Tushinde
Providing Family Support
To Help Vulnerable Children Thrive

Fiona Foundation FOR KIDS

Tushinde Day Care Report

July 2017

By Tom Davis

Background - About Tushinde

Tushinde Children's Trust was founded in March 2010. It was set up after Megan Wright, a British woman living in Kenya, visited a project working in the Mathare Slums of Nairobi.

Tushinde has partnered with a local women's group to operate a safe day care centre that provides nutrition in the form of a lunch programme and play activities and is open 12 hours a day, 6 days a week to enable mothers of very young children to work and provide for their families.

The project initiative came from the recognition that many poor mothers in this area need to leave their infants or toddlers in care so they can find work, usually casual day jobs, and that existing services available in the community are inadequate and of a very low standard. This places the children at high risk of malnutrition and neglect. In extreme cases, but quite common in the area, mothers who have no alternative would leave their infant or toddler locked in the house alone for the entire day.

This can lead to devastating consequences for the children: sickness, injury and dehydration in the short term and malnutrition and severely delayed development in the long term.

(This report is centred around one of the Day Care Centres: Veronicah's Day Care.)

Acute malnutrition considerably increases the risk of childhood morbidity and mortality, and is reported to be responsible for nearly 875,000 (13%) of the global deaths in children under five years of age [1]. Severe acute malnutrition (SAM) contributes to almost three-fifths of these deaths [1]. If identified and properly managed, it is possible to prevent these deaths [2].

[1}. Black, R.E.; Victora, C.G.; Walker, S.P.; Bhutta, Z.A.; Christian, P.; de Onis, M.; Ezzati, M.; Grantham-McGregor, S.; Katz, J.; Martorell, R.; et al. Maternal and child undernutrition and overweight in low-income and middle-income countries. Lancet 2013, 382, 427–451. Nutrients 2017, 9, 267 10 of 12

[2] Bhutta, Z.A.; Das, J.K.; Rizvi, A.; Gaffey, M.F.; Walker, N.; Horton, S.; Webb, P.; Lartey, A.; Black, R.E. Evidence-based interventions for improvement of maternal and child nutrition: What can be done and at what cost? Lancet 2013, 382, 452–477.

The Aim of this Report

From the data collected at one of the Day Care facilities, the aim is to measure the success of the programme in terms of improving the nutritional status of the children. It will also provide an insight into just how necessary this type of programme is by the initial presentation of children at the Centre. Nutritional surveys can be used to identify SAM children who are at high risk of death, preventing mortality by provision of care such as Tushinde Day Care Centres.

Using the results from a nutritional survey this report aims to investigate the data to indicate those considered wasted and/or stunted. The nutritional surveys were over a series of months, therefore enabling not only snapshot data but also a progressive investigation into nutritional status.

Data Collection & Methodology

The data was collected from a total of 20 children (age 0-5 years), between the dates of 02/06/2016 and 31/05/2017. Of the 20 children, 9 were female and 11 male.

The site of the Day Care Centre: Veronicah's Day Care Centre

The measurements recorded at each visit were:

Name

Date of birth (DOB)

Sex M/F

Weight kg

Height cm

Mid-upper arm circumference (MUAC) cm

Date of measurement (DOM)

The nutritional surveys may be recorded monthly, however due to absence from the Centre on recording dates, or a staggered arrival/departure from the Centre the number of sets of visit data for each child varies between just 2 visits up to 11 visits. This will be considered in the analysis of data.

The full data set is attached in Appendix 1 of this report.

Abbreviations:

Abbreviations: The following abbreviations are used in this report:

BMI Body mass index (weight in kg divided by height in metres squared)
DoB Date of birth
DoV Date of visit
HAZ Length or height-for-age z-score
ID Identification number
MUAC Mid-upper arm circumference
MUACZ Mid-upper arm circumference-for-age z-score
SD Standard deviation
WAZ Weight-for-age z-score
WHZ Weight-for-length and weight-for-height z-score

WHO World Health Organization

Nutritional Indicators

Assessment of malnutrition can be recorded as acute or chronic. Undernutrition over a sustained period can result in Chronic malnutrition leading to long term issues with both health and development. Undernutrition which has occurred over a short period can be described as acute, often a result of illness/infectious disease posing a high but short-term risk of death.

The common anthropometric indices used to identify malnutrition can be interpreted as follows:

Low weight-for-height: (Indicating wasting)

Wasting or thinness indicates in most cases a recent and severe process of weight loss, which is often associated with acute starvation and/or severe disease. However, wasting may also be the result of a chronic unfavourable condition. [4]

Low height-for-age: (Indicating stunting)

Stunted growth reflects a process of failure to reach linear growth potential as a result of suboptimal health and/or nutritional conditions. On a population basis, high levels of stunting are associated with poor socioeconomic conditions and increased risk of frequent and early exposure to adverse conditions such as illness and/or inappropriate feeding practices. [4]

Low weight-for-age:

Weight-for-age reflects body mass relative to chronological age. It is influenced by both the height of the child (height-for-age) and his or her weight (weight-for-height), and its composite nature makes interpretation complex. For example, weight-for-age fails to distinguish between short children of adequate body weight and tall, thin children. However, in the absence of significant wasting in a community, similar information is provided by weight-for-age and height-for-age, in that both reflect the long-term health and nutritional experience of the individual or population. Short-term change, especially reduction in weight-for-age, reveals change in weight-for-height. [4]

MUAC:

Another anthropometric indicator for malnutrition amongst young children is MUAC (mid-upper arm circumference). MUAC is independent from other indicators, such as WHZ, WAZ. It is only a reliable indicator of nutritional status of children between 6 months and 5 years. MUAC is the most reliable indication of acute malnutrition. Health workers need to be trained to measure MUAC correctly and accurately to 1mm. [4]

[4] http://www.who.int/nutgrowthdb/about/introduction/en/index2.html

12. World Health Organization. Guideline: Updates on the Management of Severe Acute Malnutrition in Infants and Children; World Health Organization: Geneva, Switzerland, 2013. Available online: http://apps.who.int/ iris/ bitstream/10665/95584/1/9789241506328_eng.pdf

13. World Health Organization; United Nations Children's Fund. WHO Child Growth Standards and Identification of Severe Acute Malnutrition in Infants and Children: A Joint statement by the World Health Organization and the United Nations Children's Fund; World Health Organization Press: Geneva, Switzerland, 2009. Available online: http: //apps.who.int/iris/ bitstream/10665/44129/1/9789241598163_eng.pdf

Interpretation of Indicators

Data collected can be used to assess acute or severe stunting and/or wasting and hence indicate acute or chronic malnutrition. From current WHO guidelines the data can be interpreted as follows:

Low height-for-age:

A low height-for-age Z score (HAZ) indicates stunting and therefore chronic malnutrition

HAZ between -3 and -2 indicates moderate stunting - moderate malnutrition

HAZ less than -3 indicates severe stunting - severe malnutrition

HAZ between -2 and zero, or positive value indicates not stunted

Consistent or improving HAZ scores are indicative of stable nutritional status.

Low weight-for-age:

A low weight-for-age Z score (WAZ) can be due to wasting (low weight-for-height (WHZ)) and/or wasting (low height-for-age (HAZ)).

WAZ between -3 and -2 indicate moderate malnutrition

WAZ less than -3 indicates severe malnutrition

Low weight-for-height:

WHZ between -3 and -2 indicate moderate wasting - moderate malnutrition

WHZ less than -3 indicates severe wasting - severe malnutrition

WHZ between -2 and zero, or positive value indicates not wasted

MUAC (for children 6 months to 5 years only):

115 mm or less indicates Severe Acute Malnutrition
12.5 cm or less indicates acute malnutrition
Between 13.5 cm and 12.5 cm indicates at risk of becoming malnourished
13.5 cm or more the child is not considered malnourished

MUAC Z Scores should be flagged for those under -3 and those between -2 and -3.

Tushinde are considering any z-scores below minus 2 a cause for concern and will flag these cases for investigation.

Whilst primary concern is to highlight Z-Scores less than -2, constant review of charts and data is needed to flag those "approaching a -2 Z-score" or who have shown significant/rapid change in Z-score. This is particularly indicative where a significant/rapid change is noted in MUAC or WHZ.

Explanation of Z Scores

If a child's Height Z-score is 2, they are in the 85th percentile. In a sample of 100 children (all of the same age/sex), 85 children will be shorter (with lower Z-score) and 15 will be taller (with higher Z-scores). So indicating that the child is "tall for their age". In the same way, a child with a height z-score of -3, in a group of 100 children, 97 will be taller and only 3 shorter, revealing that this child is short for their age.

When a child is well nourished, you would expect a constant increase in weight, height and MUAC. Increasing *or* stable z-scores can indicate positive progress in terms of nutritional status. If a child has been malnourished and is stunted a sudden increase in height (when well nourished) would not be expected . So it would therefore not be expected to see a rapid or significant increase in HAZ and/or WAZ scores.

What is a Z-Score?

A z-score is a measure of how many standard deviations below or above the population mean selected data is. Z-scores inform if "our data" is typical/atypical by comparing results from "our data" to data from a relevant population. Some data is meaningless without comparison. For example, a measurement of weight can be compared to an "average" person's weight for particular age, sex, height, etc. A z-score can indicate where one person's weight is compared to the population's mean weight. "Ideally" data would lie within -1 and +1 SD's from the mean, so a Z-score between -1 and +1.

Assuming a normal distribution, your z score would be:

$z = (x - \mu) / \sigma$ z = Z score   x = your data   μ = mean of population data   σ = standard deviation

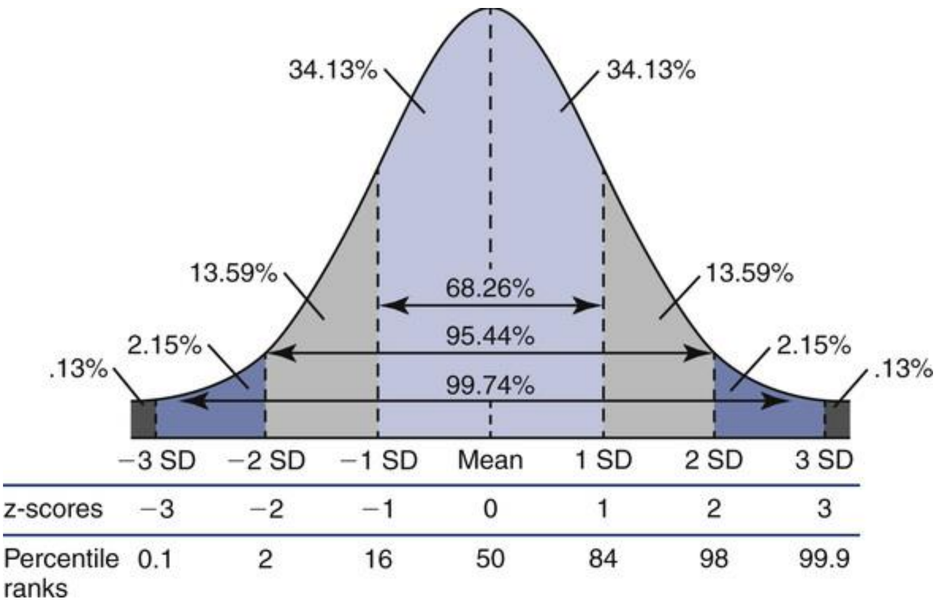
Using z-scores the individual nutritional survey data from Tushinde can be analysed alongside the WHO Child Growth Standards data for populations of the same age, sex, etc.

Using Z-scores

A Z-score is a way of comparing (for example) a child's current height/weight, etc. for their age against what their height/weight/etc. *should be* for their age compared to a relevant population. We can see how individual data "sits" within a population data set by looking at a normal distribution curve.

If a child had a HAZ Z-score of, for example, -2, this sits on the 2nd percentile line meaning that 97.7% of the population (all other variables matched) would have a higher HAZ score, and only 2.3 % of the population would have a HAZ score lower than this child.

Meaning that this child is atypical of the data set and has an unusually low HAZ - indicating moderate malnutrition.



Data Modifications and Assumptions

Height/Length and Recumbent/Standing:

The WHO software used allows for selection of recumbent/standing for each visit's data set. There was no record in the data as to whether "length" was measured laying (recumbent) or "height" (standing). However, the WHO Anthro software provides an automatic assumption/adjustment based upon child age of less than 24 months (recumbent)/greater than 24 months (standing) [1.2]. The software also provides an adjustment for recumbent height measurements when calculating length/height for age. [1.1]

Oedema:

The was no reference made at times of visits as to whether the child had a visible oedema. Fluid retention increases the child's weight, masking what may actually be very low weight This has an effect on the data recordings for weight for those with oedema present. Normally weight and associated data for children with oedema would not be included.

For this report I have made an assumption that no children presented with an oedema. [1.3]

Anomalies:, Limitations and Inaccuracies

Any anomalies, limitations and inaccuracies within the data will be investigated and reported on individually within this report.

[1.1 - http://www.who.int/childgrowth/standards/Technical_report.pdf]

Length/height-for-age. The standard for linear growth has a part based on length (length-for-age, 0 to 24 months) and another on height (height-for-age, 2 to 5 years). The two parts were constructed using the same model but the final curves reflect the average difference between recumbent length and standing height. By design, children between 18 and 30 months in the cross-sectional component of the MGRS had both length and height measurements taken. The average difference between the two measurements in this set of 1625 children was 0.73 cm. To fit a single model for the whole age range, 0.7 cm was therefore added to the cross-sectional height values before merging them with the longitudinal sample's length data. After the model was fitted, the median curve was shifted back downwards by 0.7 cm for ages above two years, and the coefficient of variation curve adjusted to the new median values to construct the height-for-age growth curves. The same power transformation of age was applied to stretch the age scale for each of the sexes before fitting cubic splines to generate their respective growth curves. The boys' curves required a model with higher degrees of freedom to fit both the median and coefficient of variation curves. The data for both sexes followed the normal distribution.

[1.2 - http://www.who.int/childgrowth/software/anthro_pc_manual_v322.pdf?ua=1

For all standards involving length or height measurements, recumbent length should be used for children younger than 24 months and standing height, for children 24 months and older. The software provides a mandatory box to tick, alongside the child's length or height data, to specify whether the measurement was taken in recumbent or standing position. The software will automatically convert 2 height to length for a child younger than 24 months whose height has been measured instead of length, and length to height for a child aged 24 months or older whose length was measured instead of height.

[1.3 - http://www.who.int/nutgrowthdb/software/Differences_NCHS_WHO.pdf]

Oedema cases do not affect the calculation of length/height-for-age z-scores but are excluded from the individual z-score calculations for the three weight-based indicators: weight-forlength/height, weight-for-age and BMI-for-age.

Data Anomalies and Limitations

As the sample size is small and the number of visits per child is few, anomalies will have a significant distorting effect on any data correlation. Hence, data believed to be anomalous will be disregarded from analysis.

Weight:

Weight change fluctuates significantly over the monthly visits. In many cases a drop or increase of more than 1.5 kg over a month is seen. For example in one case (ID 17) there was a drop of 2kg, from 7kg to 5kg in one month, flowed by an increase the following month of 1.5kg from 5kg to 6.5kg. In another case (ID 12) there was a more significant fall in weight of 5kg, from 17 kg to 12kg over a one month period. The same child also was recorded as having a 7kg increase, from 10kg to 17kg, again over a one month period.

As the data cannot be validated, and could contain errors such as data input or equipment error such as faulty scales, it is difficult to be confident that weight gains/losses are not due to external factors. For example water retention or an oedema causing significant weight gain or severe acute illness or disease causing large weight loss.

As of this, and the frequent occurrences of weight gains/falls of over 1.5kg between monthly visits, I decided to exclude one record for ID 12, recorded as 17kg (resulting in a 5 kg drop and 7kg increase between subsequent months) and one record for ID 16 where there was a 5kg weight drop in one month against the trend growth.

Height:

Height measurements are subject to measurement error, especially due to the fact that many children will be recumbent. Therefore it is expected that there will be minor fluctuations (against the growth pattern) in height measurements.

Looking at the growth pattern over the total number of visits for each child, I have excluded the following height measurements from analysis.

ID 8 - Gained 7 cm in one month period, followed by drop of 5.9 cm the subsequent month - against growth pattern.

ID 13 - Gained 21.4cm, followed by a drop of 19.8cm in the subsequent month - against growth pattern.

ID 20 - Dropped 8cm over one month - against growth pattern.

MUAC:

MUAC can be difficult to measure especially if different healthcare workers are taking measurements month to month. For ID 9 there was an increase in MUAC measurements from 14 to 17cm in a one month period. For ID 13 there was a drop in MUAC measurements from 16cm to 12.5cm in 2 months. However, for data analysis no MUAC measurements have been disregarded as all MUAC measurements were within the realm of possibility of MUAC measurement.

Drops in MUAC can be a significant indication of change in nutritional status and may need further investigation on an individual basis.

Analysis and Results

Firstly I decided to look at the change in Z-scores over the course of visits, or time at the Day Care unit.

Average Z-Scores for all children between first and last visits:

Examining firstly the average change in Z-scores for WAZ, HAZ, WHZ and MUACZ for all children taking the difference between their first and last visits. WHZ scores showed an overall positive change of 0.0135 and a total of 6 (out of 20) children having made a positive change. HAZ scores for whole data set decreased by 0.051, however a total of 10 children made a positive change (50%). WAZ scores showed an average decrease of 0.0015 and a total of 8 (out of 20) children showing a positive improvement. Lastly MUACZ scores showed a decrease by 0.334 with a total of 6 (out of 20) children making a positive improvement.

These changes are in terms of Z score, which we are looking at (generally) of between 1 and -3, so an overall range of 4. Therefore the changes in average Z scores for the whole data set ranging between +0.0135 (WHZ scores) and -0.334 (MUACZ scores) are not significant.

Children moving Z-score "bracket" between first and last visits:

It is better perhaps to now consider the changes that take place over the course of visits regarding whether individual children move out of the -2 to -3 Z-Score range, or out of the -3 or less Z-score range. By again considering the first and last visits of each child we can see upon initial presentation upon first visit for WHZ scores 4 children (out of 20) presented with a score between -2 and -3 indicating moderate wasting and moderate malnutrition. No children presented on first visit with a WHZ score less than -3. Upon final visits the number of children with a WHZ score between -2 and -3 has decreased to zero and there are no children with Z-score less than -3. This could suggest that due to an increase in weight for height measurements that the programme maybe successful in the children gaining weight. Height/weight (WHZ) giving a relationship independent of age and considering BMI, so a better indicator where a prevalence of stunting.

Now looking in the same way at the HAZ scores: in total on first visits there were a total of 8 children (out of 20) with HAZ scores between -2 and -3 and 4 children with HAZ scores of less than -3. Upon last visits in total there were 6 children with HAZ scores between -2 and -3 and 5 children with HAZ scores of less than -3. This means that overall on first visits there were a total of 12 children with HAZ score below -2 and on last visit a total of 11 children with HAZ scores less than -2. This is a positive change, however, out of all of the measurements taken height was perhaps the most difficult measurement in terms of accuracy due to recumbence and data showed many recordings that went against the data trend, with fluctuations in height being large compared to the expected growth of the children over the same period. I would also say that out of all of the measurements taken that HAZ would possibly be the least likely to show change. If a child was stunted you would not expect a rapid change in height for age (comparably you may expect a faster response in terms of WHZ for example).

Additionally, looking at WAZ scores: the number of children presenting on first visits with a WAZ score between -2 and -3 was 4 (out of 20) and there were 2 children with a WAZ score of less than -3. Upon last visits there were a total of 6 children with a WAZ score between -2 and -3 and zero children with a Z-score of less than -3.

There were no children who initially presented with a MUACZ score of between -2 and -3 and similarly, no children with an initial MUACZ score of less than -3. Upon final visits there were still no children with a MUACZ score less than -3 but there is now 1 child (out of 20) with a MUACZ score of between -2 and -3.

Analysis and Results

Impact of length of time at Centre on Z-scores:

Does the number of visits have any impact on the data (i.e. change in WHZ, MUACZ, etc.)? I decided to look at the children that had shown improvement between first and last visits in relation to how long they had spent at the centre. For the 20 children visiting Veronicah's Centre, the average number of visits was 6.9 (ranging from 2 to 11 visits). Firstly looking at the children that showed positive changes in Z scores: 6 (out of 20) children showed improvement in WHZ scores with an average of 8.3 visits. 8 (out of 20) children showed a positive change in WAZ scores with an average of 8.6 visits. 10 (out of 20) children showed positive change in HAZ scores with an average of 6.4 visits. Lastly 6 children showed positive change in MUACZ scores with an average of 7.2 visits. So in 3 of the measurements (WHZ, WAZ and MUACZ) those that made positive change had a greater than average number of visits. Those with a positive change in HAZ scores averaged just below the average number of visits.

I also looked at those children who had moved from one Z-score band to another, indicating improving Z-score (i.e. moved from less than -2 to greater than -2) between first and last visits. There were 4 children (out of 20) who moved from WHZ scores of between -2 and -3 on first visit to a WHZ score greater than -2 on final visit, the average number of visits for these 4 children is 8.25. In the same way, there were 3 children who moved either from a less than -2 or less than -3 HAZ-score up to greater than -2 and -3 respectively. These 3 children had an average of 10 visits. (There were also 3 children whose HAZ scores moved in a negative direction, with an average of 6.3 visits.)

Again in the same way, there were 5 children showing positive improvement in their WAZ scores, with an average of 9.2 visits. (There were 3 children with negative change in WAZ score with an average of 7.3 visits.). Lastly, there was only one child showing change in MUACZ scores between first and last visits, who moved from a MUACZ score of more than -2 to a score between -2 and -3, having made 4 visits.

Taking all data, each individual visit as a "snapshot":

Whilst looking at the progressive data (i.e. HAZ, MUACZ, etc over a period of visits) is valuable, due to a small sample size of only 20 children and given that some have 11 visits and some only two, a true picture of progress of the group as a whole cannot effectively be presented by the data, I also decided to look at each individual visit by each child as a "snapshot". I.e. in total the 20 children made a total of 138 visits over the course of one year. Out of these 138 visits, on 5% of the visits (7 in total) children are measured with a WHZ score of less than -2. On 65% (89 out of 138) of visits HAZ scores are below -2 with 41 visits with recordings of HAZ below -3. Showing the 65% of visits indicate "moderate to high stunting" and "moderate to severe malnutrition. WAZ scores are below -2 for 37% of total visits (51 out of 138). We would perhaps expect a high prevalence of low WAZ scores, as there is also a high prevalence of low HAZ score.

MUAC Z scores are between -2 and -3 on 8 out of 138 visits (6%) and no visit at any time, for any child recorded a measurement for MUAC resulting in a MUACZ score of less than -3.

Analysis and Results

Looking at each child Individually

As mentioned, it is not just improvements but also stability in a child's nutritional status that can be a positive sign. But moreover, a child's nutritional status is very delicate and an illness or change of circumstances can quickly have an effect, leading to sudden indications of malnutrition and even mortality.

Looking how many of the 20 children fall into the -2 to -3, or less than -3 Z-score categories at some point throughout their visits to the Centre, is perhaps the most important of all the data in terms of the safeguarding on a child's nutritional status. Looking alone at "first and last" visit data does give an indication of change over time but could easily miss a child who has a sudden illness/circumstance change leading to malnutrition.

Out of the 20 children:

At some point over the course of their visits to the centre:

5 children (20%) have a WHZ score of between -2 and -3 - INDICATING MODERATE MALNUTRITION

2 children (10%) have a WHZ score of less than -3 - INDICATING SEVERE MALNUTRITION

14 children (70%) have a HAZ score of between -2 and -3 - INDICATING MODERATE MALNUTRITION

9 children (45%) have a HAZ score of less than -3 - INDICATING SEVERE MALNUTRITION

13 children (65%) have a WAZ score of between -2 and -3 - INDICATING MODERATE MALNUTRITION

7 children (35%) have a WAZ score of less than -3 - INDICATING SEVERE MALNUTRITION

3 children (15%) have a MUACZ score of between -2 and -3 - INDICATING MODERATE MALNUTRITION

0 children (0%) have a MUACZ score of less than -3 - INDICATING SEVERE MALNUTRITION

Also, when looking at individual children's Z-scores, we can see that 4 children fall below -4 WAZ-score for (2 of which fall to more than -5) and that one child falls below -4 HAZ score (-4.22).

Conclusions and Recommendations

Whilst the sample size is fairly small and some children have only had a few visits to the Day Care Centre, we can see that some of the children have had a positive change in Z-scores whilst visiting the Centre. The 4 children (20% of total) who moved from a WHZ-scores of less than -2 to a WHZ score of greater than -2 with no children moving in a negative direction. WHZ scores are perhaps the most indicative of the three weight/ height/age relative measurements, as stunting would affect not only HAZ but also WAZ.

When considering the children that moved up or down a "z-score category", the average number of visits made for those children making a positive change in z-scores was above the "average number visits for the group" for WHZ, HAZ and WAZ-scores.

Also considering the "snapshot" data: out of 138 total visits, 65% (89 out of 138) of visits record HAZ scores below -2, with 41 visits with recordings of HAZ below -3. Meaning 65% of visits indicate "moderate to high stunting" and "moderate to severe malnutrition". WAZ scores are below -2 for 37% of total visits (51 out of 138). More obvious from the data is the number of children who, at some point, fall into the -2 to -3, or less than -3 Z-score categories, showing a prevalence of indications of malnutrition, in particular moderate and severe stunting. These can only emphasise the necessity for Day Care Centre such as Veronicah's in not only providing care with aim to improve nutritional well-being, but also by flagging severe cases.

Individual Child Graphs

As there were only 20 children in the sample for Veronicah's Day Care Centre, I was able to produce individual graphs for each child, showing the change over time in MUACZ, WHZ, WAZ and HAZ (see last 3 pages). These are particularly useful, as they can show, in an instant, improvement in z-scores, but just as importantly, they can also show if there is a sudden decline in say weight (WHZ) or MUAC. They also pick up on obvious anomalous data. (There are similar graphs viewable for data held in the WHO Anthro software.) The green line on each graph represents zero standard deviations, therefore representing the average Z-score for each category for the whole population of WHO data (or the 50th centile). The optimum for each child would be to have z-scores close to zero and in an ideal situation we would expect scores of between -1 and +1 SDs.

Whilst primary concern is to highlight Z-Scores less than -2, constant review of charts and data is needed to flag those "approaching a -2 Z-score" or who have shown significant or rapid change in Z-score.

To highlight those children whose HAZ, WHZ, MUACZ or WHZ that AT SOME POINT fall between -2 and -3, or less than -3, I have added a flag to the corner of each graph:

FLAG Z-score less than -3

FLAG Z-score between -2 and -3

all z-scores above -2

Overall Conclusion

As shown with the "snapshot" data and looking at each child individually, it is important to conclude that Day Care Centres, such as Tushinde's Veronicah's Day Care, are imperative in not only striving to improve the nutritional status and well-being of the children within it's care, but also to flag cases where acute or chronic malnutrition are prevalent and then, by provision of care, prevent mortality.

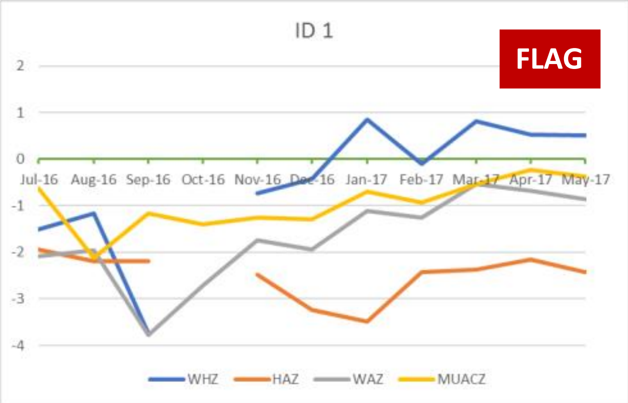
From WHO Child Growth Standards FAQ's:

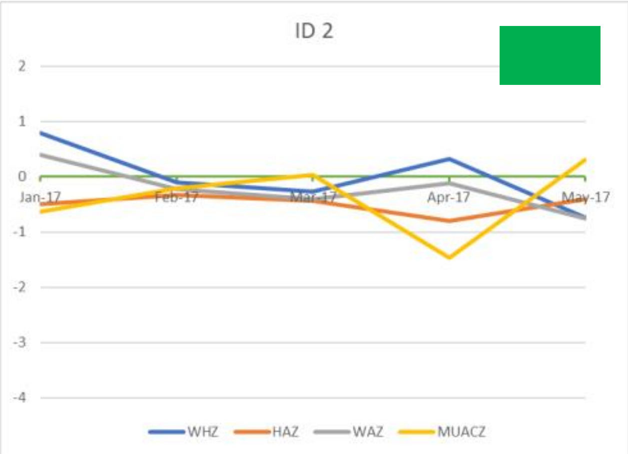
Q. "What needs to be done/addressed/improved so that all children grow well according to these standards?"

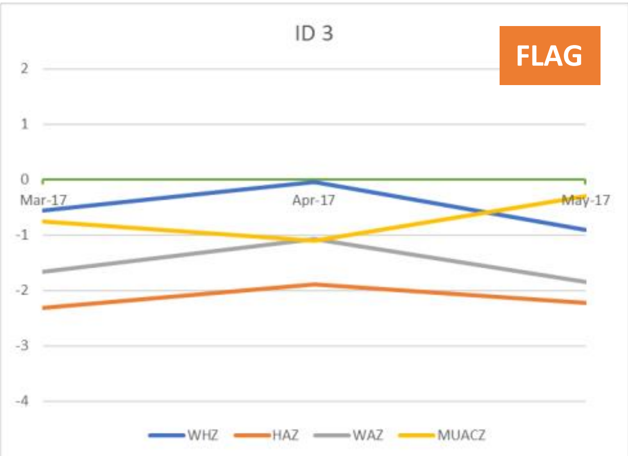
A. "...the very first step should be implementing the new standard in every country and *ensuring that every child has his/her own chart against which his/her growth is assessed followed by an appropriate follow up.* "

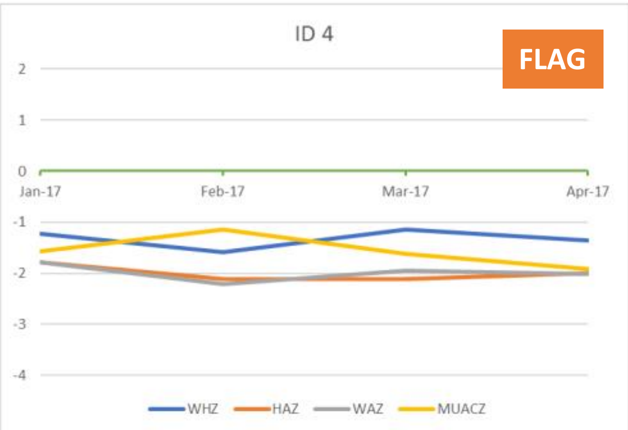
(http://www.who.int/childgrowth/faqs/what_to_do/en

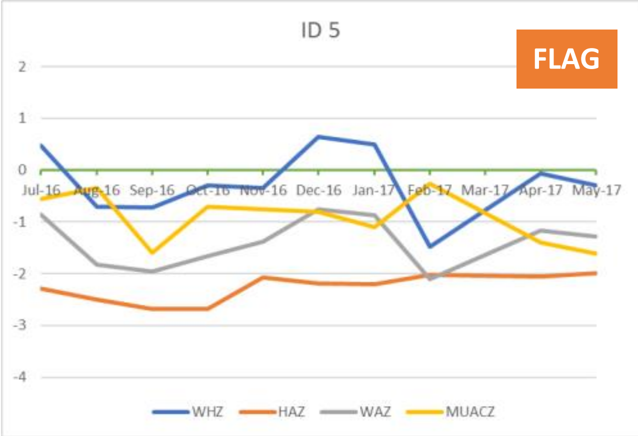
Z-Score graphs for each child by ID

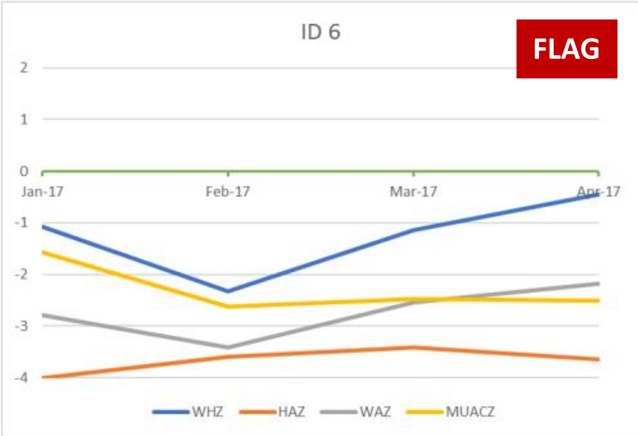


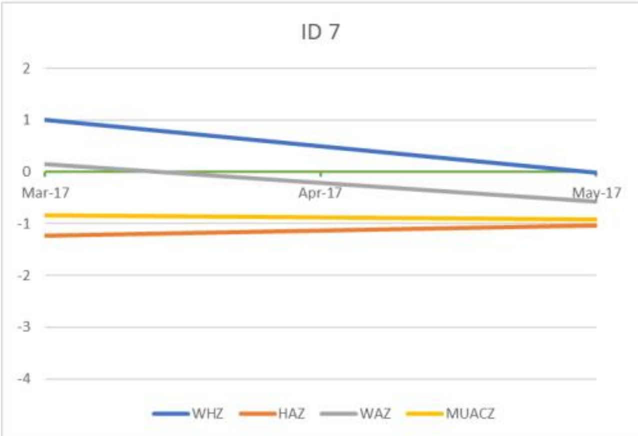


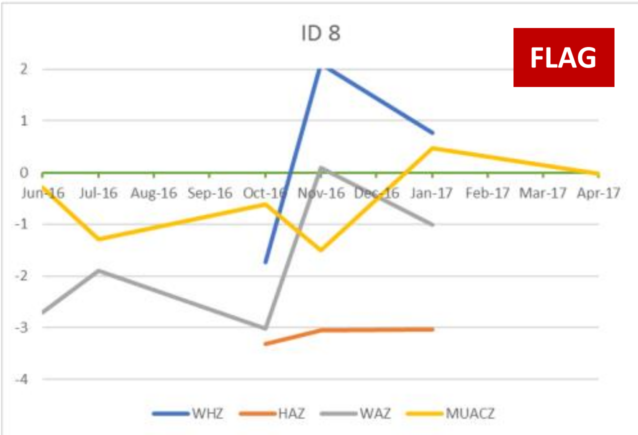




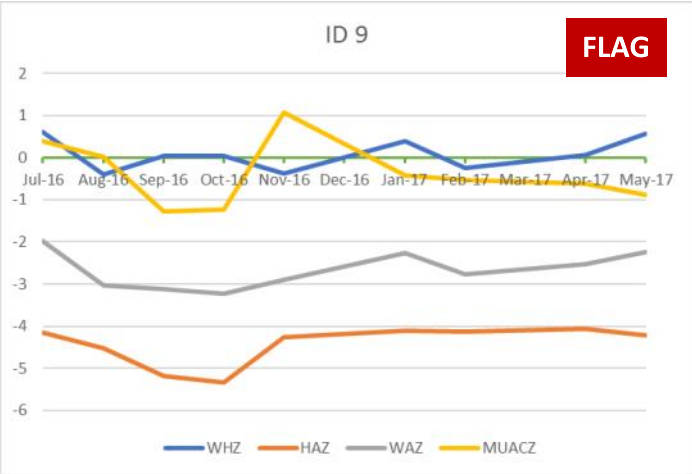


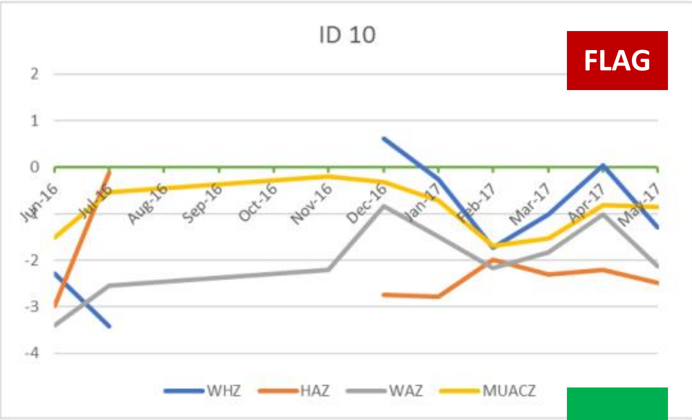


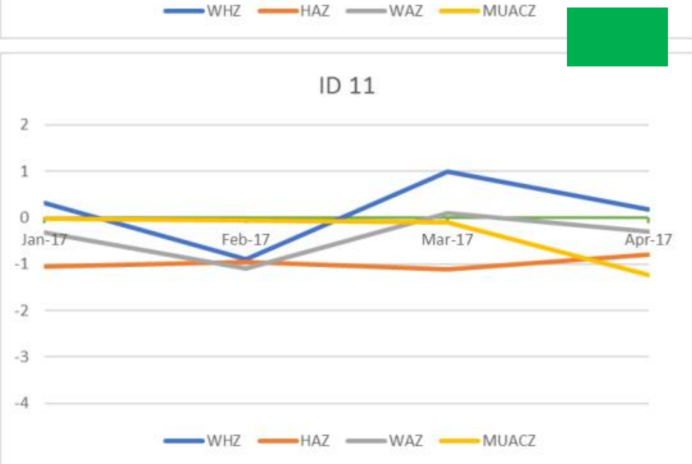


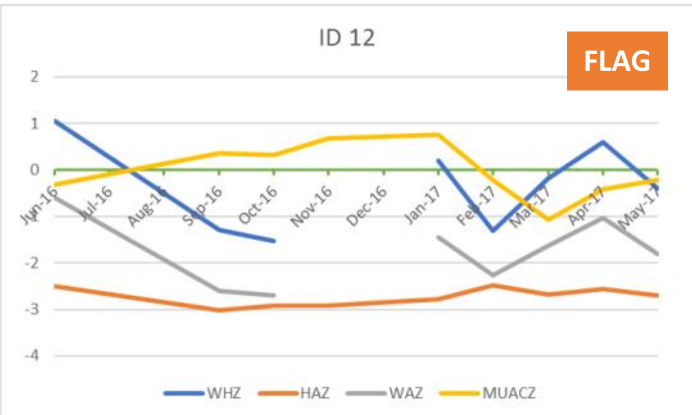


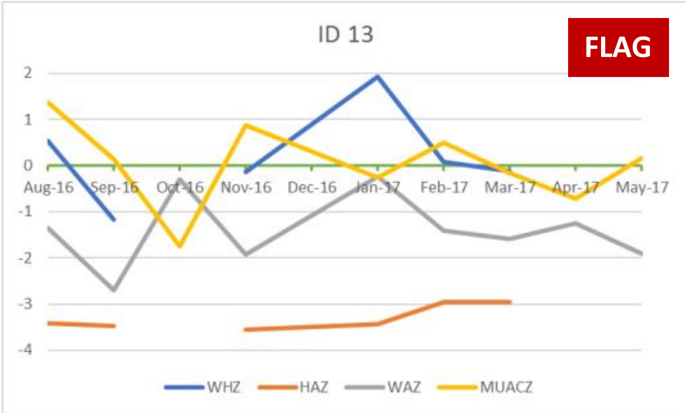
Z-Score graphs for each child by ID

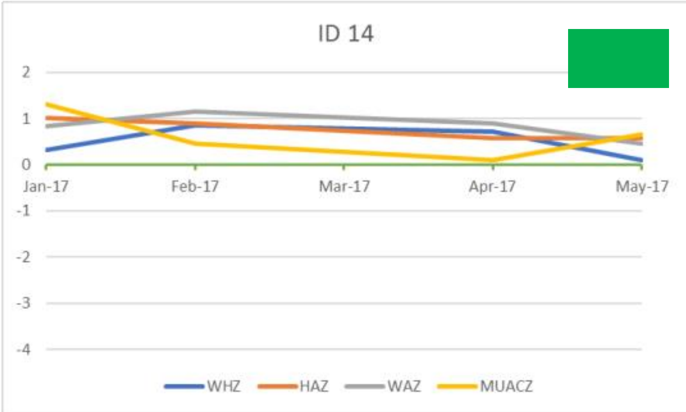


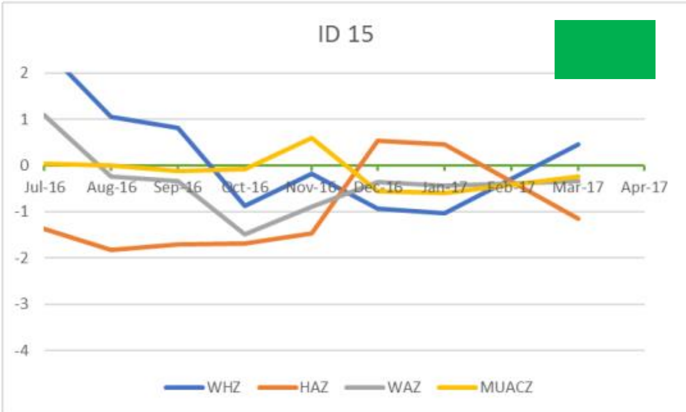


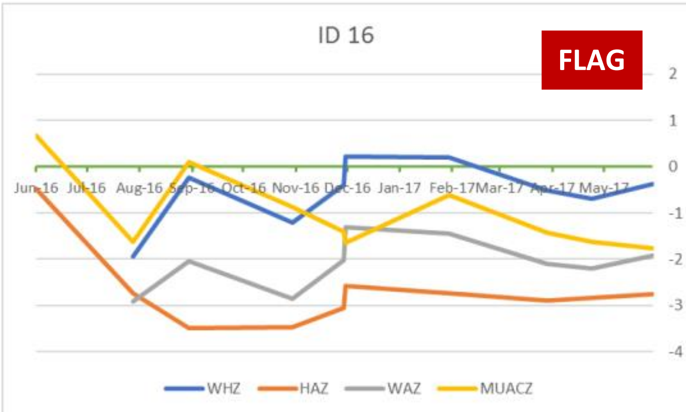












Z-Score graphs for each child by ID