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Subsidized sales of insecticide-treated nets in Afghan refugee camps demonstrate the feasibility of a transition from humanitarian aid towards sustainability

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Abstract

Background: Introducing sustainability and self-reliance is essential in chronic humanitarian emergencies before financial assistance is phased out. In Pakistan-based Afghan refugee camps, this was attempted through shifting from indoor residual spraying (IRS) to the subsidized sale of insecticide-treated nets (ITNs) for prevention of malaria and anthroponotic cutaneous leishmaniasis (ACL). Here we outline the strategy and document the progress to provide guidance for replication of similar approaches in other chronic refugee situations.

Methods: The operational monitoring data presented were collected through: (i) two surveys of knowledge, attitude and practice (KAP); (ii) routine sales reporting of health-care providers; (iii) records completed during field visits; and (iv) registers used during annual re-treatment campaigns.

Results: From 2000 until 2003, subsidized ITN sales expanded from 17 to 44 camps. Based on 2003 sales records, maximum coverage from subsidized sales exceeded 50% in 13 camps and 20% in an additional 14 camps. Free annual treatment campaigns showed that many refugees were in possession of non-programme nets, which were either locally-made or had leaked from an ITN programme in Afghanistan. Estimated re-treatment coverage of sold and existing nets through annual campaigns exceeded 43% in all camps and was above 70% in the majority.

Conclusion: Subsidized sales of ITNs have effectively introduced the components of sustainability and self-reliance to the prevention of malaria and ACL in Afghan refugee camps. Similar approaches should be investigated in other chronic refugee situations to discourage expectations of continuing humanitarian donations that cannot be fulfilled.

Background

Insecticide-treated nets (ITNs) have become the favoured vector control tool for malaria and some other vector-borne diseases, such as leishmaniasis. There is wide variation in implementation methods, from ITN components of national malaria control programmes in stable

situations to deployment as part of humanitarian emergency relief. Operational problems make it difficult to achieve the same coverage, regularity of use and insecticide treatment as under trial conditions [1], meaning that effectiveness under field conditions is expected to be less than the efficacy reported from large-scale trials [2]. Where effectiveness has been studied, ITN users were, nevertheless, at significantly lower risk of being infected with malaria, when compared to non-users [3-5].

Over recent years, humanitarian emergency relief has started to address malaria control, because many complex emergencies affect the distribution and incidence of malaria. For example, refugees from malaria endemic areas may bring malaria parasites to the host country, potentially resulting in epidemics [6]. In other settings, refugees from non-endemic areas may have to move to malaria endemic areas where they are more vulnerable to the disease than the host population, because they lack immunity and suffer from additional problems associated with displaced populations, such as stress or malnutrition [7]. In either setting, a weak health infrastructure in the host country and construction of refugee camps near mosquito breeding sites increase the potential for epidemics.

In general, complex emergencies have an early, acute phase. This may either be quickly followed by a transitional phase towards development (e.g. East Timor) [8] or by some stabilization, but continuation of conflict and absence of clear development initiatives (e.g. Afghanistan before 2001) [9], referred to as a chronic phase. Changes between phases can be rapid, with the situation either improving or deteriorating. Complex emergencies can make implementation of ITN programmes particularly challenging, because security may not be stable, refugees may have no, or limited, financial resources and frequent migration may make it difficult to locate mosquito nets for insecticide re-treatment.

Over the last decade, the protection of Afghans from malaria and anthroponotic cutaneous leishmaniasis (ACL) in war-torn Afghanistan and in Pakistan-based camps has presented one of these operational challenges. Traditionally, indoor residual spraying (IRS) had been the mainstay of control in both countries. In a chronic emergency this method could no longer be implemented in Afghanistan, as the malaria control programme had disintegrated. The need for a vertical structure and associated financial support also made IRS progressively less appropriate for application in the refugee camps [10]. Continuation of a chronic situation was foreseeable and an associated reduction in donor funding was anticipated, requiring a longer-term, low-cost control strategy. Ideally, one needed a strategy that was going to contribute towards a developmental approach and a national malaria control strategy, while remaining flexible in case the situation deteriorated.

To establish an evidence-base for the introduction of a novel and potentially sustainable approach, the efficacy of ITNs was evaluated for prevention of malaria [11] and ACL [12]. Through subsidized sales, ITN coverage was gradually expanded in the two previously targeted camps in Pakistan, the eastern region of Afghanistan and later in Kabul. Effectiveness under programme conditions was confirmed [5,13]. The Afghanistan-based programme continued to expand and by 2003 approximately 500,000 nets had been sold [HNI unpublished reports]. In the Pakistan-based refugee camps the development of a programme for the sale of ITNs was somewhat delayed until 2000, as the United Nations High Commissioner for Refugees (UNHCR) and its implementing partners were required to follow official government policy, i.e. application of IRS.

The present research analyses the operational aspects of establishing the ITN programme in the refugee camps since 2000 and the outcomes achieved over four years of implementation. As such it is meant to document experience with the sale of ITNs in a chronic emergency environment and to provide guidance for similar settings, where it may be appropriate to initiate a transition from humanitarian aid towards sustainable development.

Methods

Intervention area

After the Soviet invasion of Afghanistan, 2.5 million Afghan refugees crossed into Pakistan. The refugees were settled in more than 300 officially recognized camps in the North West Frontier Province (NWFP), Baluchistan and the Punjab (Figure 1). The first camps were established in 1989, with refugees initially living in canvas tents provided by the UNHCR that were gradually replaced by traditional mud-brick houses. Health care and food provision was free of charge for the first years, and all refugees were given blankets, pillows, kerosene oil, etc. as part of a winterization package. Free assistance was gradually phased out and is now limited to the few camps established as a result of the US Army intervention in Afghanistan after September 2001.

The refugees had come to a country where malaria continues to be highly endemic and seasonal, occurring mostly after the July to August monsoon rains. *Plasmodium vivax* peaks twice per year, once during the spring, mainly because of relapses, and once during the summer, after recent transmission. *P. falciparum* peaks once, during September/October [14]. Many of the camps were sited on low-lying, often waterlogged land, close to rivers or adjoining rice cultivation, providing ideal breeding sites

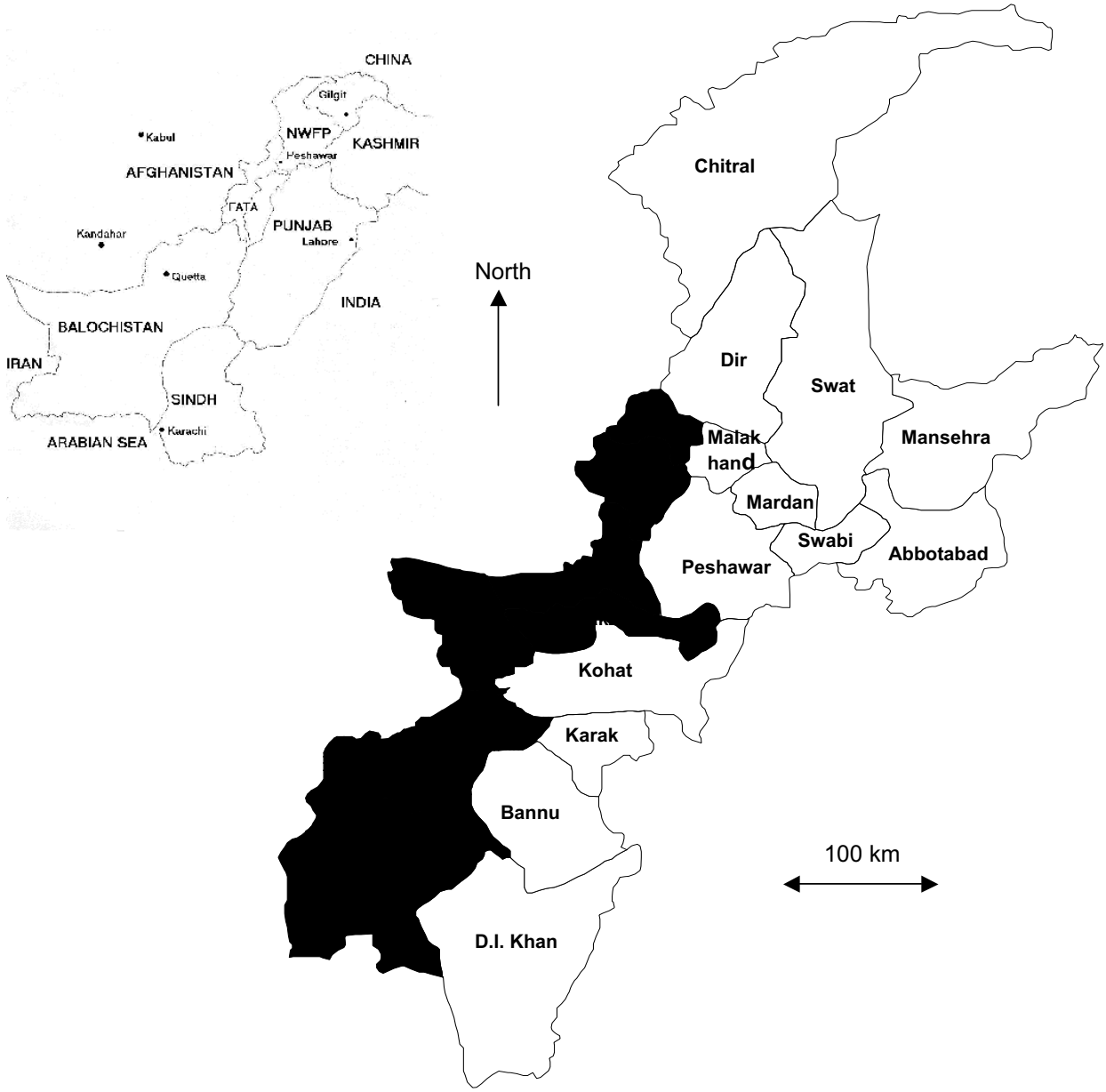

Figure 1
Small map showing the borders and provinces of Pakistan. Large map providing the district outlines for the North West Frontier Province (NWFP), with the shaded areas representing the Federally Administered Tribal Areas (FATA).

for anopheline mosquitoes For the non-immune refugees it rapidly developed into a significant burden. It reached its peak in 1991, when over 150,000 cases were diagnosed and treated at Basic Health Units (BHUs) [14].

Routine health care was provided at the Basic Health Unit (BHU) in the camps, through non-governmental organizations (NGOs) and UNHCR's governmental counterpart for refugees, known as the Project Director Health (PDH). Additional services were supported through specialized NGOs which provided support and technical advice to

health care providers; malaria control was initially addressed by Médecins Sans Frontières (MSF), but soon handed over to its developmental counterpart, Health*Net* International (HNI).

Historical vector-control interventions

Malaria control relied heavily on IRS, a long-standing method used in Pakistan and Afghanistan since the malaria eradication campaign [15]. Though highly effective, spraying campaigns placed great logistical demands on health care providers and were only cost effective (when compared to ITNs) while malaria incidence and the global price for nets were both high. Over the years cost-effectiveness changed with a decline in malaria and in the price of mosquito nets. Furthermore, the complex emergency had become chronic and it became progressively more important to encourage self-reliance in the refugees to decrease their dependency on humanitarian aid [10]. HNI thus explored the possibility of introducing ITNs as a more appropriate and sustainable vector control method.

Distribution mechanism for ITNs

In June 2000, prior to initiating the replacement of IRS with the subsidized sale of ITNs, a questionnaire-based KAP survey was carried out in 10 camps to determine whether it would be feasible to sell mosquito nets to refugees. Based on the results a uniform pricing policy was agreed among the implementing partners. As it was unknown how well this new intervention would be taken-up by the communities, only 17 camps were initially selected, depending on the capacity of the implementing partners to ensure good logistic support. During subsequent years the programme was expanded by adding camps based on malaria and ACL incidence data.

For the first year a target of 10% coverage (estimated at 3.5 persons per ITN) was set for the selected camps. Six thousand rectangular mosquito nets made of 100% polyester, 100 denier, with 12 × 13 meshes per square inch, were procured from the SiamDutch Mosquito Netting Company, Bangkok, Thailand. Each measured 220 × 180 × 150 cm and was green in colour. The pyrethroid insecticide deltamethrin (SC50 formulation) was chosen for impregnation. Based on the available stock and the target coverage for each camp, yearly ITN distribution plans were developed to allocate supplies. Prior to being sent to the field, all ITNs were labelled with serial numbers.

To develop the required skills among the field workers, e.g. Community Health Supervisors (CHSs) and Community Health Workers (CHWs), training workshops on the technical and administrative aspects of ITN implementation were organised before supplies were provided to them. In each camp the CHSs operated from BHUs as salesmen for ITNs and as supervisors for CHWs. The latter took responsibility for sales of ITNs to families in their catchment areas of the camp.

During 2000 nets were only sold for malaria prevention at a price of 210 rupees (US$ 3.5), which was lowered to 180 rupees (US$ 3.2) in 2001, following requests from camp residents and implementing partners. In 2002, nine camps with reported cases of ACL were targeted for the first time. A slightly different pricing scheme was adopted, whereby patients with active lesion and their families were entitled to highly subsidized ITNs for 120 rupees (US $ 2.1) per net. Out of the revenue for each ITN sold, CHSs were paid 8% sales commission, if they had sold the net, or 2% for monitoring of CHWs, if the net had been sold by a CHW. CHWs were paid 6% commission for each net sold by them. The 8% commission of the sales price of each net thus carried the cost of ITN distribution within the camps, whereas all other operational costs (training, monitoring, supervision, etc.) were covered by a separate programme budget.

Mechanism for re-treatment of nets

ITNs were re-treated once a year, before the start of the *P. vivax* transmission season in April/May. Re-treatment was carried out through campaigns in all camps where mosquito nets had previously been sold through regular HNI implementing partners and some additional camps that had been provided with nets by other health care providers in the past (see BHUs in Haripur, Table 2). The schedule was shared with all the implementing partners in advance, to give time for community mobilization through CHWs, CHSs, schoolteachers and loud speakers mounted on mosques. Re-treatment was free of charge, provided by a maximum of four teams per camp (each team composed of two CHWs and one CHS) working at different locations to provide easy access for the inhabitants. Campaigns in each camp were supervised by one HNI staff member. Each campaign took two to three days per camp, depending on the number of the existing nets.

In none of the camps the total number of nets (locally made, leaked from Afghanistan and sold through the programme) was known. In camps where re-treatment was carried out for the first time (i.e. the year after first offering ITNs for sale), no reliable re-treatment coverage could thus be calculated. In an attempt to arrive at a realistic re-treatment figure during subsequent years, the total number of nets treated during the campaign was divided by the total number of nets treated during the previous year (as a proxy for the total number of nets present in a camp) or the total number sold, whichever number was higher.

Table 1: Results from a pre-implementation KAP survey in 10 refugee camps in NWFP during 2000.

Camp	Number of households interviewed	Average expenditure per malaria patient*	% of households with nets	Average no. of nets/family**	% willing to buy ITN at 250 rupees per net
Azakhel-1	114	250	7	1.3	75
Badaber	122	250	3	1.3	68
Dalan	102	547	30	3.3	62
D. Dola	69	321	6	1.5	84
Gamkol	123	363	4	2.0	86
Katakana	110	355	16	2.1	47
Kerala	62	298	3	2.5	67
Kotki-2	64	613	28	1.7	73
Naryab	71	655	6	2.2	65
Oblan	97	295	5	2.6	74

* Amounts are provided in Pakistani Rupees (1 US$ = 60 Pakistani Rupees on 1 May 2000) ** The number of nets per family applies to families that already had mosquito nets

Table 2: Number of mosquito nets re-treated per camp.

	Year				
	2001	2002		2003	
Camp	Number	Number	%*	Number	%*
Ashgharoo 1 2				455	
Azakhil 1	85	733	99	1,522	70
Azakhil 2	338	975	89	1,942	79
A. Warsak		630		724	115
Badaber	88	314	77	347	43
Bagzai		1,961		2,794	82
Basoo				209	
Bhagicha	1,334	1,912	102	1,545	62
BHUs Haripur**	562	1,701	76	2,813	125
Bushera				1,631	
Chapari				712	
D. Dola	598	375	52	467	58
Dallan	642	1,021	80	1,534	76
Darsamand		1,061		1,782	107
Gambilla				85	
Ghamkol 1	53	153	72	215	101
Ghamkol 2	71	150	65	134	58
Ichrian				128	
Jalala		67		93	68
Kahi				1,461	
K. Chandna	379	605	100	883	100
Kagan	807	720	76	619	56
Katakana	173	419	81	512	71
Kerala	397	416	93	345	58
Kheshko				88	
Kotki 2	413	550	73	653	54
M. Khoja		448		1,103	73
M. Kot				1,241	
Naguman	134	322	608	215	47
Naryab	334	654	93	1,036	95
Oblan	62	142	78	219	120
Old Bagzai				150	
Satin				785	
Shashu				1,111	

Table 2: Number of mosquito nets re-treated per camp. *(Continued)*

Thall 1	147	507	90	1,011	95
Thall 2		568		1,016	85
Toor		441		752	110
W. Khwara		884		1,648	84
Yakakhund				103	
Zarinoor	754	1,473	95	1,849	83
Zangali				30	
Total	7,371	17,056		32,390	

* Estimated percentage re-treatment is given for years subsequent to the first re-treatment campaign, as calculations are based on the total number of nets treated during the annual campaign over the total number of nets retreated during the previous year (as a proxy for the total number of nets that are in a camp) or over the total number of nets sold during the previous year(s), whichever value was greater. ** Combined data from 7 BHUs

Monitoring of implementation

Prior to the intervention, sales registers and receipts were developed and introduced into each targeted camp, to facilitate record keeping. Each buyer was asked to provide name, address and family card number (for camps where this system was implemented). The number of nets purchased and the serial number(s) were also noted. This information provided the basis for monitoring activities. During monthly monitoring visits HNI staff collected revenue, paid commissions and checked the sales register and receipts. When time permitted, they also visited refugees who had bought ITNs to verify whether the net(s) remained in the household. This „leakage monitoring" was also performed by CHSs through random visits to families in their catchment area.

The risk of leakage (i.e. the loss of ITNs from the targeted communities through re-sale of nets outside the camps) is thought to be mainly due to the lack of commercial availability of ITNs in Pakistan. Demand from the local population, which until 2004 was not targeted by any ITN intervention, and from refugee camps that were not included in the present programme, far outweighs available supplies. This demand was thus seen as a potential risk for non-retention of nets by those Afghan refugees at whom subsidies had been targeted, as the temptation to re-sell nets may be high. This assumption is supported by anecdotal reports from Afghanistan (HNI, unpublished data), where people occasionally sell subsidised nets to commercial traders.

Survey on sleeping habits

To provide an estimate of the number of refugees covered by subsidized ITNs sold through the programme, the average number of sleepers per net had to be established. During autumn 2003 a questionnaire-based survey was carried out in four refugee camps, Baghicha (Mardan district), Kotki-2 (Hangu district), Azakhil (Peshawar district) and Dallan (Hangu district) (Figure 1). In each camp the CHWs were requested to help the survey team identify families that had bought ITNs over the last years. Because families often share compounds, the head of each household was interviewed with a separate questionnaire in compounds with more than one family. Data were collected on the number of: (i) family members; (ii) nets owned; and (iii) people sleeping under each net. Respondents were also asked whether the family continued to use the net throughout the year and, if not, when they stopped using it. Data analysis was conducted using STATA 6 (Stata Corporation, College Station, TX).

Maximum ITN coverage from subsidized sales

The maximum coverage achieved through subsidized sales was calculated on the basis of annual sales records, population data and the assumption that, on average, three people were sleeping under each net (see results from above survey). Because refugees had acquired nets through leakage or made them locally out of cotton material and because leakage of programme nets to non-target groups was minimal, the estimated maximum coverage from subsidized sales may be less than the total coverage of the Afghan refugees with ITNs. The ITN sales figures presented are therefore meant to illustrate the evolution of the programme not protection of the population from malaria and/or ACL *per se*.

Results

Pre-implementation KAP survey

Respondents from 934 households stated that they spend 250 – 655 rupees (US$ 4.17 – 10.90) per malaria patient in their families (Table 1). In all the camps some families had already acquired mosquito nets, in two of them (Dalan and Kotki-2) this applied to about 30% of the families. For those that already had nets, the number varied from 1.3 – 2.6 nets per family between camps. The majority of all the households (ranging from 62 to 86% between camps) stated that they were willing to buy ITNs for 250 rupees (US$ 4.17) per net, if these were made available.

Sleeping habits

The questionnaire-based study surveyed a total of 223 families. According to the information provided, up to seven people slept under one mosquito net, with 90% of nets covering between two to four people. The majority of nets were used by two to three sleepers, the mean was 2.8 per net. These results varied between camps; the lowest mean was observed for Dallan (2.3) and the highest for Azakhil (3.4). Though both were significantly different when compared to the mean for the three other camps, this was of no importance in practical terms and it was decided that future estimates of maximum coverage from subsidized ITN sales should be based on three people per net, rather than the previously assumed 3.5.

The proportion of family members sleeping under a net varied from 83% in Baghicha to 92% in Dallan, showing that in households with mosquito nets most people benefit from their protection. Most of the families stated that they stop using their nets between September and December; 64% of the families do not use their nets from November onwards. Only in Azakhil camp did 24% of respondents state that their family continued to use nets throughout the year. However, malaria transmission, particularly of *P. falciparum*, peaks during the later part of the year and continues until December.

Distribution network

ITNs were put on sale during 2000 in 17 camps (16 in NWFP and one in Punjab). A total of 2,590 ITNs were sold, providing an estimated maximum coverage from subsidized sales of one to 14% of the camp populations (See Additional file: 1 for the full data regarding this study). The target of selling ITNs to cover at least 10% of the population of the selected camps was only achieved in four camps (Baghicha, 14%; Kotki, 13%; Naryab, 14%; and Dallan, 10%). In 2001 the programme was expanded to 25 camps and it was aimed at selling sufficient nets to cover 30% of the population in already covered camps or 10% in camps where the programme was introduced. By the end of the year, a total of 9,669 ITNs had been sold, increasing maximum coverage due to subsidized sales in previously targeted camps to between three and 39% and in the eight newly targeted camps to between one and 21%.

Further expansion to an additional 10 camps took place during 2002 and sales in three of the existing camps (Ghamkol-1 & 2 and Oblan) were stopped because of insufficient demand and a low risk of malaria. In nine camps with a high number of ACL cases patients with active lesion and their families were targeted for the first time with highly subsidised nets. In five camps, where both malaria and ACL were highly prevalent, two pricing schemes were introduced. In these camps, subsidised nets were available to all residents, whereas highly subsidized nets were only provided to ACL patients and their families. By the end of the year, 17,305 additional ITNs had been sold, increasing maximum coverage from subsidized sales in previously targeted camps to between two and 63%, and in newly included camps between <1 and 28%. By 2003, 44 camps were included in the ITN programme; 25 of them were targeted for prevention of malaria, 14 for prevention of ACL and five for the prevention of both diseases. In total, 21,642 ITNs were sold and maximum coverage from subsidized sales increased to between four and 97% in previously targeted camps and to between seven and 28% in new ones. Maximum coverage from subsidized sales exceeded 50% in 13 camps and 20% in an additional 15 camps. For the year 2004 an additional three camps were targeted, increasing the total from 44 to 47.

Re-treatment

Campaigns for free re-treatment of mosquito nets were started in 2001 to ensure that nets sold during the previous year would receive a fresh insecticide deposit. Based on the results from the pre-implementation survey (Table 1), it was assumed that more nets than the number sold would be brought for re-treatment. That the proportion of existing nets would exceed that of sold ones by up to 20 times (Table 2) was not expected. It was observed that these existing nets were either locally-made from cotton material or had leaked across the border from eastern Afghanistan, where a ITN programme had been initiated by HNI in 1992 [5]. Serial numbering of ITNs by the Afghanistan programme provided the evidence for this.

Calculation of re-treatment coverage was complicated by the fact that the total number of nets per camp (locally made, leaked from Afghanistan and sold through the present programme) was unknown. Rather than calculating re-treatment coverage based on the total number of sold nets, it was decided to use the number of nets that were treated during the campaign of the previous year as a proxy for the total number of nets in a camp, if this number was higher than the total number sold. Based on this calculation, the lowest re-treatment coverage obtained for the duration of the programme was 43% (Badaber in 2003), but it was above 70% in the majority of all other camps.

Monitoring

Routine monitoring visits by HNI staff have provided regular support to the ITN implementers in the field (CHWs and CHSs). This has been particularly important in newly targeted camps. Furthermore, visits to individual families that had bought nets (randomly selected from the sales register) have shown that leakage of nets is very low. This is illustrated by the summary of monitoring visits for 2003

Table 3: Summary of ITN monitoring visits during 2003 to selected Afghan refugee camps

Month	No. camps visited*	No. families visited	No. ITNs inspected	ITNs present	ITNs moved	ITNs leaked**
May	10	39	67	64	0	3
June	5	17	51	47	2	2
July	5	19	37	33	4	0
August	9	35	54	44	5	4
September	6	33	49	46	1	3
Total	35	143	258	234	12	12

* Some camps are visited more than once per year ** Leakage is defined as a net no longer being present in a household

(Table 3). Out of 258 nets belonging to the 143 families that were visited, respondents stated that 12 nets had been moved with family members and the same number had leaked to non-target groups, such as relatives in Peshawar. There was no evidence that refugees were selling their nets to make a profit.

Discussion

Despite the promising up-take of ITNs during efficacy and effectiveness studies in Afghan refugee camps [11,13], it had been uncertain as to whether coverage of refugees could be scaled-up through subsidized sales. Reassurance was provided by the pre-intervention survey, showing that the majority of respondents were willing to pay about US$ 4 for an ITN. Their willingness to pay for nets may have been influenced by the regular high expenditure on malaria patients in Afghan refugee families. The survey indicated that many people knew that malaria is transmitted by mosquitoes, but it remains unclear whether they associated the purchase and use of ITNs with potential cost savings from preventing malaria cases among relatives.

Pre-implementation surveys can provide useful information for programme managers to guide establishment of distribution mechanisms, pricing, health education and re-treatment strategies. Resources permitting, a more elaborate questionnaire than the one used for the present intervention should be used [e.g. [16,17]] to provide additional baseline data such as socio-economic characteristics of the target population. This could then be used to target subsidies at the most impoverished in an attempt to increase overall coverage by making ITNs affordable for everyone. More detailed KAP surveys also allow for a comparison pre- and post- intervention, providing an estimate of how effective health education has been [18].

The survey on sleeping habits indicates that knowledge of malaria transmission is not as good as it would need to be to achieve maximum protection by ITNs. The majority of respondents indicated that they stop using their nets during the middle of the *P. falciparum* season. This highlights the importance of including local behaviour in an assessment of programme effectiveness. Estimated coverage of nets and insecticide may be high, but unless users are aware of when they need to use their ITNs, the intervention will fail to achieve the desired effect. Delivery of health education to Afghan refugees has to be amended, to achieve the required change in current practice.

The present implementation treated all inhabitants of malarious camps as vulnerable and provided a blanket subsidy. Based on discussion with implementing partners, a higher subsidy was provided for patients and their families that were targeted for ACL. Overall, sales prices were well accepted by the community and the programme was able to quickly increase sales of subsidized ITNs in most of the targeted camps and to expand to new ones. Our experience suggests that choosing a limited number of locations initially provides a manageable starting point. By building up capacity of health care providers and the community (e.g. CHWs), a few ITN staff (in the case of HNI, only one staff member until 2003) can gradually establish community-based delivery mechanisms and, in our experience, employ these to build up high coverage. The size and thus capacity of organisations operating in chronic emergencies is often limited, and attempting to establish a programme in too many locations at once may prove detrimental.

Regular re-treatment of mosquito nets with insecticides poses great operational problems for ITN programmes. Different strategies have been implemented, ranging from central re-treatment facilities to kits for use at home [19]. All of these have their limitations and re-treatment coverage tends to drop as projects increase in size and it gets progressively more difficult to reach all users or when cost recovery mechanisms are introduced [20-22]. Our method of choice was free re-treatment, delivered through annual campaigns. It achieved high insecticide coverage of existing and recently sold nets. However, it was successful because sufficient funding allowed for free provision of insecticide and payment of CHWs/CHSs, cooperation of implementing partners and the community was high,

the camp environment allowed focused delivery of resources and the number of nets sold and of target areas was relatively small. Furthermore, it was felt that treatment of nets in front of users, at the point of sale and during the annual campaigns, greatly contributed towards the refugees' awareness of the chemical barrier and thus motivated them to bring their net for re-treatment.

Over the coming years, nets with long-lasting insecticide treatment (LLINs) have the potential to reduce or avoid allocation of programme resources to re-treatment. However, in the interim the introduction of LLINs may lead to increased demands on implementers. Programmes that have distributed conventional nets in the past and are switching to LLINs will need to continue re-treatment of existing nets and develop, as well as deliver, separate education messages. Users of conventional nets need to be reminded that their nets need a fresh annual dose of insecticide, while buyers of LLINs need to be made aware that the net already has a chemical barrier that may not need to be renewed. With LLIN technology still young, the persistence of the chemical barrier still needs confirmation and insecticide deposits should be monitored routinely over the life of the net. This involves additional costs, with field bioassays, useful to establish continued knockdown and killing effects, requiring insectary-reared mosquitoes and analysis of insecticide residues on the net, providing insight into the persistence of the compound under field conditions, having to be carried out in a chemical laboratory. Ideally, a combination of both should be applied until firm evidence of the behaviour of insecticide deposits on LLIN over the life-time of nets has been obtained. Overall, the process of introducing LLINs into programmes that are selling conventional nets requires careful planning, to ensure that resources saved by avoiding re-treatment of new nets are not taken up by the change [23].

Monitoring of ITN distribution is often neglected when delivered by humanitarian aid programmes. Most donors are satisfied with statements of the overall number of nets purchased and delivered, requiring little detail as to whether the nets were retained by the original target group or other indicators that would allow one to assess if funds were well spent. In some cases considerable investment into ITN delivery has provided little evidence of its usefulness. For example, humanitarian assistance in East Timor delivered an estimated 140,000 nets free of charge, with little evidence of use and retention by the community. This has created the expectation that nets should be free, which potentially undermined strategies for sustainable delivery [24]. Subsidized sales of ITNs to Afghan refugees were integrated at the community level with good support for the CHWs and CHSs. Through numbering of nets, provision of basic sales records and receipts and regular field visits by HNI, field staff have been able to provide a good record of their achievements. Most importantly, it has been possible to document that leakage of targeted nets is minimal and thus that maximum ITN coverage of the population through subsidized sales has increased quickly and continues to be high.

Following the fall of the Taliban and the resulting influx of international aid, the Afghan refugees are now expected to return to their homeland. The Afghan refugee health programme and the associated sale of ITNs are entering a new and probably final phase of assistance. In line with the expected departure of refugees, UNHCR is gradually decreasing its financial support. Further donations of mosquito nets and insecticide are unlikely and continuation in the interim will depend on the use of remaining resources and cost recovery funds. Subsidized sales have been highly effective in creating demand and increasing ITN coverage, but are not sustainable without additional funding. At present it is uncertain whether repatriation can, as proposed, be completed by the end of 2005 and when the current ITN programme will be able to phase-out.

In the given circumstances the strategy was amended to generate additional funds for continued provision of nets to camps where maximum coverage resulting from subsidized sales is less than 50% or that have a high burden of malaria and/or ACL. In camps where the estimated maximum coverage from subsidized sales is already high and where incidence of malaria or ACL does not warrant continuation of subsidized distribution the price has been increased to 300 rupees (US 5,30). Re-treatment will be continued at no cost to the user, as it is expected that the introduction of cost recovery would have a considerable impact on coverage. Other programmes have already reported that insecticide treatment is not equally valued by users as owning a net [18,25], which makes cost recovery for this component particularly difficult.

Before repatriation of refugee from the camps is in full flow, it is planned to evaluate individual and community effectiveness of the current programme. By using the methodology proposed by Lengeler and Snow [1] and comparing results to those of Rowland et al [5], it will be possible to established whether time and increase in programme size has affected sustained impact. It will also allow calculation of current cost-effectiveness, which can be used for resource allocation of new donor initiatives in Pakistan, such as the Global Fund for AIDS, Tuberculosis and Malaria (GFATM).

Conclusion

Subsidized sales of ITNs can reach a large proportion of the population in a chronic emergency setting and should

be implemented in preference to free distribution. Subsidized sales initiate a transition from humanitarian aid towards sustainability by creating demand and discouraging expectations of continuing aid. Once the chronic phase shifts towards development, expansion beyond the refugee context is required to sustain initial achievements. Both Pakistan and Afghanistan now need to establish private / public sector partnerships to meet demand for ITNs and to ensure equity.

List of abbreviations

ACL – Anthroponotic Cutaneous Leishmaniasis

BHU – Basic Health Unit

CHS – Community Health Supervisor

CHW – Community Health Worker

FATA – Federally Administered Tribal Areas

GFATM – Global Fund for Aids, Tuberculosis and Malaria

HNI – Health*Net* International

IRS – Indoor Residual Spraying

ITN – Insecticide-Treated Net

KAP – Knowledge, Attitude and Practice

LLIN – Long-Lasting Insecticide-Treated Net

NWFP – North West Frontier Province

NGO – Non-Governmental Organization

PDH – Project Director Health

SC – Soluble Concentrate

UNHCR – United Nations High Commissioner for Refugee

Authors' Contributions

JK initiated the preparation of data for presentation in the manuscript and prepared all drafts, including maps. NM supervised the ITN programme staff and routine data collection. ZJ and QK supervised all ITN related field activities of HNI implementing partners. NR, TL and MR provided substantial revision of the document and additional comments on structure and content. All authors read and approved the final manuscript.

Additional material

Additional file 1

Number of mosquito nets sold per camp and estimated max % coverage from subsidised sales.
Click here for file
[http://www.biomedcentral.com/content/supplementary/1475-2875-3-15-S1.pdf]

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