

developing world's children, suffer from chronic malnutrition. The sheer scale means that this problem is far too great to be left to non-governmental organisations (NGOs) or the public sector alone.

Given the scale of need, VN believe that we need to be considering mass retail distribution mechanisms in a way not conceived of before. Steve and Paul argue that up until now, private companies have had too short-term a vision and have therefore ignored the lower end of the market pyramid, i.e. the poor. They believe that VN could help catalyse development of these markets but cannot do it on their own. They therefore need to engage with the private sector. VN can provide the knowledge and also provide a social brand. It would be a kind of 'enlightened humanitarianism' which takes the private sector beyond CSR (corporate social responsibility). Paul argues that CSR funding is significant but, more often than not, a kind of dead-end money with no real strategic underpinning. Too frequently, it is used as a way of buying off the consciences of the private sector and all who work within it. CSR has no vision of long-term sustainability. What VN are proposing is more of a strategic partnership where money can be made, at the same time as having a sustainable humanitarian impact. Paul commented that the INCAP study in Guatemala, involving a 30-year follow-up of the impact of improved early childhood nutrition, has demonstrated major economic and health benefits from the provision of nutritional supplements to children aged 6 to 24 months, including a 42% increase in adult male earning power. This significant 'return on investment' and the vast potential markets across the developing world have convinced the VN team that it is imperative and economically viable, for both governments and industry to invest in early child nutrition. Steve added that "although there will be lower profit margins, there will be massive long-term benefits. This will make community therapeutic care (CTC) look tiny. Businesses will be able to use their excess capacity without diluting profit margins on major brands. This should be very attractive to the private sector. If VN can lead by example and show how this might work it could so easily take off. We are convinced that the potential reward, albeit long term, is massive at all levels: humanitarian, socio-economic and commercial. There needs to be an evidence base, i.e. examples of how well it could work. Corporations need to invest in the long-term markets but this needs people with vision and passion". For their part, the humanitarian community need to proactively come together to develop and agree a framework setting out the terms on which they would support this ethical engagement with industry.

As Steve says, although the idea of making profit out of the poor is repellent to some people in the humanitarian sector, unless we start to consider this as an option then it is just going to be business as usual. Steve and Paul posed the question, "why can't we have a system where we use the abundant experience and resources of the private sector to fulfil and deliver to a market that is usually left out of the equation and only catered for by the public sector in a way which is ultimately completely disempowering?" As I took the last sip of my slightly over-priced coffee, I had to admit that this was an incredibly powerful and seductive vision.



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CMAM in Cambodia – indicators of acute malnutrition for screening

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This article from Cambodia shares observed differences in acute malnutrition prevalence between WH and MUAC in national survey and some programming data that run counter to the pattern observed in other regions. The authors go on to discuss programming implications for the interim CMAM guidelines in Cambodia.

According to the WHO/UNICEF Joint Statement on WHO child growth standards and the identification of severe malnutrition in infants and children (2009), "the prevalence of severe acute malnutrition...based on weight-for-height below -3 SD of the WHO standards and those based on a mid upper arm circumference (MUAC) cut-off of 115 mm are very similar". Recent analysis of programme and survey data has shown that this is not the case in Cambodia. This issue has been noted in several studies in sub-Saharan Africa, particularly among pastoralist populations. There has, however, been little research on the discrepancy between weight-for-height (WH) and MUAC derived prevalences of acute malnutrition in Asia, where undernutrition and malnutrition follow very different patterns to other regions of the world.

In Cambodia, UNICEF has supported in-patient treatment of severe acute malnutrition for a number of years. In 2010, along with development partners, UNICEF is supporting the government to develop national guidelines for the management of acute malnutrition and to begin implementation of community screening and health centre based outpatient treatment with Ready to Use Therapeutic Food (RUTF).

¹ WHO child growth standards and the identification of severe acute malnutrition in infants and children. A joint statement by the World Health Organisation and the United Nations Children's Fund. May, 2009

Cambodia programme data

Data from screening by the non-governmental organisations (NGOs), Samaritan's Purse² and Magna Children at Risk³ indicates that far more children are identified as both moderately and severely acutely malnourished by WH z-scores than by MUAC criteria. Magna screening data (both WH and MUAC were used) was collected at a referral hospital in Kandal province, where the NGO operates a large, comprehensive programme for treatment of moderate and severe acute malnutrition in Cambodia. While the facility is a 24-hour paediatric ward where any sick child will be treated, many people in the surrounding community are aware of Magna's inpatient and outpatient programme for the treatment of malnutrition. Thus the children who comprise the self-selected population, who were screened prior to admission to the facility, are far more likely to present with acute malnutrition than children in a community setting. Recent analysis of data from screening at the Magna health facility shows that the estimated prevalence of moderate and severe wasting among patients (6 to 59 months of age) according to WH (< -2 SD) is 83.1% compared with 65.8% according to MUAC (<125 mm). Differences were also found to be greatest among older children (> 24 months), whereas prevalence estimates derived from WH and MUAC were found to be similar among younger children.

Further new anthropometry data from both Samaritan's Purse (collected in slum communities in Phnom Penh where the NGO is operating) and Magna are being collated and analysed and will be presented in a future issue of Field Exchange. This article focuses on the findings of a reanalysis of the Cambodia Anthropometric Survey (CAS) 2008⁴ prompted by the discrepancy noted between WH and MUAC derived prevalences of wasting in both community and facility-based programmes.

Re-analysis of CAS 2008

The CAS 2008 is a nationally representative sample of 7,495 households with children ages 0 to 59 months, making it the largest national sample of child measurements ever collected in Cambodia. The survey was conducted in order to ascertain the effects of the 2008 food price crisis on the health and nutrition of Cambodians. MUAC was included as an anthropometric measure due to the current debate over the use of WH versus MUAC as measures of acute malnutrition.

A highly significant finding from the survey was that between 2005 and 2008, all improvements in the prevalence of acute malnutrition had effectively halted. According to analysis of the Cambodia Demographic and Health Surveys (CDHS), using the 2006 WHO growth standards for all, between the years 2000 and 2005 Cambodia experienced a 1.7% yearly average decrease in wasting, with the prevalence falling from 16.8% in 2000 to 8.4% in 2005^{5,6}. The CAS 2008 determined the prevalence of wasting to be 8.9% and not statistically significantly different from the 2005 estimate⁷.

While prevalences of moderate and severe acute malnutrition derived from WH z-scores (< -2 SD) and MUAC-for-age (MUAC/A < -2 SD) were found to be similar in the Cambodia Anthropometric Survey (CAS) 2008, at 8.9% and 8.7% respectively, MUAC (< 125 mm) unadjusted for age produced a wasting prevalence of only 3.8% (UNICEF analysis, see Figure 1). This confirms that in Cambodia, differences in prevalences derived from MUAC and WH occur at the national level, as well as in community and facility-based nutrition programmes.

With regard to severe wasting, the prevalence among children aged 6 to 59 months according to MUAC was only one third of the prevalence according to WH (See Figure 2). The greatest correspondence between both indicators is for the prevalence of moderate wasting, where MUAC prevalence is around three quarters that of WH (see Figure 3).

Reasons for WH v MUAC differences in prevalence

Part of the discrepancy between MUAC and W/H can be attributed to measurement error. The height of the youngest children is more likely to be over estimated, which leads to

² <http://www.samaritanpurse.org/>
³ www.magnachildrenatrisk.org
⁴ National Institute of Statistics (NIS), Ministry of Planning. 2008. *English supplement to the Cambodia Anthropometric Survey 2008*. Phnom Penh, Cambodia: National Institute of Statistics, Ministry of Planning prepared by UNICEF.
⁵ National Institute of Statistics (NIS), Directorate General for Health [Cambodia], and ORC Macro. 2001. *Cambodia Demographic and Health Survey 2000*. Phnom Penh, Cambodia, and Calverton, Maryland USA: National Institute of Statistics, Directorate General for Health, and ORC Macro.
⁶ National Institute of Statistics (NIS), Directorate General for Health [Cambodia], and ORC Macro. 2006. *Cambodia Demographic and Health Survey 2005*. Phnom Penh, Cambodia, and Calverton, Maryland USA: National Institute of Statistics, Directorate General for Health, and ORC Macro.
⁷ See footnote 4.

Figure 1: Wasting prevalence according to MUAC & WH, CAS 2008

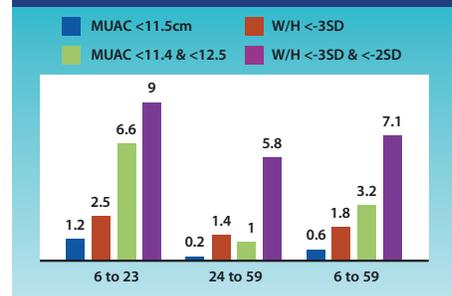


Figure 2: Severe wasting prevalence, MUAC versus WH, CAS 2008 data

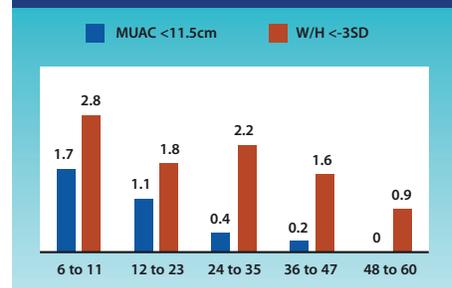


Figure 3: Moderate wasting MUAC versus WH, CAS 2008 data

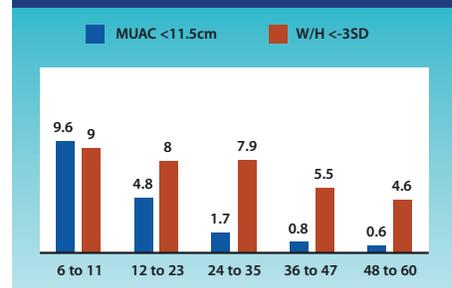
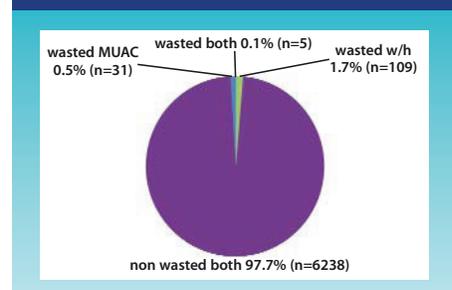


Figure 4: Percent of children (6 to 59 m) classified as wasted according to MUAC alone, WH alone or both



Figure 5: Percent of children (6 to 59m) classified as severely wasted according to MUAC alone, W/H alone, or both.



Samaritan's Purse, Cambodia, 2010



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low levels of stunting and high levels of wasting. However, over estimation occurs mostly in the 6-11 month age group and seems to disappear by 23 months of age. However, as reflected in Figures 1-3, the majority of the difference in wasting prevalence observed by MUAC and WH in CAS 2008 analysis was in older children (> 24 months) and attributable to MUAC not selecting older children. WH remains consistent across age groups in its identification of children as wasted, while MUAC preferentially selects younger children as wasted.

An additional issue when considering MUAC and WH is that the two indicators select different children. Of the 9% of children identified as wasted by either measure, only 2% were selected by both MUAC and WH (see Figure 4). For severely wasted children, only 5 out of 145 children were selected by both (see Figure 5). While previous studies have shown a similar mortality rate in children selected with either indicator among hospitalised children, there is still some uncertainty about which indicator is more appropriate for community based screening of children for therapeutic feeding.

Programming implications

Findings from the CAS 2008, along with growing international support for the development of programmes targeting acute malnutrition in non-emergency settings, has led to the development of interim community based management of acute malnutrition (CMAM) guidelines for Cambodia. The guidelines will remain in draft form until sufficient evidence is gathered from the implementation of pilot programmes,

Recommending appropriate indicators of acute malnutrition is integral to ensuring that CMAM guidelines will allow for children at increased risk of mortality due to acute malnutrition to be identified as such in community

older children (> 23 months)⁸. Having a small arm circumference relative to a set cut-off point at a young age is less likely to be indicative of increased risk of mortality than at an older age. While arm circumference increases slowly between birth and 4 years of age, it does indeed increase among healthy children. Similarly, severe deficits in WH produce an only moderately increased risk of mortality among young children (< 23 months) but a marked increase in risk after 2 years of age⁹. So during the years when there is the most discrepancy between MUAC and WH, both of these indices are likely to be at their highest mortality predictive power.

The fact that discrepancy between MUAC and WH increases with age has significant implications with regard to food security. Wasting among young children is usually indicative of recent disease often coupled with improper feeding practices, while wasting among older children is more indicative of food insecurity. In a 2009 report for the Integrated Food Security Phase Classification (IPC) Global Partners¹⁰, WH is recommended as a better indicator for monitoring changes in food security because it does not preferentially identify younger children as malnourished as MUAC has been shown to do. During periods of food insecurity, as the prevalence of wasting increases, older children are likely to experience a relatively greater increase in acute malnutrition than younger children. Thus it is possible that using MUAC alone will mask problems among older children and thus provide an inaccurate picture of food insecurity in a country or region¹¹.

Recommendations

MUAC and WH identifying different children as malnourished means that using only one indicator is likely to leave out a group of children with a similar risk of mortality. For this reason, the interim CMAM guidelines for Cambodia state that either a low MUAC score or a low WH score is grounds for inpatient or outpatient treatment of acute malnutrition, depending on the severity of the deficit and the presence of other clinical signs. This is distinct from the two-stage screening process and thus avoids the problem of 'rejected referrals,' where children referred to the health facility due to low MUAC are turned away from treatment because they do not meet the WH criterion. In a non-emergency setting such as Cambodia, the use of both MUAC and WH for community screening seems a fair compromise until additional evidence from CMAM pilot programmes in rural and urban settings can be obtained.

Findings from Samaritan's Purse, Magna, and the CAS 2008 regarding discrepancies between MUAC and WH warrant further investigation as to which is the better indicator of acute malnutrition. In particular, a facility-based study is needed in order to determine whether MUAC or WH is more associated with clinical signs of malnutrition and mortality in



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Cambodia. Given the complex relationship that anthropometric measures have with age, there is evidence of the need to disaggregate estimates of risk (for mortality and morbidity) by age in order to better assess the indicators. There may be justification for using different indicators among different age groups, although this would add complexity and thus require sufficient evidence of differences within a population.

A separate but related issue in Cambodia is the need to revise the Integrated Management of Childhood Illness (IMCI) to be in line with the WHO/UNICEF *Joint Statement on WHO child growth standards and the identification of severe malnutrition in infants and children*. At present, IMCI is used at the health centre to diagnose and guide treatment of illness among children. The IMCI algorithm includes weight-for-age (WA) z-scores as the only measure of malnutrition among young children. Research has shown that this may be acceptable for children less than 2 years of age, when low weight is more likely due to wasting than stunting, but not for older children. Low WA in older children is more likely to be caused by stunting rather than wasting (a problem that will not respond to therapeutic feeding). Now that there is evidence that the prevalence given by MUAC and WH is not similar in Cambodia, more research is needed to properly inform the revision of IMCI protocol with respect to anthropometric indicators.

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and health facilities. As the Cambodia CMAM guidelines are being developed, it is important that data is used to inform choices of anthropometric measures. In this respect, it is significant that the difference in MUAC-derived and WH-derived prevalences of wasting increases with age. The indicators produce more similar estimates of acute malnutrition for children under the age of two years than for older children. This is important given the fact that the predictive powers of MUAC and WH increase with age. It makes logical sense that the mortality prediction power of MUAC is strongest among

⁸ Pelletier, D.L. (1994). The relationship between child anthropometry and mortality in developing countries: implications for policy, programs and future research. *Journal of Nutrition* 124, 2047S-2081S.

⁹ See footnote 8.

¹⁰ Young, H. & Jaspers, S. (2009). Review of nutrition and mortality indicators for the integrated food security phase classification (IPC). SCN Task Force on Assessment, Monitoring and Evaluation, and The Integrated Food Security Phase Classification (IPC) Global Partners.

¹¹ Bern, C. & Nathanael, L. (1995). Is mid-upper arm circumference a useful tool for screening in emergency settings? *Lancet* 345, 631-33.