to occur. The supply of malaria-related intervention materials has greatly improved in most sites but some logistics problems persisted.

Engaging and empowering communities

- Participatory, consensus-building approaches to community mobilization are critically important.
- High perceived value of malaria interventions (esp. HMM with ACTs) facilitates CDI.
- Communities value implementers residing in the community.
- Information and training increased awareness and ability to participate.
- Community selection of CDI implementers important to enhance ownership and continuity. Where not selected by community, lack of commitment emerged over time.
- Continued participatory approaches remain necessary.

Engaging CDI implementers

- Selection of CDI implementers by communities is critical.
- CDI implementers are committed to serving their communities.
- CDI implementers are generally motivated by intrinsic incentives.
- CDI implementers mention desire for extrinsic financial incentives; however the lack of financial incentives has not significantly affected their willingness to serve.

Broader systems effects

- Communities became increasingly aware of public health issues, health commodities and their rights to access
- Women became more outspoken, participated more actively, and demanded that responsibilities be assigned to them.
- Community-based organizations, including women's groups, became more involved. Interest in community development was observed to expand to other development efforts.
- Health workers became more engaged in outreach activities. They came to see community implementers as partners, involving them in other outreach activities as well.