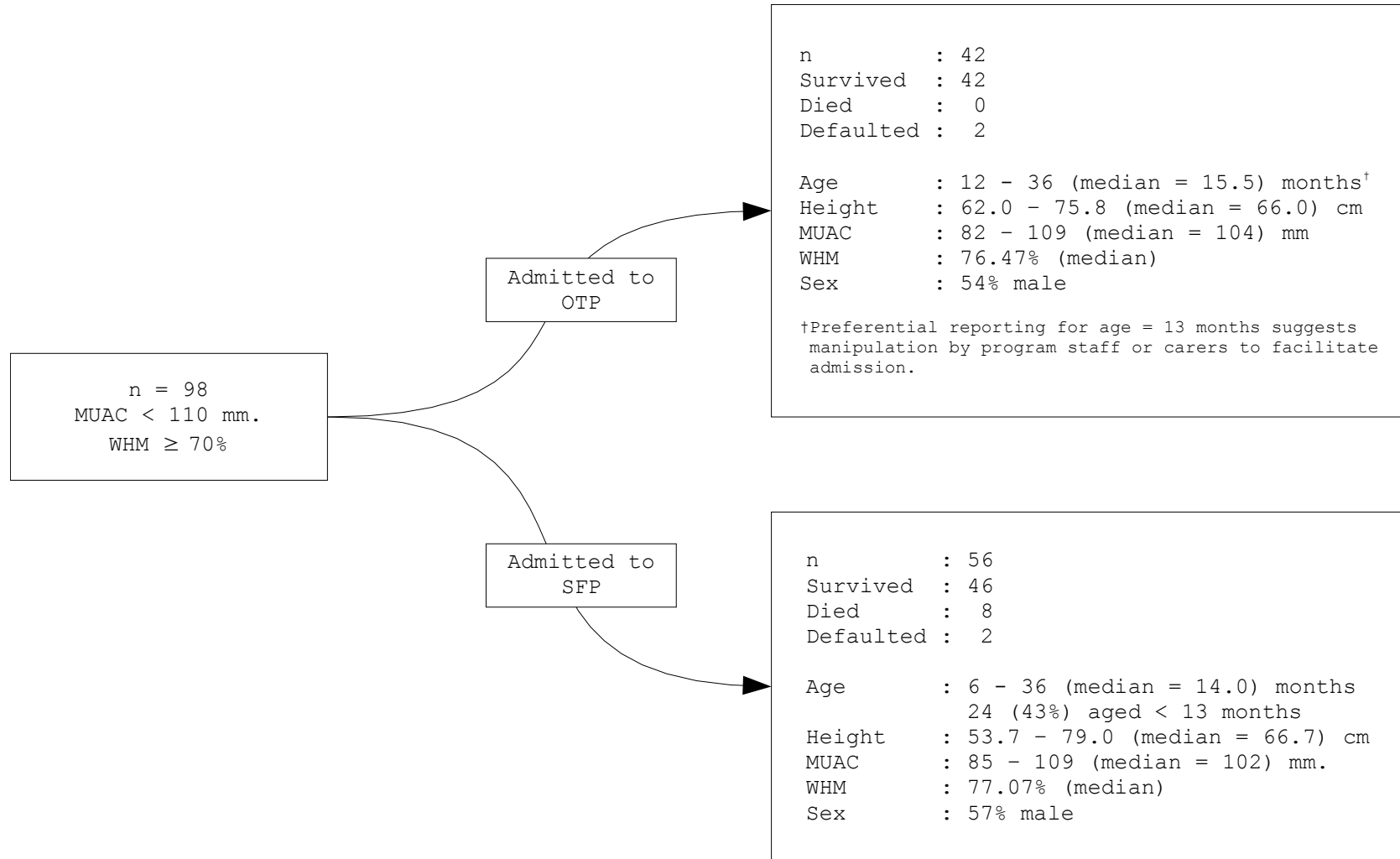


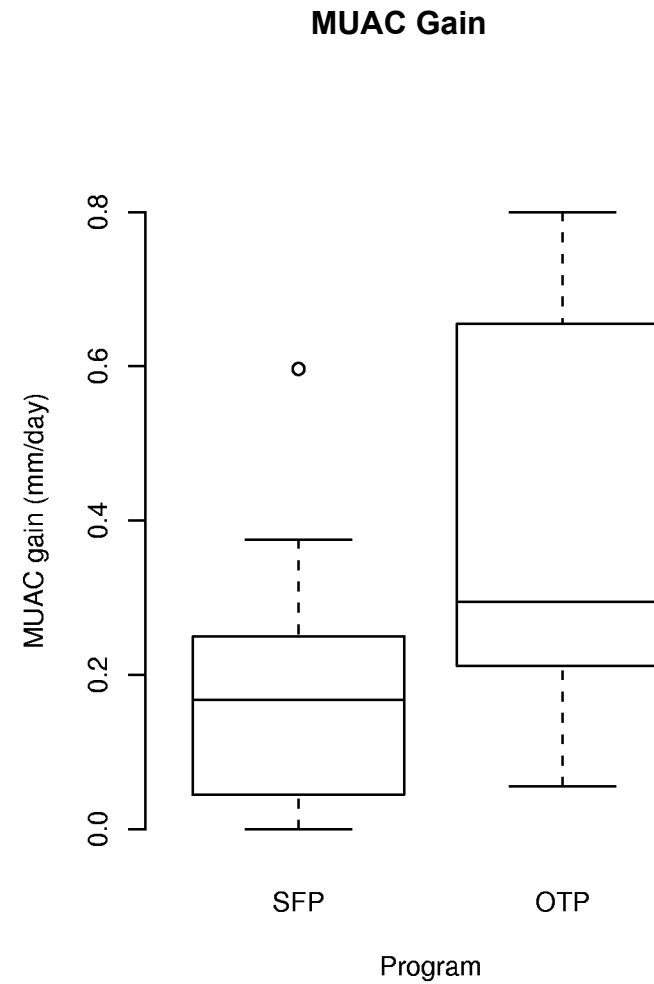
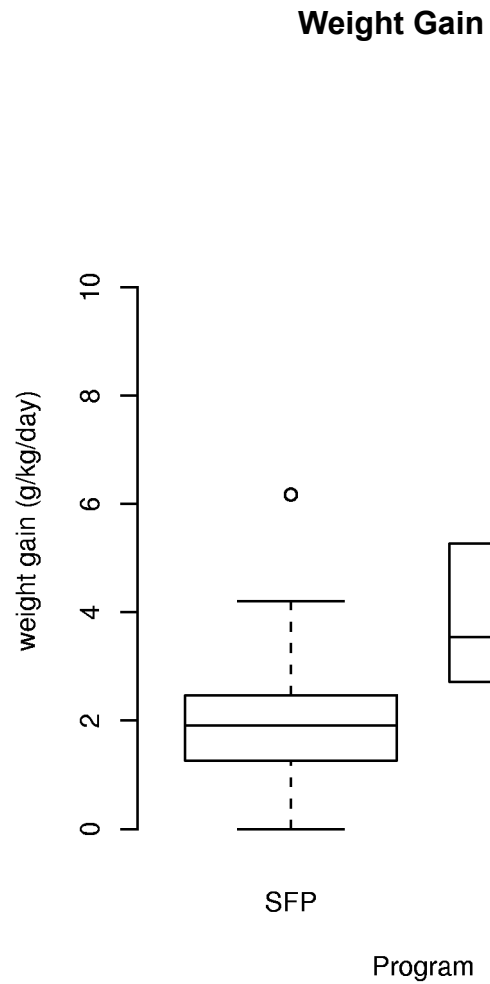
Does MUAC respond to treatment?

Mark Myatt, University College London, April 2008

The Wollo Natural Experiment



The Wollo Natural Experiment



The Wollo Natural Experiment

Over an entire treatment episode:

- Weight tends to respond to treatment
- MUAC tends to respond to treatment
- MUAC and weight respond to treatment in similar ways :
 - Both exhibit a *dose-response* relationship :
 - Low intensity treatment (SFP) : Slow response (sometimes no response)
 - High intensity treatment (OTP) : Rapid response (MUAC always responds)

The New Data

Provided by Save the Children (US) :

- Follow-up data (from admission to discharge) on ...
 - CTC program in SNNPR, Ethiopia
 - 963 patients admitted between 16th September 2003 and 16th April 2004 :
 - Fortnightly measurements of weight and MUAC

- Data used in subsequent slides :

| | |
|--------------------------------------|--|
| Admission MUAC < 11.0 cm | (MUAC admissions) |
| No oedema at admission | (MUAC admissions only) |
| Planned discharge | (by program exit criteria, avoids LTFUs) |
| WHM at discharge \geq 80% WHM | (ignores mislabelling of “failures”) |
| Discharge MUAC \geq 11.0 cm | (censor “absurd” discharges) |
| Data for at least 3 visits available | (attendance, growth curve) |

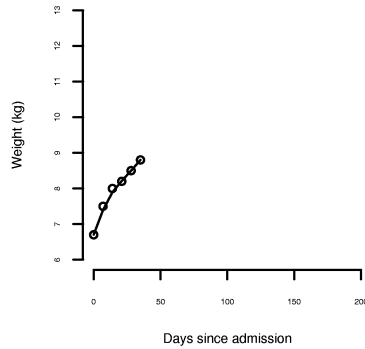
Applying selection criteria (**all criteria must be true**) gives data on ...

430 patients collected at **3452** visits.

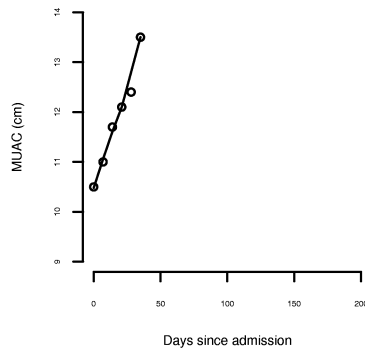
The pattern of response during the treatment episode

“Rapid”

Weight Gain



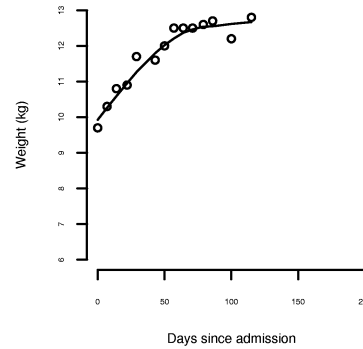
MUAC Gain



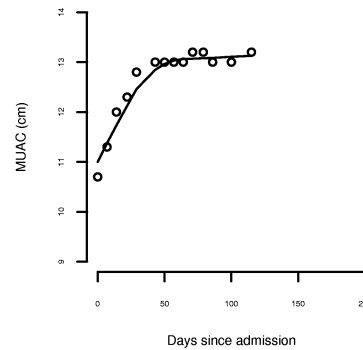
Female; c. 42 months; admission MUAC = 10.5 cm;
admission WHM = 67.4%; discharge MUAC = 13.5 cm;
discharge WHM = 88.6%

“Logistic”

Weight Gain



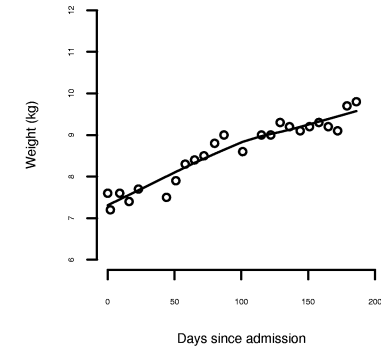
MUAC Gain



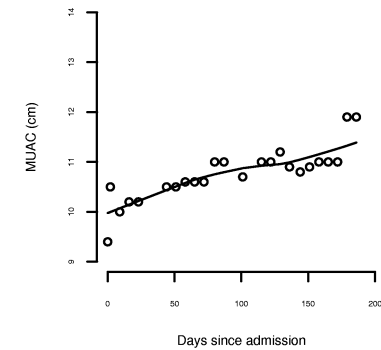
Female; c. 60 months; admission MUAC = 10.7 cm;
admission WHM = 68.1%; discharge MUAC = 13.2 cm;
discharge WHM = 89.8%

“Slow”

Weight Gain



MUAC Gain

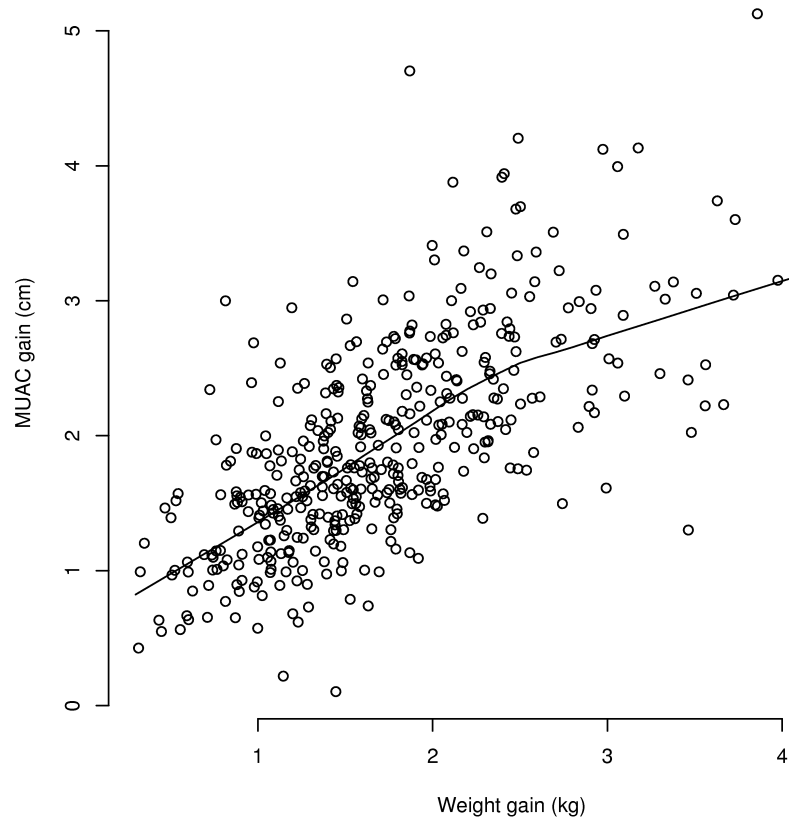


Female; c. 36 months; admission MUAC = 9.4 cm;
admission WHM = 70.4%; discharge MUAC = 11.9 cm;
discharge WHM = 90.8%

NOTE : Each of these typical patterns is a part of a “logistic” growth curve

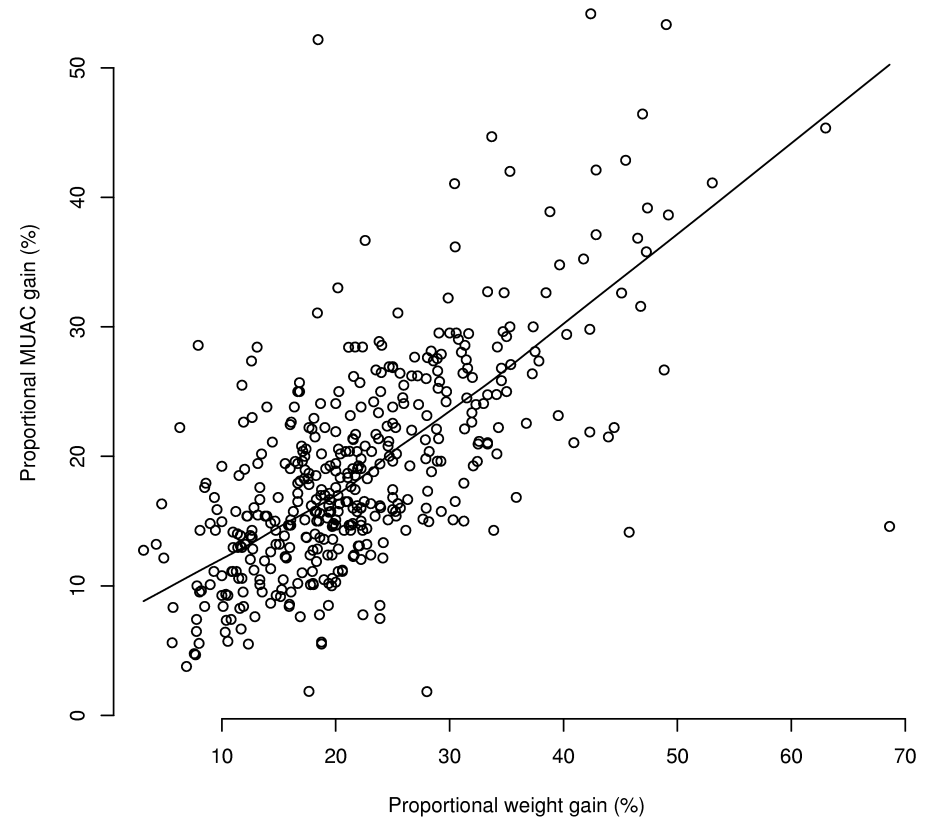
Pattern of response over an entire treatment episode

Gain



$$\text{discharge value} - \text{admission value}$$

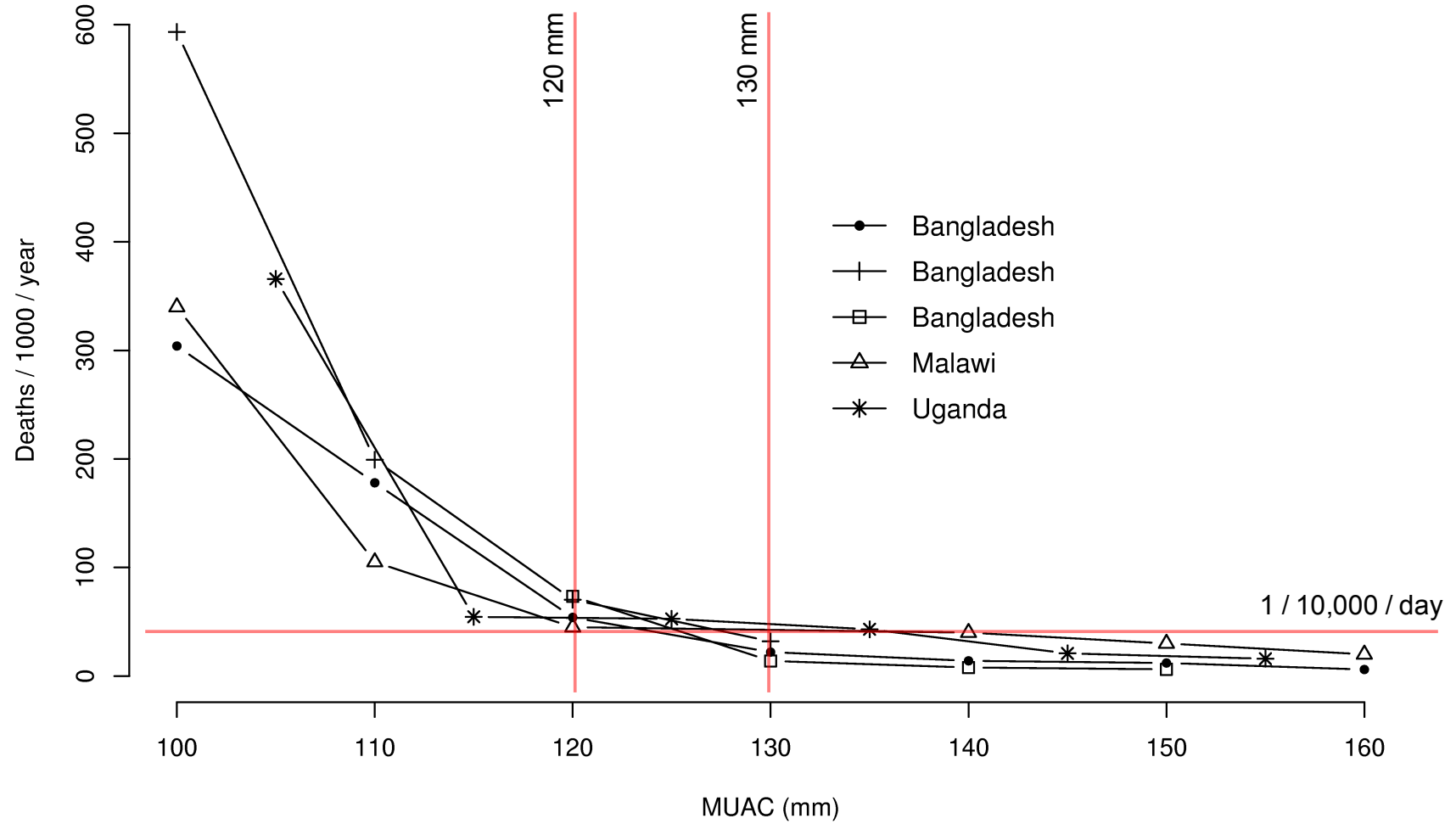
Proportional Gain



$$\frac{\text{discharge value} - \text{admission value}}{\text{admission value}} \times 100$$

MUAC responds to treatment in a similar way to weight

A suitable MUAC threshold for discharge



A suitable MUAC threshold for discharge

Discharge at 120 mm or 125 mm seems sensible :

- Admission **and** discharge criteria based on mortality risk :
 - Admit at very high (c. 4 – 20 times acceptable / baseline) risk
 - Discharge at close to an acceptable / baseline risk with patient responding to treatment

What are the implications of moving to a MUAC discharge criteria of $\text{MUAC} \geq 120$ mm or $\text{MUAC} \geq 125$ mm?

The easy part (i.e. no maths required)

Using MUAC for both admission and discharge :

- Removes the confusion arising from conflicts between admission and discharge criteria :
 - Simplifies measurements and data collection :
 - MUAC is simpler than weight
 - MUAC is much simpler than WHM (no calculations, no tables)
 - Allows greater involvement of CBVs inside the program
 - Demystifies admission, monitoring, and response :
 - Admission and discharge to criteria based on *universal* mortality risk rather than a weird definition of thinness that means different things in different populations and different things at different ages in the same population ... We will know why we do what we do!
 - Makes CTC / CMAM less restricted by “infrastructure” :
 - No need for height boards, scales, tables, growth charts, and calculators (and the staff and training of staff required to make all this stuff work)

Length of stay

Data from the Wollo Natural experiment :

- Admission MUAC (median) : 104 mm 104 mm
- Discharge MUAC (assumed) : **120 mm** **125 mm**
- MUAC growth (median) : 0.30 mm / day 0.30 mm / day
- Expected length of stay (median) : $\frac{120-104}{0.30} = 53$ days $\frac{125-104}{0.30} = 70$ days

Problems :

- Small sample size (n = 19)
- All cases had an admission WHM > 70%
- Restricted to younger children (i.e. 6 – 36 months)

Length of stay

Data from same (ex-CONCERN Wollo) program in first six months after handover to MoH (n = 246) :

- Admission MUAC (median) : 105 mm 105 mm
- Discharge MUAC (assumed) : **120 mm** **125 mm**
- MUAC growth (median) : 0.25 mm / day 0.25 mm / day
- Expected length of stay (median) : $\frac{120-105}{0.25} = 60$ days $\frac{125-105}{0.25} = 80$ days

Problems:

- No family SFP
- Context defined by improved food security ... higher proportion of children with complicated malnutrition (e.g. infection) admitted to OTP in R2D contexts compared to emergency contexts.
- Limited ability to refer non-responders to SC / district hospital despite increase in complicated cases
- Possible problems with drug availability
- No health promotion sessions at patient contact
- Immediate handover period

Length of stay – Program using target weight gain for discharge

Data from CMAM program in Lusaka, Zambia, Q4/2005 – Q1/2008 :

Program admits on :

- From community and GMP : MUAC < 110 mm or OEDEMA
- From OPD (e.g. MCH) : MUAC < 110 mm or OEDEMA
Visible severe wasting (clinical judgement)
W/H < 70% median (NCHS)
Other (referral by clinical assistant &c.)
- Self-referrals (walk-ins) : Any of the above

Program discharges on :

- 18% target weight gain achieved

Median length of stay :

- 67 days

Problems :

- No family SFP
- Possible problems with drug availability
- Occasional RUTF “stock-outs”

Length of stay

New (SC-US) Data (n = 430) :

- Admission MUAC (median) : 105 mm 105 mm
- Discharge MUAC (assumed) : **120 mm** **125 mm**
- MUAC growth (median) : 0.40 mm / day 0.40 mm / day
- Expected length of stay (median) : $\frac{120 - 104}{0.40} = 38$ days $\frac{125 - 104}{0.40} = 50$ days

Current WHM criteria :

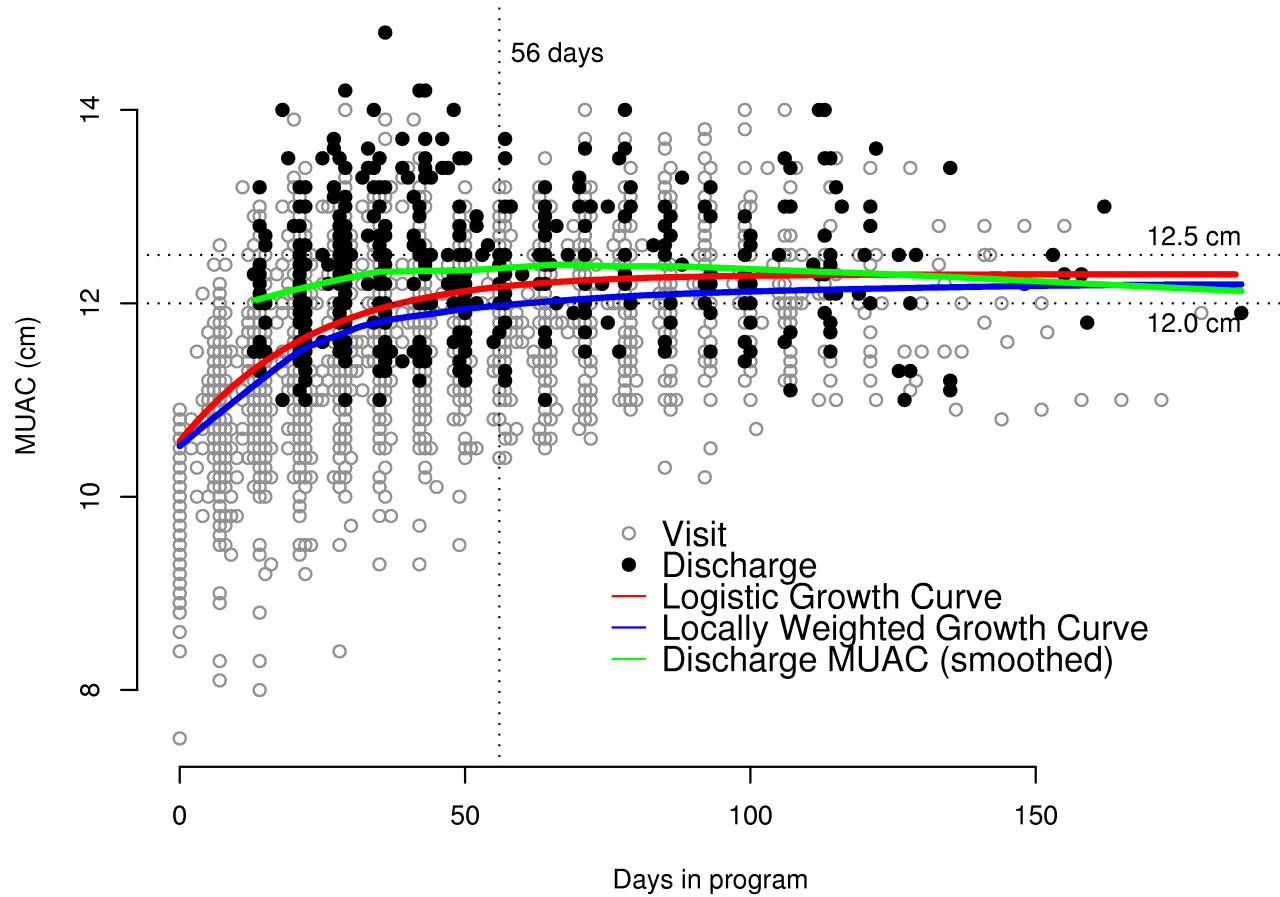
- Observed length of stay (median) : 44 days

Length of stay by age-group

| Year-centred age-group | n | Median admission MUAC (mm) | Median MUAC growth (mm / day) | Discharge criteria | | |
|------------------------|-----|----------------------------|-------------------------------|-----------------------------------|-----------------------------|-----------------------------------|
| | | | | MUAC \geq 120 mm | MUAC \geq 125 mm | WHM \geq 80% |
| | | | | <i>Expected median LOS (days)</i> | | <i>Observed median LOS (days)</i> |
| 1 | 51 | 102 | 0.36 | $\frac{120-102}{0.36} = 50$ | $\frac{125-102}{0.36} = 64$ | 47 |
| 2 | 62 | 104 | 0.37 | $\frac{120-104}{0.37} = 43$ | $\frac{125-104}{0.37} = 57$ | 50 |
| 3 | 104 | 105 | 0.40 | $\frac{120-105}{0.40} = 38$ | $\frac{125-105}{0.40} = 50$ | 42 |
| 4 | 118 | 106 | 0.37 | $\frac{120-106}{0.37} = 38$ | $\frac{125-106}{0.37} = 51$ | 44 |
| 5 | 93 | 107 | 0.51 | $\frac{125-107}{0.51} = 26$ | $\frac{125-107}{0.51} = 35$ | 43 |

Two cases with missing ages

A complicated slide



Discharge MUAC (median) :

123 mm

Discharge WHM (median) :

89.0%

A MUAC discharge criteria of **MUAC \geq 120 mm** is likely to result in **shorter** stays in program – particularly for older children –

A MUAC discharge criteria of **MUAC \geq 125 mm** is likely to result in **longer** stays in program – particularly for younger children –

What next?

Some next steps

- Two studies :
 - **ONE** : Pilot studies of programs using MUAC for both admission and discharge in a variety of contexts :
 - “Operationalise”
 - Investigate length of stay
 - **TWO** : Follow-up study in programs using WHM, proportional weight gains, and MUAC as discharge criteria investigating the frequency of negative outcomes :
 - MUAC \geq 120 mm may be **too low** for discharge without SFP ...
 - We should **LOOK BEFORE WE LEAP!**

Do no harm!



*Declare the past, diagnose the present, foretell the future;
practice these acts ... make a habit of two things - to help,
or at least to **do no harm** (Hippocrates' "Epidemics")*

MUAC \geq 120 mm may be too low :

- Use MUAC \geq 125 mm for initial pilot studies :
 - Operationalise the use of MUAC
 - Ensure that there is no increase in :
 - Re-admissions
 - Post-discharge mortality
- Then ... and only then ...
 - Trial with MUAC \geq 120 mm

