CHANGE Project (CHild malnutrition & Adult NCD: Generating Evidence on mechanistic links to inform future policy/practice)

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Data Creators

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Associated roles

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Description

PROJECT BACKGROUND:

Child malnutrition is a major global public health problem. Wasting (low weight-for-height) is a particularly severe form of malnutrition affecting 49 million children and responsible for 900,000 deaths/year in children aged <5years. With climate change disproportionately affecting vulnerable populations, there is real danger of the problem worsening over coming decades. The need for optimal treatment programmes is immediate and great. Whilst malnutrition treatment programmes do exist, obstacles to their success include the need to:

- Ensure children thrive long-term – not just survive short term Current programmes address the immediate risk of malnutrition-associated death. They do not account for increasing evidence that survivors are at greater risk of long term health problems from non-communicable disease (NCD) e.g. heart disease, diabetes, obesity. Because underlying mechanisms for the link are poorly understood, potential to tackle the 'double-burden' of malnutrition (i.e. coexistent undernutrition and overweight/obesity/NCD) is limited.
- Understand & measure more meaningful outcomes – including future health risks Current programmes consider return to normal weight as the key marker of success. What really matters however is health. Predicting ill health many years later (adult NCD) is challenging
- Question assumptions around rapid post-malnutrition weight gain (PMWG) Current programmes often encourage rapid weight gain following an episode of malnutrition. However, high income country (HIC) data suggest show that too rapid a weight gain in small infants can cause harm by increasing future NCD risk2. Whether this trade-off between too slow vs too fast weight recovery also applies in low-and middle income countries (LMIC) is unknown.

Responding to and addressing these challenges, the CHANGE project is a 3 year package of work with several aim and objectives:

AIM:

To optimise severe malnutrition treatment programmes by better understanding the mechanisms linking infant/child undernutrition to longer-term (adult) NCD

OBJECTIVES:

1.   To understand how post-malnutrition weight gain (PMWG) affects risks of cardiometabolic NCD
   a.   How does the timing of an episode of malnutrition influence this risk?
   b.   How does severity of malnutrition influence this risk?
   c.   How do different patient management approaches influence this risk?

2.   To develop biomarkers for predicting NCD risk in survivors of child malnutrition by:
   a.   Describing the biochemical characteristics of malnutrition survivors, differentiating those with/without NCD.
   b.   Describing the biochemical profiles of different patterns of PMWG
   c.   Identifying biomarkers common to different patterns of PMWG and NCD risk in survivors

Project objectives will be achieved through 6 related work packages (WP)

WP1: DATA SYNTHESIS & STANDARDIZATION: We will develop standard definitions of post-malnutrition weight gain (PMWG)/post-malnutrition growth (PMGr) and apply this to our available datasets. These include historical treatment cohorts from Jamaica, Malawi, and Ethiopia.

WP2: UNDERSTANDING HOW POST-MALNUTRITION-WEIGHT-GAIN (PMWG) INFLUENCES RISK OF NCD (towards objective 1): Existing data from three prospective treatment cohorts form a natural experiment whereby: Jamaica-LION cohort involved inpatient treatment and had fastest rates of PMWG; Ethiopia-ACAM cohort was outpatient-only and had slowest PMWG; Malawi-ChroSAM cohort was mixed in/outpatient and had intermediate PMWG. We will explore inter-&intra-site PMWG and its association with NCD-relevant outcomes already in the databases. We hypothesise greatest risk of NCD in cohorts and individuals in cohorts who had the fastest rates of PMWG.

WP3: DESCRIBING BIOCHEMICAL CHARACTERISTICS OF MALNUTRITION SURVIVORS (o2a): Here we will look for persistent post-malnutrition metabolic differences which could increase NCD risk. To do so, we will assess known metabolic markers/predictors of NCD development and employ state-of-the-art lipid profiling of serum from survivors of early-life malnutrition and controls in cohorts from Malawi, Jamaica and Ethiopia.

WP4: DESCRIBING BIOCHEMICAL PROFILES OF DIFFERENT PATTERNS OF PMWG (obj. 2b): Samples from infants two new infant/birth cohorts will be assessed to see if the above metabolic perturbations are already evident in early life. Metabolic profiles associated with different rates of PMWG will then be determined.

WP-5: IDENTIFYING BIOCHEMICAL SIGNATURES LINKING PMWG & NCD RISK (obj. 2c): This will combine data from WPs 2–4, comparing biochemical patterns associated with PMWG with those associated with pre-clinical/overt NCD. This will also lead to understanding of mechanisms underlying early life malnutrition / later life NCD risk. Any biomarkers common to both ends of the lifecourse can potentially be used in other studies to flag early risk of NCD without having to wait for many years to actually measure that NCD.

WP 6: GRIPP (Getting Reseach into Policy/Practice)-Stakeholder engagement/research co-creation: Qualitative work and stakeholder engagement will help us understand the wider context of our work and will also ensure co-creation of important project next steps.

Additional information
Datasets and other project outputs will be linked to this project record as the project proceeds.

Associated publications
- Severe malnutrition or famine exposure in childhood and cardiometabolic non-communicable disease later in life: a systematic review. https://doi.org/10.1136/bmjgh-2020-003161
- Metabolomics in plasma of Malawian children 7 years after surviving severe acute malnutrition: "ChroSAM" a cohort study. https://doi.org/10.1016/j.ebiom.2019.06.041

Participating Institutions
- London School of Hygiene & Tropical Medicine
- MEIRU (Malawi Epidemiology and Intervention Research Unit)
- Jimma University, Ethiopia
- Tropical Metabolism Research Unit (TMRU), University of West Indies, Jamaica
- Wellcome-MRC Institute of Metabolic Science, Cambridge University
- School of Human Development and Health, Southampton University

LSHTM Faculty/Department
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Funder information

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Project dates

- Start date: 21 March 2021
- Completion date: 30 September 2023

Geographic regions covered

Malawi, Ethiopia, Jamaica