BUILDING THE EVIDENCE FOR IMPROVED INFANT AND YOUNG CHILD COMPLEMENTARY FEEDING PRACTICES AMONG THE URBAN POOR IN SUB-SAHARAN AFRICA

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Abbreviations

AMREF	Africa Medical Research Foundation
APHRC	African Population and Health Research Center
CHV	Community Health Volunteer
DHS	Demographic and Health Survey
IYC	Infant and Young Child
IYCF	Infant and Young Child Feeding
IYCN	Infant and Young Child Nutrition
LMIC	Low and Middle-Income Countries
MAD	Minimum Acceptable Diet
MCH	Maternal and Child Health
MDDS	Minimum Dietary Diversity Score
MMF	Minimum Meal Frequency
MoH	Ministry of Health
NUHDSS	Nairobi Urban and Health Demographic Survey
SSA	Sub-Saharan Africa
UK	United Kingdom
UNICEF	United Nations Children's Fund
WHO	World Health Organization

Executive Summary

It is estimated that by 2025, more than half of the population in developing countries will live in urban areas. Yet, the expansion of economic opportunities and access to critical services in most developing countries is lagging behind population growth and this has resulted in large urban poor populations with challenges impacting on their health. Slum residents remain vulnerable to food insecurity due to chronic poverty which is associated with poor infant and child feeding practices. This contributes to malnutrition and nutrition deficiencies of these children. Our study sought to understand the current evidence on nutrition-specific and nutrition-sensitive interventions for improving the nutritional status of infants and young children (IYC) living in urban poor areas who are receiving complementary foods, with a focus on both Kenya and Malawi. In so doing we aimed to understand the evidence that should be prioritized to improve infant and young child feeding (IYCF) programmes and policies. Also of relevance is to understand the social and physical drivers affecting IYC complementary feeding and particularly the role of rapid urbanization in sub-Saharan Africa (SSA).

We adopted a mix of methods to generate evidence on IYC nutrition among the urban poor. We started with a rapid review of literature to explore nutrition-specific and nutrition-sensitive interventions that have been done to improve the nutrition of IYC receiving complementary foods in rapidly urbanizing SSA. This review was expanded to all urban poor populations in low and middle income countries due to a lack of studies within SSA. Secondly, we conducted an analysis of secondary data to understand the status of infant and young child nutrition (IYCN) as well as the social and physical drivers of appropriate IYC complementary feeding. The datasets included the most recent Demographic and Health Surveys and the Maternal and Child Health Survey by the Nairobi Urban and Health Demographic Surveillance System (NUHDSS). The secondary data analysis was guided by the Fenske, Burns, Hothorn, and Rehfuess (2013) framework for child stunting. The framework defines the underlying, intermediate and immediate causes of child malnutrition, with complementary feeding practices classified as an intermediate cause of stunting.

Lastly, we employed a Delphi-based consensus-generating strategy to gather data from key stakeholders in order to identify and prioritize research gaps to inform IYCN programmes and policies that target complementary feeding. Delphi is a technique for "harnessing and organising judgement in problems that are complex and require intuitive interpretation of the evidence or informed guesswork" (Thangaratinam & Redman, 2005). The stakeholders included policy stakeholders working with the ministries of health in both Kenya and Malawi, non-governmental organizations and academia. The Delphi approach included an initial meeting to generate ideas and clarity on potential items; this led to development of a tool which consisted of 55 items for stakeholders to respond to (second phase), and a third round that sought to build consensus on selected key areas based on the results of the first round.

The objectives of the program of research were threefold: 1) to establish the current evidence on nutrition-specific and nutrition-sensitive interventions for improving nutrition of IYC receiving complementary foods in the context of rapid urbanization in sub Saharan Africa (*rapid review*); 2) to determine the drivers of complementary feeding practices and behaviours in sub Saharan Africa and Nairobi slums (*secondary data analysis*); and, 3) to identify the highest ranking evidence or research gaps for improving IYCF programs and policies among the urban poor in SSA (*Delphi*).

Key results from the rapid review:

- There were few nutrition-sensitive or nutrition-specific intervention studies focusing on IYC complementary feeding in low-income urban settings in SSA published between 2014 and 2018, with only five published intervention studies in low and middle income countries during the period, with only one coming from SSA. Two studies included both nutrition-specific and nutrition-sensitive interventions, two focused on nutrition-specific and one focused on nutrition-sensitive interventions. Four of these interventions were successfully carried out but their effect on child nutritional status was minimal.
- The outcomes investigated by the studies were varied although there was more focus on nutritional status outcomes than indicators of diet in the studies included. Indicators of diet that were studied were minimum acceptable diet (MAD) and minimum dietary diversity score (MDDS)

Key results from the secondary data analysis:

- Almost one in every two children in urban poor settings in Nairobi, Kenya do not eat the required number of meals in a day as measured by the minimum meal frequency (MMF). In most cases (60%) the meals are composed of less than four of the prescribed food groups as measured by the minimum dietary diversity score (MDDS) and only one-third (34%) of children met the minimum acceptable diet (MAD).
- In the SSA countries analysed (n=24), a paltry 15% of the children met MAD, and this varied significantly between countries (from 0.6% in Lesotho to 32.1% in Ethiopia).
- The prevalence of stunting among children aged between 6 and 23 months in Nairobi slums (43%) was higher than in all of the urban poor settings in Kenya (20%) based on DHS data. In urban sub-Saharan Africa, across the 24 countries studied, 24% of children living in the poorest 40% ranked households were stunted.
- From the DHS analysis, children born to mothers with primary and at least secondary education, were respectively 1.1 and 1.5 times more likely to meet MAD compared to mothers with no education. Also, neither gender of the child nor relative household socio-economic status (measured by wealth index) within poor urban areas were significant drivers of MAD.
- In both the Nairobi slum and DHS datasets, we did not find any significant association between stunting and MAD - in either the bivariate or full logistic regression analysis.
- From the DHS data analysis for the urban poor, diarrhoea and the sanitation were significantly associated with stunting. Children who experienced episodes of diarrhoea in the last 14 days or exposed to unimproved toilet facilities had an increased likelihood of stunting (OR of 1.23 and 1.28 respectively).
- Among the rural poor, women's employment was an important driver of stunting. In particular, work was not protective for stunting among children from poor families.

Key results from the Delphi consensus-generating exercise:

- There was consensus among stakeholders from across SSA that poor quality of care, lack of social support for caregivers and community health volunteers (CHVs), insufficient maternal education, unemployment, food insecurity, and lack of clean water, and sanitation and hygiene were known common causes of child malnutrition among the urban poor;
- There was a lack of consensus as to whether the causes of malnutrition in urban poor areas are as well understood as in rural areas;
- There was also consensus on the need to explore micronutrient supplementation, complementary feeding, and safety and hygiene conditions of informal day care centers as potential areas of interventions through which to improve IYCF;
- There was agreement amongst stakeholders that interventions around IYC nutrition exist but there was a lack of consensus surrounding monitoring/ evaluation of these existing intervention programmes and the perceived efficacy of extant programmes;
- Interventions should be holistic and address a combination of the identified causes of malnutrition. In particular, empowering urban poor women by providing education and information will enhance their decision-making autonomy and improve the nutritional wellbeing of their children and this was endorsed as an important area;
- There was a lack of consensus on how the interventions can be implemented in urban poor settings, likely reflecting differences in what might be needed across the different countries.

Conclusions

The status of IYCF in urban poor settings in Kenya is deficient, and this is happening alongside poor child growth, as demonstrated by the high prevalence of stunting. Yet, few interventions, yielding small effects sizes, have focused on this important segment of the population. The urban poor are faced with complex and unique challenges, and this calls for more holistic or systems-based approaches in designing and implementing IYCF interventions. In particular, the design, testing, monitoring and implementation of nutrition-specific and nutrition-sensitive interventions should be prioritized as well as the implementation of existing policies targeting the urban poor in Kenya.

1 Introduction

Malnutrition is the leading cause of death among children under five years, yet its prevalence remains high (WHO Multicentre Growth Reference Study Group, 2006). The joint child malnutrition estimates by UNICEF, WHO and World Bank Group showed that the global prevalence of stunting among the under-fives was at 22.9% in 2016 (UNICEF, WHO, & World Bank, 2017). In absolute numbers, this translates to approximately 154.8 million children under five, globally. A child is said to be stunted when their length or height-for-age is below −2 standard deviations (SDs) of the World Health Organization's (WHO) child growth standard median. The same report estimated the prevalence of stunting among this age group in sub-Saharan Africa to be at 34.2% in the same year. Kenya and Malawi, the two countries of primary focus in this project, noted an overall decline in the prevalence of stunting from 41% to 26% (Kenya) and 54.6% to 42.4% (Malawi) between the years 2000 and 2014. However, this prevalence remains higher than the global estimate of 22.9%.

Stunting, also known as impaired linear growth, has been linked to impairment of early child development, increased susceptibility to short-term morbidity and mortality (as well as reduced productivity and learning capacity), and increased susceptibility to non-communicable diseases later on in life (Stewart, Iannotti, Dewey, Michaelsen, & Onyango, 2013). The causes of stunting are numerous with suboptimal complementary feeding, including the inappropriate timing of introduction of solid foods in low and middle-income countries (LMICs), being one of the major causes (Marriott, White, Hadden, Davies, & Wallingford, 2012). Despite a decrease in the levels of stunting, IYCF practices have deteriorated, or rather continue to worsen. For instance, between 2008 and 2014, the proportion of children aged 6-23 months who received the minimum acceptable diet decreased from 39% to 22% in Kenya and from 19% to 8% in Malawi (KNBS, 2015; NSO & ICF, 2017). Other factors such as maternal under-nutrition, maternal stunting, infant infections, and maternal infections prior to birth contribute to stunting of their children after birth (Stewart et al., 2013).

While stunting can manifest from as early as birth, it often occurs after 6 months; this coincides with the complementary feeding period. In the SSA context, complementary feeding is typically characterized by poor quality foods and low diet diversity, resulting in inadequate micronutrient nutrition in the children. Poor feeding practices such as non-responsive feeding, inconsistent feeding, inadequate feeding during illnesses, provision of meals that are not nutritious, non-adherence to adequate sanitation and hygiene, as well as unsafe preparation and storage of feeds (Stewart et al., 2013).

Research evidence has demonstrated the role played by interventions to prevent and reduce stunting and deaths in the under-fives. In particular, interventions which promote optimal IYCF practices could prevent up to 20% of deaths in under-fives in countries with high child mortality (Jones, Steketee, Black, Bhutta, & Morris, 2003; Kramer & Kakuma, 2004). Moreover stunting is associated with poverty and poor living conditions. Approximately one-third of urban residents in LMICs live in slums and are poor, with an additional 100,000 moving in daily (UNDESA, 2017). Children living in slums are more likely to experience under-nutrition than other urban children (Unger, 2013). In Kenya, nearly 50% of children under five living in urban slums are stunted (compared to 26% total urban and 37% rural) (Kimani-Murage et al., 2015; Olack et al., 2011). Nevertheless, evidence-based interventions to improve infant and young child (IYC) health/nutrition among the urban poor are lacking (Ezeh et al., 2017; Lilford et al., 2017).

Africa is experiencing rapid urbanization and nutrition transition with consequent changes in the social and physical environments and shifts in food habits and practices. By 2050, it is estimated that 56% of Africans will live in urban areas (up from 40% in 2014) (United Nations, 2014). Little is known about how urbanization influences IYC feeding practices. IYC nutrition is an important element of growth. Indeed, children who receive optimal feeding are less likely to be stunted. Despite the importance, children in low and middle-income countries experience sub-optimal feeding and are exposed to the risk of malnutrition and mortality.

A 2017 scoping review identified gaps in knowledge regarding slum-based children, who are the most at risk of malnutrition, for appropriately targeting interventions (Goudet, Griffiths, Bogin, & Madise, 2017). For example, there is a lack of evidence on nutrition interventions in slum environments and almost no evidence regarding the potential for nutrition-sensitive interventions in slums. This is despite a large proportion of nutrition-specific interventions in isolation being found to be unsuccessful in slum environments. In addition, a recent Cochrane review which assessed the impact of nutritional interventions to reduce stunting in infants and children under five years old in urban slum in low and middle income countries (Sophie, Barry, Nyovani J., & Paula, 2019). Though

nutritional interventions reported in this Cochrane review had potential to improve child growth, they were from outside slum contexts and their effects were small when implemented in slum contexts (Sophie et al., 2019). Recommendations from these reviews suggest that nutrition-specific interventions alone are unlikely to be successful in slums because of poverty-related environmental challenges. They identify a need for multi-sectorial interventions that combine both nutrition-specific and sensitive interventions as well as assessing the effects of practices and policies by governments and non-government organizations. They further identify the need for interventions taking place in poor urban areas to provide more information about the context and adaptations which are undertaken to implement the intervention because of the context.

The highly mobile nature of slum populations also makes programming more challenging. The review on nutritional interventions for preventing stunting in children (0 to 5 years) living in urban slums (Goudet et al., 2017), shows how nutrition-specific interventions have the potential to decrease stunting in non-slum contexts but identifies a lack of consistent evidence of such nutrition-specific interventions working in these settings. Challenges linked to urban service provision should be considered and potential methods of adaptation should be explored further if nutrition-specific interventions are to improve low birth weight and stunting in urban poor environments.

In the context of the rapid urbanization taking place in SSA, and the growth of the urban poor population, there are shifts in food habits and feeding practices that adversely affect the nutrition status of not only children, but potentially the entire population. The effects of the shifts are worse among children. It is therefore imperative to better understand IYCF patterns, practices and drivers among the urban poor in African cities in order to support the design and implementation of effective urban nutrition programs. This is important in strengthening the understanding of key potential pathways for improving IYCF and reducing the risk of stunting in poor urban areas in SSA.

We therefore adopted an innovative approach by developing a UK-Africa interdisciplinary network with the expertise to support interventions to promote optimal IYC feeding practices in rapidly urbanising environments. The network is called the UK-Africa Network to Improve the Nutrition of Infants and Young Children Living in Poverty (NINO LIP) in urbanising sub-Saharan African countries. The network adopted a multi-pronged approach to understand the practices and interventions for improving the nutrition of IYC receiving complementary foods in the context of urbanizing SSA. The approach involved three key streams:

1) A rapid review to document the existing literature on nutrition-specific and nutrition-sensitive interventions targeting the urban poor in LMICs.

2) Analysis of demographic and health survey data, and pre-existing data from slums in Nairobi, that provided evidence on the social and physical drivers of appropriate IYC complementary feeding.

3) Engagement of key stakeholders and policymakers working in the field of IYCF using a modified Delphi (consensus gathering) technique, which identified and ranked evidence emanating from the rapid and secondary analyses, and from stakeholder input, for improving IYC feeding programmes and policies among the urban poor.

Through this approach we aimed to generate evidence to drive future research and inform policies to improve the nutritional status of infants and young children (under two years) living in poverty in sub-Saharan African (SSA) countries experiencing rapid urbanization.

The specific objectives of the research were to:

1) Establish the current evidence on nutrition-specific and nutrition-sensitive interventions for improving nutrition of IYC receiving complementary foods in the context of rapid urbanization in SSA.

2) Determine the drivers of complementary feeding practices and behaviours in SSA and Nairobi Slums through secondary data analysis.

3) Identify the highest ranking evidence or research gaps for improving IYC feeding programs and policies among the urban poor in SSA.

2 Methods

In order to address the research objectives, we adopted a mixed methods approach involving a rapid literature review, secondary analysis of existing datasets, and a modified Delphi-based exercise. These approaches are described in detail, below:

2.1 Rapid literature review

The rapid literature review aimed to synthesize existing research evidence on the effectiveness of nutrition-specific and nutrition-sensitive interventions on the nutritional status of IYC (aged 6-59 months) who are receiving complementary foods and who are living in urban poor areas in low and middle incomes countries (*Research objective 1*). We developed and published a protocol (to aid in the rapid review) in PROSPERO International prospective register of systematic reviews. The literature search focused on peer-reviewed articles written in English and searched the MEDLINE, EMBASE, Science Direct, Web of Science, Scopus, and African Index Medicus databases. Attempts were also made to include grey literature.

Following the review by Goudet et al. (2017), which covered the period up to 2013, our rapid review targeted children aged between 6 and 23 months living in urban poor households in low and middle income countries and focused on studies published between 2014 and 2018 as these years were not covered by the previous review.

2.2 Secondary Data Analysis

We conducted secondary analysis to determine the drivers of complementary feeding practices and behaviours in Sub Saharan Africa and Nairobi slums (*Research objective 2*). Two main sources of data were used for this purpose: The Demographic and Health Surveys (DHS) for SSA and the Nairobi slums maternal and child health (MCH) study. DHS are nationally representative data collected every five years in all countries in SSA. The DHS data were restricted to urban households that were ranked as poorest (bottom 40%). The analysis was restricted to children aged between 6 and 23 months and on two main outcomes: 1) stunting and 2) minimum acceptable diet appropriate for a child's age based on the WHO classifications for assessing IYCF practices. The DHS included the latest datasets (collected since 2013) from 24 SSA countries and focused on the bottom 40% of urban households ranked as poor using a computed urban specific wealth index.

The MCH study was a longitudinal study conducted by the African Population and Health Research Center (APHRC) between 2007 and 2010, and nested within the Nairobi Urban Health Demographic Surveillance System (NUHDSS). It is one of the few data sources available on infant and young child feeding practices in the slum environment in urban SSA. The study enrolled children from birth and their mothers and prospectively followed them until the age of 5. Additional follow-up of the children and recruitment of new children was carried out between 2012 and 2014. By 2014, the study had recruited about 8000 children.

The secondary data analysis of both the Nairobi slum data and the DHS was guided by the Fenske et al. (2013) framework. The framework defines the underlying, intermediate and immediate causes of child malnutrition. In particular, the framework helped identify the extraction of specific variables for inclusion in the analysis.

2.3 Construction of key indicators

The first step was identification of countries with the most recent DHS survey for inclusion in the secondary data analysis, with a total of 24 countries fitting the inclusion criteria. This was followed by extraction of variables of interest for each country as well as the Maternal and Child Health Nairobi slums Survey by APHRC. Thereafter, we constructed a wealth index to identify the poorest households and identified the IYCF indicators: minimum dietary diversity score (MDDS), minimum meal frequency (MMF) and minimum acceptable diet (MAD). We used the WHO classification to compute the IYCF indicators (WHO, 2008):

Stunting: We classified children with height for age (HAZ) z-scores of below 2 standard deviations as stunted.

MDDS: A child was categorized to have met the MDDS if they were aged between 6 and 23 months and had received at least four foods from the seven food groups during the previous day. The seven food groups included: dairy products, cereals/grains, roots and tubers; legumes and nuts; flesh foods (meat, fish, poultry and liver/organ meats); eggs; vitamin A-rich fruit and vegetables, as well as other fruit and vegetables.

MMF: A child was categorized to have met the MMF if she/he was aged between 6 and 23 months and had in the previous day received solid, semi-solid or soft foods the recommended minimum number of times. The indicator was developed separately for the breastfed and non-breastfed children. For the breastfed children, the frequency varied by age; those aged between 6 and 8 months should obtain a minimum of two meals, while the 9 to 23 months should receive at least three meals in

a day. For the non-breastfed, irrespective of their age, they should at least have four meals, which include milk feeds. According to WHO, a meal is composed of solid, semi-solid foods and snacks (WHO, 2008).

MAD: This indicator combined both the MDDS and MMF indicators. For the breastfed children, a child was categorized to have met MAD if she/he met both the MDDS and MMF indicators. For the non-breastfed children, besides meeting both the MDDS and MMF, they also ought to have received at least two milk feeds.

Wealth Index: We reconstructed the DHS wealth index for each country, stratifying by area of residence (urban and rural) and excluding sanitation measures (toilet type and water sources) using the approaches described by the DHS (Rutstein, Undated). We excluded water and sanitation variables from the wealth index because we were interested in their effect, independent of their association with wealth, on stunting. We first dichotomized the assets and amenities (roofing, wall and flooring materials) and type of cooking fuel indicators. Using Principal Component Analysis, we computed a composite score based on the assets, amenities, number of sleeping rooms, land size and the number of animals belonging to the household separately for each country using the DHS procedures. The computed score was thereafter categorized into five equal groups from the poorest (1) to the richest (5).

2.4 The modified Delphi technique

Thangaratinam and Redman (2005) define Delphi as a technique for "harnessing and organising judgement, particularly in problems that are complex and require intuitive interpretation of the evidence or informed guesswork". In this study, we used a modified Delphi approach to build consensus on views from experts working in the field of child nutrition, particularly complementary feeding, and with knowledge on nutrition-specific and nutrition-sensitive interventions. The development of the Delphi tool comprised three phases: first, a workshop brought together selected experts to brainstorm on the status of IYCF among the urban poor. Specifically, the discussions focused on understanding whether there are other groups doing similar work; whether nutrition is a problem among children aged 6 to 23 months in general and specifically among the urban poor; what has worked and not worked; existing policies and their effectiveness; potential evidence gaps and what needs to be done to bridge the gaps.

The discussions led to the development of an initial Delphi tool which consisted of 55 items grouped into three parts: i) current nutrition status of urban poor children (11 items); ii) what is already known regarding IYCF among the urban poor (18 items); iii) what future work is needed and how it can be done (26 items). The tool was shared online with 67 identified stakeholders as well as the African Nutrition Society members, out of which 44 responded. We used the snowballing approach to identify participants for the Delphi process. The participants included: 1) government officials in the ministries of health, gender and children, agriculture, and directorates in the line ministries such as family health and at both national and county levels in Kenya and Malawi; 2) non-government stakeholders including UNICEF, Save the Children, the Food and Agriculture Organization, and the African Nutrition Society members with knowledge and experience on IYCF in urban poor populations within sub-Saharan Africa, and, 3) from academia. The results of the second round identified areas with consensus, and others that lacked consensus. Using the evidence, we designed a third and final round targeting those responding from the first round in order to build consensus on critical areas.

2.5 Data analysis

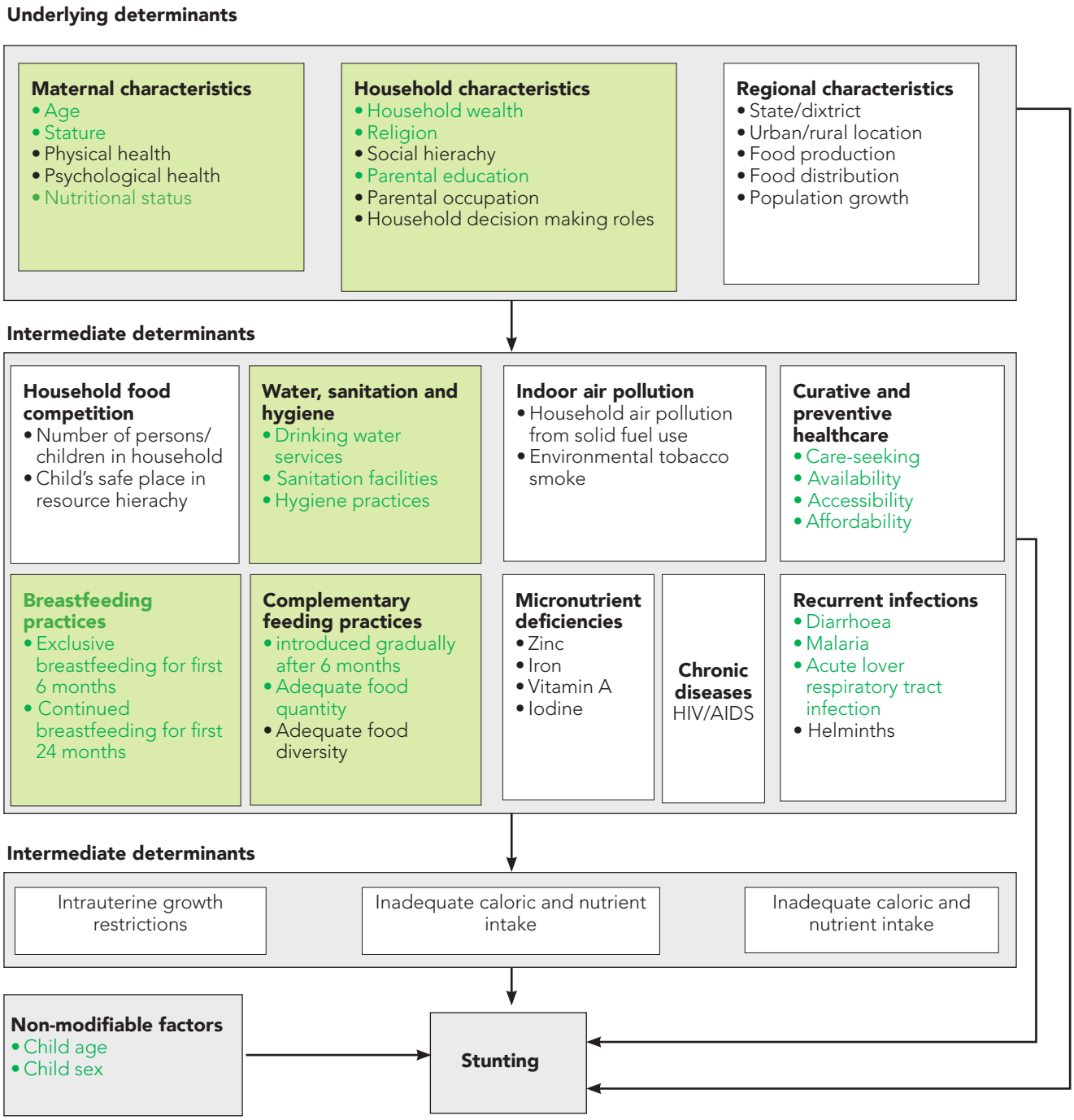
The data analysis techniques employed for the secondary data analysis included both descriptive statistics and regression analysis. That is computation of frequencies, percentages and means for the descriptive statistics and logistic regression. The logistic regression models were guided by the Fenske's framework [Figure 1] and aimed at establishing the drivers of minimum acceptable diet (MAD) in the context of the urban poor. We also examined the association between MAD and stunting, taking into consideration other known determinants including child, maternal and household characteristics. The DHS data were weighted and we adopted a multi-level approach in order to take into consideration clustering effects at the country level.

For the Delphi study, we grouped items based on the broad areas of interest and based on the study tool, which had three main sections: a) the nutritional status of urban poor families; b) what is already known regarding IYCF among the urban poor and, 3) what future work is needed on IYCF and how it can be done. We summarized the responses to each of the items to establish whether there was consensus or a lack of it. The items were rated on a 5-point Likert scale from strongly agree to strongly disagree. For an area to have consensus, we looked for skewing towards extreme ends (either strongly agree/agree or strongly disagree/disagree) of the possible responses and items agreement of at least 70%. Descriptive statistics were computed for each item.

2.6 Ethical Approval

Ethics clearance was obtained from APHRC's Internal Ethics Review Committee and the Amref Health Africa Ethics and Scientific Review Committee (AMREF-ESRC P528/2018) in Kenya and the National Committee on Research in the Social Sciences and Humanities (No. P.12/18/336) in Malawi.

Figure 1: Adapted Fenske's analytical framework



Note: Light green box shows the data available in DHS while green font indicates the data available in APHRC's MCH study.

3 Results

3.1 Evidence on nutrition-specific and sensitive interventions for improved IYCF

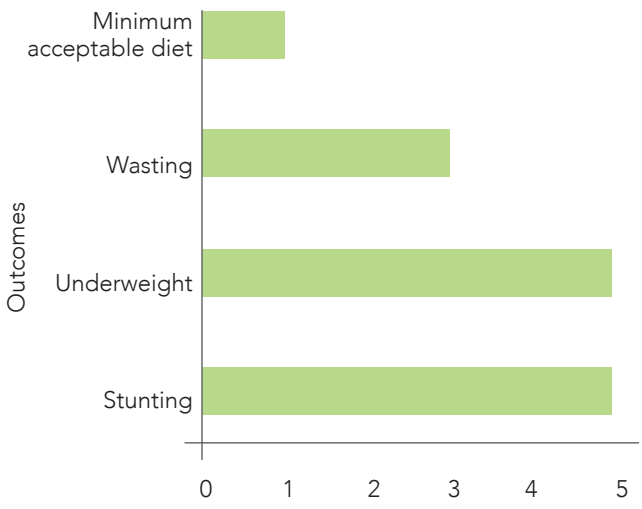
The existing evidence on nutrition-specific and nutrition-sensitive interventions for improving IYC nutrition in urban poor settings was explored through a rapid review of the existing literature. The intensive review identified five papers that fitted the inclusion criteria and were published between 2014 and 2018 (Box 1): two from India (More et al., 2017; Strand et al., 2015), and one each from Bolivia (Martinez et al., 2018), Haiti (Iannotti et al., 2014) and South Africa (Tomlinson, Rotheram-Borus, Scheffler, & le Roux, 2018). The studies included interventions that were either nutrition-specific, nutrition-sensitive or a combination of both. In particular, two studies included both nutrition-specific and nutrition-sensitive intervention, two were on nutrition-specific and one was nutrition-sensitive.

The studies focused on a combination of outcomes, with all of them including both stunting and underweight as outcomes and three of them including wasting (Figure 2). The IYCF indicators were rarely studied, and only two included minimum dietary diversity score (MDDS) and one included minimum acceptable diet (MAD). Evidence suggests that malnutrition is associated with IYCF. In this case, the MDDS and MAD can be said to be intermediate outcomes. Indeed, improving IYCF practices could reduce incidence of child-malnutrition, thereby reducing under-five mortality and promoting optimal growth and development, including cognitive development. There is therefore a clear need for more research on these intermediate outcomes if we are to better understand the feeding processes and their association with malnutrition in poor urban environments.

The following key points emerged from the five papers:

- There is limited evidence on nutrition-sensitive and nutrition-specific interventions aimed at improving IYCF among the urban poor in SSA.
- The urban poor are often associated with living in informal settlements which have different cultural, structural, and legal statuses from formal settlements. The effectiveness of interventions proved to work in formal and rural settings may not necessarily work for the urban poor. However, targeted interventions bearing in mind the urban poor setting, like community resource centers, provision of folate and Vitamin B-12 and promoting the welfare of mothers and mentorship can effectively improve IYCF.
- Models of delivering interventions can be complex and thus should be innovative to increase uptake and effectiveness. The models may work through intermediate outcomes such as increased knowledge. For instance Martinez et al. (2018) found that counselling and interactive play helped increase education that elicited knowledge acquisition and behavioural change; which positively impacted on child growth.
- Behavioural change strategies can be considered an effective component of health policies, but may not be sufficient to improve final anthropometric outcomes on their own.
- The More et al. (2017) study offers useful lessons for implementing interventions despite not observing significant improvements in nutritional status. Some of the lessons included the importance of the duration of exposure and dosage more so for a population experiencing high turnover and understanding other potential factors that may come into play during program implementation.

Figure 2: Outcomes investigated by studies included in the rapid review



Box 1: Summary of the five published studies included in the rapid review

Study/Ccountry	Intervention	Age in months	Nutrition Sensitive	Nutrition specific	Effects and sizes
Strand et al 2015 **India**	Vitamin B12 and folic acid	6-30		✓	↑ weight-for-age z-scores: *[0.07, 95% CI 0.01 - 0.13; P< 0.05]*
Ianotti et al 2014 **Haiti**	Lipid based supplement	6-11		✓	↑ length-for-age z-scores: *[0.13, 95% CI 0.08 - 0.18, P=0.02]* ↑ weight-for-age z-scores: *[0.12, 95% CI 0.07 - 0.17, P=0.02]*
More et al 2017 **India**	Community centers	<60	✓	✓	No significant improvement in nutritional status *[Odds Ratio 0·92, 95% CI 0·75–1·12]*
Tomlinson et al 2017 **South Africa**	Home visits & counselling	18		✓	Less likelihood of underweight *[Odds Ratio 4.37, 95% CI: 1.03 – 18.49, P<0.05]*
Martinez et al 2018 **Bolivia**	Home based play intervention to deliver nutrition messages	<12	✓	✓	↑ knowledge, IYCF & DD, no change in nutritional status Length-for-age z-scores *[-0.03, 95% CI -0.13 – 0.08, P=0.65]* Weight-for-age z-scores: *[-0.02, 95% CI -0.12 – 0.08, P=0.78]* Weight-for-height z-scores: *[0.00, 95% CI -0.11 – 0.12, P=0.96]*

3.2 Prevalence of stunting and IYCF in Nairobi Slums and SSA

This part of the research involved secondary data analysis to understand IYCF and its drivers in an urban poor context. The analysis was conducted for both the DHS data and a focused database from urban informal settlements in Nairobi. This section presents the results of the analysis including both the descriptive and regression analysis. The IYCF indicators examined included minimum dietary diversity score (MDDS), minimum meal frequency (MMF) and minimum acceptable diet (MAD).

Figure 3 shows the prevalence of IYCF indicators and stunting among children aged between 6 and 23 months living in Korogocho and Viwandani, two urban informal settlements in Nairobi, between 2007 and 2014, as well as the reported Kenyan urban figure from the 2014 Kenya DHS report. The two slum areas are characterized by high levels of stunting; 43% of the children included in the analysis experienced stunting by the time they were almost two years i.e. cumulative prevalence of stunting. The level of stunting in the slums is high compared to that of Kenyan urban poor households extracted from the DHS at 20%.

The prevalence of MMF was high compared to MDDS in Nairobi slums, and was more or less the same for the Kenya Urban DHS. In the Nairobi sample, exclusive breastfeeding was about 2%, with half of the children introduced to liquid foods at birth. While 72.3% of the children received the recommended number of meals per day, only 40.3% received at least four groups. This implies that the majority of children in the Nairobi slums met the minimum food frequency, however, the meal may not be of the required nutritional composition. Consequently, only 34% and 19.8% of the children were reported to meet the required minimum acceptable diet in Nairobi slums and Nairobi urban areas, respectively. *Figure 3: IYCF indicators and stunting among children aged 6 to 23 months*

Figure 3: IYCF indicators and stunting among children aged 6 to 23 months

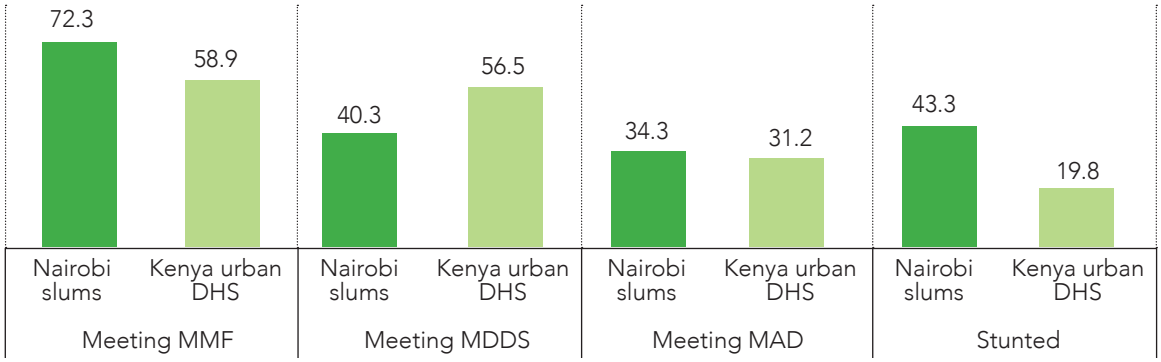
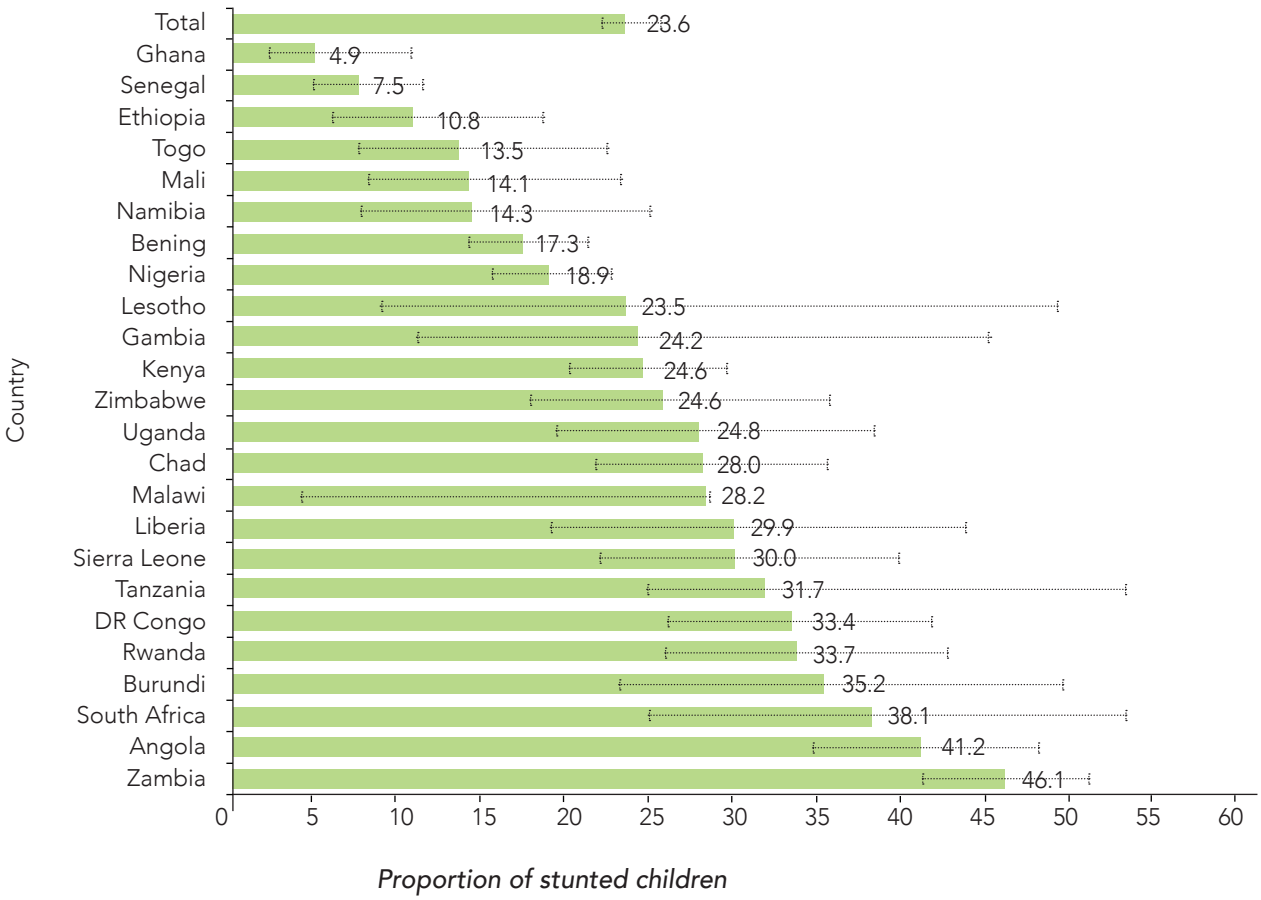


Figure 4 summarises the prevalence of stunting for 24 countries based on the DHS analysis of the urban households ranked in the poorest 40%. Overall, stunting in children living in urban poor households was 23.6% and varied by country. Ten countries had at least a prevalence of 30%, with the highest rates observed in Zambia at 46.1%; while only two countries, Ghana (4.6%) and Senegal (7.5%), had a prevalence of stunting below 10%. Stunting levels in Malawi and Kenya, the countries of particular interest in this research, were 28.2% and 24.6% respectively, which were higher than the DHS reported urban levels of 19.8% and 25%, respectively.

Figure 4: Prevalence of child stunting among poorest 40% of urban households by country



While these results indicate a high prevalence of stunting among the urban poor in SSA, they also show that stunting is not proportionate, and this is important in promoting learning between countries.

Figure 5 shows the proportion of children meeting the minimum acceptable diet (MAD) in each country as computed from the DHS. Overall, only 15% of the children aged between 6 and 23 months met the required dietary requirements for their age. In some countries like Liberia, almost all children were exposed to diets that were below the minimum requirements. Ethiopia had the largest proportion of children meeting MAD at 32%, however, the sample of urban households ranked in the poorest 40% was small as shown by the large confidence intervals. In Kenya and Malawi, 26.8% and 10.8% of urban poor children met the MAD. In Kenya, the rate is lower than that of all urban areas at 33.5% and that of Korogocho and Viwandani (34.3%). In Malawi, the proportion of children in the poorest urban households meeting MAD was 5.2% lower than that of all urban areas.

3.3 Drivers of MAD in SSA

Figure 6 shows selected factors associated with IYCF, as represented by MAD in urban informal settlements of Nairobi. The bars that are below one indicate a potential risk factor, while above one are 'protective' - i.e. they represent an increased likelihood of meeting MAD. The number of children aged below five years in the household was significantly associated with decreased likelihood of meeting the minimum acceptable diet. That is, the risk of meeting MAD decreased by 18% and 30% for children living in households with two and three of more children respectively when compared to households where there was only one child aged below 5 years.

Children aged at least 12m were significantly more likely to meet MAD compared to those aged between 6 and 11 months. The results regarding access to water and sanitation, captured by household access to improved toilet and safe water, appear mixed. For instance, while having improved toilet facility was positively (OR 1.22, 95% CI 1.05 – 1.46, P=0.03) associated with MAD, access to safe water had a negative association (OR 0.72, 95% CI 0.52 – 1.01, P=0.06) and was a risk factor - this finding is counter-intuitive and calls for further examination.

Household wealth, mothers' education, and gender of the child were not significantly associated with meeting MAD in the Nairobi slums. In addition, while the effect of household wealth was not statistically significant, children from the least poor households were more likely to meet the MAD as compared to those coming the poorest households.

In the DHS analysis, child's age, number of children aged below five years in the household, and mothers' education were significantly associated with not meeting MAD. Unlike in the Nairobi slums, in the DHS model, children born to mothers with primary and at least secondary education were 1.5 and 2 times more likely to meet MAD compared to those with no education. Child's age and number of children in the household

Figure 5: MAD among poorest ranked urban households by country

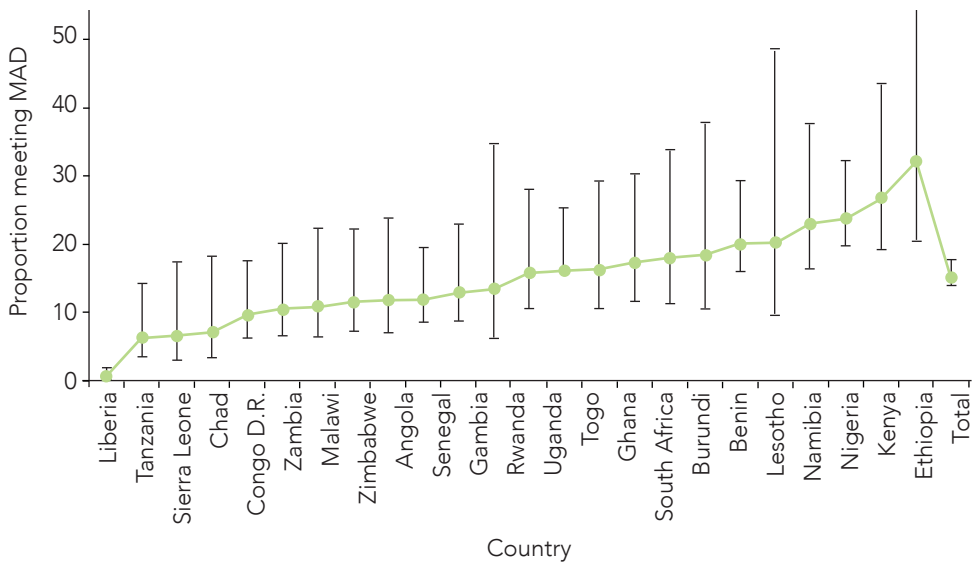
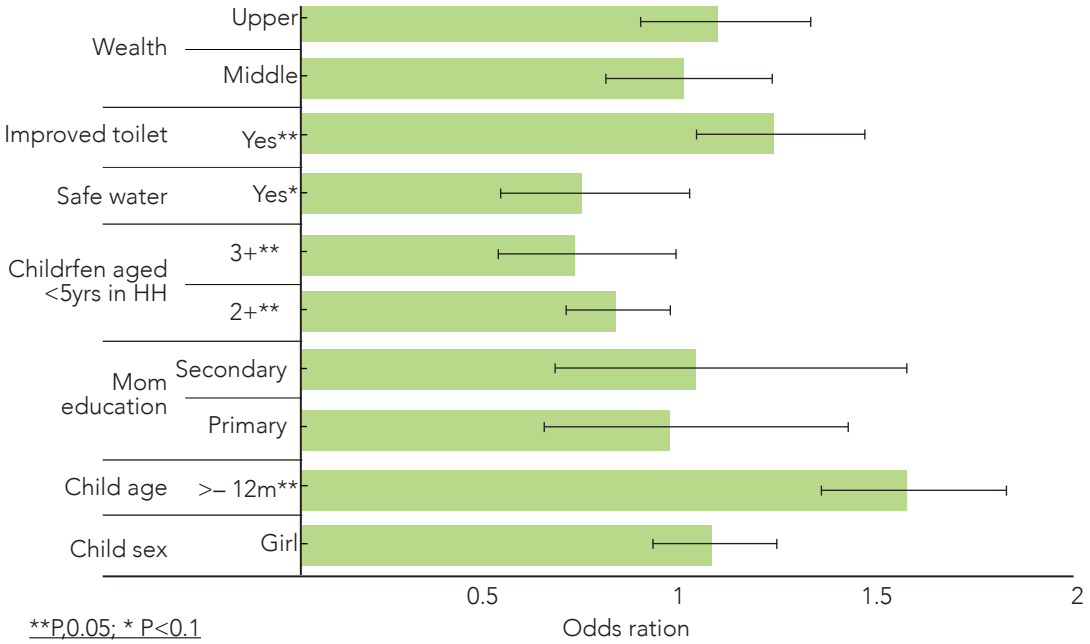


Figure 6: Selected factors associated with meeting MAD in Nairobi Slums



were significant and showed consistent directions in both models. Further, the DHS data analysis for the urban poor, diarrhoea and the sanitation were significantly associated with stunting. Children who experienced episodes of diarrhoea or exposed to unimproved toilet facilities had an increased likelihood of stunting (OR of 1.23 and 1.28 respectively). A comparative analysis of the rural poor diarrhoea and sanitation variables were not significant; however, women's employment was an important driver of stunting. In particular, in in rural areas women participation in economic activities significantly increased the risk of child stunting by 15%; while it was not significant for the urban poor.

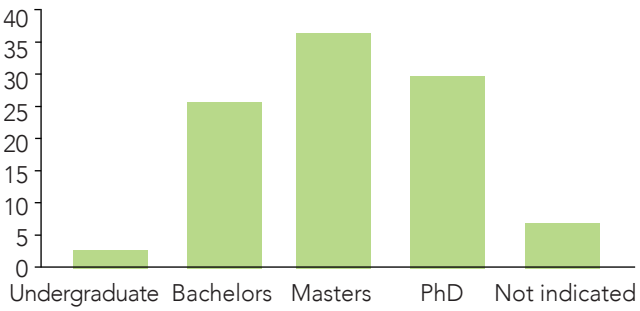
3.4 Relationship between IYCF and stunting

In both the Nairobi slum dataset and the DHS, we did not find a significant association between stunting and MAD in the bivariate or the full logistic regression analysis, which might be explained by the low levels of infants being fed a MAD, which limits the variation available in the data on which to model this association. In the Nairobi slum model, the risk of stunting in children meeting the minimum acceptable diet was higher, though it was not significant. The gender of the child and age were significantly associated with stunting. Girls were less likely to be stunted, while the risk of stunting increased with the child's age. In Nairobi slums, children from wealthier households were less likely to be stunted, while those coming from households with many under five children were more likely to be stunted.

3.5 Highest ranked evidence and research gaps for improved IYCF

This part of the research sought to understand the evidence gaps and what expert stakeholders thought needed to be done in order to improve policies, plans and strategies relating to IYC nutrition in SSA using a Delphi approach. The key stakeholders included policy, academic, researchers and practitioners- working in the field of IYC nutrition.

Figure 7: Education level of DELPHI participants



The Delphi exercise aimed to establish consensus on three main areas that are critical to IYC nutrition among the urban poor settings: i) the current nutritional status of urban poor children mainly in terms of the causes of malnutrition; ii) what is already known about IYC nutrition interventions among the urban poor; and iii) establishing what future work is needed to address the causes of malnutrition in the context of the urban poor

in SSA. Following an initial consultation meeting with stakeholders, 55 items were developed and put into an online survey. This online tool was shared with identified participants. In total, 44 responses were received. From Figure 7, it can be seen that the participants were well educated, with 64% attaining at least a Master's degree. Further, data shows that on average the participants had worked in this field for 15 years and that 66% had a specialization in nutrition (data not shown).

The participants came from several African countries and while Kenya and Malawi were over- represented, both were case- study countries and hence had high levels of targeted recruitment (Table 1). Despite this, we also had participation from West Africa, particularly Ghana, and Nigeria. Some of the respondents were affiliated with more than one country and thus we aimed to capture countries in which the respondents were currently focusing in their work.

Table 1. Which country/countries in SSA do you work in?

Country	Frequency	%
Ghana	4	8.33
Kenya (one both Kenya and Uganda)	23	47.91
Malawi	12	25
Nigeria	4	8.33
Others (Senegal, Mali, Benin, Ghana, Niger, South Africa, Ethiopia)	3	6.24
Not indicated	2	4.17

3.5.1 Part A: Nutritional status of urban poor families

This section sought to establish the nutritional status of urban poor children and the causes of malnutrition in urban poor settings in sub-Saharan Africa. There was a mix of understanding regarding the nutritional status of children living in urban poor settings.

Overall, respondents agreed with six items that related to the existence of interventions on IYC nutrition. In particular, the experts agreed that i) policies that support IYCF are not specific to the urban poor, ii) that messaging and nutritional interventions improve IYCF and iii) that there are organizations working to understand the state of IYCF in urban poor settings.

We also observed lack of consensus on a number of items. Specifically, there were five items where respondents did not agree. These items related to stakeholders' perceptions surrounding monitoring/ evaluation of existing intervention programmes, intervention work with urban poor families, and a perceived lack of efficacy of extant programmes.

Table 2: Nutritional status of urban poor families

% agree & strongly agree	
There are existing intervention programs that are aimed at improving the nutritional status of children in urban poor settings	68.75
There is monitoring and evaluation of such programs	45.83
There is follow-up of action plans from previous reviews/evaluations of programs	35.42
There are organizations that have done work into infant and young child feeding (IYCF) in urban poor settings	76.60
There is sufficient documentation and stock-taking of the on-going IYCF work already being implemented in urban poor settings	22.92
IYCF messaging and nutritional counselling interventions are effective at increasing exclusive BF	82.98
Nutrition-specific interventions targeted at mothers who are feeding infants and young children in urban poor areas currently exist	68.75
Nutrition-sensitive interventions targeted at mothers who are feeding infants and young children in urban poor areas currently exist	47.92
Policies and intervention programs aimed at supporting infant and young child nutrition are NOT specific to the urban poor	83.33
To date, policies and intervention programs aimed at supporting child nutrition have been effective at improving infant and young child nutrition for the urban poor	25.00
Policies and intervention programs aimed at supporting infant and young child nutrition are already being implemented with the urban poor	43.75

Table 3: Causes of malnutrition in infants and children in urban poor settings

% disagree & strongly disagree	
Poor quality of care (at home and/or in day care settings) plays a role in the poor nutritional outcomes among infants and children in urban poor settings	95.74
Urban poor caregivers require social support to help improve the nutritional outcomes of their children	97.92
Maternal education plays a role in the nutritional outcomes of children in urban poor settings	95.74
Inadequate maternal employment plays a role in the poor nutritional outcomes of children in urban poor settings	89.58
Lack of support plays a role in the poor nutritional outcomes of children in urban poor settings	93.75
Community health volunteers (CHVs) in urban poor settings lack the support needed to engage caregivers with child nutrition in their home environment	68.75
Poverty is a factor contributing to sub-optimal practices in child feeding	85.11
Food insecurity is a factor contributing to sub-optimal practices in child feeding	93.62
Lack of proper sanitation and hygiene contributes to infections among children, affecting their nutritional wellbeing	97.78
Lack of clean water and sanitation in urban poor areas impacts the nutritional status of young children	95.65

There was consensus on the common causes of malnutrition with the majority of the respondents agreeing with the 11 statements (Table 3). The causes included poor quality of care, lack of social support for caregivers and community health volunteers (CHVs), low maternal education, inadequate maternal employment, food insecurity, and poor water, sanitation and hygiene. Participants either agreed or strongly agreed that the causes of malnutrition in the urban poor settings are generally known. This is important in defining the potential interventions to improve child nutrition status in these settings. The causes are many and varied, and hence calls for design of complex interventions that are holistic and multi-sectoral in their approach.

3.5.2 Part 2: What is already known

This section sought to understand the existing interventions and how useful they are in improving nutritional status of children in urban poor households as well as the understanding on the common causes of malnutrition.

There was a mix of consensus that the roles of various interventions in improving nutritional status of children living in urban poor settings are not adequately known (Table 4). The interventions included micronutrient supplementation, exclusive breastfeeding and its value, complementary feeding and its appropriateness, and safety and hygienic conditions of informal day care centers. The consensus among stakeholders on the lack

Table 4: Interventions to improve nutritional status of children in urban poor status

% disagree & strongly disagree	
The value of micronutrient supplementation in the context of maternal, infant and young child nutrition (MIYCN) is well understood for the urban poor.	52.08
The need for exclusive breast-feeding is well understood among urban poor caregivers.	41.67
The value of exclusive breast-feeding is well understood among urban poor caregivers.	34.04
The recommendations regarding complementary feeding are well understood among urban poor caregivers (i.e. families understand what it is).	57.45
The value of complementary feeding is well understood among urban poor caregivers.	54.35
The challenges experienced by urban poor families in relation to IYCF are well understood.	65.96
Urban informal day care centers provide appropriate infant and young child feeding practices.	80.00
Urban informal day care centers provide safe, hygienic environmental conditions.	87.50

Table 5: Common causes of IYC malnutrition in urban poor families

% disagree & strongly disagree	
Poor quality of care (at home and/or in day care settings) plays a role in the poor nutritional outcomes among infants and children in urban poor settings	95.74
Urban poor caregivers require social support to help improve the nutritional outcomes of their children	97.92
Maternal education plays a role in the nutritional outcomes of children in urban poor settings	95.74
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of knowledge on the role played by known interventions to improve IYC nutrition in poor urban areas points to gaps in evidence among the urban poor, and provides opportunities to design and test the impacts of such interventions in these settings. The results for exclusive breastfeeding point to a mix of views with a group of participant's agreeing that existing interventions on the same are adequate while others report they are not adequate and this may represent differences in evidence across countries.

The common cause of malnutrition within the communities of interest are well known and documented across the board (Table 5). Other than CHVs lacking support to engage caregivers, participants agreed to a larger extent that the quality of care, maternal education and employment, water hygiene and sanitation, poverty and food security are potential causes of child malnutrition. The focus was on understanding the causes of malnutrition in children living in urban poor settlements, which are characterized by high levels of poverty, food insecurity and low levels of employment. There was a lack of consensus as to whether the causes of malnutrition in urban poor areas are as well understood as in rural areas. This is important and provides an opportunity

Table 6: What needs to be done to improve IYCF among the urban poor?

% agree & strongly agree	
More studies or evidence on the CAUSES of malnutrition in urban poor areas are needed	75.00
The reasons for poor complementary feeding in urban poor areas need to be better understood	80.00
there is a need for integrated, multi-sectoral analysis of existing country-level data on Nutrition-sensitive interventions programs/policies	100.00
There is a need for integrated, multi-sectoral analysis of existing country-level data on Nutrition-specific interventions programs/policies	100.00
Studies are needed to assess the cost effectiveness of NUTRITION-SENSITIVE interventions in urban poor settings	91.49
Studies are needed to document the cost effectiveness of NUTRITION-SPECIFIC interventions in urban poor settings	91.49
Evidence about access to food for the urban poor population needs to be generated	89.36
The urban poor community should be engaged to identify gaps and potential solutions	97.92

Table 7: Needed future work on IYC nutrition

% agree & strongly agree	
The evidence on IYCF that has been gathered by organizations to date should be used to evaluate the situation in urban poor areas	74.47
There is a need for nutrition-specific interventions targeted at urban poor **mothers** feeding infants and young children	88.37
There is a need for nutrition-specific interventions targeted at urban poor **adolescents** feeding infants and young children	91.30
There is a need for nutrition-sensitive interventions targeted at urban poor **mothers** feeding infants and young children	92.50
There is a need for nutrition-sensitive interventions targeted at urban poor **adolescents** feeding infants and young children	91.49

for comparative studies to understand the causes of malnutrition in both settings to establish context specific interventions.

3.5.3 Part C: Future work needed

This section focused on understanding three key areas of future work to improve the nutrition of children living in urban poor households: i) what needs to be done to improve IYCF (Table 6); 2) future work on IYCF (Table 7), and; 4) the efforts need to understand IYCF in these settings (Table 8). Four items examined what needs to be done in order to improve the nutritional status of children with a key focus on addressing the causes of malnutrition in urban poor settings. There is a consensus that more needs to be done to shed light on the roles played by complementary feeding, food security, and current practices on exclusive and complementary feeding in reducing child malnutrition among the urban poor. In addition, all respondents agreed there was a need for a multi-sectorial examination of existing evidence on nutrition-sensitive and nutrition-specific intervention at the country level as well as their cost effectiveness. The responses underscore not only understanding the reasons but also practices for effectiveness of interventions.

The Delphi exercise also shed light on potential future work needed and how it can be carried out (Table 7). Specifically, the potential solutions that can be easily explored in order to improve IYC nutrition in urban poor settings. The participants underscored the need for nutrition-specific and nutrition-sensitive interventions targeting adolescents and mothers living in these settings. In particular, efforts to understand current practices around known interventions such as micro-nutrient supplementation, complementary feeding and exclusive breastfeeding were felt to be of importance (Table 8). The interventions can be aimed at addressing specific or a combination of the identified causes of malnutrition.

Table 8: Efforts needed to understand IYC nutrition in urban poor settings

% agree & strongly agree	
Efforts are needed to better understand the current practices around micronutrient supplementation in the context of Maternal, Infant, and Young Child Nutrition (MIYCN)	89.36
Efforts are needed to better understand the current practices around exclusive breast-feeding	87.23
Efforts are needed to better understand the current practices around complementary feeding	95.83
Empowering urban poor women by providing education and information will enhance their decision-making autonomy and improve the nutritional wellbeing of their children	85.42
Empowering urban poor women by facilitating saving and income generation will enhance their decision-making autonomy and improve the nutritional wellbeing of their children	97.92
Better quality day care is an important way to improve child nutrition in urban poor settings	93.75

While there was consensus on the causes of malnutrition, what needs to be done and the kind of interventions that can be implemented, there was divergence on how the interventions can be implemented. The diversity was in terms of whether there is enough monitoring and documentation of existing programs, existence of nutrition-sensitive interventions as well the existence and implementation of policy and practices targeting the urban poor. The diversity could be attributed to i) respondents views, interactions and experiences more so working with urban poor settings; ii) varied respondent knowledge and existence of different practices across countries; and iii) lack of clearly reported evidence around any of the existing interventions.

The final round of the Delphi study asked respondents to select two out of six statements regarding what future work they think is needed and how this can be done. The statement *"More studies or evidence on the causes of malnutrition in urban poor areas are needed"* was the highest ranked priority area, with 16 of the 31 stakeholders (51.6%) selecting it.

They were then asked to select seven out of 22 statements relating to potential solutions to (mal) nutrition in urban poor IYC that they believe are the most important priority areas for future work. Two statements were joint highest ranked by stakeholders. These were: *"Before any further programs are developed or implemented, a situational analysis of the urban poor must be undertaken"* and also *"The urban poor community should be engaged to identify gaps and potential solutions"*. Nineteen of the 31 stakeholders (61.3%) selected these.

status of children with a key focus on addressing the causes of malnutrition in urban poor settings. There is a consensus that more needs to be done to shed light on the roles played by complementary feeding, food security, and current practices on exclusive and complementary feeding in reducing child malnutrition among the urban poor. In addition, all respondents agreed there was a need for a multi-sectorial examination of existing evidence on nutrition-sensitive and nutrition-specific intervention at the country level as well as their cost effectiveness. The responses underscore not only understanding the reasons but also practices for effectiveness of interventions.

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4 Conclusion

The status of IYCF living in urban poor settings in Kenya and SSA, characterized by both high levels of stunting and low levels of minimum acceptable diet, is astonishing. Specifically, among the urban poor households living in two urban informal settlements in Kenya, 43% of the children were found to be stunted by the age of two years, and only 34% met the required minimum acceptable diet (MAD). Moreover, the DHS analysis showed a poor situation for infant diets and nutrition, with 24% of children in urban poor households stunted (i.e. the poorest 40%) and only 15% met MAD, a proxy measure for IYCF. The NUHDSS and DHS supported by previous studies showing that the majority of the households in the informal settlements consume the same type of food and reduce the number of meals per day as a way of coping with food insecurity (Kimani-Murage et al., 2014). The informal settlements are characterized by high levels of food insecurity, with only one in five households classified as food secure, with children inadvertently affected, especially during times of crisis (Faye, Baschieri, Falkingham, & Muindi, 2011; Kimani-Murage et al., 2011; Mutisya, Kandala, Ngware, & Kabiru, 2015). Nevertheless this research for the first time shows the scale of the problem across SSA.

Despite the low rates of IYCF and high rates of stunting in SSA, there is limited evidence globally regarding what interventions work to improve the nutritional status of children in these settings. In particular, from the rapid review, there were few nutrition-sensitive and nutrition-specific intervention studies focusing on IYC complementary feeding in low-income urban settings in SSA that were published between 2014 and 2018. In this review, out of the five papers, four interventions were found to be effective, although the impacts were small. Of the studies that were identified only one focused on a SSA country. A previous review by Goudet et al. (2017) identified 58 studies, with 22 involving interventions that were only nutrition-specific and none on nutrition-sensitive, while the remaining 38 focused on risks to malnutrition rather than interventions to prevent malnutrition among the urban poor; 27% of the interventions were not effective.

There was little focus on the IYCF indicators in the identified studies, but rather on malnutrition outcomes. Malnutrition is associated with IYC nutrition, and their effects are manifested through stunting and wasting as the ultimate outcomes of interest. In this case MDDS and MAD can be said to be intermediate outcomes. Indeed, improving IYCF practices reduces incidences of child-malnutrition, hence reducing under-five mortality and promoting growth including cognitive development (Rakotomanana, Gates, Hildebrand, & Stoecker, 2017). Our analysis of DHS data showed no significant relationship between these IYCF indicators and stunting outcomes. We think this might be because of a lack of variability, given the low prevalence of the MAD across the countries. Despite this, there is a significant gap in the knowledge base and an area for future work to focus on understanding the IYCF indicators and their association with child nutrition status.

Of the five studies, four of the interventions were successfully carried out however their effect on child nutritional status was minimal and may not warrant generalization or even replication. Moreover, informal settlements are complex, and face different challenges, some of which are context related, which can all have a bearing on child nutrition and development. These salient issues featured prominently in the Delphi survey but there was little coverage of context in the papers from the Goudet review or the ones included in this study.

We attempted to understand the importance of context by conducting separate analysis of the DHS data for the rural and urban poor ranked households. Our findings revealed that among the urban poor households, diarrhoea and sanitation to be important drivers of stunting, while in the rural population, women employment status. The findings for diarrhoea and sanitation point to the importance of these factors in the urban environment as having a bigger effect size on stunting than meeting the MAD. In rural areas, work is not protective of poor families for infant stunting. While the finding may be controversial, the results are collaborated by a study in Peru that found children of mothers engaged in unpaid work to have an increased likelihood of stunting (Chávez-Zárate, Maguiña, Quichiz-Lara, Zapata-Fajardo, & Mayta-Tristán, 2019). In rural SSA, majority of women engage in employment activities that are menial, low paying and that do not promote good child care- giving practices (Samman et al., 2016) such as farming, and this potentially explains the observed increased risk of stunting.

Potential nutrition-specific and nutrition-sensitive interventions need to take into account the unique context of slum populations so as to be holistic in their design, testing, monitoring and implementation. The complex challenges in urban poor settings may need a more holistic or systems-based approach to designing and implementing IYC interventions and too few studies currently lend themselves to addressing these broader determinants of undernutrition. The design

and implementation of interventions should ensure the participation of the urban poor community in identifying existing gaps and offering potential solutions. This is in order to develop an informed situational analysis of the urban poor and the contexts in which such interventions will be implemented including those mostly affected. Furthermore, studies taking place in urban slums should report adaptations to the urban poor context so that learning can be transferred between contexts.

Based on the findings from the Delphi survey, the following were identified as priority areas for future research on IYCF among the urban poor:

- Stakeholders identified poor quality of care, lack of social support for caregivers and community health volunteers (CHVs), insufficient maternal education, unemployment, and food insecurity, lack of clean water, and sanitation and hygiene as the common causes of child malnutrition among the urban poor. While more studies or evidence on the causes of malnutrition in urban poor areas are needed, it is imperative to engage the urban poor community to identify gaps and potential solutions;
- Stakeholders held consensus on the need to explore micronutrient supplementation, complementary feeding, and safety and hygienic conditions of informal day care centers as potential areas of interventions through which to improve IYCF. Further exploring other methods to change behavior such as use of visual aids and care group models and information sharing should be promoted to enhance optimal MIYCN in urban poor settings;
- Stakeholders were in agreement that interventions should target adolescents and mothers living in urban poor settings, and that interventions should aim to address specific or a combination of the identified causes of malnutrition. In particular, empowering urban poor women by providing education and information will enhance their decision-making autonomy and improve the nutritional wellbeing of their children.
- Stakeholders felt that priority areas for future work into IYCF should involve conducting more studies or generating further evidence into the **causes** of malnutrition in urban poor areas. They also felt that a situational analysis of the urban poor MUST be undertaken, before any further programs are developed or implemented. Finally, stakeholders agreed that the urban poor community should be engaged to identify gaps and potential solutions to IYCF challenges in urban poor families.

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