Prospective, sentinel-site community surveillance of mortality and acute malnutrition in Haiti: concept paper

1. The Health and Nutrition Tracking Service

The HNTS is an umbrella initiative conceived as a collaboration of UN agencies, bilateral donors and non-governmental organizations (NGOs) for the review, validation, analysis and interpretation of critical health and nutrition information in selected humanitarian emergencies. The HNTS is designed to supplement, and not replace, existing efforts in areas with humanitarian crises.

The goal of the HNTS is to support humanitarian decision-making by offering the best possible evidence-base information on health and nutrition.

The HNTS is critical in supporting the cluster approach, in particular the health and the nutrition clusters. At the global level, the HNTS is focusing on gaps and limitations in existing methodologies for collection of data relevant to humanitarian assessment and how to improve them through its Expert Reference Group and its engagement with existing initiatives. At the country level, the opportunities presented by commitment in various countries through the health and nutrition clusters will be used to improve the skills and abilities of in-country partners (e.g. governments, NGOs) to improve the quality of data and their interpretation.

2. Background and rationale

Haiti's entire health system, from its infrastructure to the very staff and system that operated it, has been deeply affected by the earthquake. The health information system, which was already very weak before the quake, has entirely collapsed. Basic data on health and nutritional status are lacking with which to benchmark the severity of the probable ensuing health crisis, and launch/adapt appropriate relief interventions. Specifically, there is a need to collect and monitor data on population mortality rates, and on the prevalence of acute malnutrition.

In addition, it would be useful for the Haiti Ministry of Health and the humanitarian community to monitor the coverage of nutritional interventions, i.e. the proportion of beneficiaries in need of the intervention that do receive the intervention. Ongoing coverage information would be critical to monitor the likely impact of programmes, and understand where geographically to expand interventions. Coverage is rarely measured in real-time or even in post-intervention evaluations of relief programmes, but is an important determinant of programme impact.

Prospective surveillance is a recognized and well-documented approach to generate health data.[1] However, in recent years there has been decreasing utilization of mortality surveillance in developing countries and crisis-affected settings. Instead, most countries and relief agencies have relied on retrospective surveys to supplement failing or missing vital registration systems.[2,3] Although retrospective mortality surveys are less costly and time consuming than surveillance, by definition they yield estimates reflective of the past, not the

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[1] Frerichs RR. Epidemiologic surveillance in developing countries. Annu Rev Public Health 1991; 12:257-280.
[2] Burnham G, Lafta R, Doocy S, Roberts L. Mortality after the 2003 invasion of Iraq: a cross-sectional cluster sample survey. Lancet 2006; 368(9545):1421-1428.
[3] Salama P, Assefa F, Talley L, Spiegel P, van d, V, Gotway CA. Malnutrition, measles, mortality, and the humanitarian response during a famine in Ethiopia. JAMA 2001; 286(5):563-571

present, and, unless repeated periodically, cannot provide information on changes over time.[4]

Furthermore, surveys often feature severe biases and yield imprecise estimates, particularly when conducted by staff with insufficient statistical skills. Prospective surveillance provides for real-time monitoring and early warning of deteriorations, so as to inform immediate action by health services providers. Similarly, it provides a way to detect substantial improvements in health conditions that may guide the decision to scale back relief programmes.

The principles of the system that HNTS would like to implement were already presented to and welcomed by the Health and Nutrition clusters in Haiti, and the Haiti Health Information Cell (Cellule d'Information Santé d'Haïti).

Epicentre has started to set up a community surveillance system of mortality and acute malnutrition in the Médecins Sans Frontières catchment areas in Port-au-Prince. Contacts have been made and Epicentre has accepted to share methodology and tools.

3. Aims and objectives

The aim of the system is to assist the Haiti Ministry of Health and the humanitarian community to reduce morbidity and mortality in the affected populations, by providing ongoing information on population mortality, malnutrition prevalence, and the coverage of nutritional interventions. To achieve this, a population-based sentinel surveillance system will be implemented.

The specific objectives of this system are to:

1. Estimate prospectively the crude all-age and under 5 years mortality rate in the population, and specifically:

    1.1. Monitor mortality trends within sentinel sites;

    1.2. Estimate mortality rates within the entire affected population;

2. Estimate the prevalence of global, moderate and severe acute malnutrition;

    2.1. Monitor trends of % of cases of acute malnutrition defined by MUAC and oedema within sentinel sites;

    2.2. Estimate % of cases of acute malnutrition defined by MUAC and oedema within the entire affected population

    2.3. Estimate the prevalence of global, moderate and severe acute malnutrition defined by weight-for-height and oedema every 6 months

3. Estimate and monitor trends in the coverage of nutritional rehabilitation interventions.

4. Partners

The Health and Nutrition Tracking Service will assist the Haiti Ministry of Health to set up and coordinate the surveillance system. The main partners will be the community workers of the affected populations, the Health and Nutrition Clusters, UNICEF, the World Health Organization, the US Center of Disease Control and Prevention, and Epicentre.

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[4] Checchi F, Roberts L. Interpreting and using mortality data in humanitarian emergencies: a primer for non-epidemiologists. Network Paper number 52.
http://www.redr.org/redr/support/TSS/doc/mortality_OliverMorgan.pdf (accessed Dec, 2009).

5. Methods

As a guiding principle sentinel sites should be selected in high-density population areas, i.e. urban areas in the affected communes and IDP settlements.

Haiti is divided in 11 *départements*. The second level of administrative division is the *commune*, of which there are 140. The lowest administrative level is the *section*, of which there are 562.

The surveillance system would be set up in several phases:

- The first phase would include the Port-au-Prince area, i.e. the Aire Métropolitaine of Port-au-Prince (the communes of Port-au-Prince, Carrefour, Delmas, Pétion-Ville, Cité Soleil and Kenscoff) plus the communes of Croix-des-Bouquets, Léogane, Petit-Goave, Grand-Goave, Arcahaie, Tabarre and Cabaret, all located in the département of Ouest.
- The next phase(s) would include the urban areas and the IDP settlements in the other départements.

The target population would be divided in two strata: resident population and displaced population (organized and spontaneous settlements).

In the Port-au-Prince area, data will be collected from 25 sites in each stratum. The sentinel sites will be selected randomly either by probability proportional to size from a sampling frame of administrative units, or by using the centric systematic area sampling described elsewhere[5], depending on available data.

The entire population of these areas will be considered the study population as the surveillance system will be designed to yield findings that are representative of the entire population of these areas.

Within each sentinel site, home visitors will conduct a baseline population census, and then collect information on deaths, births and in- and out-migration from every consenting household on a weekly basis, so as to monitor mortality rates prospectively.

Every month, home visitors will also measure the middle-upper arm circumference (MUAC) and oedema of all children in the sentinel sites, and verify whether children meeting criteria for acute malnutrition are under treatment in supported programmes. Data from children from the sentinel sites but temporarily admitted in nutritional centres will also be collected.

Data will be collected, entered, analysed and fed back to local and national stakeholders on a weekly and monthly basis.

6. Methods specific to each study objective

6.1 Objective 1: Estimate mortality and monitor its trends

Data collection

A baseline census will be conducted in all the consenting households within the sentinel sites during the first visit by home visitors.

During the first and all subsequent visits, household heads will be asked about any births or deaths in the household during the previous week, after reassuring them that the census is not linked to a registration or distribution of food or other relief goods. During visits after the first, household heads will also be asked about any new arrivals to or departures from the household during the previous week (i.e. since the home visitor's last visit), due to reasons other than birth or death: population denominators will be updated accordingly.

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[5] Myatt M, Feleke T, Sadler K, Collins S. A field trial of a survey method for estimating the coverage of selective feeding programmes. Bulletin of the World Health Organization, January 2005, 83 (1)

The home visitor will also meet once a week with administrative or traditional authorities of the site, and ask about any new households being formed within the site. Consent and census information will be collected from these households during the next visit, and demographic information on subsequent visits.

Analysis

The crude mortality rate over the past week will be expressed as deaths per 10 000 person-days, and computed as

$$CMR = \frac{\text{deaths during the past week}}{\text{population at the end of the week} \times 7 \text{ days}} \times 10\ 000$$

Similarly, the under 5 years mortality rate over the past week will be computed as

$$U5MR = \frac{\text{deaths among children under 5y during the past week}}{\text{population of children under 5y at the end of the week} \times 7 \text{ days}} \times 10\ 000$$

Monthly CMR and U5MR will also be computed. Mortality rates within sentinel sites will be plotted on a weekly and monthly basis so as to observe trends. As these are derived from data collected from all households, no confidence intervals will be calculated.
However, projected mortality rates (CMR or U5MR) over one week or one month and their 95% confidence intervals will also be computed for the entire study population of each stratum, by assuming a Poisson distribution. To do this, the sentinel sites will be treated as a sample of clusters of unequal size, and standard errors will be adjusted for the observed design effect.

6.2 Objective 2: Monitor trends in acute malnutrition

Data collection

Starting during the first visit, and thereafter once every month, home visitors will measure the MUAC and check for the presence of bilateral oedema for each child aged between 6 and 59 months residing in each household within their sentinel sites. In case age is unclear, children will be assumed to meet the age criteria based on height/length criteria (children with height or length 65-110 cm will be included). Children meeting moderate or severe malnutrition criteria, as well as children who look very ill, will be referred to the nearest nutritional centre, unless they are already under treatment at a centre (see below). If children or caregivers are absent during the initial household visit, the home visitor will make three further attempts to measure them.
Some children from the sentinel sites may be under treatment in health structures or nutritional centres: the surveillance supervisor will identify any of these based on facility registers, and measure them on the spot, with these data being added to those collected from the community.

Analysis

The percentage of acute malnutrition cases, according to MUAC and/or the presence of nutritional oedema, will be computed as

$$Prevalence = \frac{\text{children 6 - 59m old with acute malnutrition based on MUAC and/or bilateral oedema}}{\text{all children 6 - 59m old measured by MUAC and/or oedema}}$$

MUAC and/or the presence of nutritional oedema is proposed as the single measure of nutritional status, as it is easy to measure, enables quick on the spot classification of the

child's malnutrition status, and is more predictive of the risk of dying than weight-for-height indices.[6] As for mortality, trends in the percentage of cases observed by MUAC and oedema will be observed within the sentinel sites. However, the percentage of cases observed over the entire study population will also be estimated by assuming a Binomial distribution, and applying the same cluster survey adjustments. Moreover, weight and height will be measured every six months in order to estimate acute malnutrition prevalence by weight-for-height and oedema.

6.3 Objective 3: Estimate nutrition programme coverage

Data collection

For each child who classifies as acutely malnourished during the above cross-sectional surveys, the home visitor will verify whether (s)he is already under inpatient or outpatient treatment in a nutritional centre.

Analysis

The coverage of the nutritional interventions will be estimated as

$$\text{Coverage} = \frac{\text{children with acute malnutrition and currently under treatment}}{\text{all children with acute malnutrition}}$$

Children who are admitted at a supported nutritional centre and classify as malnourished by MUAC and/or nutritional oedema at the time of the survey will be added to both the numerator and the denominator of the above equation.

Coverage of severe and moderate acute malnutrition treatment will also be estimated, and computed as above.

This estimate of coverage should be interpreted with caution, as the criteria for admission to nutritional rehabilitation programmes are not based on MUAC and oedema alone, but rather on the presence of acute malnutrition as defined by MUAC, bilateral oedema and/or low weight-for-height. However, unless children who do not classify as malnourished by MUAC or oedema, but are malnourished according to weight-for-height, systematically differ from the others in terms of their access to treatment, the estimate of coverage should not be biased.

7. Timeline

HNTS is willing to start setting up the system as soon as possible, possibly before the end of April.
The set up of the first phase (i.e. Port-au-Prince area) should take about 3 months.
Other areas (next phase[s]) would be included progressively after a trial period of at least 2 months.
The whole project should last from 12 to 18 months.

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[6] Myatt M, Khara T, Collins S. A review of methods to detect cases of severely malnourished children in the community for their admission into community-based therapeutic care programs. *Food Nutr Bull* 2006 Sep;27(3 Suppl):S7-23.