

A review of water and sanitation provision in refugee camps in association with selected health and nutrition indicators – the need for integrated service provision

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ABSTRACT

The first global overview of basic water and sanitation indicators in refugee camps is presented (using data from 2003–2006) and compared with selected health and nutrition indicators. This demonstrates that average levels of water and sanitation provision are acceptable at camp level but many refugee operations are suffering from gaps that cross-cut these sectors; e.g. typically poor sanitation provision is corresponding with low per capita availability of water. These findings were confirmed at household level with two household surveys undertaken in African refugee camps; households reporting a case of diarrhoea within the previous 24 hours collect on average 26% less water than those not reporting any cases. In addition, typically higher levels of morbidity of one infectious agent are also reflected across other infectious agents; this is reinforced by comparing the relationship between morbidity and nutrition status from selected camps. The importance that hygiene, environmental conditions and local settings have on health (both of refugees and also local communities) is underlined. Interventions to improve indicators across the water, sanitation, health and nutrition sectors rely not only on increased and sustained resources but must entail an integrated approach to simultaneously tackle short-comings across all these vital sectors.

Key words | camp survey, indicators, integrated service provision, refugee

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INTRODUCTION

Both the planning and undertaking of comprehensive research on water, sanitation and hygiene promotion issues among refugee populations has remained a challenge. Reasons include security restrictions, complex operational conditions, scarce resources, understaffing or high staff turn-over, the difficulty of undertaking thorough measurements during emergency situations and the fact that refugee camps are often forcibly located on marginal lands. Hence, these very real constraints hinder efforts by water and health professionals to systematically document and build on lessons learnt in order to improve services in these areas in subsequent refugee operations. It has also meant that all the available time and resources are needed simply keeping water supply and sanitation control mechanisms functioning and so the need for research is overlooked. In addition,

statements such as ‘millions of refugees throughout the world receive between 7 and 15 L/p/d’ (Roberts 1998) have been difficult to comment on as, up to now, an overview on water and sanitation provision in global refugee operations has been lacking.

This paper aims to build on recent monitoring initiatives by the United Nations High Commissioner for Refugees (UNHCR) to outline the current global water and sanitation situation in refugee camps. This also allows an identification of areas where knowledge gaps still exist and how these can be filled in order to allow targeted improvements to be made for public health benefit in refugee camps. Two surveys at the refugee household level were used to complement and confirm the data gathered from this global exercise.

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WATER AND SANITATION IN REFUGEE SETTINGS

UNHCR is mandated by the international community to assist and protect the world's refugees. At the end of 2005 it counted 20.8 million people of concern consisting of refugees (40%), internally displaced persons assisted by UNHCR (32%), stateless persons (11%), with the remainder made up of asylum seekers, returned refugees and others of concern (UNHCR 2006a). These figures do not include refugees under the mandate of the United Nations Relief and Works Agency for Palestine Refugees in the Near East (UNRWA). UNHCR directly assisted 50% of all refugees in 2005. UNHCR's mandate entails a fundamental responsibility for providing legal security (asylum, non-refoulement and full enjoyment of human rights), physical safety (against natural or man-made threats) and material assistance (basic necessities of life). Hence, this mandate consists of assuring their human and protection rights, access to survival needs, physical protection and also their health, well-being and dignity.

In relation to this strong protection mandate of UNHCR, it is also worth highlighting that though access to water is a basic human right there have been many documented examples of inadequate water and sanitation provision in refugee camps in Uganda, Chad, Kenya, DRC and many other countries (Shrestha & Cronin 2006). This poor provision is continuing today and is evident in IDP (internally displaced persons) camps also, such as in Darfur (Sherlock 2006).

The importance of strong coordinated water, sanitation and hygiene promotion interventions are well known. Uddin Khan and Shahidullah (1982) documented that in one refugee camp in Bangladesh where sanitation facilities had been provided the cholera rate was 1.6 per 1,000, whereas in the two camps without facilities the rates were 4.0 and 4.3 per 1,000. However, cholera was not totally eliminated, even in the one camp with sanitation facilities, highlighting the importance of hygiene promotion and tackling other risk factors when combatting cholera. In the case of the 1994 Rwandan crisis more than one million Rwandans fled the genocide in their country to the neighboring DRC and where up to 60,000 died from a vicious cycle of water shortage and, inevitably, cholera (UNHCR 2003). The initial average crude mortality rate was 20 to 35/10,000/day and was associated with explosive epidemics of diarrhoeal disease caused by *Vibrio cholerae* 01 and *Shigella dysenteriae* type 1. The interventions implemented

consisted of low-technology but effective measures including bucket chlorination at untreated water sources, designated defecation areas, active case-finding through community outreach and oral rehydration and these measures were associated with a steep decline in death rates (to 5 to 8/10,000/day) by the second month of the crisis. However, four weeks after the Rwandan influx of refugees, global acute malnutrition (GAM) rates among children under 5 year olds ranged between 18 and 23% and those most at risk were children with a recent history of dysentery and those in households headed by women (Goma Epidemiology Group 1995). This helps to underline the interactions between water and sanitation provision, health, nutrition and social factors. It was concluded for that particular crisis that the prevention of high mortality due to diarrhoeal disease epidemics in displaced populations relies primarily on the prompt provision of adequate quantities of disinfected water, basic sanitation, community outreach, and effective case management of ill patients. This is the basic message also conveyed in the main aid agencies' emergency response guidelines (MSF 1997; UNHCR 2000; UNICEF 2005a). Strong hygiene promotion is needed to maximise and sustain the benefits of these interventions and findings that hygiene behaviour changes have persisted for years after the hygiene promotion occurred indicates that this can be a very cost-effective health intervention (Cairncross *et al.* 2005).

There are few studies documenting the effects of insufficient water quantity on refugees. Roberts (1998) describes a study involving a group of Mozambican refugee households where faecal-oral diseases were the main cause of death. The households there were divided into the groupings of <15, 16–20, 21–30 and >30 litres/person/day (L/p/d) and found a steady association between consuming more water and experiencing less diarrhoea among children and among all age groups combined; households consuming 10 to 15 L/p/d experienced 2.5 times more diarrhoea than those that consumed more than 30 litres. In practice, there is little information overall on the realities of water distribution across refugee camps once it leaves the taps, although water quality studies suggest the importance of extending protection measures to the household level (Clasen & Bastable 2003). Another area where more information is needed is on which coping mechanisms refugees must put in place to overcome any such distribution inequalities and how they are impacted by poor distribution system performance with frequent breakdowns in supply.

Emergencies, like the Rwandan crisis do not, however, account for the majority of UNHCR refugee operations. Protracted camps in the ‘care and maintenance’ phase are much more common and ensuring adequate water of sufficient quality in a sustained manner is a constant challenge. Water and sanitation provision in these settings has many more functions than solely health-related. This means, in practical terms, that

- There is adequate and equitable distribution of water so that it does not become a source of power which can be abused for sexual or commercial exploitation.
- Proper layout and design of water points is important to ensure safe access and to minimise the potential for gender-based violence and minimize conflict at water points.
- The provision of appropriate (e.g. Roberts *et al.* 2001) and sufficient water containers to ensure proper water storage.
- Access and distance to the collection point is also important as it affects the amount of energy expenditure spent on this task and time; long distances transporting water mean substantial amounts of refugees’ precious calories go on this task alone (Shrestha & Cronin 2006).
- There is sufficient water for livelihood enterprises and

other income-generating activities such as agriculture, livestock etc.

- Aspects of sanitation and hygiene promotion must be organised so as to maximise opportunities for refugee dignity and well-being.

However, there are also provision problems in these protracted situations. Indeed, refugee groups are typically made of 70% to 80% women and children who bear the brunt of water collecting activities. A survey in 2004 suggested that 42% of school-going children in Kyangwali camp (Uganda) were regularly diverted from their school programs to help their mothers collect water (AAH 2004) and so education should not suffer due to poor access to water.

All of these points reinforce that the provision and integration of adequate services in the basic life-sustaining sectors of water, food, health and nutrition, shelter and sanitation are core to these issues of protection, well-being and dignity. The inter-linkages between these sectors are well documented (Oxfam 2003; UNHCR/WFP 2004; UNICEF 2005a; WHO 2005) and a conceptual outline presented (Figure 1). Indeed in complex emergencies, adequate shelter, water, food, and sanitation linked to effective

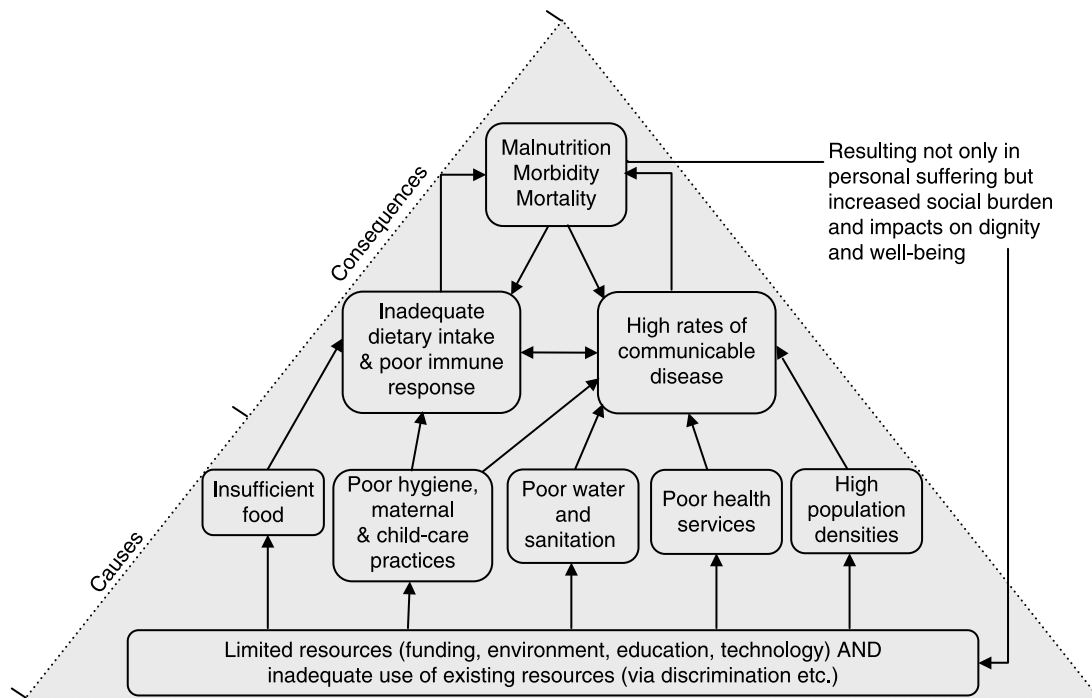


Figure 1 | Conceptual outline of the relationships between the water & sanitation, nutrition and health sectors and how insufficient service provision in these sectors can lead to a vicious cycle of increased rates of malnutrition, morbidity and mortality that can only be broken with appropriate operational interventions.

case management, immunisation, health education, and disease surveillance are crucial (CDC 1992; Connolly *et al.* 2004). In addition, refugees and other stakeholders, especially women and groups with special needs, need to be encouraged to participate in all stages of design and maintenance of the water and sanitation facilities; this may not always be fully possible due to the speed with which facilities have to be provided, but community consultation should be the norm rather than the exception (IASC 2007). There should be sustainable exploitation of the available water sources and minimisation of associated environmental impacts to help develop a good rapport with the host community and uphold the institution of asylum. To ensure these issues are addressed in operations, UNHCR employs a number of targets (referred to as standards and indicators) to assess if its programs are adequately addressing the needs of the beneficiaries in the camps which form the basis of the planning and resource allocation decisions (UNHCR 2000,

2006b). These complement, though some vary slightly, from the communally-used Sphere standards (Sphere 2004) (Table 1).

Examination of these standards and indicators must be done in an integrated manner and this paper attempts this by first of all describing the current situation and documenting the present gaps in provision in the key inter-related sectors of water, sanitation, health and nutrition in refugee camps. Where standards are not currently being met, or where there is insufficient information, the consequences are analysed and documented as this can lead to the identification of priority areas for improvement. These identified areas can then be built on in order to plan effective solutions that enable operations to meet the required standards. If the benefits of integrated interventions in these sectors can be identified in certain settings, then such improvements could be used as best practice to improve water and sanitation services across all of UNHCR's camps.

Table 1 | Minimum standards for water and excreta disposal provision based on UNHCR (2000, 2006b) and Sphere (2004)

Rationale	Description of standard	UNHCR	Sphere project
Basic needs for well being and health	1. Average quantity of water available per person/day	>20 litres	> 15 litres
	2. Water containers per household (average of five members)	1 × 20 litres, 2 × 10 litres, 2 × 5 litres	2 × 10–20 litres & enough storage containers at household level
	3. Communal latrine coverage	20 people/latrine	20 people/latrine
Ensure social and security needs in an equitable manner	4. Distance from farthest dwelling to water point	<200 m	<500 m
	5. Number of persons at each water point	80 to 100 per tap 200 to 300 per hand pump/well	250 per tap 500 per hand pump 400 per well
	6. Optimum distance of latrine from household	6 to 50 m	<50 metres
Minimisation of health risks	7. Number of faecal coliform organisms at distribution point	0 per 100 ml treated water	0 per 100 ml treated water
	8. Free chlorine residual concentration in disinfected water	0.2–0.5 mg per litre	0.5 mg per litre

METHODOLOGY

A two-pronged approach is used to get an over-view of the current water and sanitation provision in refugee camps. The first approach is to analyse the data on water and sanitation services collected by UNCHR's principal global monitoring tool, known as the Standards and Indicators initiative (UNHCR 2006b), which was requested from the 130 refugee camps which were home to populations in excess of 2,500 refugees (as of January 2005). The water and sanitation (primarily excreta disposal) data covers refugees in UNHCR-managed camp settings only and is presented here to focus on the quantity of water supplied and latrine coverage available. The format of this global monitoring tool is to compare average annual data (i.e. one value per camp) and it was completed in 93 camps located in 24 countries; these camps have a total combined population of ~1.8 million. The data from the Standard and Indicators initiative presented here is composed of monitoring activities carried out during the years 2003 to 2005 inclusive. In these settings UNHCR partners implement water, sanitation and health activities directly on the ground with operational and financial overview by UNHCR offices in the field and, therefore, much of the base data for the Standards and Indicators initiative is collected by UNHCR partners. UNHCR had over 102 partners in 2005 and these range from Government bodies to national and international non-governmental organisations.

The second approach is to collate the data supplied in the UNHCR health coordinators' annual reports. These reports cover the period July 2004 to June 2005 and span 20 countries consisting of ~90 camps with a combined population of approximately 3 million refugees. These results were complemented by including available nutrition surveys carried out in UNHCR-managed camps in, Algeria, Bangladesh, Chad, Kenya, Nepal, Sierra Leone, Tanzania, Sudan and Uganda during 2004 and 2005. These are examined to further facilitate analysing the linkages between high morbidity and mortality, water and sanitation provision and acute malnutrition.

In addition, two household surveys were carried out in refugee camps, one in West Africa (Ghana) in December 2005 and one in East Africa (Kenya) in June 2006, to compare the standards and indicators information with the situation on the ground but also to assess to what extent inequalities in distribution occur. They also provide insights into how

the quality of water and sanitation provision impacts upon the daily lives of refugees. The same standardised questionnaire was used in both surveys with surveyors fluent in the local language first attending a workshop training prior to carrying out the household visits. Households were chosen by visiting every *n*th house (*n* being a randomly picked number) across all sections of the camps with 840 households visited in the West African camp and 285 in the East African camp; full survey methodology is given in Cronin (2006). Spot checks were used to check on response uniformity. All replies were entered into a Microsoft EXCEL spreadsheet for statistical analyses.

RESULTS

Water and sanitation provision in UNHCR refugee operations (2003 to 2005) as indicated by the Standards and Indicators initiative, are summarised in Tables 2 and 3. These tables demonstrate that while the overall median and average values for water supply and median values for latrine coverage across UNHCR refugee operations are better than the UNHCR standards (Table 1), there are still large numbers of camps where the average water supply is inadequate and there are not enough latrines for the population. In fact, the numbers of camps with less than

Table 2 | Results from UNHCR standards and indicators report: per capita water availability (litres per person per day 2003 to 2005) based on annual averages per camp

	2003	2004	2005
No. of camps with data available	92	73	93
Maximum	152.5	361	444
Minimum	1.6	6.9	6
Median	20.2	22	20.1
Average	23.1	35	31.3
% of these camps meeting UNHCR 20L/day standard	54	59	53
Average % of population in camps meeting the UNHCR 200 m access distance standard	86	72	77

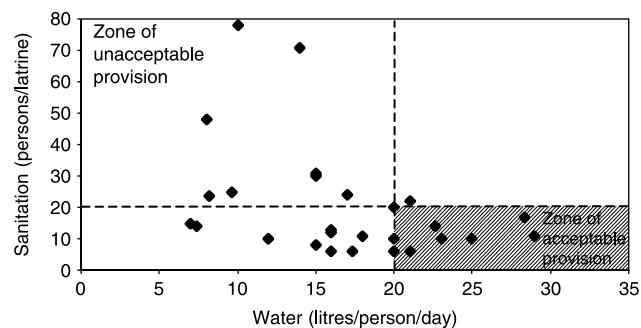
Table 3 | Results from UNHCR standards and indicators report: excreta disposal availability (persons/latrine 2003 to 2005)

	2003	2004	2005
No. of camps with data available	89	81	90
Maximum	793	802	1124
Minimum	2.8	3.5	5.0
Median	10.9	11	6.4 ^a
Average	27.7	36	26.9
% of these camps meeting UNHCR excreta disposal standards	74	67	83

^abased on family latrine coverage figures assuming 5 people per family.

20 litres per person per day was over 40% for reporting camps in each of the three years. If the Sphere standard of 15 L/p/d is used instead of UNHCR's 20 L/p/d water supply then the percentage of camps not meeting this value on annual basis is between 18% and 32% for the years 2003–2005 respectively. Over a quarter of the camps have an insufficient number of latrines, i.e. there are greater than 20 people per latrine.

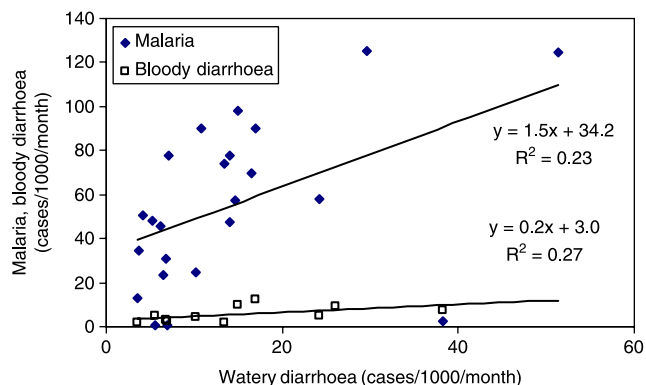
The UNHCR health coordinator annual reports which contained both health data and water and sanitation standards and indicators data were selected for further data analysis. Figure 2 plots water per capita availability and latrine provision across those operations where data is available and demonstrates that many operations fall

**Figure 2** | Breakdown of camps meeting water (per capita availability) and/or excreta disposal standards in 28 refugee camps from UNHCR operations in Ethiopia, Kenya, Tanzania, Uganda, Zambia, Ghana, Sierra Leone, DRC, Chad, Algeria, Nepal, Pakistan, Bangladesh in 2005; acceptable provision implies water >20 litres per person per day; excreta disposal <20 persons per latrine; unacceptable provision, i.e. indicators are lower than the above minimum standards.

outside the zone of acceptable provision; typically poor sanitation provision (i.e. high numbers of persons per latrine) often corresponds with low per capita availability of water.

Figure 3 demonstrates the link between watery diarrhoea and malaria and the high burden of morbidity in some operations is evident. Indeed, malnourished individuals have compromised immunity and are not only more likely to contract many communicable diseases, but also suffer from more frequent, severe, and prolonged episodes of these diseases (Connolly *et al.* 2004; WHO 2005). Watery diarrhoea and malaria display a large range of values in Figure 3 due to different local and climatic conditions while bloody diarrhoea values are lower and with a smaller range. It is important to note that Figure 3 demonstrates not only that typically higher levels of morbidity of one infectious agent, linked to the water and sanitation sector, are also reflected across other infectious agents but underlines the importance that general environmental conditions (e.g. poor sanitation leading to stagnant water) have on health in refugee camp settings.

In addition to difficult environmental conditions, insecurity and insufficient resources are other factors which influence morbidity and mortality for both refugee and local communities. This is compounded by loss of health staff, damage to infrastructure and poor co-ordination (Connolly *et al.* 2004). To demonstrate the importance of the surrounding setting and environmental factors, Under 5 year old mortality data from UNHCR records for

**Figure 3** | A comparison of average annual watery diarrhoea crude incidence rates (cases/1000 persons/month) with average annual malaria and bloody diarrhoea crude incidence rates (cases/1000 persons/month) in selected UNHCR operations during the year 2005.

July 2004 to June 2005 (per 1000 population per year) are presented along with country level mortality (per 1000 live births per year) data for January to December 2004 from UNICEF (2005b) (see Figure 4); the different data collection systems employed mean that these figures cannot be directly compared. The general trend visible here of countries which suffer higher rates of refugee mortality also suffering high local communities mortality (for instance comparing countries like DRC with Bangladesh) is reinforced by the fact that nutrition surveys in refugee camps and surrounding local areas has frequently shown that there is an equally poor nutritional status in both populations (UNHCR 2006c). Other potential correlations between the local community health and mortality indicators (from UNICEF 2005b) and refugee operations were also looked for, but without significant trends being discernible.

Figure 5 presents the link between morbidity and GAM values from nutrition surveys in the camps and demonstrates the relationship between morbidity (bloody diarrhoea and malaria crude incidence rates) and nutritional status from seven refugee camps in Ethiopia during the period 2004/5; there is a wide range in malaria incidence values due to the wide variation in geographical location, climate and elevation where the camps are found within the country, as for Figure 3.

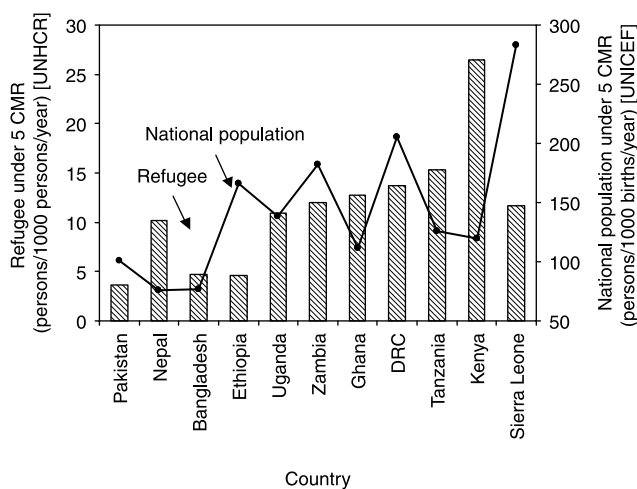


Figure 4 | Under 5 Crude Mortality Rates (CMR) for national populations from January to December 2004 (UNICEF 2005b) presented with selected Under 5 Crude Mortality Rates for refugee populations from July 2004 to June 2005 from UNHCR country operations during 2005; it is important to note the different data presentation scales on the axes which do not facilitate direct comparisons to be made.

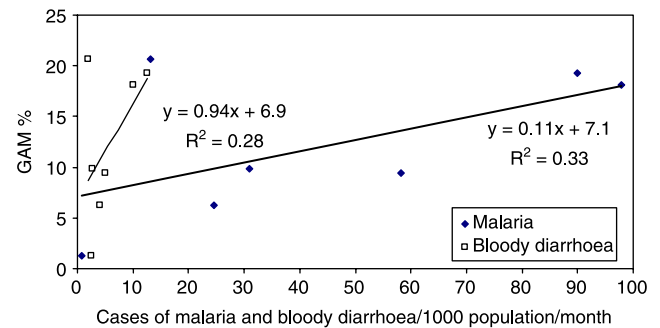


Figure 5 | Relationship between nutritional status (Global Acute Malnutrition reported in z-score) and selected morbidity indicators (cases/1000/month of bloody diarrhoea and malaria) in seven Ethiopian refugee camps during 2004/5.

The results from the two household survey results (Table 4) highlight the key parameters associated with water and sanitation services; these have been grouped into results relating to background, access, usage and sanitation & hygiene while survey findings related to diarrhoea are presented in Table 5. The average water quantities and distance to the source mirror the values provided by the Standards and Indicators reports and comply with the UNHCR standards of 20 L/p/d and 200m respectively. There are many similarities across the camps with the same median household size (6), over 60% of respondents in both surveys were women and they, along with their children, are charged with water collection in the vast majority of cases (in fact, adult males are solely responsible for water collection in 11% or less in both camps) and this has negative impacts on child education in both camps (mainly arriving late and failing to do homework). Monthly or more frequent interruptions in water availability are reported in 54% and 79% of the west and east African camps respectively with the main coping strategies in both camps being reported as using less water (bathing is where most economise on), buying or borrowing water or going further in search of water, the latter increasing the risk of attack. Disputes at water points are also commonly reported.

Sanitation access is very poor in the West African camp (11%) and much of the water supply is from unprotected sources. Hygiene is certainly better in the East African camp as higher proportions of respondents there had access to hygiene training and refuse disposal points were closer to houses. Despite this, the diarrhoea incidence reported in the East African camp was only marginally higher (17% as

Table 4 | Results from two household (HH) surveys carried out in refugee camps

	Parameter	West African camp (Ghana)	East African camp (Kenya)
Back-Ground	Date of survey	Dec. 2005	June 2006
	Camp population	10,000	50,000
	No. of HH interviewed	840	285
	Median HH size	6	6
Water access issues	% of respondents female	79	64
	Average time spent on water collection (minutes)	35	99
	Average distance to main source of water (m)	153	163
	% of HH where no women or children are involved in water collection (i.e. adult males only)	11	6
	% of HH where school-going children collect water	59	59
	if yes, % arrive in school late	29	39
	% fail to do homework	20	27
	% reporting monthly or more frequent interruptions in water supply	55	79
Water usage	Average water usage (litres/person/day) ^a	40	20.5
	Usage breakdown %:		
	Bathing	29.6	16.8
	Cooking	14.7	13.0
	Drinking	11.5	10.3
	Cleaning House	5.6	8.9
	Animals	0.2	14.6
	Gardening	0.6	10.8
	Laundry	37.0	14.4
Other	0.8	11.0	
Sanitation and Hygiene	% with separate drinking water container	88	93
	Frequency of cleaning of this container ^b	67% daily	64% daily
	% who remove water from container by pouring	30	33
	% with a designated latrine	11	95
	Average distance from shelter to latrine (m)	6	15
	% of HHs disposing of child's excreta in latrine	31	87
	Average distance from shelter to refuse disposal (m)	222	15
	% of HH who received hygiene training	23	32
	% of HH with the area surrounding the shelter with a level of hygiene judged to be adequate	69	65
% of HH with access to a mosquito net	8.2	74.6	

^aAll of the East African camp supply is chlorinated and distributed via tapstands; much of this figure of West African camp supply is from unprotected sources and is used mostly for washing and cleaning while one sixth of respondents there state that they use some form of household treatment.

^bThe proportion of containers assessed as clean (inside and outside) was 78% in both camps.

Table 5 | Diarrhoea and water quantities relationships from the 2 household (HH) surveys carried out in refugee camps and referred to in Table 4

Parameter	West African camp (Ghana)	East African camp (Kenya)
% of all HH reporting a case of diarrhoea (minimum of 3 watery stools) within the previous 24 hours	15	17
Average no. of cases of diarrhoea per HH in those reporting diarrhoea within the previous 24 hours	1.3	1.4
Average per capita water usage (litres) in HH reporting no cases of diarrhoea \pm 95% confidence interval	41.8 \pm 2.2	21.5 \pm 1.7
N of HH used to calculate this value	716	236
Average per capita water usage (litres) in HH reporting cases of diarrhoea \pm 95% confidence interval	30.9 \pm 3.4	15.9 \pm 1.3
N of HH used to calculate this value	123	47

opposed to 15%). Similar levels of community hygiene in the area around the home were reported with approximately two thirds of both camp households assessed as having an adequate standard.

DISCUSSION

Limitations of the review

More detailed camp or country level comparisons on water or sanitation services are not possible from the Standards and Indicators data as only annual average values are reported and analysed. This is important to be borne in mind when interpreting the results as this reporting mechanism focuses on key aspects at a camp level reported annually; hence one value for latrine coverage or per capita water usage is returned per year and so neither spatial nor temporal variations in water and sanitation provision can be considered. In addition,

health centre statistics only reflect on those who presented themselves for assistance; active case finding was not undertaken. Given the difficult working conditions and high workload placed on medical practitioners in these settings, no resources could be spared for independent case collaboration or quality control aspects. Different camps and implementing partners may employ different analytical techniques and/or reporting mechanisms which complicates data consolidation across the sectors and population changes in refugee camps are notoriously hard to monitor with new influxes, unreported deaths etc. For this reason, UNHCR is introducing a new standardized Health Information System (HIS), including nutrition, to help better constrain these uncertainties and improve data analysis for the future. In fact, many of the morbidity levels presented (e.g. in Figure 3) would, (if averages values are taken) trigger alerts under the HIS weekly alert thresholds. These are defined, at health facilities dealing with \sim 10,000 people, as 5 cases of bloody diarrhoea, 5 cases of watery diarrhoea in $>$ 5 years age group and 1.5 times the baseline average for that time period for malaria cases. Therefore, the HIS will also facilitate quicker intervention responses following more prompt recognition of increases in morbidity levels and standardised case definitions.

Issues in spatial differences in access to services across camps cannot be dealt with by single annual average indicators and so this is why detailed household surveys were employed so as to gain more information. There is a need to reinforce existing monitoring to pick this up as unequal distribution of food, water, non-food items etc. is a reality in most refugee camps. Such inequalities can be due to the location of the water points, breakage or vandalism of taps, control/influence systems in operation in the camp or lack of storage facilities in the home and is a serious issue due to the importance of water quantities to health. An evaluation of a cholera outbreak in Kakuma refugee camp, Kenya, in April/May 2005 (Cronin 2005) found that a major contributing factor was inequality in water distribution within the camp (Table 6) while the coping mechanisms put in place was to take water from unprotected sources. In areas with high attack rates, average per capita water consumption was found to be $<$ 11 litres/person/day while the camp average was approximately 16 litres/person/day (Cronin 2005). Of course, other factors were also found (by Schultz 2006) to increase transmission risk, such as sharing a latrine with three or more households (i.e. over \sim 20 people).

Table 6 | Relationship between water supply and cholera attack rate in Kakuma camp, Kenya during the 2005 cholera outbreak

Camp Zone	Cholera Attack Rate per 1000 ^a	Water availability litres per household per day ^b	Water availability litres per person per day ^c
Kakuma 1	7.9	44.2	8.84
Kakuma 2	15.9	37.0	7.4
Kakuma 3	3.4	46.6	9.32

^afrom Schultz (2006).^bfrom Cronin (2005).^cbased on an average of 5 per family.

Interestingly, in the two camp household surveys, households reporting a case of diarrhoea within the past 24 hours collect 26% less water on average than those that did not report any diarrhoea cases (Table 5). Many examples of poor water and sanitation provision can be linked with refugees having rural or nomadic backgrounds and the fact that they may not be used to living in camps with their associated higher population densities. These settings demand higher levels of personal, domestic and communal hygiene to offset the increased opportunities for transmission of communicable diseases. The lack of awareness on the need for using more water for hygiene is undoubtedly an important factor but there is also, as Roberts (1998) states, ‘a profound need for research to quantify the association between water availability and human suffering’. Likewise, temporal variations in water supply (linked to dry or wet season fluctuations) or sanitation (due to flooding of latrines or structural damage) cannot be deciphered using single average annual values. Hence, while the work of this paper deals principally with large numbers of cases and populations and, therefore, the focus is an overview/situational analysis rather than a controlled scientific study which can exactly quantify the influences of the various variables, the camp surveys have given insights into what sub-standard provision of water and sanitation means to refugee dignity and also the need for detailed monitoring tools to highlight these issues.

Linkages across the sectors

The links between the quality of water and sanitation services (Figure 2) is not surprising as operations often, though not always, have common challenges with funding

constraints, capacity issues such as lack of availability of sufficient qualified staff in these areas or often the same implementing partner (perhaps in need of resources and/or capacity building) may be in charge of both sectors. Indeed, 63% of points in Figure 2 fall into the quadrants of totally acceptable or unacceptable provision while the fact that there are many more operations providing acceptable latrine coverage but unacceptable water supply rather than vice versa reflects not only on the constraints outlined above but also on the arid and difficult environmental settings that refugee camps are often located in. In addition, the strong link between nutritional indicators and morbidity, as evident in Figure 5 is, of course, compounded by other related issues such as the quality and quantity of the distributed food ration, immunological response, HIV status and micro-nutrients deficiencies (such as anaemia or angular stomatitis), pregnancy and lactating period and, of course, social issues such as schooling rates, cultural practices, substance abuse etc. However, despite these complications and the limitations in the data collection outlined above, and the need for improved monitoring tools, it is note-worthy that clear trends do emerge in Figures 2, 3 and 5.

Challenges in the water and sanitation sector

Decades after WHO and UNHCR first introduced guidelines and standards on water and sanitation service provision for the humanitarian community, and several years after the concerted drive by the Sphere project to advocate for such standards, the humanitarian community is still struggling to fully meet the minimum emergency standards for water and sanitation provision for displaced persons. All agency

guidelines stress that 15 or 20 litres/person/day is the minimum need in camp situations and that it should be augmented at the first available opportunity though this is often misinterpreted as 'the estimated population figure is to be multiplied by 15 (or less) to give the daily amount of water to be pumped' with pipeline leakages, spillage, economic usage etc. often neglected. Financial resources are always a major constraint especially in protracted refugee camps and in 'forgotten' crises. However, even in situations where adequate financial resources were available, such as the Indian Ocean tsunami of December 2004, there were reports of poor water and sanitation provision to displaced populations by less experienced actors who failed to adhere to accepted guidelines in project planning and implementation (Telford *et al.* 2006). Such issues are often compounded by access problems, inappropriate interventions and uncoordinated responses.

Despite the insights which have been outlined as to how poor water and sanitation provision can compound morbidity and mortality, there is a need for greater awareness of the impact of resource gaps on the suffering related to poor water, sanitation, health and nutrition services, especially in protracted refugee situations. Detailed epidemiological studies can help demonstrate the cost-benefit payback of providing improved water and sanitation coverage and more effective hygiene promotion though these studies must consider how best to operationalise their findings. This can help convince donors and financial controllers as to why more resources are justified. Until such information exists for a range of settings, provision should be well in excess of the minimum guideline values. Indeed, as Roberts (1998) states, 15 to 20 litres/person/day are needed in the acute phase of a crisis and less may be sufficient in the later phase rather than vice-versa but the practicalities are often very difficult. For instance, in Chad or Darfur, where there are large congregations of displaced persons in an arid environment, there are huge demands on the scarce local water resources and this gives rise to friction with the local communities. Even in the Tsunami disaster aftermath, in the initial stages an estimated 1 to 2 litres of clean water per person per day was provided and this rose to 15 L/p/d after two months (Fesselet & Mulders 2006).

Of course, water quantity is only one aspect of water provision with water quality also of central importance. Stronger feedback mechanisms of water quality monitoring results to decision makers are needed to ensure health risks

flagged by these monitoring programs are acted upon in a timely fashion. To overcome the issue of poor spatial and temporal understanding of water and sanitation supply, further household surveys (such as those described above) are central in helping to better understand dynamics at camp level. Targetted priority interventions can then be made to improve the situation. In addition, more frequent replacement of non-food items (including jerry cans for both water transport and storage) in protracted situations could help reduce food ration exchange or exploitation, coping mechanisms used by refugees to procure these items.

Opportunities

Dealing with the water, sanitation, health and nutrition sectors in isolation will not maximize the potential overall benefits, and may even hinder progress in the other sectors (UNHCR 2006c). In order to reach a consensus on priority strategies for food, nutrition and health interventions (which includes all of the compounding factors, such as water and sanitation provision, communicable diseases, access to non-food items, child and women's rights, gender and self-sufficiency strategies) in January 2006 UNHCR and WFP held joint consultations and subsequently briefed donors and the international community on the nutrition situation, the gaps and planned global strategies. Since then, UNHCR has communicated specific programming instructions to all field operations concerned with malnutrition and/or poor health situations, asking them to prioritize and strengthen the related sectoral elements of the integrated approach in their annual budget submissions. As a result, integrated plans of action are being drawn up in close consultation with partners on the ground. A range of project proposals has also been developed and submitted for private sector funding consideration in order to find some of the required resources. Such initiatives need increased and sustained support if real improvements and consistent compliance with our humanitarian standards are to be achieved and long-term impacts made on overall refugee health, well being and dignity.

CONCLUSIONS

While, comprehensive research on water, sanitation and hygiene promotion issues among refugee populations has remained a challenge, recent monitoring initiatives in

UNHCR and dedicated household surveys in two refugee camps have allowed a better understanding of the current water and latrine coverage provision in refugee camps. This has shown that the overall median and average values for both water supply and latrine coverage across UNHCR refugee operations from 2003 to 2005 meet the UNHCR standards but that there are still large numbers of camps where the average water supply is inadequate and there are not enough latrines for the population. Indicators across the water, sanitation, health and nutrition sectors in refugee operations show how the quality of service or gaps in one sector has clear impacts on another. Also crude comparisons between refugee and local residents' mortality rates point to the shared difficult environmental and security conditions and insufficient resources impeding service provision for both. The limitations of such a global overview and the use of one annual value are acknowledged but this information has strengthened understanding of the affects of inadequate service provision. Household surveys showed how gaps in poor water and sanitation were affecting refugee wellbeing and health; for instance, children collecting water has adverse affects on their education while in both camp surveys households reporting a case of diarrhoea within the past 24 hours collect 26% less water on average than those who did not report any diarrhoea cases. Concrete actions steps are required and these include:

- Integrated approaches must be better planned and implemented to tackle short-comings across all of these vital sectors and should also consider longer-term issues such as, sufficient water for agriculture, food security, access to livelihoods etc.
- These interventions must aim to improve service provision to over and above the prescribed minimum standards in the water, sanitation, health and nutrition sectors but this will also require increased and sustained resources.
- Further and more detailed research at field level is vital to gain an improved understanding on the impact of insufficient water and sanitation on refugees and for the resulting findings to be shared with donors and resource managers. Coupled with this strengthening of monitoring initiatives is also required.
- Continued improvement and expansion of the Health Information System to standardise and strengthen data collection and analysis across refugee operations. This will

also strengthen cooperation between all actors working in these difficult settings.

- In acute emergencies there is a special need to provide as much water as possible in the early critical phase though practicalities dictate that this is not always possible.
- The plight of refugees in protracted situations must continue to be highlighted.

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