## New technologies to help unravel why millions of undernourished children die

- 6 Million children below 5 years die annually
- 80% of deaths are in sub-Saharan Africa and Asia
- 45% of deaths have underlying malnutrition
- Most deaths are due to common infections

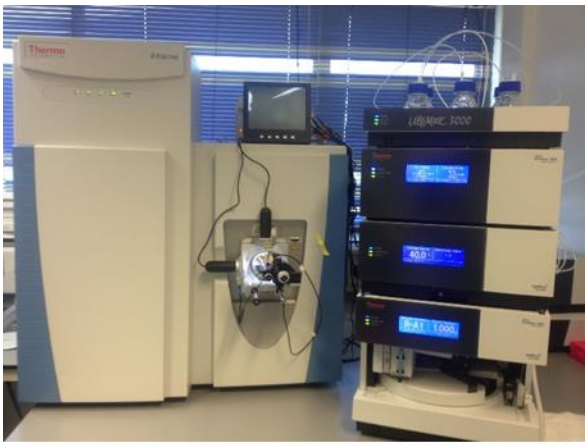
According to estimates by UNICEF [1] close to six million children die every year before their fifth birthdays. About 80% of these deaths occur in sub-Saharan Africa and Asia. Almost half have underlying malnutrition. Children with poor nutrition are more likely to die from common infectious diseases than well-nourished community peers[2]. Death in undernourished children is thought to be driven by an interaction between malnutrition, poor ability of the body to absorb scanty nutrients and grow, and inability of the body to fight disease[3]. Most undernourished children are hospitalized mainly following an illness episode. Despite considerable efforts, clinical trials, and guidelines on management of acutely ill malnourished children; in-hospital and post-hospital mortality remains unacceptably high, making it an area where nutritional science could be transformative.

## Anthropometric screening for undernourished children

Mid Upper Arm Circumference (MUAC) Tape

Anthropometric measurements such as the mid upper arm circumference, weight, height, and age that reflect wasting, stunting, or underweight are quite effective in screening and selecting frail undernourished children at a high risk of death. However, these measurements do not inform the understanding of mechanisms that lead to death. Standard clinical and laboratory measurements on the other hand are critical in guiding hospital management of such children but often lack important biological explanations leading to death. Understanding such critical processes could inform on where best to invest resources for interventions to achieve maximal benefit. Understanding the causal mechanisms that lead to death is an important area which needs new thinking and new approaches.

## New Technologies


A Liquid Chromatography mass spectrometry technology

A new approach that can measure numerous biological molecules in blood including proteins and metabolites with great accuracy is a mass spectrometer [4]. Systematic measurements of such molecules from ill undernourished children in hospital, after hospitalization, and in the community can allow a broader view of biological processes leading to death. Compared to other technologies, very small amounts of blood are required to generate large amounts of information. Carefully collected clinical information and samples from human studies form a valuable resource that may hold crucial information related to death. Such information may reveal why the body can't fight common infections, can't absorb nutrients properly, and inform which body organs are diseased. This valuable technology hasn't been widely applied in undernutrition research.

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I trained as a Biochemist at Kenyatta University in Kenya and at Rhodes University in South Africa. Currently, I am an early career post-doctoral researcher with the KEMRI-Wellcome Trust Research Programme in Kilifi, Kenya. I am part of the childhood acute illness and nutrition network [6] where we aim to optimize care for vulnerable children in low resource settings to improve survival, growth, and development. I have received specialized training in liquid chromatography and mass spectrometry to measure proteins in blood and use such information to determine which biological processes are linked to deaths and poor nutritional status. I have recently completed work that helps to understand some biological reasons why many undernourished children die within two months after being discharged from hospital. I am also excited to use this and other technologies to understand why certain children develop kwashiorkor.


1. https://data.unicef.org/topic/child-survival/under-five-mortality/
2. http://www.who.int/nutgrowthdb/publications/risk/en/
3. https://www.ncbi.nlm.nih.gov/pubmed/29570495
4. https://www.news-medical.net/life-sciences/Mass-Spectrometry-Applications.aspx
5. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5686508/
6. http://chainnetwork.org/