

**Establishing Early Warning Thresholds for key
Surveillance Indicators of Urban Food Security:**

The Case of Nairobi



CONCERN worldwide

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Introduction

Historically there has been comparatively little analysis of urban humanitarian action (Knox Clarke and Ramalingam, 2012) even if major disasters, such as the Port-au-Prince earthquake in 2010 have led to an understanding of the need for greater attention to preparedness, relief and recovery work for emergencies in the urban context. This comes against a backdrop of increased general warnings of another three to five big urban emergencies expected in the next 10 years (Knox Clarke and Ramalingam, 2012). An important area that has not been addressed to any great extent has been the identification of, or response to, slower onset or chronic emergencies in an urban context, in particular the invisible emergencies of food security or malnutrition; something often compounded by a lack of disaggregated data in major urban areas. **The intention of the IDSUE programme has been to develop an easy to use set of indicators to identify a food security or nutrition emergency in an urban context and the thresholds against which different levels of an emergency could be declared.**

Global Context: Urban Population Growth and Urban Slums

Narratives describing the scale and speed of urban growth are manifold; illustrative of the figures included in these are that in 2014 the urban population accounted for 54% of the total global population, up from 34% in 1960. This population is expected to grow approximately 1.8% per year between 2015 and 2020, 1.6% per year between 2020 and 2025, and 1.4% per year between 2025 and 2030. More pertinent perhaps is that urban population growth, in absolute numbers, is currently concentrated in the less developed regions of the world, where it is estimated that by 2017 a majority of people will be living in urban areas (WHO). In Africa, while over one third of the continent's one billion inhabitants currently live in urban areas, by 2030 that proportion will have risen to a half with the population of some cities swelling by up to 85% in the next 15 years (UN-HABITAT, 2010)

The rapid growth in urban areas means that poverty is becoming concentrated in fast-growing at-risk and mostly unplanned informal settlements, massively increasing the number of people living in cities vulnerable to disasters or conflict (Knox Clarke and Ramalingam, 2012). In addition to the familiar headline-grabbing natural disasters, the poorest sections of the urban population are vulnerable to more routine covariate shocks, such as price increases, that come from living in extreme poverty and being dependent on 'risky' livelihoods, characteristic of the large and growing slums in urban areas. This is complicated by the heterogeneity even in informal settlements that means any urban crises can make beneficiary identification and needs analysis a problem (Parker and Maynard, 2015). Within larger urban centres, there can be high absolute numbers experiencing 'unseen' crises; for instance increases in food prices or drops in demand in the labour market can affect the poorest disproportionately, something masked in aggregate figures driven by the sheer size of the city.

Paul Knox Clarke and Ben Ramalingam (2012) highlighted 'the [humanitarian] system as a whole is not well prepared for urban disasters – there are serious questions as to whether existing standards, assumptions and operating procedures are relevant in urban contexts'. This is in part because 'experiences, approaches, tools and skill set of humanitarian agencies are still mostly grounded in rural or camp settings' (IRC, 2015). Notwithstanding, the past five years has seen a general recognition 'that humanitarian response in urban situations is substantially different from rural situations; and that the number and scale of urban humanitarian responses will continue to grow as more of the world's population move to towns and cities³. Part of this different type of response is the need to focus more on engagement, advocacy and support, rather than straightforward service delivery, which may be more suitable in a rural context (Parker and Maynard, 2015).

There have, however, been some initiatives to address this, for instance as part of the Resilient Cities campaign, the UN Office for Disaster Risk Reduction (UNISDR) provides a 10-point checklist² for making urban cities resilient, one of which is to install early warning systems and emergency management capacities. The importance of this is

1 This article is based on an original paper produced by Jay Chaudhuri, former Project Coordinator/Technical Advisor for the IDSUE project at Concern Worldwide, Kenya. It has benefitted from substantial comments from Joanna Napierala and Chris Pain (Concern Worldwide), Ronak Patel (Stanford University), Nick Cox (USAID-OFDA), Kaija Korpa, Calum McClean (ECHO), Sohel (UCL), Quentin Legallo (NRC), Allister Clewlow (Samaritans Purse) and from discussions during a workshop with representatives from Nairobi City County in November 2015.

2. Source: http://www.conference2011.disaster-resilience.net/index.php?option=com_content&view=article&id=107&Itemid=96

3. This is taken from an early draft of the guidelines for the use of Sphere standards in urban settings which at the time of writing are still being finalised.

reiterated in the next steps section of the Knox Clarke and Ramalingam report (2012 report which identifies the need to establish a better early warning [sic] system and adapt existing systems for urban contexts as well as establishing a clearer definition of an urban crisis. This has been taken on board by the Inter-Agency Standing Committee (IASC) – Meeting Humanitarian Challenges in Urban Areas (MHCUA) working group³, which has identified the need to develop a toolkit of vulnerability indicators, food security assessment tools and guidelines and an early warning system specific to urban settings (IASC, 2015).

Early Warning Systems and Emergencies in Urban Contexts

Historically, early-warning systems for humanitarian frameworks have focused on rural contexts. The numerous information sharing and coordination platforms⁴ have focused on rural food security and livelihoods, while the various factors which affect rural communities (such as rainfall, migration and crop yield) have also been extensively studied and accepted by stakeholders. Due to the similar, predominantly agricultural, livelihood activities undertaken in rural areas shocks tend to affect most of the population homogeneously, while the ability to cope is similar across the community.

Urban vulnerability in terms of food and nutrition security is quite specific and different to that observed in rural areas, even though a high dependence on food produced outside cities can make urban residents vulnerable to droughts, flooding and other extreme weather events that occur some distance away (Knox Clarke and Ramalingam, 2012). Related to the dependence on markets as a source of food those with the lowest incomes and most insecure forms of employment will be the most affected by any shock; a 10% rise in the price of a staple hurts those living in the poorest income quintiles in urban areas the most (FAO, 2008). Slum dwellers are more likely to encounter disasters such as landslides or flooding than residents in other urban areas (Grunwald, 2011) and urban phenomena such as insecurity in informal settlements, manifest in the prevalence of mugging or stabbing, will also affect an individual's level of vulnerability. Complications can also emerge when displaced populations flock to urban centres, or when there are health-based emergencies, such as cholera outbreaks – however mass displacement or a disease outbreak is too unpredictable to be a central element of a broader surveillance framework for food and nutrition security. These can lead to 'invisible' periods of severe stress among the most vulnerable households.

The fundamentally different nature of urban environments also means they require a different type of early-warning system. For instance, any system will need to focus on the most at-risk geographical areas and households; the analysis of the entire urban population would mask significant differences within socio-economic groups

(Creti, 2010). In urban areas these at risk locations are synonymous with the informal settlements, locations where highly vulnerable households reside, often masked by surrounding prosperity. The implication here is any early-warning system (or surveillance system) for food and nutrition security does not need to collect information on middle-class and upper class residential areas of the city, rather the city needs to be considered a system where livelihoods and incomes are stratified by location.

A second key point is that any early-warning system needs to incorporate a set of indicators which are localized to the urban context. Primary amongst these are disposable income, which is a strong determinant of food security in an urban context, with many households unable to earn enough in a month to feed their family. This means a whole series of coping strategies unique to urban areas (and sometimes even to a particular context) are adopted and need to be tracked. Further, slow-onset crises in the urban informal settlements can have many origins which need to be monitored. The labour market, insecurity, external shocks/stresses, and lack of basic services all play varying roles in determining how the most vulnerable households are faring.

The IDSUE programme in Kenya

In Nairobi, after the 2007/8 post-election violence, the idea emerged to develop a monitoring system for the informal settlements as well as establish an operational coordination system. Agencies argued that these factors had created a humanitarian crisis in the slums but there were no well-defined indicators helping to measure or describe such a situation. Second, there was no evidence how much worse the situation could become when compared to baseline conditions (which were already quite poor). In response Concern Worldwide conducted two consecutive one-year pilot studies around urban vulnerability in 2011 and 2012. Poor formal settlements as well as informal settlements were surveyed in order to compare relative vulnerability of residents. Subsequently a three-year grant from USAID OFDA was secured to expand the sites of data collection to include Kisumu and Mombasa and develop coordination and early-action systems in place.

4. IPC, FEWSNET among the most notable.

5. The typology of informal settlement will not be covered in this paper. Korogocho has a higher level of vulnerable households as well lower incomes and higher food insecurity. The combination of these characteristics present the area as a logical candidate where slow-onset emergencies will evolve, especially when compared to Mukuru and Viwandani.

The surveillance system consists of two essential elements – routine collection of data at household level and weekly monitoring of price data. This evolved over a number of stages.

In the first, as an official sampling frame did not exist for those areas under study, a comprehensive enumeration process was required before any data could be collected. This resulted in the collection of a full list of all households in both formal and informal settlements; this was then used for random selection of households, and a comprehensive 'baseline' questionnaire was administered on a quarterly basis. The questionnaire was refined after each wave of quarterly data collection.

Since 2014 data is collected from individual households on a monthly basis using a smaller surveillance survey, in this case only the most vulnerable villages are selected for the study and the focus is on smaller set of indicators (2014- 2015). Both baseline and surveillance data are representative samples for their respective areas with the same methodology for enumeration and sampling utilised for both surveys.

This monitoring at household level is supplemented with weekly monitoring of market price data.

Sampling

The first stage of the sampling strategy was to identify the most vulnerable informal settlements; this involved looking at available secondary data to understand both a candidate list of informal settlements in terms of vulnerability but also population. Then for the six largest informal settlements (Korogocho, Mukuru, Viwandani, Kibera, Eastleigh and Kawangare) a random sample of household was selected to collect primary data on the situation of household members. For each interview GIS coordinates were also recorded which enabled spatial analysis of indicators. Based on this collected information two areas, Korogocho and Kibera, were identified as the two most vulnerable and food insecure informal settlements.

Unsurprisingly, early analysis of the baseline datasets (collected between 2012 – 2013) revealed large differences in a number of indicators between areas, attributed to the fact that each informal settlement had their own demographic profile and unique labour market dynamics⁵. At the same time amenities and neighbouring factors such as proximity to employment sources (factories for daily labour, dumpsites for scavenging) shaped the livelihood opportunities and subsequently income levels. The income and food security inequalities demonstrated that vulnerabilities across informal settlements varied.

However, the early analysis also revealed, that even within the informal settlements not all slum dwellers were equally disadvantaged and that there were specific constraints experienced by the most disadvantaged neighbourhoods, suggesting that even at this level averages could mask reality, and the poorest areas would be the ones to sound the alarm first. (The argument that within an urban context there will be identifiable geographical areas that suffer disproportionately from problems has also been made

recently in Parker and Maynard (2015).) Spatial mapping supports the assertion that inequality within informal settlements is large, even in highly vulnerable areas (see Figure 2 and Appendix A) making it possible to identify areas within specific informal settlements that were considerably worse off than others. This implication of 'not all slums are the same' is significant for several reasons.

- There was not a huge need to monitor for a slow-onset crisis in every informal settlement⁶. Some areas, though very poor, were not the highest priority areas.
- Secondly, the types of shocks will differ by area. Insecurity, food insecurity and hunger will all vary depending on the area in question.
- Third, the most vulnerable, though prevalent in almost all areas, are in higher concentrations in certain informal settlements; this is particularly observed in Korogocho, where there are a higher percentage of female-headed households and IDPs (see Appendix B).

In this respect it was felt that a surveillance system would be more appropriate if it collected data on a more regular basis from a smaller sample of households in specifically disadvantaged areas within the informal settlements. The process of identifying these villages included application of hot spot analysis which enabled the team to define areas of high occurrence of studied phenomena versus areas of low occurrence. In this case the composite indicator included information on households' food insecurity (HFIAS), the concentration of lowest income quintile residents of that informal settlements, and percentage of severe hunger (HHS). This allows a relative ranking of all villages and the three most vulnerable villages within each of the most vulnerable informal settlements were identified to serve as the surveillance system for monitoring the food security situation in Nairobi. (In Figure 2 below the identified (green) areas show where 30% of the total population of the particular informal settlement fall below an identified threshold.) The data presented in this document covers only the selected 'surveillance villages'.

Preparation of tools

The process of indicator refinement has evolved over the past five years and included: focus group discussions with people living in the informal settlements which helped identify key issues and develop a candidate set of localised indicators specific for the area. Issues of chronic violence such as experiencing certain types of shocks, or avoidance behaviour due to increasing insecurity emerged as highly important. Indicators to capture this were developed and combined with standard indicators, such as Household Food Insecurity Access Scale, which have been tested in a wide range of contexts (2011). The questionnaire with the information collected on household level was tested in both formal, poor settlements as well as in a wide range of informal settlements. Two years of quarterly data collection helped develop and refine a set of indicators and helped to identify good predictors of household hunger (2012 – 2013).

⁶ There are likely to be several, and not one, candidate where a crisis can emerge. For IDSUE, there is at least one candidate, in the area of Korogocho. For the purposes of this document, the results will primarily focus on Korogocho. Mukuru and Viwandani, two other IDSUE locations rank considerably lower in terms of deprivation and vulnerability. While these locations provide useful information in terms of a comparison or reference point, they are not useful for setting a 'minimum' threshold, as an emergency (specifically severe hunger) is not likely to emerge in either location before Korogocho, based on the current data

Baseline vs. Surveillance Data Collection Tools

Two different data collection tools were used in the baseline and surveillance surveys. The baseline survey tool contains more detailed questions and is more time-consuming to administer; it had originally been administered on a quarterly basis, but based on IDSUE experience it was recommended to be utilised only at the beginning of research to establish baseline values for researched populations and to allow for cross-sectional analysis across indicators. The baseline data collection is also used to identify the villages that are the most vulnerable and therefore qualify for monthly surveillance data collection. The baseline tool is used as a diagnostic to compare results across areas as well as understand the critical issues in each informal settlement. For instance, analysing data collected from the baseline tool clearly demonstrated that Korogocho was the most vulnerable informal settlement in Nairobi, and showed it

as the area with the highest prevalence of severe hunger.

After careful analysis of baseline survey data it was recommended to carry out baseline survey only once every few years. More frequent use of baseline survey would be recommended in case when the population (in terms of households numbers) has significantly increased. This number is tentatively set at 20%, meaning if the population of a surveillance village has increased by 30%, a comprehensive baseline survey needs to be done.

The surveillance tool, which is a shortened version of the baseline questionnaire, is designed to provide real-time information on the most vulnerable areas and identify potential early-warning interventions. An overview of the data collection helps illustrate how selected indicators and thresholds in this document are linked to the monthly data in the surveillance villages.

Table 1 Key differences between data collection tools used in IDSUE

Data Collection	Baseline	Surveillance	Markets
Area of Analysis	Survey Entire Informal Settlement	Survey most vulnerable villages (sub – unit of informal settlement)	Track food and essential non-food items from markets / points of sale in the informal settlements. Identify three markets per informal settlement.
Unit of Analysis	Households	Households	Shops, markets etc.
Frequency	At the beginning of urban surveillance. Followed up once every few years.	Monthly	Weekly
Objective	Assess level of deprivation, categorize type of slums (mostly casual labour, Female headed households, etc), identify areas for longer term surveillance	Monitor for slow-onset urban emergency Track over time along most critical indicators	Track changes in food prices, which are likely to be main stressor for vulnerable households.
Indicators	Large set of indicators which will demonstrate levels of poverty, well-being, and access issues.	Small set of indicators which will show change over time and progression towards or away thresholds/triggers for action.	Individual market changes. Food Basket Index

Selecting Indicators for Surveillance

While there is a general acceptance that urban children are better nourished than their rural counterparts (Ruel and Garrett, 2004), urban settings also present higher malnutrition differentials between poor and better off parts of the city than in rural areas (Ruel *et al.* 1998). The ultimate sign of a food security emergency is an increase, above a certain threshold, in acute malnutrition, which has been recorded in the IDSUE data using **MUAC**⁷. However, in terms of being able to predict an emergency, by the time large changes in MUAC can be observed an opportunity to take early action has been missed; for this reason the focus of data collection is around the **Household Hunger Score (HHS)** and a variety of other indicators that act as good predictors of the HHS.

Two complementary approaches have been undertaken in refining the list of indicators for Surveillance on a monthly basis. The first entailed a series of consultations on what key informants saw as the most appropriate, the second involved the development of a statistical model to identify good predictors of MUAC and Household Hunger Scores based on the data collected in the baseline surveys.

The 'localized' indicators were developed and refined over a period. The criterion for the selection of these indicators was their sensitivity to change, and assessed suitability by experts for monthly data collection. As it was part of the objectives of the grant, it was always understood that thresholds for action would be set utilising these indicators (when applicable) in a consultative manner.

The second has been to undertake a multinomial logistic regression of the data sets collected in the baseline survey (in August 2012, February, April and November 2013 and February 2014) to statistically test the best predictors of household food insecurity and hunger, defined using the Household Food Insecurity Access Prevalence tool. The results of this analysis will be made available as a separated paper⁸.

The model is based on the assumption the Household Hunger Score (HHS (severe)) is the early warning indicator by which we can model other early-warning indicators and that severe hunger increases before any full-blown slow-onset emergency. Previous analysis suggested the following could be utilised as good predictors:

1. Prevalence of Diarrhoea (as a proxy for illness)
2. (Reported) Experience of a Shock

7 The Mid Upper Arm Circumference (MUAC) is a measurement that allows health workers to determine quickly if a child is acutely malnourished. It measures the circumference of the arm at the midpoint between their shoulder and elbow using a typical MUAC band. Children between six and 59 months with a MUAC measure of 115mm or below are said to be severely acutely malnourished, while those in the range greater than 115 but less than 125mm are considered to be moderately acutely malnourished

8. The original indicator for inclusions were identified through the multivariate analysis to identify predictors of severe hunger (as measured through Household Hunger Score) utilising Akiake Information Criterion, binomial regression analysis. This was a model-fitting exercise for the Nairobi informal settlements.

3. (Often Used) Avoidance Measures (to also incorporate respondent's sense of insecurity)
4. Livelihood Source (specifically the proportion of respondents who are engaged in scavenging and casual labour)
5. Self-reported Household Income
6. Proportion of (self reported) household income of the poorest quintile spent on food

Spikes in severe hunger are likely to be an early-warning indicator for a full-blown food security emergency in the informal settlements. In the IDSUE data **Severe Hunger** is measured through the Household Hunger Score (HHS), an experiential household food deprivation scale comprising a subset of the nine occurrence questions used in the Household Food Insecurity Access Scale (HFIAS). The HHS is intentionally designed to be used across country and cultural contexts and has been validated for this purpose and is commonly used for assessment, geographic targeting and monitoring and evaluation in settings affected by substantial food insecurity (FAO 2011) making it also relevant for urban settings. At the same time, within the data collected in Nairobi, the HHS and MUAC scores were observed to be closely correlated. This is most appropriate to use in areas of substantial food insecurity *inter alia* to monitor the prevalence of hunger over time and to provide information for early warning or nutrition and food security surveillance⁹. The specific questions asked were – in the past four weeks:

- was there ever no food of any kind to eat in your household because of lack of resources to get food?
- did you, or any household member go to sleep at night hungry because there was not enough food?
- did you or any household member go a whole day and night without eating anything because there was not enough food

if the answer to any of these questions were positive respondents were then asked how often, with three response options included – rarely (once or twice in the last four week), sometimes (once every week), or often (more than once a week in the last four weeks).

The **prevalence of diarrhoea** is taken as a proxy for household illness. For under-five children this metric has significant importance as it can be directly linked with potential under-five deaths. In the baseline survey respondents were asked to identify if anybody in the household had been ill in the previous two weeks, then list these people and subsequently identify the illness the individual had, from this it has been possible to identify the proportion of children aged between six and 59 months who had diarrhoea in the past two weeks. In the Surveillance questionnaire this was refined somewhat, as all children in the household have been listed, and a specific question asked as to whether they had been sick in the previous two weeks, and if so, what illness did they have.

9. For more details on the HFIAS and the HHS see Ballard, T., J. Coates, A. Swindale and M. Deitchler (2011) Household Hunger Scale: Indicator Definition and Measurement Guide, Washington, FHI360

Respondents in both the baseline and surveillance surveys were asked about the occurrence of **personal shocks** in the household. Specifically the question asked whether the respondent, or anyone in their household, had experienced a fire, flood, mugging, stabbing, harassment / intimidation, burglary, eviction, property destruction or rape / sodomy in the previous four weeks. However, it has always been expected that the answers recorded here will be volatile, being based on individual's perceptions.

The indicator recording often-used **Avoidance Measures** is designed to incorporate respondent's sense of insecurity. This indicator is likely to represent a combination of factors, such as crime by local gangs and perpetrators of robbery, burglary, harassment and tensions between local populations. Specifically the question used in the baseline surveys asked *how often have you / household member used avoidance measures in the last four weeks due to insecurity, such as using escorts, using unusual routes, coming home earlier than usual etc*) with four response options provided, never, rarely (once or twice in the last four weeks), sometimes (once every week) and often (more than once a week in the last four weeks). This has been refined somewhat in the surveillance exercise to ask *have you, or any member of your household members, needed to use any of these avoidance behaviours in the last four weeks?* With five options presented – coming home earlier than usual, using an escort, using a longer way / different route, staying at home, other.

The shift towards a surveillance system hypothesises that changes in the frequency of specific **Livelihood Sources**, which would normally only be considered for use in extreme cases of poverty, can act as an early warning of

an impending food crisis. In particular the proportion of respondents who are engaged in scavenging and casual labour. The baseline questionnaire first asks for the main livelihood source for the household and then how many people in the household currently have a source of income, the age of the people, the source of this income and how much each of them is paid. The Surveillance questionnaire asks a similar set of questions, firstly listing all adult household members, whether they earned an income in the last four weeks, what was the main source of income and how much did they earn in the last four weeks. This allows the calculation of two specific indicators. The first is the source of income, in particular the proportion of household members earning their main income from scavenging and / or casual labour, taken to represent a worsening of the livelihood situation as these are last resort activities. The second is changes in the self-reported income (along with all the challenges entailed with this indicator). [It should be noted that, as identified in Creti (2010), the 'main' income may be elusive or misleading as it masks the diversity and complexity of urban livelihoods]. A third, related indicator which can be included here is the proportion of income that is spent on foodstuff.

Weekly Monitoring of Price Data

At the same time data on a basket of a price of goods, collected separately is included underlining the point that in urban areas, for many poorer households, it is affordability that is a more serious problem than availability. More detailed information on development of this monitoring tool is included in publication titled "Price bulletin: July 2013-June 2014 of the Indicator Development for the Surveillance of Urban Emergencies – IDSUE".

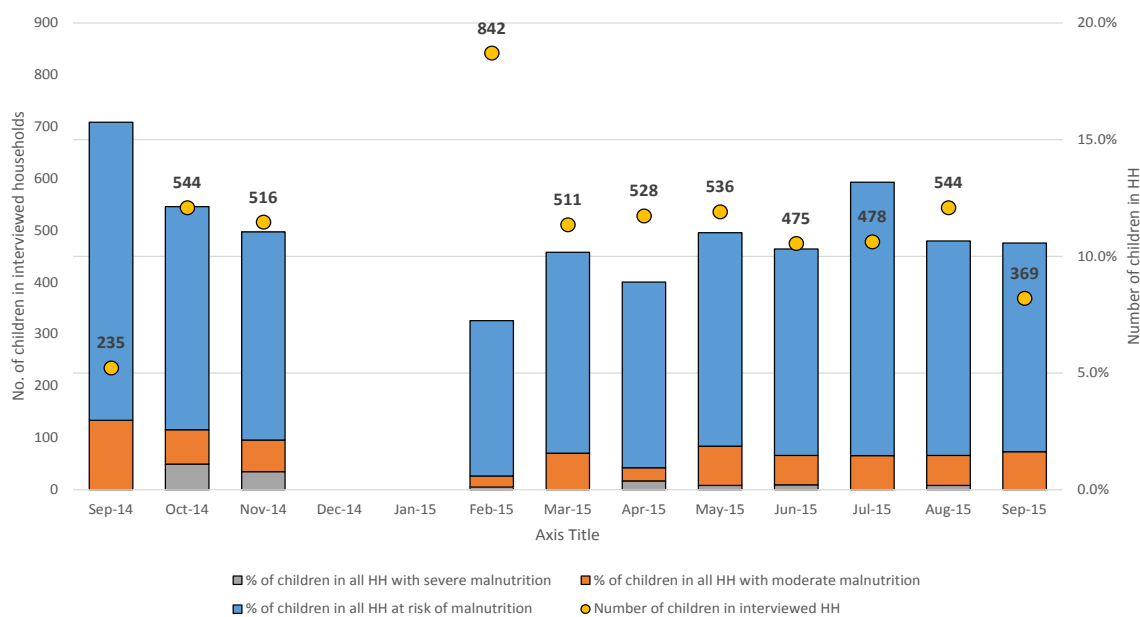
Results

The following presents the results of the basic analysis of the surveillance datasets undertaken for each of the selected indicators identifying the highest and lowest scores for each. This helps to show, from a variability perspective, how these could be considered appropriate for an early warning system.

Firstly, in terms of the MUAC measure, as the following figure shows over two years for which surveillance data is available the proportion of children from all interviewed households suffering from severe acute malnutrition (% of children with less than 115mm) has ranged between 1.1% (in October 2014) and no cases in September 2014, and March, July and September of 2015. The proportion of children moderately acutely malnourished (MUAC in range between 115 to 124.9mm) has varied between 0.5% in February 2015 and 3.0% in September 2014.

However the proportion of children described as being at risk of malnutrition (with MUAC values between 125 and 135 mm) has ranged from a low of 6.7% (in February 2015) to a high of 12.8% (in September 2014), suggesting a larger variation in this specific measure.

Figure 3 Nutritional Status of children aged 6-59 months (SAM, MAM and at risk of malnutrition) and number of children aged 6-59 months in interviewed households

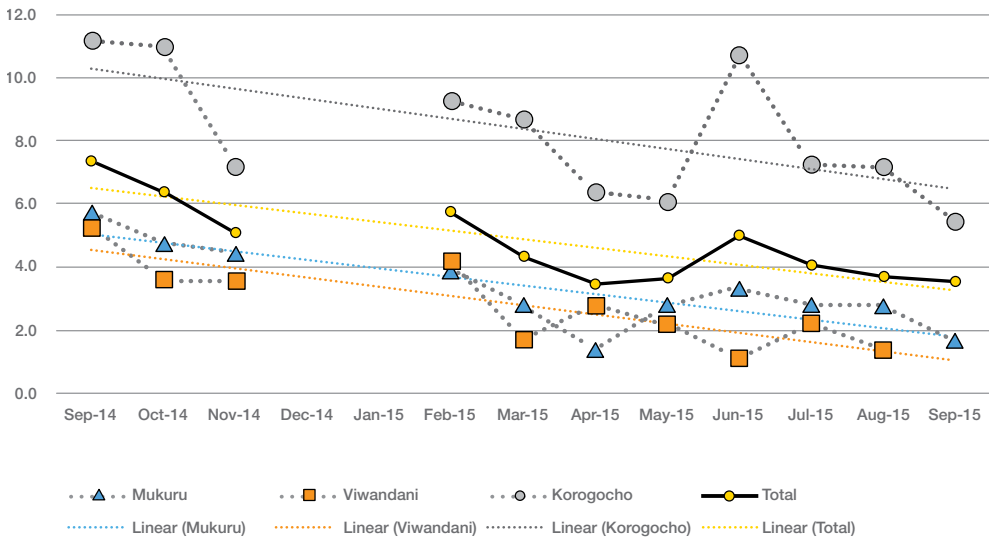


Source: Surveillance Datasets waves 2-12.

In terms of the Household Hunger Score, the proportion of households assessed as being severely hungry varies, not just in terms of location, with proportions being much lower in Viwandani and Mukuru than in Korogocho, but also in terms of monthly peaks, with the highest proportion recorded in Korogocho in September and October 2014 (above 11%). The lowest proportion recorded in Korogocho was in September 2015 (below 6%), which except for a jump above 10% in June 2015 represented a steady decline also observed in other researched areas. The range in the other two areas is considerably narrower, for instance the lowest score recorded in Viwandani was 1.1% in June 2015 with a high of 7.3% in September 2014. An even narrower band is observed for Mukuru, ranging from a low of 1.4% (in April 2015) to a high of 5.7% in September 2014.

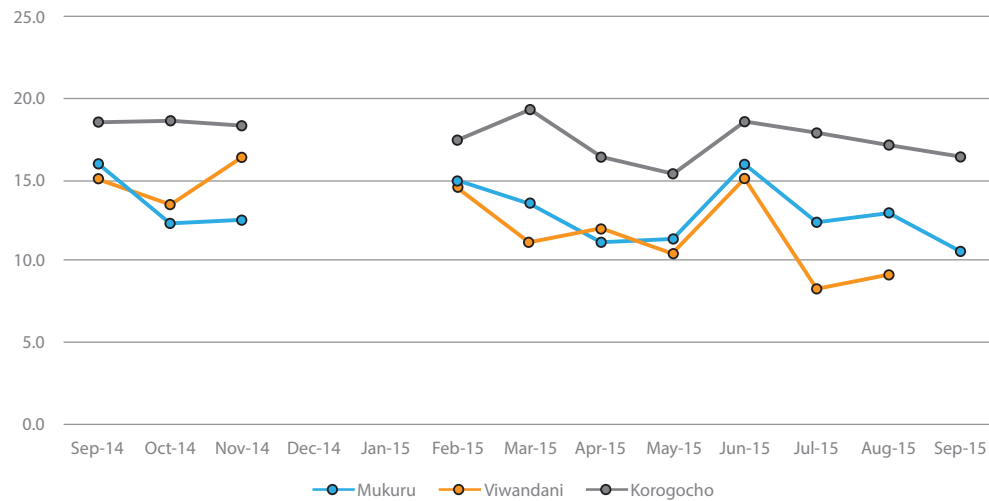
Looking further at the figures on degree of food insecurity access study (HFIAS) in the household in the past four weeks among only the poorest population (defined as belonging to the first income quintile in each studied area) we again observe considerable differences between areas with Korogocho having the highest means for the population assessed as severely food insecure. In August 2015 the difference in mean HFIAS between the poorest residents in Korogocho and Viwandani was equal to 16.

Figure 4 Trends in Household Hunger Score measured as percentage of HH in severe hunger (Sep 2014 – September 2015), by area



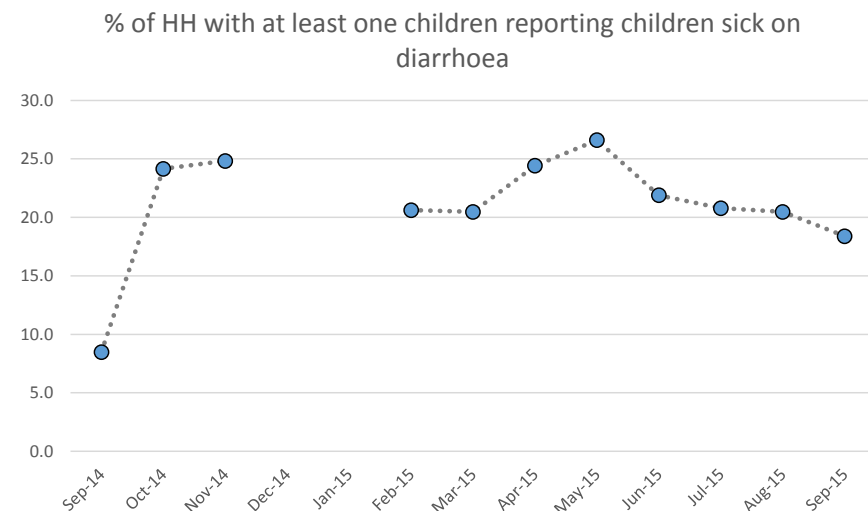
Source: Surveillance Datasets waves 2-12.

Figure 5 Average degree of food insecurity (HFIAS) for households in first income quintile (Sep 2014 to Sep 2015)



Source: Surveillance Datasets waves 2-12.

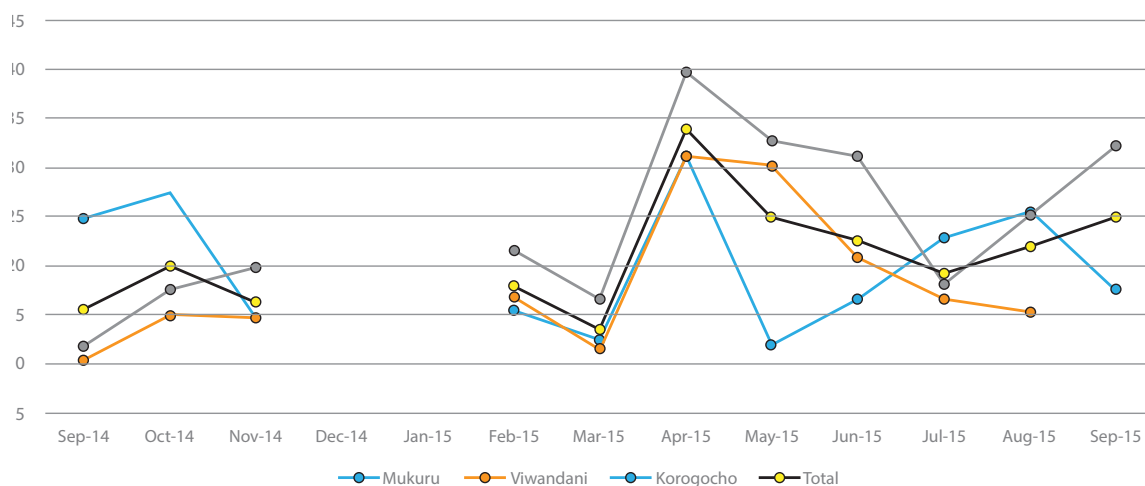
Figure 6 Share of Households with at least one child aged 6 -59 months old reporting children sick on diarrhoea (Sep 2014 to Sep 2015)



The indicator, prevalence of diarrhoea amongst children between the age of six and 59 months (commonly referred to as under five) has been taken as a proxy for households reporting illness. The results from the surveillance exercise show that this has varied from a low of 8.5% in September 2014, to a high of 26.6% in May 2015. This is similar to data collected from the District Health Information System (DHIS) which shows spikes in February, March, October and November.

Source: Surveillance Datasets waves 2-12

Figure 7 Share of households in which members have experienced at least one shock in the previous four weeks



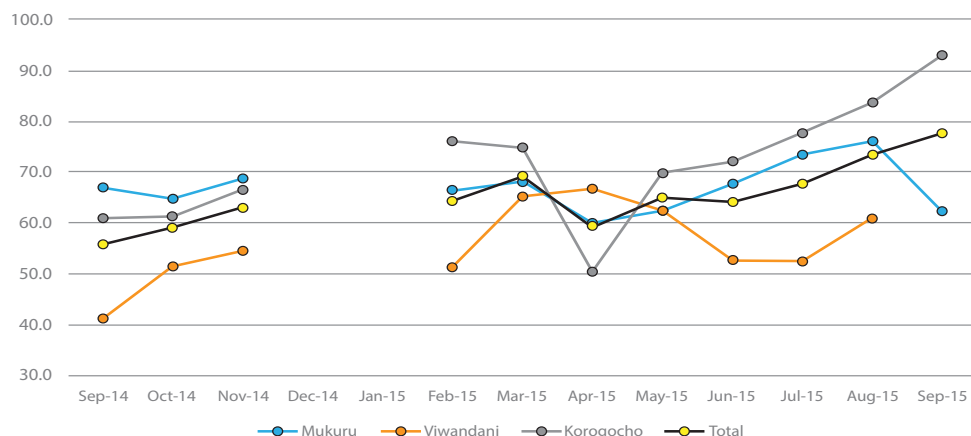
Source: Surveillance Datasets waves 2-12.

Data collected reflects the occurrence of **shocks on personal level (mugging / stabbing / harassment / rape) and on household level (fire, floods, burglary, property destruction, eviction)**. In April 2015 as many as 33.9% of households have experienced at least one shock on personal or household level, this is a routinely high number. At the end of 2014 a greater share of residents in Mukuru reported occurrence of at least one shock. In the whole of 2015, with the exception of July, the share of the population reporting at least one shock was highest among residents of Korogocho (in July this was highest amongst the residents of Mukuru). There are also seasonal differences which need to be examined more carefully to provide a deeper understanding.

A follow-on indicator deals with the **frequency of the use of avoidance measures**, with five options presented – coming home earlier than usual, using an escort, using a longer way / different route, staying at home, other. The lowest proportion of respondents giving this answer was observed in the fall of the 2014, before observing upward trend since the beginning of 2016. There was a significant drop in the percentage of people who reported using any avoidance measure in the survey carried out in April 2015 in Korogocho with a peak in the share of people reported being exposed on shocks at the same time.

Supplementary qualitative work has revealed there may be localized factors which temporarily influence local perceptions. For example in Korogocho a newly paved road saw more members from the community use it to walk to the factories in the morning and evenings. The increased foot traffic also attracted robbers and the local community then identified the new road as being ‘unsafe’. These highly localized dynamics reflect the complexity of trying to relate aggregated figures to dynamic ground level events. However, increased avoidance behaviour is a clear sign that community members feel increasingly insecure.

Figure 8 Share of households reporting using any avoidance measures in last 4 weeks.

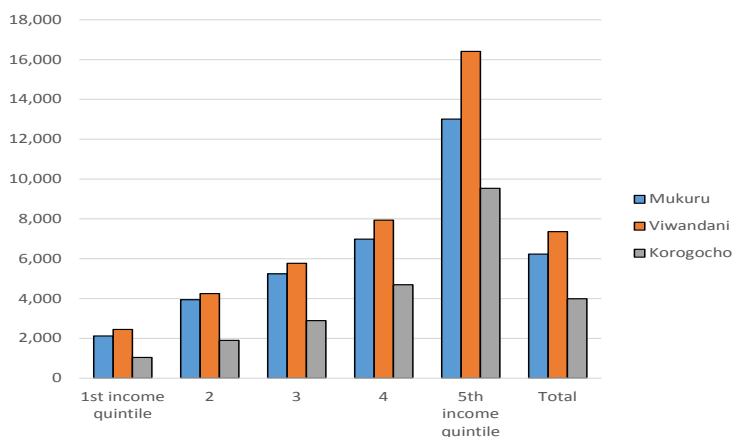


Note: Wave 2-10 answers ‘yes’ to question ‘Have you or any of your household members needed to use an avoidance behaviour in the last four weeks?’. Waves 11-12 answers other than ‘never’ to question ‘How often have you/household member used avoidance measures in the last 4 weeks due to insecurity such as using escorts, using unusual routes, coming home earlier than usual etc?’

Source: Surveillance Datasets waves 2-12.

Respondents are asked to provide an estimate of their **total household income** in the previous four weeks. Instead of reporting on the straightforward mean or median household income, it is proposed that a surveillance system needs to consider at least the equivalised household income to reflect differences in a household's size and composition. To do this the total household income is divided by the number of 'equivalent adults', using a standard (equivalence) scale. This gives a weight to all members of the household (and then adds these up to arrive at the equivalised household size) using the following - 1.0 to the first adult; 0.5 to the second and each subsequent person aged 14 and over; 0.3 to each child aged under 14¹⁰. As the results in Figure 9 show there are sizable differences between income quintile and between the various areas.

Figure 9 Adult equivalised mean household income (September 2014), by area

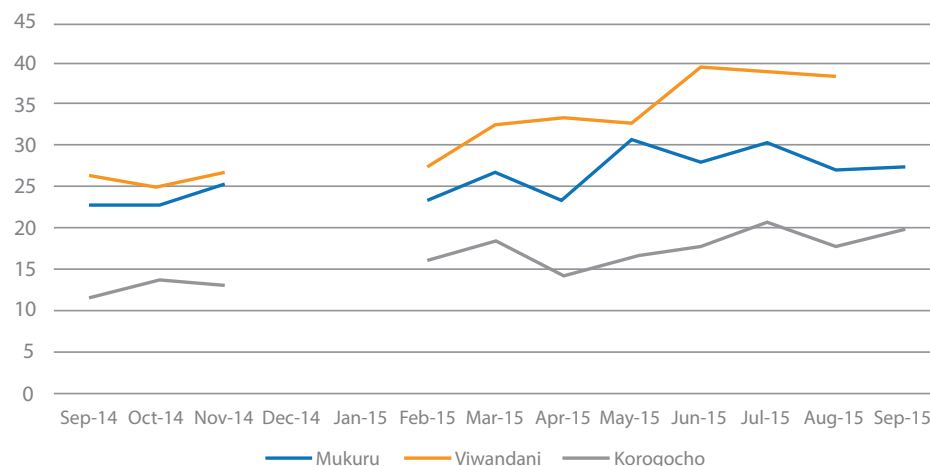


However, a more practical early warning or surveillance indicator may be to identify a survival threshold and to record the proportion of the population living below this line. One possibility is to set this as an 'absolute' poverty line, for instance at Kes 2,500 per adult equivalent¹¹. As Figure 9 shows this would capture the poorest quintile in all areas, but a considerably larger portion of the population in Korogocho. A number of other alternatives exist to make the reported income indicator more practical for surveillance purposes, one of these include the number of food baskets (for which data is collected separately) the poorest quintile can purchase in a given month; this is presented in Figure 10.

Source: Surveillance Datasets wave 2.

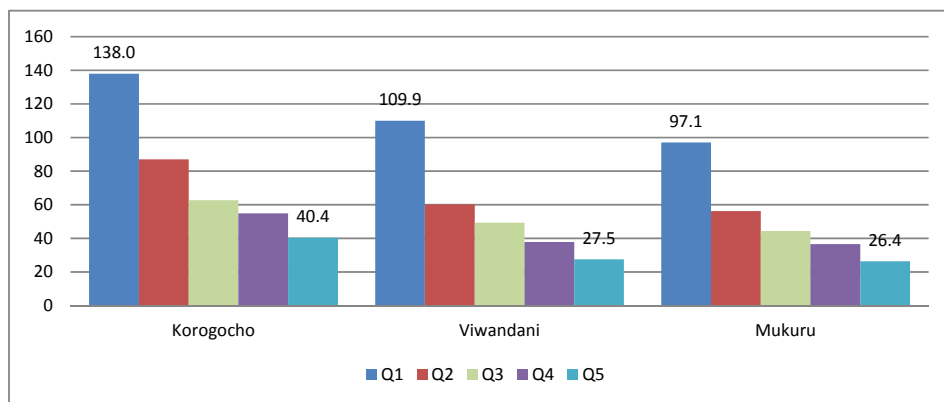
Figure 10 Number of baskets of food purchasable per adult equivalent

Another alternative could be to look at the proportion of household expenditure that was spent on food (regularly over 75%, sometimes over 100% - see Figure 11 below for an illustration of this and how this is particularly a problem in Korogocho). This is despite the fact that in urban contexts, the population need to pay for basic items such as water or cooking fuel that are essentially free in rural areas.



Source: Surveillance Datasets waves 2-12.

Figure 11 Food Expenditure as % of reported household income, by quintile

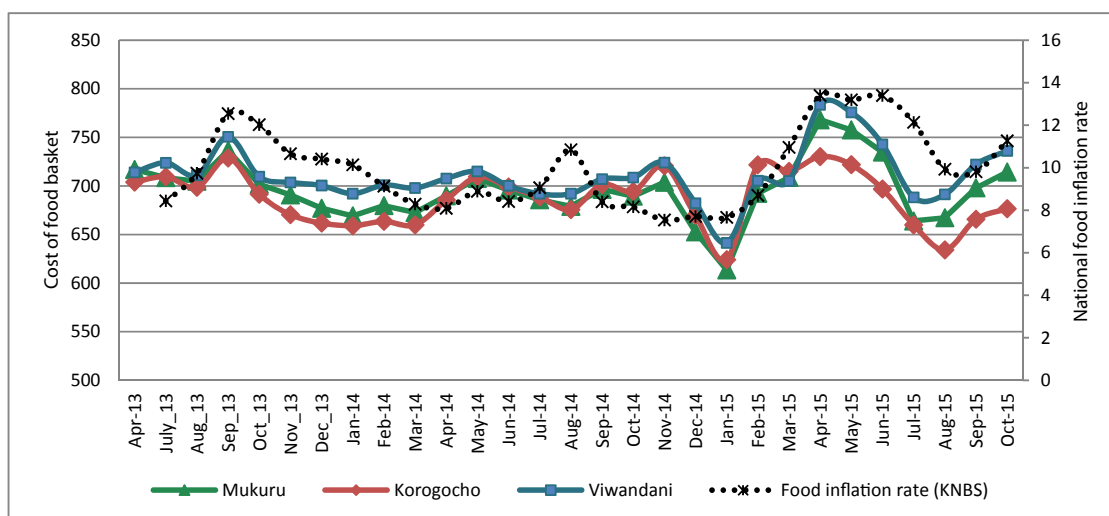


Even though the use of recall data on income is fraught with methodological problems, it is suggested that it still acts as a good proxy for household asset poverty. Continued analysis to identify the most appropriate way to utilise the income data will be undertaken over the next six months.

10. The adult equivalence scale have been calculated using the "OECD-modified scale", which is used by the Statistical Office of the European Union (EUROSTAT) since the late 1990s. This scale, first proposed by Haagenars et al. (1994), assigns a value of 1 to the household head, of 0.5 to each additional adult member and of 0.3 to each child. Recent OECD publications (e.g. OECD 2011, OECD 2008) comparing income inequality and poverty across countries use a scale which divides household income by the square root of household size. This implies that, for instance, a household of four persons has needs twice as large as one composed of a single person. More details are available at <http://www.oecd.org/eco/growth/OECD-Note-EquivalenceScales.pdf>

The final indicator included is for food prices, which reveals a highly volatile situation for the prices of the basket of goods recorded on a weekly basis, with monthly trends similar to national trends, peaking in the months of April, May, June, representing seasonal trends in prices. Price spikes in 2013 were because of increases in VAT and since October 2014 we are beginning to see increasing prices possibly due to weakening currency.

Figure 12 Food Price Trends April 2013 – October 2015



While a simple threshold could be set for when the price of the basket passes a certain level, this would need to change on a regular basis to take account of inflation and increases in salary, so a means of linking this closer to income needs to be considered. As highlighted, this will form the focus of further analysis of the data.

Discussions – Setting Thresholds for Each Indicator

In recognition of the fact that setting thresholds to facilitate an early response to a food or nutrition security shock is a predominantly political discussion, a workshop was held with various urban stakeholders in Nairobi in November 2015. Present in the workshop were representatives of Nairobi City County, Kenya Red Cross, Concern Worldwide and several technical humanitarian agencies to help guide this process towards a consensus. (This is also in recognition of the fact that national and municipal government need to play a strong role in this process, a challenge in the Nairobi context where the coordination structure for urban disaster response is still the subject of an ongoing conversation taking place within Nairobi County.)

Other challenges identified during the workshop included:

1. There is very little knowledge about indicators or trends recording harassment or violence and how these are potentially linked to issues of ethnic ties, gender, or refugees. These are highly subjective and constantly changing.
2. Ranges of volatility can be highly area-specific, for instance the HHS is within a range of 6-8 basis points for Viwandani and Mukuru. A surge of two percent would be considered high for these respective areas, but in Korogocho monthly fluctuations of between 5 and 8 basis points can be seen – so the question was raised as to the appropriate level of disaggregation, in particular when identifying absolute or relative thresholds.
3. For the Nairobi informal settlements (even at village level) the population numbers are large and often increasing making the distinction between absolute numbers and percentages increasingly important. Even in informal settlements a 15% GAM rate will be rarely achieved due to larger population bases and a more heterogeneous mix of people. This supports the view that smaller measurement areas are more effective to find malnourished children.

To ensure that what is developed for urban areas is methodologically consistent with that used in rural areas, it was agreed in the workshop to follow a similar warning system that identifies a normal, alert, alarm or emergency situation. This would also be broadly in line with the IPC approach which utilises five stages of an emergency: Minimal/None, Stressed, Crisis, Emergency, Famine. However, what still needs to be developed is the actions which goes alongside the different classifications.

11. As of 2nd February US1 = 102.4 Kenya Shillings, so the amount suggested here would be slight less than US\$25

Table 2 Thresholds for IDSUE Indicators linked to different assessments of Food and Nutrition Security

Normal	GAM Case Load	1-2% (case load 5,120 – 10,240)
	% assessed as Severely Hungry	0 to 4%
	Prevalence of Diarrhoea	1-4.9% (case load 5,120 – 25,088)
	% reporting they Experienced a Shock	0 – 20%
	% reporting they used an identified Avoidance Measures	0 – 69%
	% of respondent households engaged in scavenging	TBD
	Self-reported Household Income	TBD
	% of self-reported household income spent on food	TBD
Change in Food Price	TBD	
Alert	GAM Case Load	2.1-3.4% (case load 10,752 – 17,408)
	% assessed as Severely Hungry	4 to 7%
	Prevalence of Diarrhoea	5-7.9% (case load 25,600 – 40,448)
	% reporting they Experienced a Shock	21 – 30%
	% reporting they used an identified Avoidance Measures	70 – 74%
	% of respondent households engaged in scavenging	TBD
	Self-reported Household Income	TBD
	% of self-reported household income spent on food	TBD
Change in Food Price	TBD	
Alarm	GAM Case Load	3.5% - 4.9% (case load 17,920 – 25,088)
	% assessed as Severely Hungry	7 to 10%
	Prevalence of Diarrhoea	8-9.9% (case load 40,960 – 50,688)
	% reporting they Experienced a Shock	31% and above
	% reporting they used an identified Avoidance Measures	25% and above
	% of respondent households engaged in scavenging	TBD
	Self-reported Household Income	TBD
	% of self-reported household income spent on food	TBD
Change in Food Price	TBD	
Emergency	GAM Case Load	5% and greater (case load 25,600 and above)
	% assessed as Severely Hungry	Over 10%
	Prevalence of Diarrhoea	10% and greater (51,200 and above)
	% reporting they Experienced a Shock	31% and above
	% reporting they used an identified Avoidance Measures	25% and above
	% of respondent households engaged in scavenging	TBD
	Self reported Household Income	TBD
	% of self-reported household income spent on food	TBD
Change in Food Price	TBD	

Conclusion and Way Ahead

More work is required to refine the thresholds and to provide information on how frequently these have been crossed at different points in the past three years, the implications this would have on the numbers that would require an emergency response and the potential cost of this. This will be an area of focus of the analysis in the programme over the coming six months. Additional areas of analysis which may reveal key indicators include:

- Detailed analysis of trends in equivalised income for all areas and waves, including expanding the data presented to include baseline scenario data
- Creating an indicator which will relate the reported income to the price of the food basket to calculated disposable income; this can be expressed in terms of the number of households capable of buying a number of standard food baskets, and to look at this in terms of quintile group.
- Further analysis of the data for different household structures
- Further analysis of the datasets to see what they reveal in terms of the labour market, for instance difference between people who have monthly income as opposed to those who are underemployed in the week preceding the study.
- Calculation of elasticities of HFIAS over income to see how changes in disposable income might increase numbers of severely hunger people.

More thought also has to be given to the type of response necessary. There is a general feeling that cash and market-based responses are the most appropriate ones in an urban context to address issues of food and nutrition security, however this hypotheses may need to be tested further. There is also a potential argument, that has been put forward in some quarters, that much of what is being flagged up in the warning system from IDSUE requires 'just good development' to address. However, in the continued absence of this in a context like the urban slums of Nairobi, there is heightened vulnerability with a small shock leading to an emergency with increased mortality and morbidity, underlining the need to respond. That is not

to say that potential response options should not consider means of bridging the (false) gap between humanitarian and development work, for instance:

- When responding to an increased incidence of child illnesses, what needs to be done to increase capacity at the local clinics? Similar questions abound with the management of increases in rates of malnutrition.
- When responding to the shocks experienced by the extreme poor, at times contiguous with specific disadvantaged groups (such as the elderly, children and people living with disabilities) what can be done to ensure inclusive urban planning and social protection is put in place that benefit this section of the population, such as child friend spaces, programmes to keep children in school and the provision of accessible areas for disabled.
- When responding to livelihood or income shocks, ultimately resulting in food and nutrition insecurity, caused by insecurity how do the underlying, systemic problems get addressed as well.

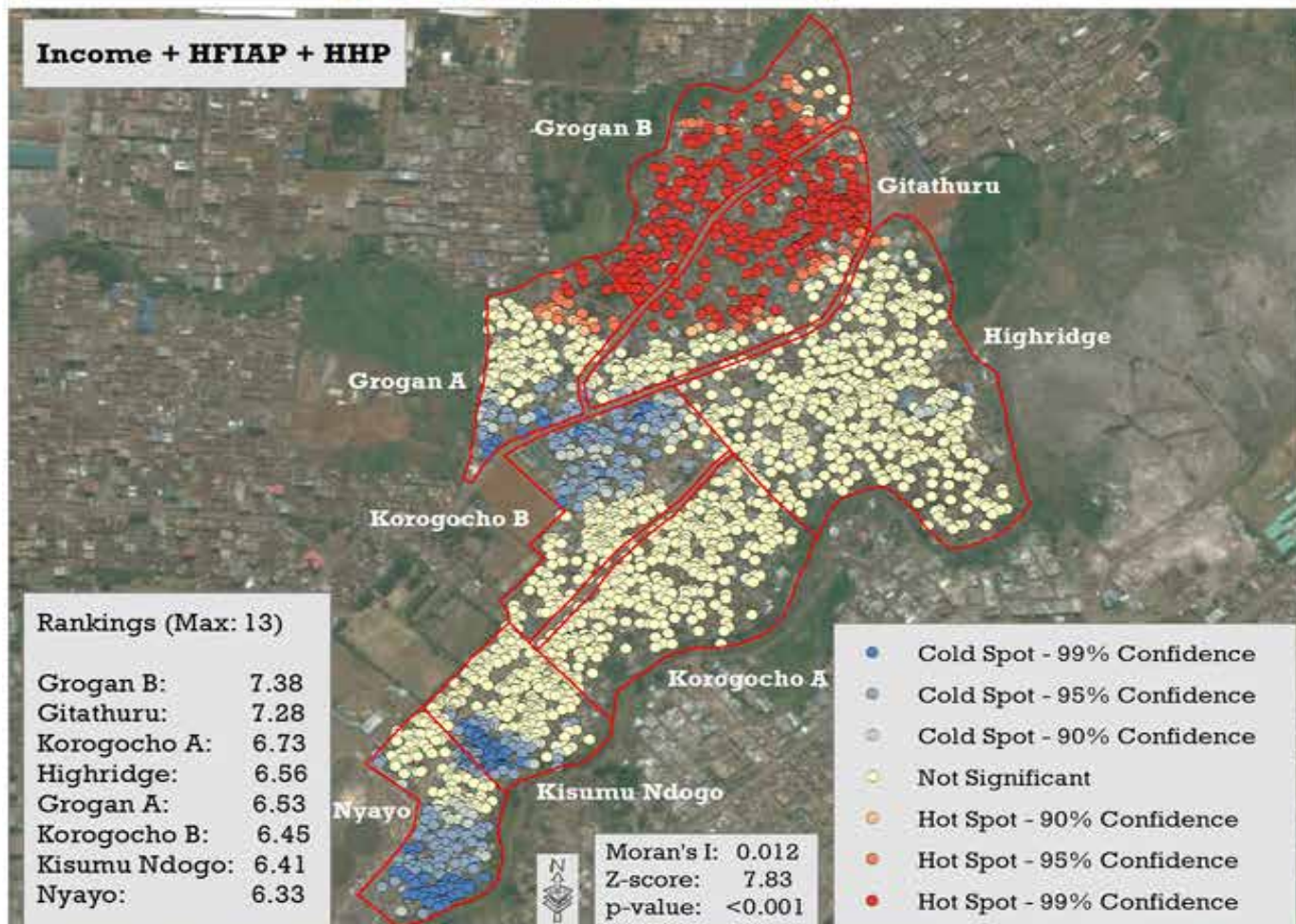
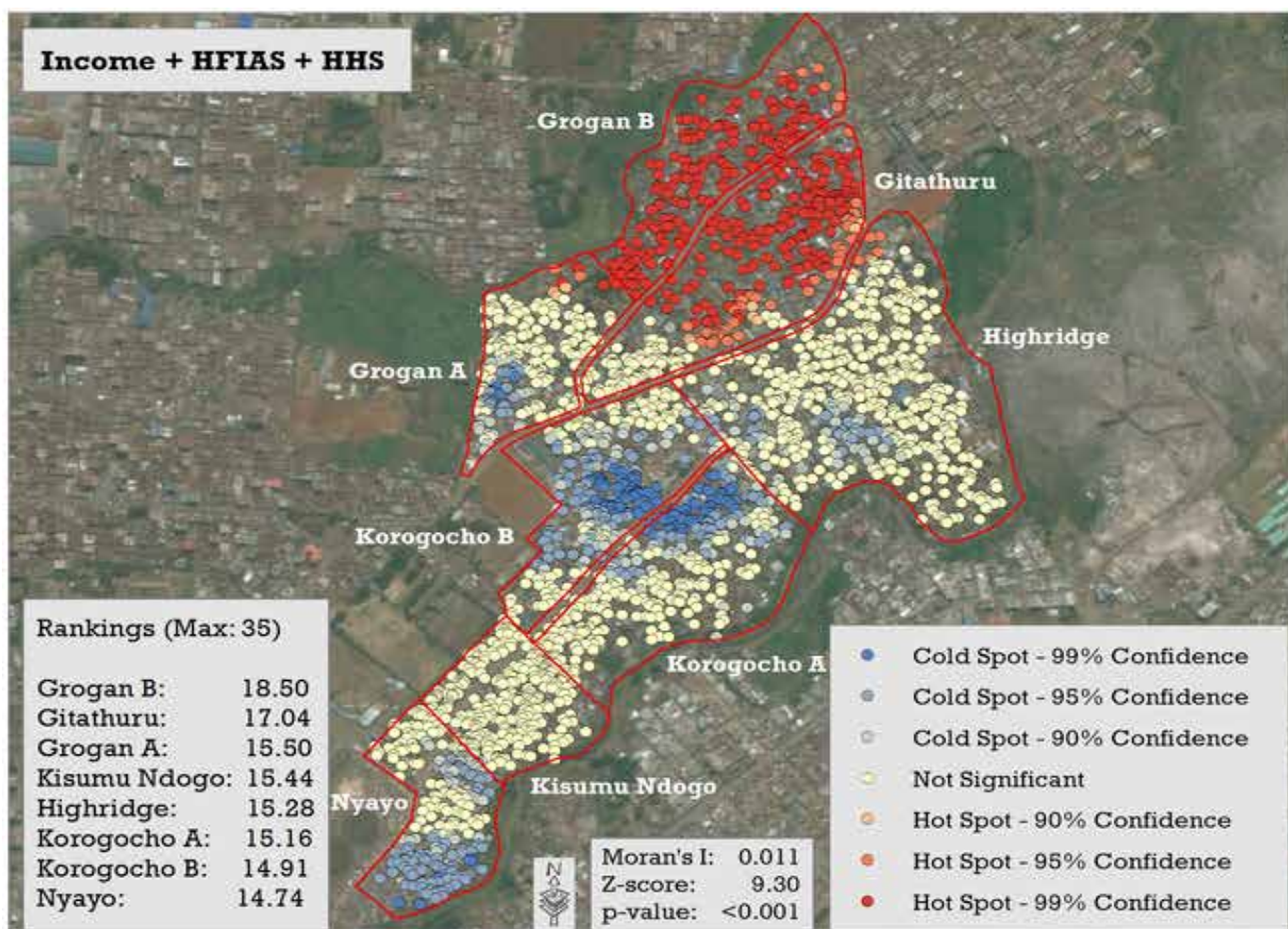
As the IDSUE programme has predominantly focussed on food and nutrition security there are of course potential emergencies that occur outside the IDSUE view, and the data collected is unlikely to predict all threats to the most vulnerable. For example, a measles outbreak would not be detected as it doesn't fall within the programme's monitoring framework. For any coordination body, it will be important to understand the limitations of IDSUE within the broader urban context and look for complementary sources in order to develop a holistic view of threats and resilience within the informal settlements.

Finally, the obvious owner and champion for any future work in Nairobi is the appropriate disaster coordination body located within Nairobi City County Council, and the IDSUE programme will need to work with them to develop appropriate interventions based on the early-warning data. Further, the data generated through IDSUE needs to be incorporated into development programming through County information systems. The County executives would be best placed to provide guidance on this.

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Appendix A: Geo-spatial mapping of vulnerability



Appendix B: Results Table - Korogocho

Household Demographics	8/12	2/13	4/13	11/13	2/14
Sample size	428	553	546	584	705
Average household size (all ages)	5	4	4	4	4
Number of children under 5	1	1	1	1	1
Length of residency (years)	14	14	13	14	12
Household head					
Age of household head (average)	-	-	-	-	39
Household heads under 18 years old (%)	-	-	-	-	0.9
Female household head (%)	25	34	34	40	31
MUAC for children 6 to 59 mos. old (%)					
Severe malnutrition (< 115 mm)	0.6	0.6	1.1	0.5	0.2
Moderate malnutrition (< 125 mm)	1.7	1.9	1.4	1.5	1.9
At risk for malnutrition (< 135 mm)	5.3	6.6	11.7	7.2	9.5
Where did household come from? (%)					
Rural area	51	41	32	39	28
Other slum	16	27	8	13	22
Same slum	11	9	40	30	32
Non-slum urban area	22	22	20	17	16
Other country	-	-	-	-	0.1
Why did you move here? (%)					
Looking for employment	-	-	-	-	33
Breadwinner lost job/ deceased	-	-	-	-	4
High cost of living	-	-	-	-	20
Ethnic tensions (IDPs)	-	-	-	-	2
War/civil strife (Refugees)	-	-	-	-	0.7
Other	-	-	-	-	33
Water	8/12	2/13	4/13	11/13	2/14
Pay for water (%)	88	86	88	88	89
Time to water source (minutes)	2	2	2	2	2
Time queuing for water (minutes)	4	5	5	10	9
Liters of water/person/day	17	19	17	20	18

Meeting 15L/day threshold (%)	52	56	55	69	61
Main water source (%)					
Piped or tap water	82	86	84	95	95
Water tanks	18	14	16	5	3
Water vendors	0	0	0	0	2
Lake, river, or well	0	0	0	0	0
Quality of water (%)					
Clean water	76	75	77	81	86
Very clean water	20	23	21	15	10
Dirty water	4	3	2	4	4
Very dirty water	0	0	0	0	0
Food	8/12	2/13	4/13	11/13	2/14
Dietary Diversity Score (HDDS)	6.7	5.7	6.0	5.0	-
Main food source (%)					
Purchase raw food	98	96	97	94	93
Purchase cooked food	1	4	2	5	4
Produce own	0	0	0	0	0
Borrow, relief food, safety nets	0	0	0	0	0
Discarded food	0	0	0	0	0
Number of meals per day (average)					
Adult	2.4	2.6	2.6	2.4	2.4
Child (under 18 years old)	2.7	2.7	2.9	2.6	2.7
Household Food Insecurity and Access (HFIA)					
HFIA Score (HFIA S)	10	10	11	12	11
Food Secure (%)	8	11	10	7	9
Mildly food insecure (%)	3	4	3	6	4
Moderately food insecure (%)	35	19	19	21	23
Severely food insecure (%)	54	66	69	66	65
Household Hunger					
Household hunger score (HHS)	0.9	1.4	1.4	1.8	1.4
Little to no hunger (%)	73	62	60	50	57
Moderate household hunger (%)	23	32	33	38	37
Severe household hunger (%)	4	7	7	12	6

Health	8/12	2/13	4/13	11/13	2/14
Households reporting illness (%)	49	42	46	50	49
Average number of ill people/household	1	1	1	1	1
Morbidity (%)	33	31	31	36	35
Average age of ill persons	16	19	19	20	19
Under 5 years old illness (%)	43	34	37	34	38
Felt increased levels of stress (%)	-	-	-	-	58
Type of illness (%)					
Diarrhoea	18	14	12	20	18
Fever	41	39	42	25	22
Cough	47	35	41	23	28
Headache	27	26	30	28	23
Vomiting	9	15	12	10	11
Convulsions/seizure	0	2	1	2	2
Difficult/fast breathing	8	11	11	12	12
Measles	1	0	1	4	1
Injuries	3	5	4	4	5
Malaria	-	-	-	-	17
Mental illness	-	-	-	-	0
Other illnesses	6	35	27	26	23
Sought care/treatment (%)	93	88	79	81	86
Average cost of treatment (KSH)	-	-	-	-	1491
Median cost of treatment (KSH)	-	-	-	-	200
Type of treatment sought (%)					
Public hospital	16	8	5	17	11
Public health clinic	27	22	34	33	35
Private hospital	9	7	7	7	4
Private health clinic	13	15	17	11	11
NGO hospital	6	5	0	1	3
NGO clinic	11	11	8	4	9
Pharmacy/chemist	26	31	28	25	30
Traditional healer/herbalist	6	3	1	1	1
Other treatment	0	2	0	2	2
Shocks and Security	8/12	2/13	4/13	11/13	2/14
Experienced one or more shocks (%)	6	13	19	22	15
Total number of shocks experienced (average)	1.1	1.1	1.2	1.5	1.3

Overall number of shock events (average)	1.3	1.3	1.5	3.1	1.9
Shocks experienced in last 4-weeks (%)					
Fire	4	6	1	10	4
Floods	4	0	13	34	11
Mugging/Stabbing	77	76	74	56	23
Burglary	15	19	24	21	10
Eviction	4	4	4	18	13
Property destruction	4	6	2	12	7
Rape/sodomy	0.0	2.9	1.9	2.4	2.9
Harassment/intimidation	-	-	-	-	61
Number of shock events in 4-weeks					
Fire	1	1	1	1	1
Floods	1	0	2	3	2
Mugging/Stabbing	1	1	1	1	1
Burglary	2	1	1	1	2
Eviction	1	2	1	1	1
Property destruction	1	1	1	7	2
Rape/sodomy	0	1	1	2	2
Harassment/intimidation	-	-	-	-	1
Felt scared in community (%)					
Never	16	26	21	23	26
Rarely (1 or 2 times in 4-weeks)	23	28	27	22	29
Sometimes (once every week)	36	21	26	20	17
Often (more than once a week)	25	25	26	35	29
Used avoidance measures (%)					
Never	19	33	32	33	31
Rarely (1 or 2 times in 4-weeks)	34	37	33	28	36
Sometimes (once every week)	27	17	18	21	17
Often (more than once a week)	20	13	17	18	15
Perception of community security (%)					
Very bad	22	22	25	33	22
Bad	41	35	31	24	30
Not very bad	19	25	28	26	33
Good	18	17	14	16	15
Very good	0	2	3	1	0

Did not feel safe leaving child at school (%)	-	-	-	-	4
Child did not feel safe at school (%)	-	-	-	-	4
Housing	8/12	2/13	4/13	11/13	2/14
Own house	19	18	17	17	13
Rent house	81	80	80	82	86
Free house	0	1	3	1	1
Livelihoods	8/12	2/13	4/13	11/13	2/14
Monthly salary	8	11	12	8	11
Casual labor	54	53	52	50	49
Hawking/petty trading	22	16	13	14	14
Remittances	1	0	2	1	3
Scavenging	0	3	2	2	3
Safety nets (e.g. merry go round)	0	1	0	0	0
Business	13	13	18	21	14
Other	3	4	3	3	6
Average household income (KSH)	8585	10369	9187	9587	9412
Median household income (KSH)	7000	7550	7200	7200	8000
Number of people in household earning an income (average)	1.2	1.2	1.2	1.2	1.2
Expenditures (4-week recall average)					
Percent household income spent on food	105	86	90	89	65
Percent household income spent on water	5.3	3.9	3.9	5	3.8
Percent household income spent on rent	23	19	19	21	17
Percent household income spent on debts/loans	8	12	20	20	20
Percent household income spent on savings	-	-	-	-	4
Breadwinner					
Average breadwinner income (KSH)	8378	9981	8147	8637	8443
Median breadwinner income (KSH)	6000	7200	7000	7000	7000
Percent household income earned by breadwinner (average)	93	94	93	95	94
Female breadwinners (%)	32	37	40	38	38
Average age of breadwinner	36	36	37	38	37
Average grade level completed by breadwinner	-	7.9	7.8	8.7	7.9

Average number of hours worked/day	8.4	8.1	8.2	8.4	8.2
Average number of days worked/week	5.5	5.7	5.6	5.3	5.3
Mode of payment for breadwinner earnings					
Hourly (%)	0	0	0	2	0
Daily (%)	77	75	73	76	78
Weekly (%)	9	8	10	11	7
Monthly (%)	11	17	16	11	13
Other (%)	2	0	1	0	1
Coping (4 week recall)	8/12	2/13	4/13	11/13	2/14
Used credit	53	43	53	54	57
Took a loan	29	15	12	14	16
Removed children from school	17	16	20	23	38
Household member left household	13	7	9	11	8
Begged for food or money	8	8	10	3	8
Stolen food or money	2.1	2.2	2.0	1.0	0.6
Know someone that stole	45	37	42	26	26
Got food/money from friend/family/neighbor	29	30	40	31	43
Taken a second job	-	-	-	-	29
Sold an asset	-	-	-	-	13
Used 1 or more of the above	87	75	82	77	84

Acknowledgments

Concern would like to thank the United States Agency for International Development (USAID) - Office of Foreign Disaster Assistance (OFDA) whose support enabled this document to be published. Concern would also like to acknowledge Chris Pain (Head, Technical Assistance, Concern Worldwide, Dublin) for taking the lead and Joanna Napierala (Data Analyst, Concern Worldwide, Dublin) for her contribution.

We would also like to thank Ronak Patel (Stanford University), Nick Cox (USAID-OFDA), Kaija Korpa, Calum McClean (ECHO), Sohel (UCL), Quentin Legallo (NRC), Allister Clewlow (Samaritans Purse) for their contribution to the document.

Concern would like to thank the Ministry of Health, Ministry of Agriculture and Nairobi City County staff who participated in the threshold setting workshop that helped guide this process further. Finally Concern would like to thank our partners Kenya Red Cross Society, World Vision Kenya and other civil society organizations that have been part of this ongoing process.

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Report designed by Kul Graphics Ltd

Citation: Pain, C., Erasmus, W., Chaudhuri, J., Napierala, J. (2016) Establishing Early Thresholds for key Surveillance Indicators of Urban Food Security: The Case of Nairobi, Concern Worldwide's Research on Indicator Development for the Surveillance of Urban Emergencies, Concern Worldwide, Nairobi, Kenya. April 2016, Version 1

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