Introduction to Nutrition Modeling in the Lives Saved Tool (LiST)

Amy Mayberry¹ and Saul Morris²

¹Action Against Hunger, London, United Kingdom; and ²Children’s Investment Fund Foundation, London, United Kingdom

Introduction

The world has set ambitious goals to improve the nutritional status of children over the next 2 decades, including the Sustainable Development Goal to end malnutrition in all its forms by 2030 (1). The World Health Assembly similarly aims to accelerate progress to improve maternal, infant, and young child nutrition by 2025, with specific targets to reduce by 40% the number of children <5 y of age who are stunted and to reduce the prevalence of childhood wasting to <5% (2). With an estimated 45% of the 6.9 million child deaths each year linked to undernutrition (3), the achievement of these targets for undernutrition is also critical for the success of global child survival targets.

Recent high-profile movements have mobilized the global community around this issue, including >$4 billion in funding commitments made at the Nutrition for Growth Summit in 2013 as well as the UN General Assembly declaration of a Decade of Action on Nutrition in 2016. But this is not enough. The world will not meet any of these targets without a renewed and coordinated effort to successfully protect children from undernutrition. At the country and programmatic levels there remains a lack of consensus about what needs to be done to achieve those targets. Without high-quality data and effective tools for analysis, the complex interaction of variables that determine nutritional status and its relation to mortality among women and children has made evidence-based programming difficult.

In the area of child survival, the development of user-friendly, evidence-based models has supported country-level planning and global dialogue around the prioritization and resourcing of high-impact interventions. One of the most successful examples of these has been the Lives Saved Tool (LiST). LiST has been used by >90 governments, UN agencies, nongovernmental organizations, and donors in low- and middle-income countries and as the core tool in at least half a dozen Lancet series published over the past decade, including the 2008 and 2013 Lancet series on maternal and child nutrition and undernutrition (4, 5). LiST is now a highly influential tool globally for modeling and planning maternal and child health interventions, but it has been less used to plan and assess the scale-up of nutrition-specific interventions that fall outside of these health packages.

The 2 Lancet nutrition series spurred a number of updates to LiST including the addition of nutritional status, both as a direct outcome after intervention and as a predictor of other outcomes in the model, and the incorporation of a handful of nutrition and nutrition-sensitive interventions. Those updates were critical, albeit ultimately limited by the available evidence. However, in recent years, the pace at which new evidence is being produced is encouraging, if sometimes overwhelming; 540 articles were published on breastfeeding interventions from October 2014 to August 2016 alone (6). The knowledge gained by this renewed attention underscores both the need and the opportunity to update LiST. The 9 articles presented in this supplement, which encapsulate the most substantial updates to the nutrition components in LiST to date, reflect the growing evidence of the underlying risks of undernutrition and clarify opportunities to intervene from pregnancy until age 5 y.

Updates to the Modeling of Underlying Undernutrition Risks

New analyses of the underlying risks of undernutrition represent an important advancement in the modeling of undernutrition in LiST. Work done as a part of these updates includes refined estimates of the odds of stunting in children as they move from one age group to the next. (This analysis will be published elsewhere.) As a result, LiST is now better able to predict the apparent persistence of stunting in children as they grow older and achievable impacts of earlier interventions. In addition, Kozuki et al. (7) present the development of a new algorithm that expands the ability of LiST to model the impact of interventions in pregnancy on low birth weight, an outcome used for global targets, in addition to small-for-gestational-age and preterm births. Although imperfect, this is a positive step...
forward to improved modeling and tracking against global targets focused on low birth weight.

Updates to Maternal and Child Interventions

The updates presented in this supplement represent notable progress in the strengthening of LiST to model bundles of nutrition-specific and nutrition-sensitive interventions and their impact on birth outcomes, stunting, wasting, maternal anemia, and maternal and child mortality. With up to one-third of stunting originating prenatally, the analysis of nutrition interventions delivered in pregnancy presented in this supplement represents a critical step to address the gaps in both the literature and the LiST. Although the evidence is mixed across birth outcomes, Heidkamp et al. (8) document the inclusion of revised effect sizes for calcium supplementation, multiple micronutrient supplementation, and balanced energy supplementation. These are important updates to LiST for those seeking to estimate the direct and indirect impacts of interventions delivered in pregnancy on birth outcomes, stunting, and child mortality. In another article, Heidkamp et al. (9) outline several updates to the LiST model for anemia, including modeling for both pregnant and nonpregnant women of childbearing age. The model now includes 5 intervention linkages for the prevention of maternal anemia and deaths due to hemorrhage: untargeted (“blanket”) iron supplementation or fortification, household insecticide-treated bednet ownership, intermittent preventative treatment of malaria in pregnancy, and iron and folic acid and multiple micronutrient supplementation during pregnancy.

The findings presented on complementary feeding interventions in Panjwani and Heidkamp (10) highlight an area in which there is a growing body of evidence but where the generalization of effect sizes across such a diverse set of interventions and populations remains a challenge. As with the previous effect size value included in LiST, the overall effect of this intervention on stunting and wasting outcomes was proven to be smaller than expected. Of note is the addition of complementary feeding as a preventive intervention for wasting in this latest version of LiST. This is an important expansion to improve the modeling of wasting within LiST, yet highlights the limitations of the existing evidence on the prevention of wasting and the further need to strengthen the wasting components of the model.

Two final articles review the evidence for interventions with an impact on child mortality and show how LiST can be applied to an expanded set of nutritional interventions. The meta-analysis on breastfeeding presented in Sinha et al. (6) provides differential impacts of diverse platforms for breastfeeding promotion. This is an important update to allow for more-realistic modeling of breastfeeding promotion programs. Engle-Stone et al. (11) show an application of the model with the use of LiST to estimate the child mortality effects of a broader range of vitamin A–related interventions.

Inconclusive Findings and Data Limitations

As noted in a number of articles in this supplement, there are areas in which the available evidence remains inconclusive or limited, preventing the inclusion of certain interventions or linkages in LiST. The evidence analyzed for deworming interventions was not able to support the inclusion of deworming in LiST, given the inconsistent evidence of effect on mortality, anemia, and growth at the population level. Due to a lack of prevalence and intensity data, the analysis (to be published elsewhere) was unable to explore the complex interactions and effects on high-risk groups. The article by Jackson and Black (12) on the links between malaria and stunting presents a different challenge. The evidence reviewed was insufficient to include a link between malaria and stunting in LiST; although the causal link may exist, the authors noted a critical limitation of the study data, namely the ethical responsibility to diagnose and treat children for malaria. This will continue to limit the ability of future data to detect any possible effects of malaria on stunting. Finally, the analysis of food security indicators in Jackson et al. (13) highlights the lack of nationally representative data at this point in time, but future updates can still be made to LiST as improved data become available.

Conclusions

These updates to the LiST reflect the latest available evidence and programmatic approaches to achieve a set of global priorities and targets. They have strengthened the ability of LiST to model the nature of stunting and wasting, the persistence of undernutrition across age in individual children, and the effects of maternal and child interventions on health and nutritional status outcomes and mortality. Although the evidence base continues to grow and future findings should also be included into LiST, this is a major achievement. A stronger LiST that incorporates nutrition interventions and subsequent outcomes will allow countries and programs to estimate the impact of scaling up packages of nutrition-specific and nutrition-sensitive interventions and, ultimately, to better track progress toward the global targets set by the world Health Assembly (2) and the Sustainable Development Goals (1).

Acknowledgments

The authors’ responsibilities were as follows—AM and SM: wrote the manuscript and had primary responsibility for the final content; and both authors: read and approved the final manuscript.

References


