



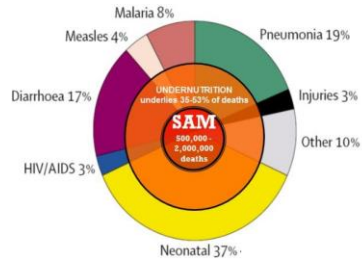
Long-term Effects of Severe Acute Malnutrition on Stunting (& Chronic Disease) *ChroSAM Study*

ENN Technical Meeting
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(on behalf of project team)
With special thanks to: Natasha Lelijveld
PhD student, University College London

Background:

SAM-related morbidity as well as mortality



Global Causes of Mortality. WHO 2010



5y child deaths:

10,800,000 (2000)
→
6,300,000 (2013)

BUT...
more survivors
→ long term effects (morbidity) matter more

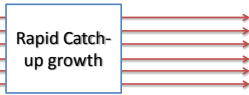
Background:

Development Origins of Adult Disease

- 1992 Hales and Barker: "DOAD" hypothesis – adaptations to early life (nutritional) adversity which:
 - increase likelihood of immediate survival
 - but adversely affect health in later life
- Now strong evidence of long-lasting effects / role in chronic disease

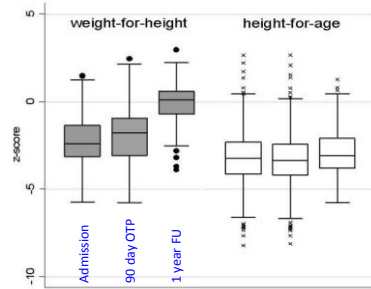
Effects of early SAM?

- In-utero 'malnutrition'
- Low Birth Weight
- Formula feeding
- Early malnutrition



Background:

One-year post-SAM follow-up, Malawi



Kerac M, Burn J, Chagaluka G, Bahwere P, Collins S, Tomkins A, Seal A. (2014) Follow-Up of post-discharge growth and mortality after treatment for Severe Acute Malnutrition (FuSAM study): a prospective cohort study. *PLoS One*

Aims and Objectives



Aim:

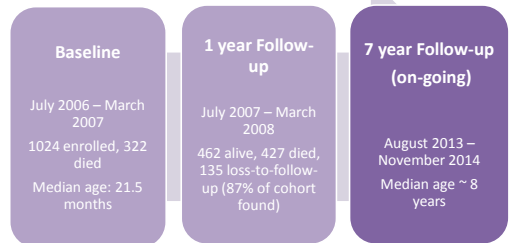
To explore the long-term effects of SAM (7 years post-discharge).

Objectives:

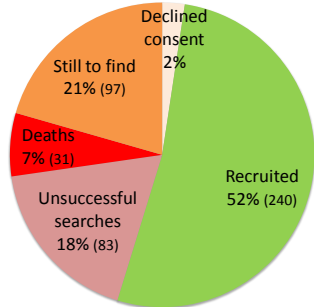
In a longitudinal cohort design with sibling and community controls, to quantify effects of SAM on:

1. Survival
2. Growth and body composition
3. Early markers of chronic disease

Methods: The Cohort



Recruitment Progress



n= 462

August 2014

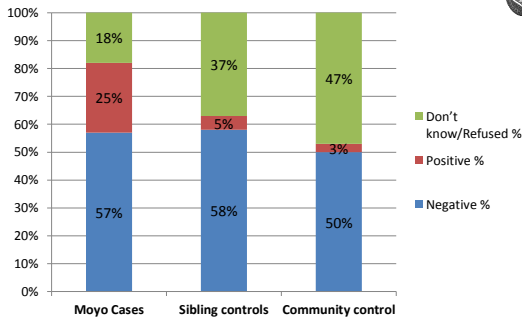
Summary Statistics



	MOYO Cases n=242	SIBLING Control n=191	COMMUNITY Control n=155
Median Age (years)	9.7	10.4	9.5
Males (gender)	(151) 55%	(88) 46%	(78) 50%
Had TB	(10) 4%	(1) 0.5%	(1) 0.6%
Ever admitted to hospital (except SAM)	(46) 19%	(41) 21%	(39) 25%

August 2014

HIV Status of Sample

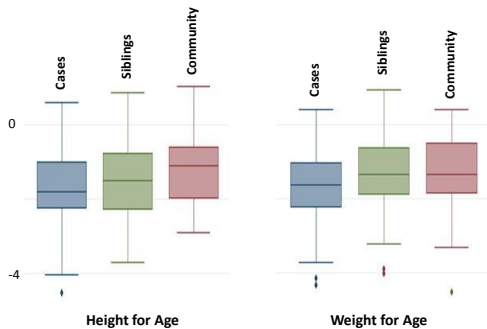


Mortality



- 32/274 (12%) have died between 1 year and 7 years post discharge
- Of 32 deaths:
 - 56% (18) of deaths HIV positive
 - 19% (6) had a disability
 - 31% (10) had neither HIV nor a disability
- Is this excess mortality over and above background? Not yet explored

Anthropometry



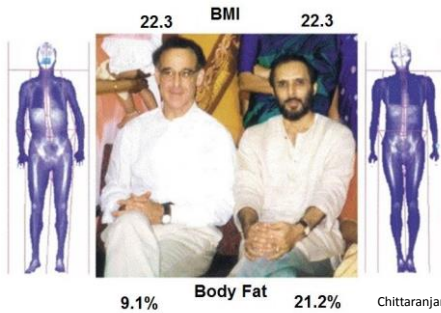
Anthropometry



- Linear Regression: Cases vs Community Controls, including age, gender and HIV

Measurement	Community Control Regression Coefficient	95% Confidence Interval	P value (Moyo vs Community)
WAZ	0.34	0.07, 0.61	<0.05
HAZ	0.53	0.22, 0.83	<0.001
BAZ	0.17	-0.1, 0.34	0.16
Sitting height ratio	-0.47	-0.89, -0.04	<0.05

Body Composition



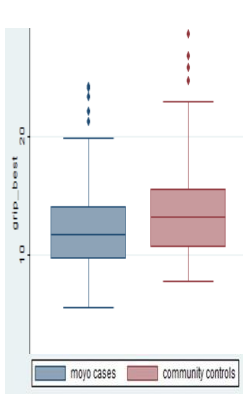
Chittaranjan and Yudkin, The Lancet, 2004

Body Composition



- Linear Regression: Cases vs Community Controls, including age, gender and HIV

Measurement	Community Control Regression Coefficient	95% Confidence Interval	P value (Moyo vs Community)
Waist:Hip ratio (log)	-0.02	-0.05, 0.001	0.05
Skinfold thickness ratio (log)	0.03	-0.07, 0.12	0.57



Hand Grip Strength (kg)



Key Messages



- There are important long-term implications of SAM
- Ex-SAM cases = more stunted & underweight than than siblings and community controls
 - Sitting height suggests that torso has been preserved and limb growth compromised
- Also some evidence of:
 - Adverse body composition (waist:hip ratio)
 - Functional implications (weaker handgrip strength)

Potential Implications



Scientific	Programme	Policy
<ul style="list-style-type: none"> Adding evidence to DOAD in new patient group Define window of plasticity Inform future research project 	<ul style="list-style-type: none"> Focus on SAM morbidity as well as mortality Earlier detection? More/different fup care? Altered initial feeding regime? 	<ul style="list-style-type: none"> Adds weight to 'SUN' movement http://scalingupnutrition.org/ Advocate for more investment in acute malnutrition

Other outcomes

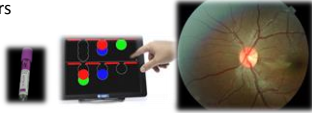


Mortality and Growth	Early markers of Chronic Disease	Risk factors/ confounders
<ul style="list-style-type: none"> BMI Stunting Wasting Underweight Head Circumference Waist-Hip Ratio 	<ul style="list-style-type: none"> Cardiovascular Respiratory Physical activity Cognition Body composition (BIA) Retinal vasculature Function 	<ul style="list-style-type: none"> SE Status Family characteristics (e.g. education) Maternal anthropometry Maternal mental health Duke University Religion Index HIV status

Future Analysis



- **Future analysis (core)**
 - BIA data: compare Impedance (& estimates of fat mass/Fat-free mass) between groups using LMS reference method
 - Disaggregate data by age of admission, severity of SAM at admission, kwashiorkor present, and gender
 - Compare physical activity accelerometer data
- **Future analysis for wider 'ChroSAM' study**
 - Cognitive function
 - Glucose tolerance / insulin / c-peptide / HbA1c
 - Retina vessel diameters
 - Lipid profile
 - Epigenetic profile
 - 1-step exercise test



Future Research



- Hypothesis generating study:
- Explore mechanisms underpinning the effects
- Intervention trials to improve management of SAM i.e. altered feeds, earlier case finding, post-SAM follow ups
- Exploring Adolescence as a second window for intervention
- Cohort study of children treated with new, outpatient model, as a comparison



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