Childhood Stunting: Epidemiology and determinants in Zambia and sub-Saharan Africa

A Literature Review

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The opinions expressed herein are those of the authors and do not necessarily reflect the views of USAID.

Presentation Outline

- Introduction
- Methods
- Results
- What works, gaps, and conclusions
- Zambia-specific implications and next steps

Introduction

Background

“This literature review was made possible with the generous support of the American people through the U.S. Agency for International Development in partnership with Khulisa.”

Scaling Up Nutrition - Learning and Evaluation (SUN LE) is a 4 year USAID-funded project implemented by Khulisa Management Services, Inc. (Khulisa) in partnership with the Government of the Republic of Zambia (GRZ), and in collaboration with 3 institutional partners – Indaba Agricultural Policy Research Institute (IAPRI), ICF Macro, Inc. (ICF) and University of North Carolina at Chapel Hill (UNC).

Purpose of the Literature Review

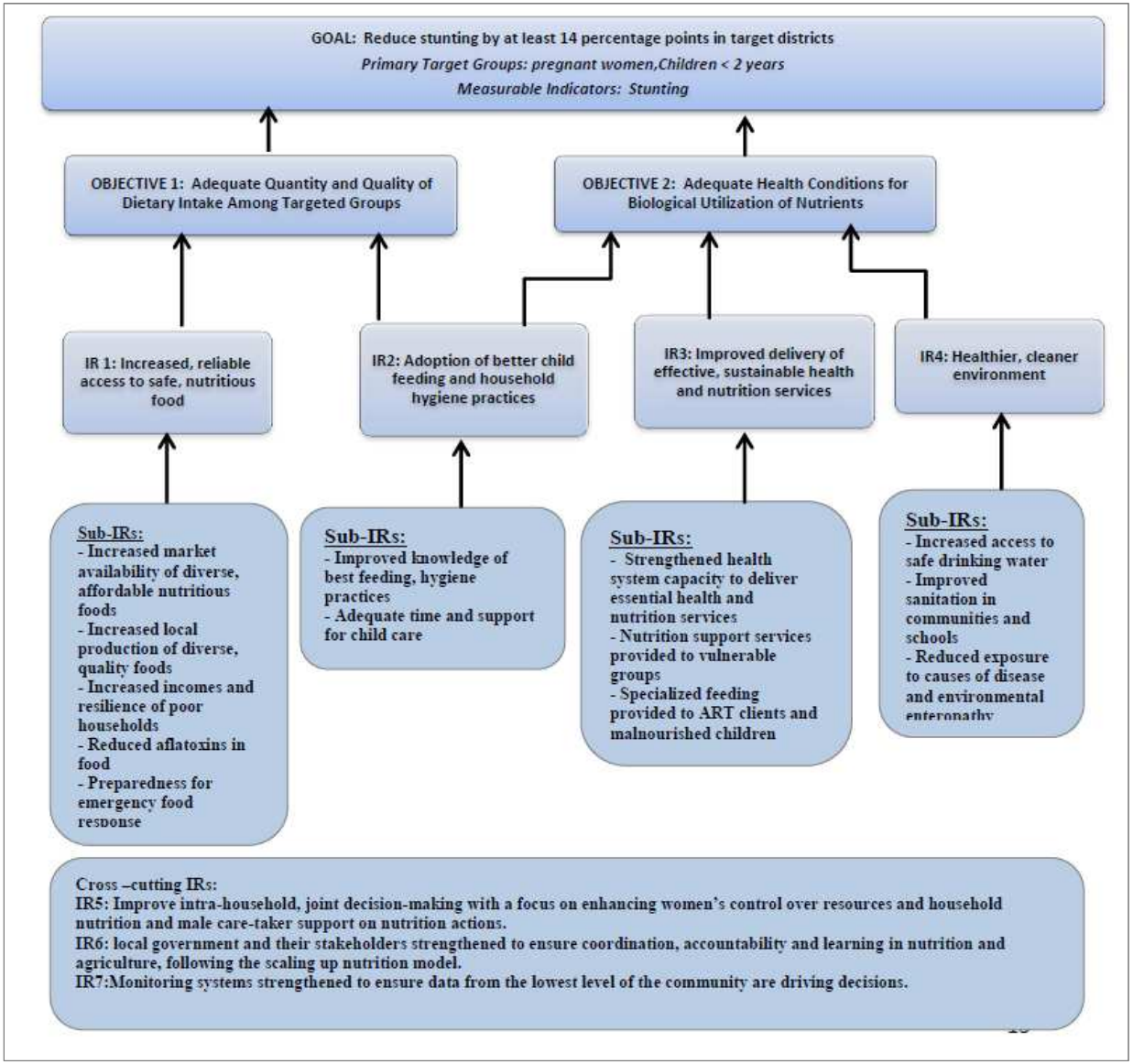
- To compile relevant information about childhood stunting in Zambia and the region in order to orient the NFNC Monitoring, Evaluation and Research Technical Working Group (TWG) to the state of the science so that they can provide informed guidance to the SUN 2.0 Programme, SUN TA, and SUN LE activities, focused studies, and Learning Agenda.

- Findings from the literature review, along with discussion with the TWG, will result in identified learning gaps. The Learning Agenda will then be adapted to address these learning gaps.

Methods

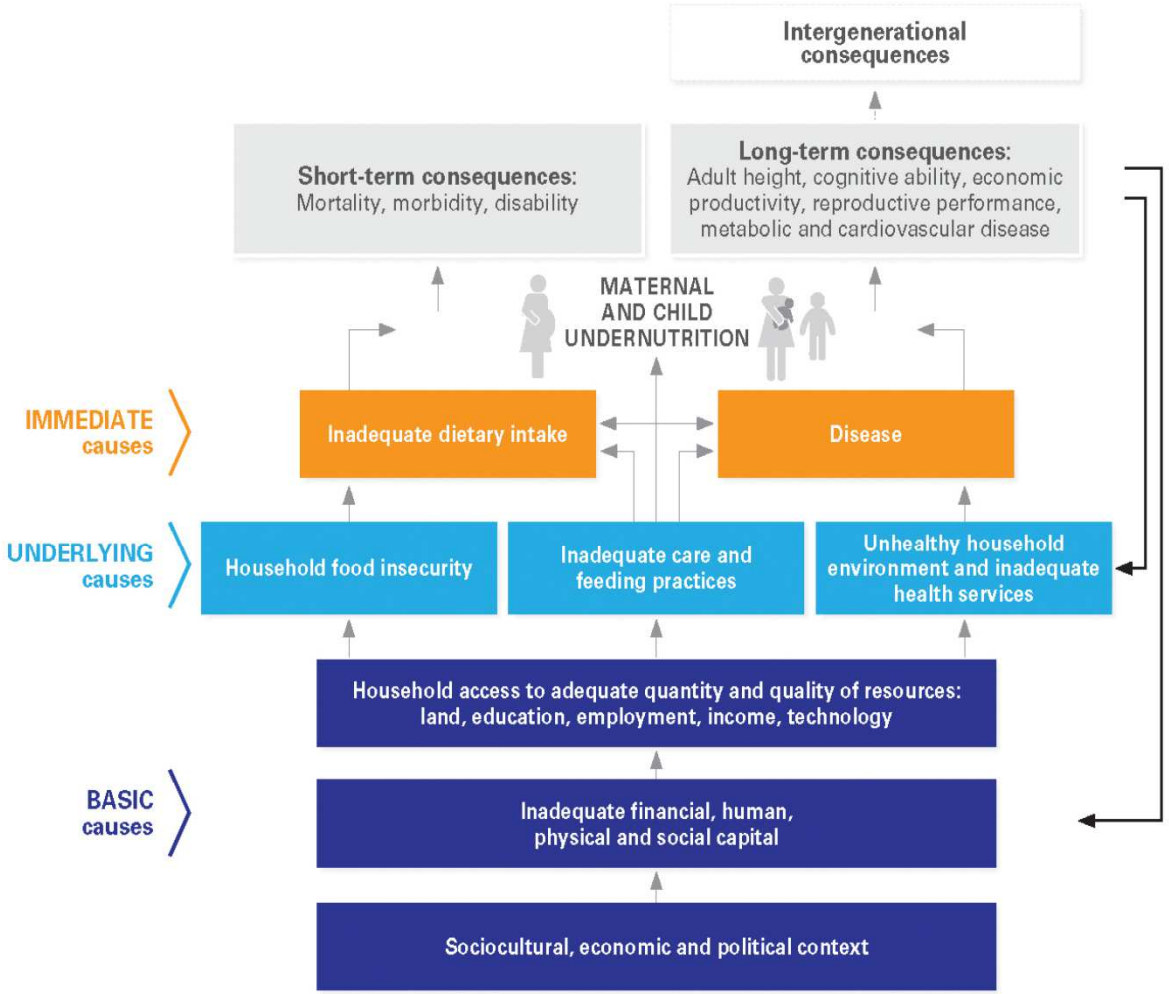
Zambia

Results Framework to Reduce Childhood Stunting



UNICEF Conceptual Framework:

Determinants of Child Undernutrition



The black arrows show that the consequences of undernutrition can feed back to the underlying and basic causes of undernutrition, perpetuating the cycle of undernutrition, poverty and inequities.

Source: Adapted from UNICEF, 1990.

Approach

- 1) “Snowball approach” using the Lancet Maternal and Child Nutrition Series (2013) as a starting point, and following citations for series publications.
  - Review of all contributions to the series and relevant citations of the contributions.
    - 7 comments
    - 4 series papers
    - 2 articles
  - Identification and review of relevant publications, and subsequent citations, as relevant.
  - Identification of gaps.
- 2) Systematic approach searching select databases and search engines for relevant publications, program and activity reports, and Government of Zambia publications.
  - All databases and search engines were searched using the same search terms documented in the master search list. Relevant institutional pages were also searched.
- 3) Excel was used to arrange the articles and relevant findings by thematic area (mapped to the UNICEF Framework).
  - 169 sources reviewed (36 Zambia-specific)

Search Strategy

- Conducted literature searches between 20 March and 10 April 2019
- Scope:
  - Topic: stunting or undernutrition
  - Search: timeframe was restricted to publication dates between 1 January 2009 and 10 April 2019 for Lancet Maternal and Child Nutrition Series (2013) and other seminal publications, and between 1 January 2014 and 10 April 2019 for all other sources.
  - Audience/focus population was restricted to female adolescents, pregnant and lactating women, infants and young children (2 years of age and under).
  - Geographic Focus: Zambia was the primary focus, with additional sources from sub-Saharan Africa used in cases where Zambia-specific information was not available. In some cases, contextual and other relevant information came from sources with a broader or global geographic focus.
    - Urban vs rural distinction as applicable; SUN LE districts as available, and community level as relevant
  - Language was restricted to English publications.

Search Strategy (cont.)

- Some modifications to search:
  - For **PubMed** and the **Development Experience Clearinghouse (DEC)**, further limited the search by adding in “Sub-Saharan Africa” (SSA).
  - For **SCOPUS**—the first search for Stunting and Zambia with the five year limit produced already obtained publications, so no further searches were done.
  - For **Google Scholar**—first search for Stunting and Zambia, limited by adding “undernutrition” returned 1000+ results, and the first 15 pages only were relevant.
  - All article titles and abstracts were imported into **Endnote** for initial reviews. Full text articles were stored in Endnote and on a SharePoint site.

Search Terms

Words Searched	Plus	Results - PubMed	Results - DEC
Stunting	+ Zambia + Sub-Saharan Africa (SSA) + SSA + Nutrition + SSA + Epidemiology + SSA + Determinants + SSA + Multi-sectoral	427 results	42 results
Nutrition + Food + Access + (SSA- DEC Search only)	+ Pregnant Women + Lactating Women + Children Under 2	100 results	376 results
Nutrition + Food + Stunting OR Undernutrition	+ SSA + Agriculture/Agricultural + Safe Handling + Storage + Cooking + Cooking Practices + Cooking Processes	183 results	54 results
Diet OR Dietary OR Dietary Diversity + SSA	+ Stunting OR Undernutrition	70 results	23 results
Food Security OR Food Insecurity + SSA	+ Stunting OR Undernutrition	42 results	21 results

Search Terms (cont.)

Words Searched	Plus	Results - PubMed	Results-DEC
Feed OR Feeding OR Feeding Practices + Stunting OR Undernutrition + SSA	+ Breastfeeding OR Exclusive Breastfeeding + Complementary Feeding + Care + Practices	74 results	592 results
Hygiene + Stunting OR Undernutrition	+ Practices + Water OR water and sanitation OR water and hygiene OR hygiene and sanitation OR water, sanitation and hygiene OR WASH	225 results	285 results
Nutrition + Stunting OR Undernutrition	+ Health system + SSA (PubMed only) + Antenatal Care + SSA (PubMed only) + Infection OR Infection Screening + SSA (PubMed only) + Diagnosis + Treatment	366 results	554 results
[Environment OR Environmental] OR [House OR Household] + Stunting OR Undernutrition	+ SSA (PubMed only) + Unhealthy + Soil + Mycotoxins + Africa (PubMed only) + Weather + SSA (PubMed only) + Agriculture	291 results	429 results

Search Terms (cont.)

Words Searched	Plus	Results - PubMed	Results - DEC
Agriculture + Stunting OR Undernutrition	+ SSA (PubMed only) + Production OR Productivity + Access + Post-Harvest	102 results	468 results
HIV/AIDS + Stunting OR Undernutrition	+ Child Health OR [Child AND Stunting] + Child Growth	90 results	149 results
Health OR Healthcare + Stunting OR Undernutrition + (SSA - PubMed only)	+ Limited Access + Inadequate	24 results	219 results
Gender OR Ethnicity OR Wealth OR SES OR Poverty + (SSA - PubMed only)	+ Stunting OR Undernutrition	129 results	244 results
Social OR Economic OR Political + (SSA - PubMed only)	+ Maternal Undernutrition + Child Undernutrition	26 results	90 results

Results


showed
prevalence
countries
supplements
areas
significantly
group
trainings
highly
underweight
program
community
change
status
district
evidence
2015
caring
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undernutrition
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2016
agriculture
practices
breastfeeding
household
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malnutrition
security
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odds
exposure

Childhood Stunting

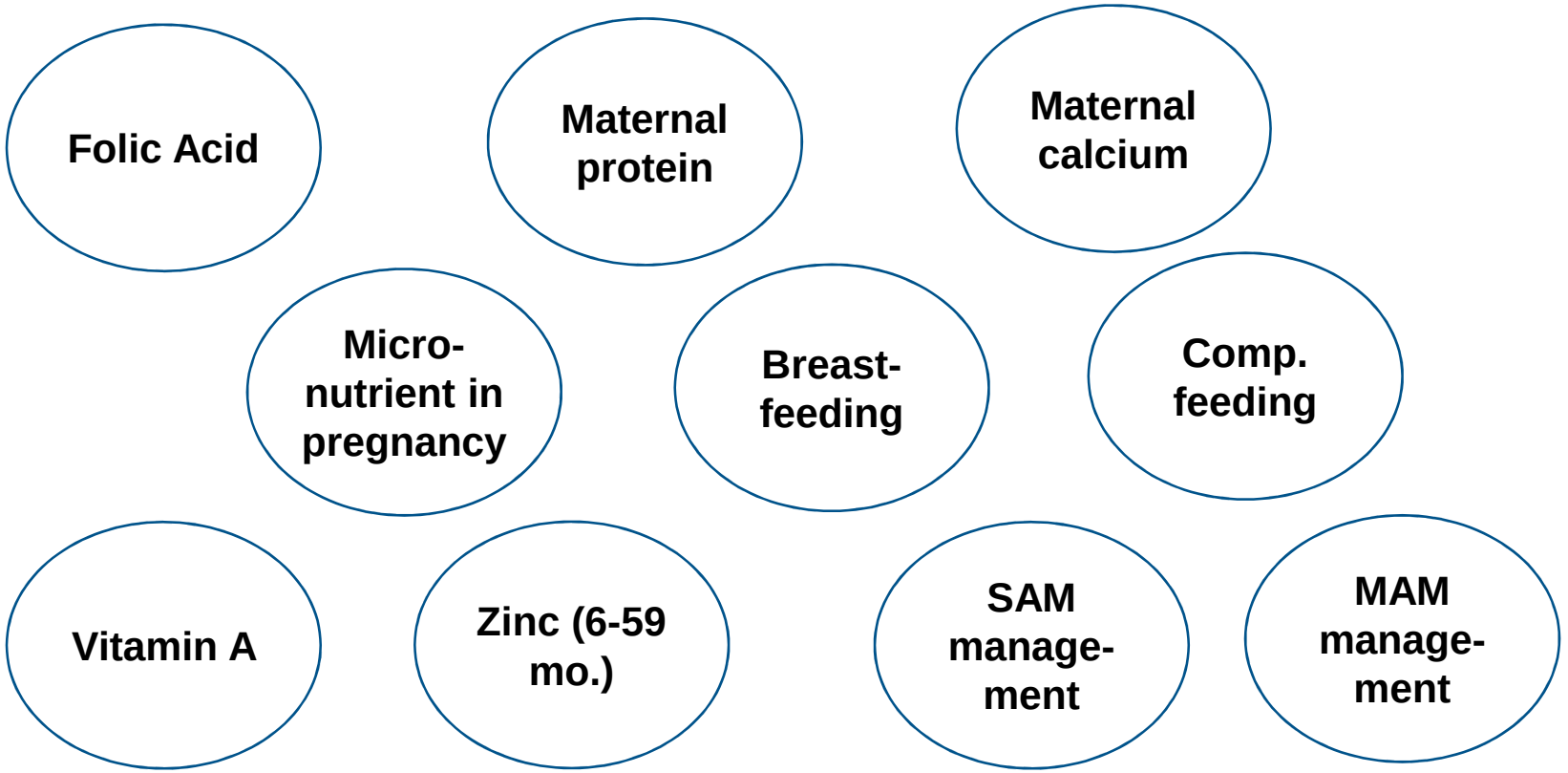
- **Effects**: increased risk of short-term morbidity and mortality, non-communicable diseases later in life, and reduced learning capacity and productivity (Black et al., 2013).
- **Etiology**: begins in utero, continues through the first two years of life, and is highest at 18-24 months of age (Dewey & Huffman, 2009; Prendergast & Humphrey 2014; Victora et al., 2010).
- **Causes**: multifactorial - maternal nutrition status, infant and young child care and feeding practices, hygiene and sanitation, frequency of infections, and access to healthcare are key proximal determinants of child growth, and are influenced by the cultural, social, economic, political, and environmental context (Black et al., 2013; Prendergast & Humphrey, 2014; Stewart et al., 2013).

Childhood Stunting Epidemiology in sub-Saharan Africa

- Although childhood stunting prevalence decreased minimally between 2000 – 2015 (Ricci et al., 2018), Africa was the only region with an increase in the number of stunted children (Black et al., 2013); 50 million stunted children (one-third of world total) (UNICEF, 2017).
- One-third of global burden of undernutrition is in sub-Saharan Africa, with the highest rates of childhood stunting in eastern Africa (Akombi et al., 2017).

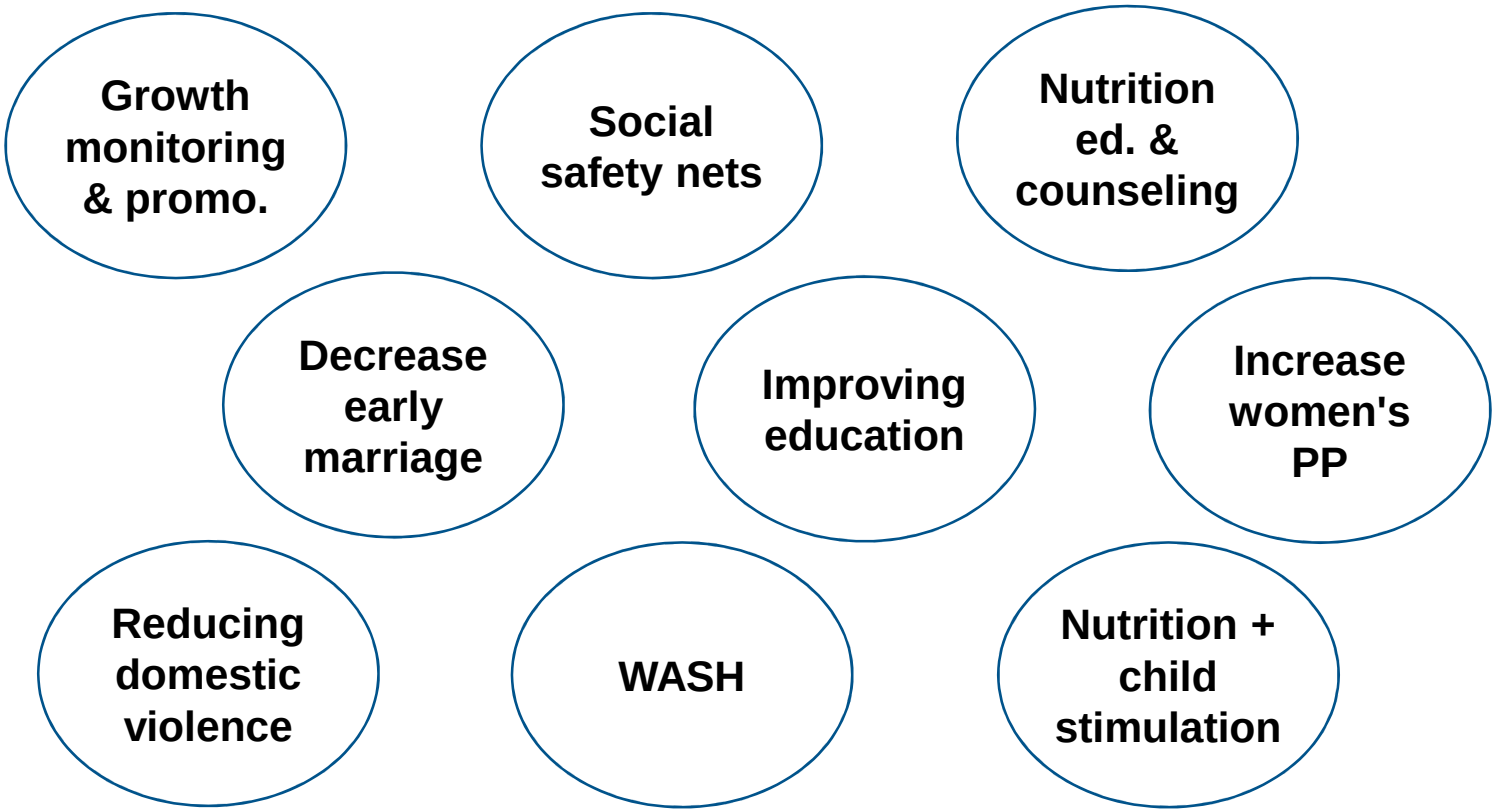
Childhood Stunting Epidemiology in sub-Saharan Africa (Nutrition-Specific)

- Scaling up 10 (nutrition-specific) interventions to 90% coverage could reduce childhood stunting by 20% (Bhuttah et al., 2013)

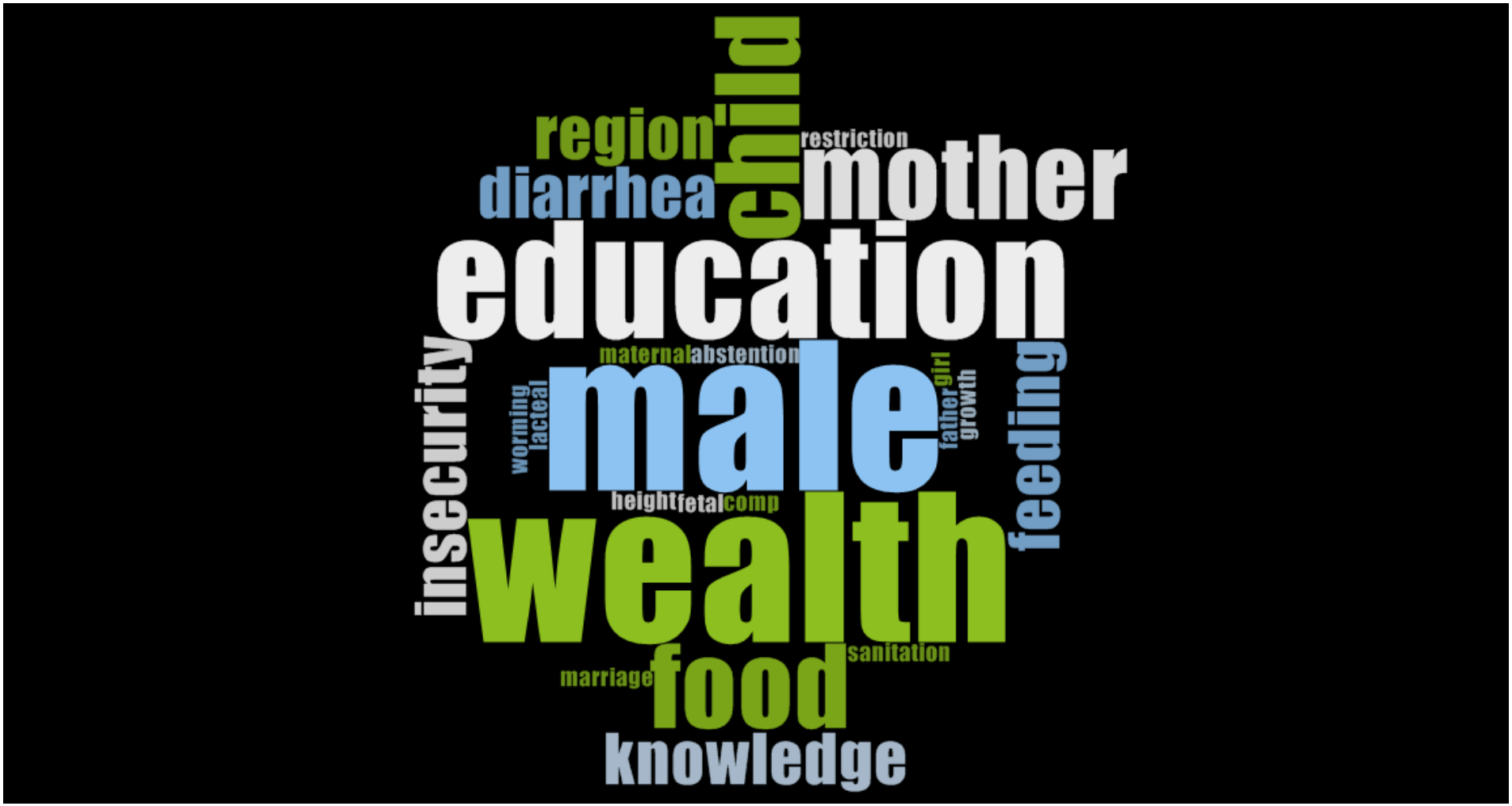


Childhood Stunting Epidemiology Globally (Nutrition-Sensitive)

- Hossain, 2017; Ruel, 2013; Vir, 2016



Childhood Stunting Determinants in sub-Saharan Africa



Sub-Saharan Africa: Childhood Stunting Determinants

Determinants	Author(s)
Fetal growth restriction and unimproved sanitation leading risk factors for stunting	Danaei et al., 2016
Male children are more likely to be stunted	Akombi et al., 2017; Asfaw et al., 2015; Bukusuba et al., 2017; Doctor and Nkhana-Salimu, 2017; Nshimyiryo et al., 2019
Age of child (above 6 months)	Doctor and Nkhana-Salimu, 2017; Eshete et al., 2017; Nshimyiryo et al., 2019
Mother's and father's education level	Balogun and Yakumu, 2015; Efevbera et al., 2017; Eshete et al., 2017; Nshimyiryo et al., 2019
Cultural food taboos during pregnancy	Ersino et al., 2018
Household wealth	Akombi et al., 2017; Bukusuba et al., 2017; Efevbera et al., 2017; Eshete et al., 2017; Nshimyiryo et al., 2019
Pre-eclampsia via low birthweight; multiple births; small birth size	Akombi et al., 2017; Browne et al., 2015; Gebremedhin, 2015; Nshimyiryo, et al., 2019

Sub-Saharan Africa: Childhood Stunting Determinants (Cont.)

Determinants	Author(s)
Early marriage	Efevbera et al., 2017
Age of introduction to complementary foods	Bukusuba et al., 2017
Lack of caregiver knowledge about childhood stunting	Bukusuba et al., 2017; Mukunya et al., 2014
Food insecurity	Bukusuba et al., 2017; M'Kabi, et al., 2017
Diarrheal illness	Akombi et al., 2017; Asfaw et al., 2015
Pre-lacteal feeding	Asfaw et al., 2015
Low maternal height	Nshimyiryo et al., 2019
No de-worming medication during pregnancy	Nshimyiryo et al., 2019

Ethiopia: Childhood Stunting Determinants

Determinants	Author (s)
Presence of diarrhea in the past two weeks, male sex, and pre–lacteal feeding significantly associated with childhood stunting	Asfaw et al., 2015
Child caring practices, dietary diversity and breastfeeding status associated with childhood stunting	Abate and Belachew, 2017
Gender and socio-economic-demographic structure of the households, including imbalance of power, control of farm produce, physiological density, household size and dietary habits during pregnancy were associated with maternal and child undernutrition	Ersino et al., 2018
Childhood stunting associated with mother's education, child age and household wealth	Eshete et al., 2017
Advanced maternal age, rural residence, lack of antenatal care were associated with underweight	Nigatu et. al., 2018

Childhood Stunting in Zambia (DHS 2014)

- Childhood stunting is higher in rural areas (42%) than urban areas (36%), and Northern Province has the highest proportion of stunted children (49%), while Copperbelt, Lusaka, and Western provinces have the lowest (36% each).

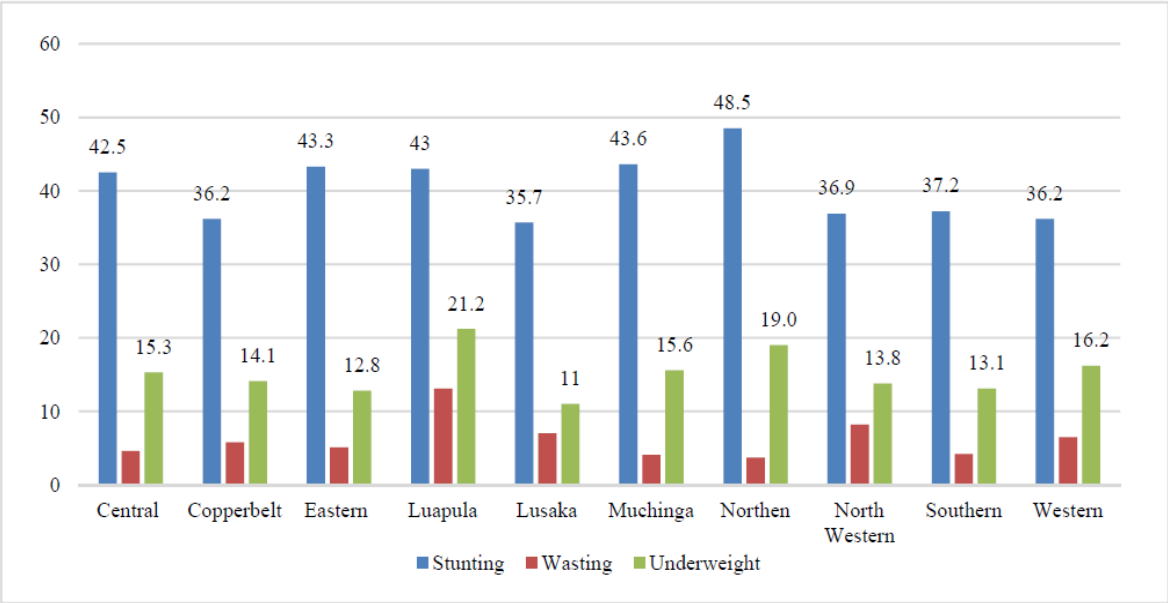


Figure 1. Incidence of stunting, underweight, and wasting of children (3-59 months) by province

Source: CSO, 2014.

Childhood Stunting in Zambia (DHS, 2014)

- Childhood stunting prevalence is highest (54%) in children age 18-23 months and lowest (14%) in children less than 6 months of age
- Over 50% of children who were small at birth are stunted
- 50% of children whose mothers are underweight (BMI <18.5) are stunted
- Only 18% of children whose mothers have more than a secondary education are stunted, compared with 45% of those whose mothers have no education
- Children in the wealthiest households (28%) are much less likely to be stunted than those in the poorest (47%)
- More stunted children in rural areas (42%) than in urban areas (36%)
- Stunting is higher in male (42%) than in female children (38%)
- Higher stunting levels among children born less than 24 months following the previous birth (46%) compared to those born 24 months or more after the preceding birth (34%)

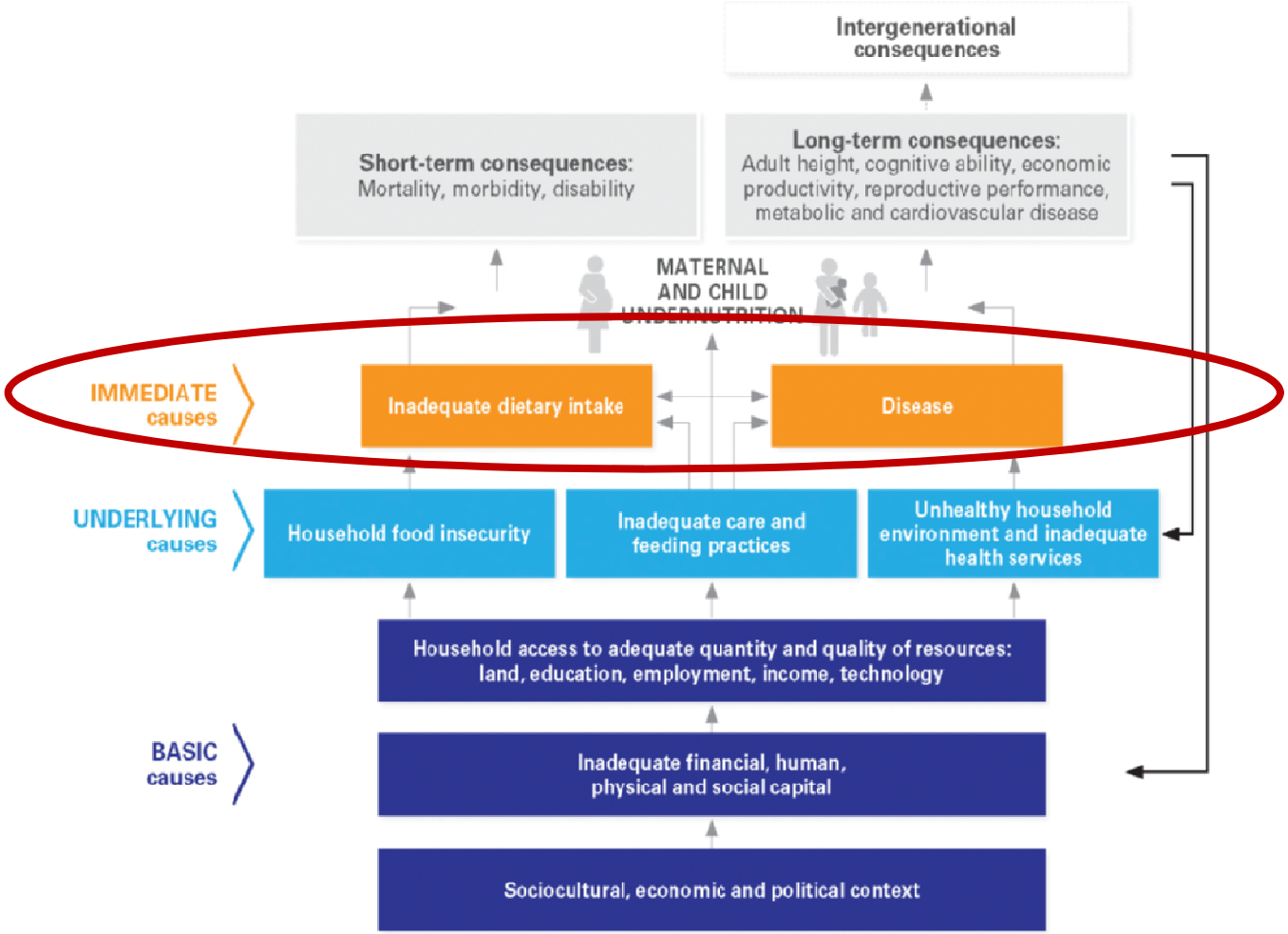
Zambia: Childhood Stunting Determinants

Determinants	Author (s)
First born children of adolescent girls more likely to be stunted	Fink et al., 2014
Sex and age of a child, mother's age and education, residence, wealth and duration of breastfeeding	Hangoma et al., 2017; Mzumara, et. al., 2018
Community of residence	Hangoma et al., 2017
Increased number of chickens (not livestock) associated with increased dietary diversity	Dumas et al., 2018
High diversification can improve nutrition, but may come at the cost of reducing household production efficiency	Mofya-Mukuka, 2016
Household income, maternal education, food insecurity status, mother's participation in nutrition training, and child dietary diversity found to significantly affect childhood stunting	Mulenga et. al., 2017

Nutrition-related Services in the Health System

and

Nutrition and Infectious Diseases



The black arrows show that the consequences of undernutrition can feed back to the underlying and basic causes of undernutrition, perpetuating the cycle of undernutrition, poverty and inequities.

Source: Adapted from UNICEF, 1990.

Nutrition-related Services in the Health System

- Several factors inhibiting women's participation in nutrition services (Bezabih et al., 2018)
- Conflicting priorities and limited knowledge of child feeding messages limit the uptake of nutrition-related services (Ruel-Bergeron et al., 2018)
- Controlling disease and increasing awareness of care for children and women are critical, specifically in settings with persistent global acute malnutrition (Young and Marshak, 2017)

HIV

- The impact of the malnutrition-infection cycle on the immune system is important due to the prevalence of HIV in Zambia (13%)

Impact	Author(s)
HIV exposed infants…	
…less likely to achieve motor milestones	Buonomo et al., 2015
…had poorer nutritional status	Chalashika et al., 2017; le Roux et al., 2019
…had shorter breastfeeding duration	le Roux et al., 2019
HIV-infected children do not respond as well as non-infected children to nutritional care	Jesson and Leroy, 2015
Women with low CD4 and those without ART delivered lower weight babies	Morden et al., 2016

Malaria

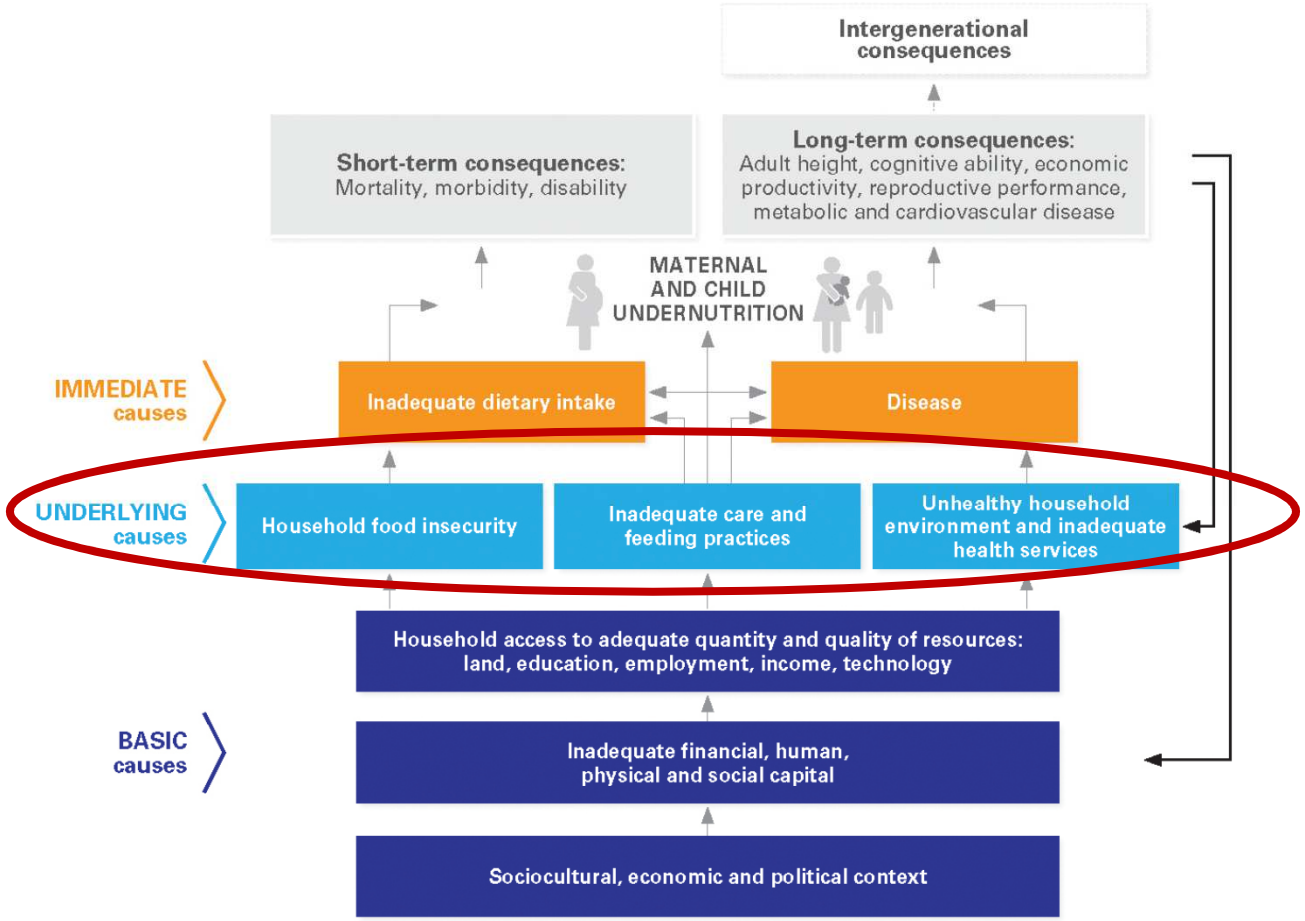
- Although malaria is a public health concern, evidence on the relationship between malaria and childhood stunting is limited

Literature review on the effects of malaria on childhood stunting (Jackson et al., 2017)
✓ Mixed evidence for effect of malaria on childhood stunting
✓ No trials of effect of malaria interventions on childhood stunting
✓ Insufficient evidence to include malaria as a determinant of childhood stunting
✓ Noted gap in literature on this topic
✓ Studies are bound to treat children for malaria and that extra surveillance precludes observation of effect of “natural” disease on childhood stunting

Access to Safe and Nutritious Foods

and

Feeding Practices for Children under 2



The black arrows show that the consequences of undernutrition can feed back to the underlying and basic causes of undernutrition, perpetuating the cycle of undernutrition, poverty and inequities.

Source: Adapted from UNICEF, 1990.

Access to Safe and Nutritious Food

- Staple foods are plentiful but were associated with higher proportions of childhood stunting and wasting (Amaral et al., 2018)
  - Diets are high in staple foods, i.e. maize, but low in foods that provide micronutrients or protein
- Micronutrient needs can be met with local food when several nutrient-dense but rarely consumed foods were included in daily diets (Arimond et al., 2018)
- Lack of access to a diverse diet negatively affected nutrition status (Fungo et al., 2016, Govender et al., 2016)
  - Access to forest foods, traditional crops and home gardens helped to increase food security and access to nutritional foods
- The relationship between dietary diversity and childhood stunting differ with the degree of stunting (Amugsi et al., 2017)
  - Dietary diversity interventions may have more impact on children at higher risk of malnutrition

Zambia: Access to Safe and Nutritious Food

Zambia-specific findings	Author (s)
Protein sources, such as fish, were associated with reduced childhood stunting, and may contribute to improved nutritional outcomes	Marinda et al., 2018
Limited intake of non-staple foods and low dietary diversity were identified as determinants for malnutrition	Mulenga, 2018; SUN Movement, 2017
Women of reproductive age lack financial resources, receive inflexible complementary feeding advice, and have competing priorities that compromised their dietary quality.	Grech et al., 2018
Women's diets were high in staple and plant based foods but lower in foods rich in micronutrients, especially iron and calcium	Grech et al., 2018
The maize economy is important and may negatively affect progress on diversifying diets and programmes to improve food availability and use	Acosta and Fanzo, 2012; NFNC, 2017
Small-scale egg production increased consumption of eggs, but no impact on child stunting, possibly due to short follow-up time	Dumas et al., 2018

Supplementation and Feeding Practices

- Food supplementation alone was not associated with preventing stunting *in utero* or up to 6 months after birth (Ashorn et al., 2015; Callaghan-Gillespie et al., 2017)
- In Burundi, projects showed success in reducing childhood stunting by providing rations for the full 1,000 days
  - Further supplementation with nutrient supplements were also successful, but care needs to be taken when creating the formulation for the rations (FANTA, 2018)
- In Zambia, early introduction to complementary foods is common and sub-optimal complementary feeding practices are also common (NFNC, 2017)
- In Benin, maternal food preparation behaviors (including refrigeration) can prevent child malnutrition, controlling for biological and socioeconomic factors (Nagahori et. al., 2018)

Supplementation and Feeding Practices (cont.)

- In Ethiopia, mother's place of residence in urban settlement, and postnatal checkup, were significantly associated with timely initiation of complementary feeding (Ayana et al., 2017)
- Supplementing maternal diets during pregnancy and for 6 months postpartum, and infant diets after 6 months with nutrient supplements (SQ-LNS) did not promote child growth by 18 months in rural Malawi (Ashorn et al., 2015)
- In Ethiopia, nutrition education and recipe demonstrations given twice monthly for 6 months resulted in improved maternal knowledge and better child nutritional status (Mulualem et al., 2016)
- In Kenya, post-partum depression was associated with reduced breastfeeding and underweight infants and was higher among mothers of malnourished children (Haither et al., 2018; Madeghe et al., 2016)

Childhood Stunting and Feeding Practices

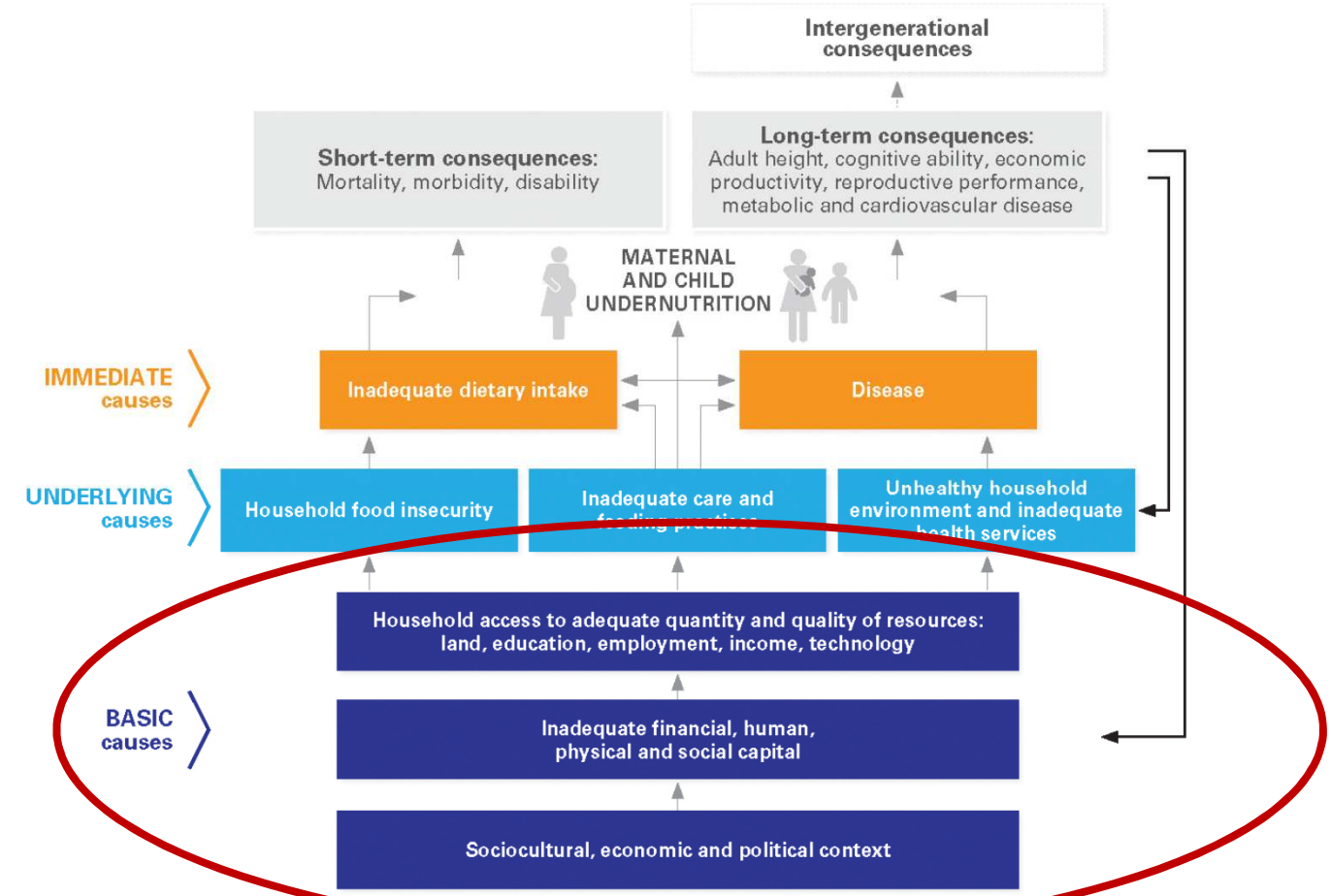
Global determinants of childhood stunting associated with feeding practices include

- ✓ Place of residence (Ayana et al., 2017)
- ✓ Nutrition education (Mulualem et al., 2016).
- ✓ Maternal food preparation behaviors (Nagahori et al., 2018)
- ✓ Post-partum depression (Haither et al., 2018; Madeghe et al., 2016).
- ✓ Women's empowerment (Na et al., 2015)
- ✓ Caregiver's knowledge about breastfeeding (Nankumbi and Muliira, 2015)
- ✓ Caregiver's knowledge about complementary feeding (Nankumbi and Muliira, 2015)
- ✓ Influence of culture custodians on the caregivers (Nankumbi and Muliira, 2015)
- ✓ Caregiver's burden of other responsibilities (Nankumbi and Muliira, 2015)

Household Hygiene Practices

and

Environmental and Social Considerations



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Source: Adapted from UNICEF, 1990.

Zambia: Household and Community Hygiene Practices

Practices	Author(s)
Poor WASH conditions negatively affect child growth and development due to repeated exposure to enteric pathogens	Cumming and Cairncross, 2016
Limited access to safe water and sanitation, and poor hygiene increase risk of infections that can contribute to undernutrition	NFNC, 2017; SUN Movement, 2017
Continued sensitization on handwashing practices (including in schools) and implementation of hand washing facilities improved adherence to hand washing	World Vision, 2017
Headmen support and advocacy for toilet construction resulted in high acceptance among community members to adopt new behaviors	World Vision, 2017
Community-designed play-yard may have protected children "from ingesting soil and livestock feces"	Reid et al., 2019

Environmental Considerations

Considerations	Author(s)
High population density areas, and areas with low micronutrient densities, harbor the greatest potential for using agricultural fortification as a way to combat malnutrition	Berkhout et al., 2019
Dietary diversity increased in wetlands as compared to drylands	Chakona et al., 2017
Agriculture training and education program in nutrition, health care, and child stimulation resulted in positive linear growth for children but did not improve stunting	Marquis et. al., 2018
Bio-fortified maize improved quality protein intake in young children	Gunaratna et al., 2019
Information on aflatoxins is mixed	Chen et al., 2018; Mupunga et. al., 2017; Watson et al., 2018

Social Considerations (e.g., gender, ethnicity, wealth)

Considerations	Author(s)
Most robust predictors of reductions in undernutrition worldwide: secondary education for girls, reductions in fertility, accumulation of household assets, and increased access to health care	Gillespie et al., 2013; SUN Movement, 2017
High levels of poverty exacerbate the nutrition situation	NFNC, 2017
Gender inequality is associated with acute and chronic undernutrition due to links between gender and intervention areas and influence of gender in agriculture, health, education, community development and WASH	FAO, 2012
Increasing height (of child) is associated with increased wages for men and women; but mixed evidence on association between economic growth (at national level) and childhood stunting	McGovern et al., 2017

What works, gaps and conclusions

What Has Worked?

Successful approaches	Author(s)
Multi-faceted approach which included investment in agriculture, poverty reduction, feeding initiatives, and a stable political environment	Gillespie et al., 2013
Building an evidence base on how to scale up nutrition-specific and nutrition-sensitive interventions with quality and equity	Gillespie et al., 2013
Economic empowerment for women	NFNC, 2017
Specific targeting of mothers with children that have moderate acute malnutrition	Kajjura, Veldman and Kassier, 2019
Nutrient-dense food supplements with local food	Gewa et al,. 2014
Health extension workers, supported by the government, and trained to provide nutrition-specific and nutrition-sensitive interventions	Lemma and Matji, 2013

Gaps Identified in the Literature

Gaps in understanding	Author(s)
Effectiveness of commercial sector involvement	Gillespie et al., 2013
Enforcement and implementation of policies to improve nutrition and food standards	Zambia Nutrition Advocacy Plan, 2017
New or modified WASH strategies beyond traditional interventions to address exposure pathways during 1000 days	Cumming and Cairncross, 2016
Effect of drought on malnutrition, including coping strategies and food aid targeting	Bauer and Mburu, 2017
Biological efficacy to reduce microbial ingestion	Reid et al., 2018
Relationship between aflatoxin exposure and undernutrition	Watson et al., 2017
How to use process evaluations to understand what's preventing impact	FANTA, 2018

Conclusion

Other points to consider

- ✓ Nutrition-specific interventions alone cannot address childhood stunting (Bhutta et al., 2013; Global Nutrition Report, 2017)
- ✓ Interventions do not always have the desired impact on childhood stunting (Humphrey et al., 2018; Kumar et al., 2018; Luby et al., 2018; Null et al., 2018)
- ✓ Need to promote the production of diverse and nutritious foods (GIZ, 2017)
- ✓ Need to strengthen early warning systems and local response capacity related to agro outbreaks and crop failures (IAPRI, 2018)
- ✓ A paradigm shift from interventions focusing solely on children and infants to those that reach families, improve living environment, and nutrition is needed (Danaei et al., 2016)
- ✓ Need to better understand cross-cutting elements, like gender, livelihoods, and seasonality, or inter-linkages and pathways that show one underlying cause driving another (Young and Marshak, 2017)
- ✓ Stunted children are at an increased risk for obesity, and interventions need to carefully planned around this issue (Vonaesch et al., 2017)

Zambia-specific Implications and Next Steps

Zambia: Current Interventions and Implementation Challenges

Zambian interventions & implementation challenges

In several communities across Zambia, crucial elements for improved nutrition include *(Moramarco et. al., 2016)*

- ✓ Preventing deterioration of malnutrition
- ✓ Adequate antiretroviral treatment
- ✓ Extending duration of feeding supplementation

In Eastern Zambia *(Weiss, 2016)* ***-*** *qualitative assessment*

- ✓ Training (caregivers) alone cannot improve IYCF practices
- ✓ Elements contributing to successful implementation:
  - ✓ Coaching support for caregivers to understand the behavior change process
  - ✓ Support of community based staff to use job aides
  - ✓ Sharing assessment results

In Chipata *(Fink et al., 2017)*

- ✓ Home-based growth monitoring (HBGM) alone did not affect child development
- ✓ Community-based growth monitoring (CBGM) + nutritional supplementation (NS) reduced children's development scores (the intended positive effect)
- ✓ HBGM is a cost-effective tool for increasing parental efforts toward reducing children's physical growth deficits

Zambia: 1000 Most Critical Days Program (MCDP) I

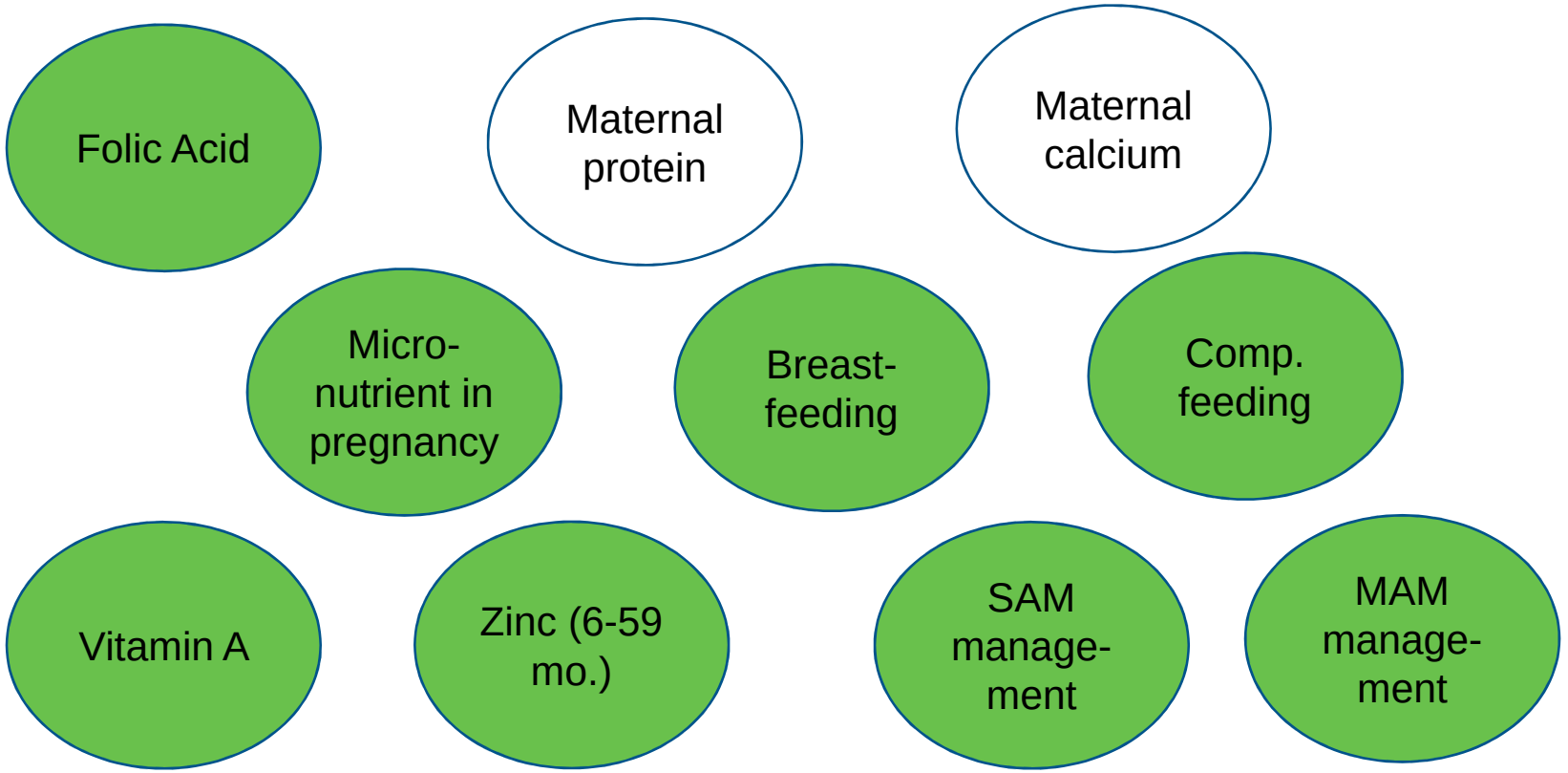
- The National Food and Nutrition Commission identified several challenges and gaps in MCDP-I (NFNC, 2017)
  - ✓Low expansion and coverage of high impact interventions
  - ✓Low profile given to nutrition in the sectors
  - ✓Inconsistent policy and strategic direction on nutrition-sensitive programming
  - ✓Limited systems to reinforce sector accountability to implement the program
  - ✓Inadequate technical capacity and institutional systems to support program implementation
  - ✓Inadequate convergence of interventions and services to the household level

GRZ SUN Interventions at Community Level

- Social and Behavioral Change Communication:
  - Diet for Pregnant Women
  - Diet for Breastfeeding Women
  - Exclusive Breastfeeding
  - Complementary Feeding
  - Feeding the Sick Child
- Micronutrient Supplementation:
  - Folic Acid for Pregnant Women
  - Iron Supplementation for Pregnant Women
  - Vitamin A for infants and young children
  - Zinc supplementation for infants and young children
- Early initiation of breastfeeding (at delivery)
- Growth Monitoring for young children
- Deworming for young children
- Water and Sanitation services
- Nutrition-sensitive Agriculture promoting Dietary Diversity

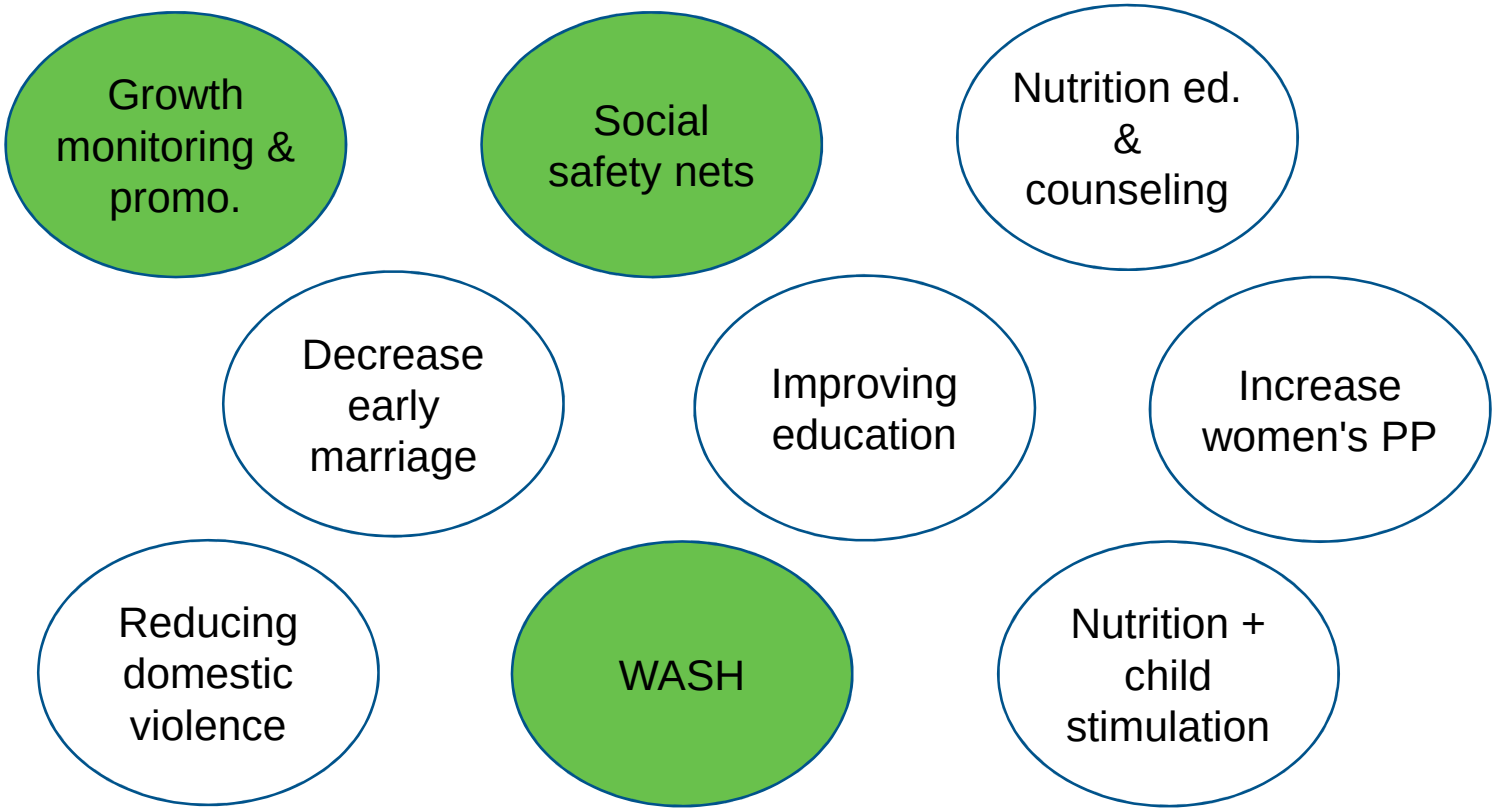
Childhood Stunting Epidemiology in sub-Saharan Africa (Nutrition-Specific)

- Scaling up 10 (nutrition-specific) interventions to 90% coverage could reduce childhood stunting by 20% (Bhuttah et al., 2013)



Childhood Stunting Epidemiology Global (Nutrition-Sensitive)

- Hossain, 2017; Ruel, 2013; Vir, 2016



Relationship of GRZ SUN Interventions to Literature Review Findings

- **GRZ SUN interventions align with recommended interventions and offer opportunities to contribute to research gaps on the following:**
  - Early initiation of breastfeeding
  - Diets for pregnant and breastfeeding women
  - Feeding the sick child
  - Nutrition-sensitive agriculture promoting dietary diversity

"Successful interventions were characterized by a combination of political commitment, multi-sectoral collaboration, community engagement, community based service delivery platforms, and wider program coverage and compliance. Even for similar interventions, the outcome could be compromised if the context differed."

- **-- Hossain, 2017**

Gaps to consider

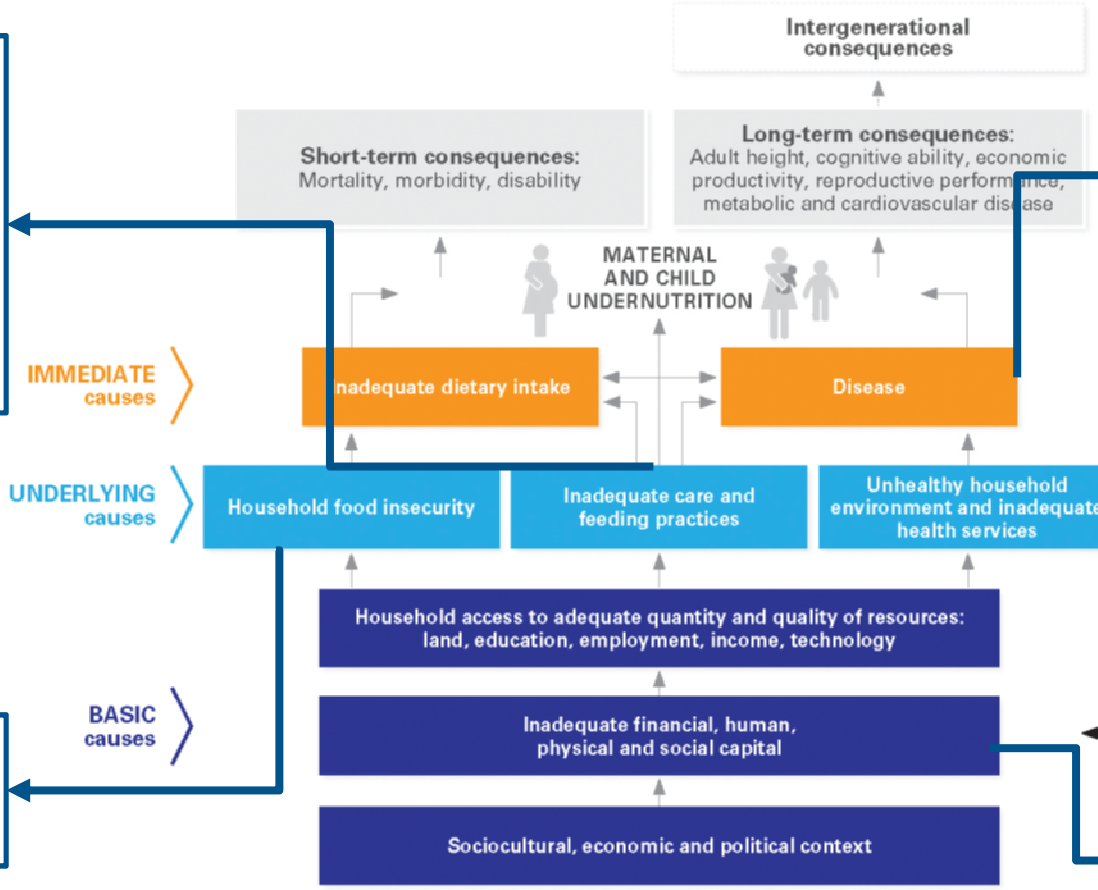
How to implement effective behavior change interventions related to complementary feeding

How to integrate delivery of health services at facility and community level

What is the prevalence, impact and way to reduce aflatoxins and enteric disease pathogens

How to improve nutrition services

How the commercial sector can contribute to improving child nutrition status



The black arrows show that the consequences of undernutrition can feed back to the underlying and basic causes of undernutrition, perpetuating the cycle of undernutrition, poverty and inequities.

Source: Adapted from UNICEF, 1990.

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