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Commercial Baby Food: Consumption, Sugar Content and Labelling Practices in Uganda

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ABSTRACT

Introduction: There has been a worldwide increase in the consumption of processed foods in low- and middle-income countries. Processed foods are now easily available and accessible with the increased presence of transnational corporations, urbanisation and improving economies—all essential drivers of the nutritional transition. Ultra-processed foods and beverages (UPFB) have been identified as a significant contributor to total dietary energy and, in specific settings, the biggest source of sugar for infants and young children. High consumption of free sugars in early childhood is associated with poor health outcomes, including early childhood caries, overweight/obesity and an increased risk of developing other non-communicable diseases (NCDs). Furthermore, the first years of a child's life are important for getting accustomed to various tastes and textures that determine food choices later in life. Unfortunately, Uganda has been slow in addressing NCD nutrition-related health issues, thus risking a double burden of diseases. For example, there is no data on current infant and young child feeding practices regarding commercial food products. However, some regions that are advanced in addressing unhealthy dietary practices, like Europe, have adopted WHO international guidelines and recommended promoting optimal infant and young child feeding.

Aim: The present study aim was to establish infant and young child feeding practices among urban/peri-urban children aged between 6 and 36 months with a special focus on commercial baby foods. Additionally, to examine the adherence to selected local and international label guidelines and to assess the nutritional suitability of commercial baby foods commonly consumed in an urban setting.

Methods: Two cross-sectional studies were carried out to achieve the aims: Study 1 was among 6 to 36-months-old children attending four selected health facilities between October and December 2021 in Kampala. A standardised structured questionnaire and a 24-hour diet recall were used. The primary outcome in Study 1 was the consumption of at least one commercial baby food the previous day. A modified Poisson was used to analyse associated family and child factors. Study 2 was a cross-sectional survey of photographs of commercial baby food labels purchased between March and April 2022 from seven stores and five shops around Kampala metropolitan using an adapted questionnaire that was based on the WHO Europe nutritional profile model to capture sugar, energy content and taste properties and the Global Alliance for Improved Nutrition label checklist. Data in both studies were entered using electronic collection; Open Data Kit. Performance scores on labelling and nutritional suitability were derived using up to seven and eight items, respectively.

Results: For study 1, a total of 410 caregiver-child pairs of 6-36 month-olds were randomly recruited, with 94% of caregivers being mothers whose mean (SD) age was 30.7 (±5.3) years, 59% of mothers and 73% of fathers had attained a college education. Of the 410 children, 51% were female, and 33% had no siblings. The median age (L1, L3) was 18 (12, 25) months. Eighty-one percent consumed commercial baby foods the previous day, which was significantly negatively associated with maternal education (PR=0.71, 95%CI 0.50-0.99, *p=0.042*). In the week before, 69% had consumed ultra-processed foods frequently (4-7 days). Increasing child's age; 13-24 months (OR=2.87, 95%CI 1.62-5.08, *p*<0.001), 24-36 months (OR=3.68, 95%CI 1.88-7.20, *p*<0.001) and maternal education [OR=2.85, 95%CI 1.02-7.96, *p*=0.045] were significantly positively associated with frequent consumption the previous week. For Study 2, a total of 135 labels composed of 60 commercially available complementary foods (CACF) and 75 other foods and sweetened beverages were sampled. Nearly two-thirds (59%) were imported products. The overall median total sugar per 100g was 13.9g, while that of commercial CACF was 12.1g. Overall, 82% of products had at least added sugar. Only 28% of the sampled 60 CACF fully complied with the selected national and international guidelines on labelling. Only 16% were nutritionally suitable for optimal infant and child nutrition based on their taste, sugar content, and energy properties, and these were locally produced fortified cereals. None of the sampled products fulfilled both label and nutritional requirements for CACF.

Conclusion: The dietary habits of the surveyed Ugandan population were unhealthy, characterised by the frequent consumption of processed foods with added sugar. This is partly fuelled by the nutrition transition, with the increased availability of UPFB and the increasing presence of transnational corporations. Poor regulation of labelling/promotion practices and nutritional content of commercial products are key factors working against optimal infant nutrition. Therefore, there is a need for the re-enforcement of Ugandan regulations and policies using international recommendations, thereby creating a health-promoting environment to promote optimal infant and young child nutrition. Additionally, health authorities should consider building strong nutritional education programmes on complementary feeding and mass campaigns to discourage sugar consumption and expose 'hidden sugars'.

KEYWORDS: Complementary feeding, Ultra-processed foods, Commercial Complementary Foods, Added Sugar, Food Labels, Unhealthy Diet, Snacks, Sugar-sweetened Beverages, Nutrition Transition, Uganda

DECLARATION

I declare that *Commercial Baby Food: Consumption, Sugar Content and Labelling Practices in Uganda* is my own work, that it has not been submitted for any degree or examination in any other university, and that all the sources I used or quoted have been acknowledged by complete references.

Full name: Catherine Lutalo Mwesigwa Date: March 2023

Signed: 

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A famous African adage states:

If you educate a boy, you train a man. If you educate a girl, you train a village!

(Author unknown)

This statement represents the potential impact this work could have in time to come, even at the population level. Again, a big **THANK YOU** to all that had a hand in this!

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ACRONYMS AND ABBREVIATIONS

BF	Breast feeding
BM	Breast milk
BMS	Breast milk substitutes
CACF	Commercially available complementary food(s)
CBF	Commercial baby food
COVID-19	Coronavirus disease 2019
CPF	Commercially produced food(s)
CRFA	Common risk factor approach
CSV	Comma separated values
CVD	Cardiovascular disease
EBF	Exclusive breast feeding
ECC	Early childhood caries
FOP	Front of pack label
GNI	Gross national income
HFCS	High fructose corn syrup
ID	Identification
IYC	Infant and young child(ren)
IYCF	Infant and young children feeding
LIC(s)	Low-income country(ies)
LMIC(s)	Low- and middle-income country(ies)
LQ	Lower quartile
MAD	Minimum acceptable diet
MDD	Minimum dietary diversity
MMF	Minimum meal frequency
NCD	Non-communicable disease(s)
NPM	Nutrition profile model
NR-NCD	Nutrition-related non-communicable disease(s)
OWO	Overweight or obesity
SDH	Social determinants of health
SES	Socio-economic status/score
SSA	Sub-Saharan Africa
SSB	Sugar-sweetened beverages
UBOS	Uganda Bureau of Statistics
UDHS	Uganda Demographic and Health Survey
UK	United Kingdom
UNBS	Uganda National Bureau of Standards
UNICEF	United Nations Children's Fund
UPF(B)	Ultra-processed foods (and beverages)
UQ	Upper quartile
US(A)	United States (of America)
WHO	World Health Organisation

OPERATIONAL DEFINITIONS

Infant	An individual aged 0-12 months
Young child	An individual aged 13-36 months
Breast milk substitute (formula)	Any milk or products that could be used to replace milk totally or partially, in either liquid or powdered form, that are specifically marketed for feeding infants and young children up to the age of 3 years.
Infant formula	Breast milk substitute for infants 0-6 months, it is usually formulated industrially in accordance with applicable Codex Alimentarius standards, to satisfy the normal nutritional requirements of infants up to between four and six months of age and adapted to their physiological characteristics.
Follow-up formula	Breast milk substitute for infants 6-12 months
Growing-up formula	Breast milk substitute for young children aged 12-36 months.
Complementary feeding	Timely introduction of safe and nutritional foods in addition to breast-feeding OR the transition from breast milk alone (or breast milk substitutes) to include other food including family food. It is recommended that other foods, semi-solids be introduced at about 6 months to meet the nutritional requirements of infants and young children until about 36 months.
Commercially available Complementary foods	Infant and young children's food or beverage, excluding breast milk substitutes, with a label indicating that it is meant for children younger than 36 months.
Minimally processed foods	Natural foods altered by processes such as removal of inedible or unwanted parts, drying, crushing, grinding, fractioning, filtering, roasting, boiling, pasteurisation, refrigeration, freezing, placing in containers, vacuum packaging, or non-alcoholic fermentation. None of these processes adds substances such as salt, sugar, oils or fats to the original food.
Processed foods	Relatively simple products made by adding sugar, oil, salt or other simple culinary additives to unprocessed foods. Most processed foods have two or three ingredients. Processes include various preservation or cooking methods, and, in the case of breads and cheese, non-alcoholic fermentation.

Ultra-processed foods	Industrial formulations (foods and drinks) typically with five or more and usually many ingredients, such as sugar, oils, fats, salt, anti-oxidants, stabilisers, and preservatives. Ingredients only found in ultra-processed products include substances not commonly used in culinary preparations and additives whose purpose is to imitate sensory qualities of unprocessed of minimally processed foods or to disguise undesirable sensory qualities of the final product.
Commercially produced foods	Industrial manufactured foods intended for consumption among the general population, not only young children. Includes processed and ultra-processed foods
Label	Any tag, brand, marks, pictorial or other descriptive matter, written, printed, stencilled, marked, embossed or impressed on, or attached to, a container (see above) of any breast milk substitutes or commercially available complementary foods
Marketing	Product promotion, distribution, selling, advertising, product public relations, and information services.
Total sugar	All mono- and disaccharides present in food, derived from any source.
Added sugar	All mono- and disaccharides added to foods during processing or preparation (e.g., brown sugar, corn sweetener, corn syrup, dextrose, fructose, glucose, sucrose, high-fructose corn syrup, honey, invert sugar, lactose, maltose, malt syrup, molasses, raw sugar, and naturally occurring sugars that are isolated from whole food and concentrated so that sugar is the primary component, e.g., fruit juice concentrates). Excludes naturally occurring sugars present in intact fruit, vegetables, or dairy products or in juiced or pureed fruit and vegetables.
Free sugar	All mono- and disaccharides except those that are naturally occurring and present in whole (intact, cooked, or dried) fruit and vegetables or dairy products. Includes all “added sugars”, those added by the consumer and sugars that are naturally present in juiced or pureed fruit and vegetables, sugars naturally present in honey, syrups, unsweetened fruit juices and fruit juice concentrates.
Sugar	A term used to refer to any of the above, total, added and free sugars.
Cariogenic/cariogenicity	Conducive to the development of dental cries

Early childhood caries	The presence of one or more decayed (non-cavitated or cavitated lesions), missing (due to caries), or filled tooth surfaces in any primary tooth in a child 71 months of age or younger
Severe early childhood caries	Among children younger than three years, any sign of smooth-surface caries, and among those older
Nutrition Profile Model	The science of classifying or ranking food according to their nutrient composition for reasons related to preventing disease and promoting health

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CHAPTER 1

INTRODUCTION

There is a worldwide increase in the use of processed foods, especially in low and middle-income countries (LMIC) (Fanzo *et al.*, 2019). Processed foods have been reported as a significant contributor to the total dietary energy among infants and young children (IYC) in high-income countries and, in some settings, the biggest source of free sugar in the diet of IYC (Theurich *et al.*, 2020). In sub-Saharan Africa (SSA), consumption is primarily driven by a general nutritional transition in the region where people in all age groups are gradually changing from consuming traditional diets high in fibre and micronutrients. Instead, they are switching to "westernised diets" that are often highly processed (ultra-processed), high in sugar, fat, and salt, low in fibre, and less nutrient-dense (FAO and WHO, 1985; Tschirley *et al.*, 2015). The transition is also currently taking place in Uganda and is reported to be associated with urban dwellings (Auma *et al.*, 2019). In other countries, the increase in consumption of processed foods during early childhood is characterised by commercially available complementary foods (CACF), formula (Baker *et al.*,2016), commercially produced snacks, beverages, and reduced consumption of home-prepared complementary foods (Pries *et al.*, 2017; Tzioumis *et al.*, 2015b).

Diets characterised by high consumption of sugar-containing processed foods during early childhood are associated with an increase in the likelihood of nutrition-related non-communicable diseases (NR-NCDs), for example, dental caries, also known as early childhood caries (ECC) among children (American Academy of Pediatrics, 2017; Gupta *et al.*, 2013) and overweight or obesity (OWO) (Danquah *et al.*, 2020; Popkin, 2002). OWO in early childhood is a strong predictor of adult obesity, morbidity (other NCDs) and mortality (De Onis, Blössner and Borghi, 2010; Zhang *et al.*, 2013). In addition, OWO in early childhood has been identified as a precursor for Type 2 diabetes, certain cancers and probably cardiovascular diseases (Koletzko *et al.*, 2012).

Dental decay

Over the last two decades, there has been evidence of an alarming global prevalence of dental caries in all age groups (Bagramian, Garcia-Godoy and Volpe, 2009), with this more prominent in the low-income countries (LICs) and seems to coincide with the penetration of the

transnational companies and the marketing sugar–containing processed foods and beverages to previously unexposed LICs (Sheiham and James, 2014a) like Uganda. Transnational corporations increase access and availability of ultra-processed foods and beverages (UPFB) by establishing local supply within countries, aggressively marketing their products, corporate branding and influencing the political environment. These corporations frustrate policies that work against their profiteering (Kearns, Glantz and Schmidt, 2015; Kickbusch, Allen and Franz, 2016) or they influence policy such that it favours them (Bridge, Lomazzi and Bedi, 2020).

ECC is the most common chronic childhood disease. It is defined as "the presence of one or more decayed (non-cavitated or cavitated lesions), missing (due to caries) or filled tooth surfaces in any primary tooth in a preschool-age child between birth and 71 months of age" (WHO, 2017c). Masood *et al.* (2012) reported findings from an ecological study that showed that low-income and high-income inequality has a strong positive relationship between a country's caries experience and per capita sugar consumption. Sheiham *et al*.(Sheiham and James, 2014a) also demonstrated that the caries burden in LIC countries was so low before they were exposed to sugar and gradually started increasing to high prevalence levels (Petersen, 2004).

The direct costs to treat dental diseases are so high that LIC cannot even afford to treat them, especially in the face of competing infectious diseases. As such, in many of these countries, young children whose parents cannot afford to pay for treatment live with the untreated disease for most of their early childhood (Petersen *et al.*, 2005). The late disease is associated with pain, disturbed sleep, and trouble eating, which could further affect a child's nutrition and quality of life (Low, Tan and Schwartz, 1999; Nora *et al.*, 2018; Singh *et al.*, 2020). Severe dental disease, including the resulting dental infections in early childhood, is also associated with wasting, stunting, poor overall child development (Large and Marshman, 2022) and poor general health later in life (Ruiz *et al.*, 2022).

In Uganda, few studies on ECC have been carried out over the last decade. Among those published so far, ECC's prevalence ranged from 39.5% to 48.1% in rural areas (Birungi *et al.*, 2015; Musinguzi, Kemoli and Okullo, 2019) and over half among urban pre-school children in Kampala (Kiwanuka, Åstrøm and Trovik, 2004). Due to the paucity of Ugandan studies, ECC's rural-urban differences and trends over the years cannot be established. However, given the

nutritional transition, current estimates might be more than half of the 3-5-year-old urban/peri-urban populations have ECC.

Sugar and taste development

In addition, the intake of sugar or sweeteners in infancy and early childhood influences the acquisition of taste patterns which lead to established sweet preferences in later life (Mennella, 2014). Several CACF contain sweet-tasting carbohydrates (usually free sugars) and mask the "unpleasant" vegetable with flavours with fruit as purées or concentrated juice. Such sweetening and flavouring may negatively influence children's learning about food taste and texture, thereby promoting unhealthy food choices in adolescence and later life (Beauchamp and Mennella, 2009; Bridge, Lomazzi and Bedi, 2020).

When CACF are appropriately fortified and of suitable nutritional composition, it can improve the nutritional status of children during the complementary period (Phu *et al.*, 2012; Pries, Huffman, Adhikary, *et al.*, 2016). By six months, breast milk alone is insufficient to meet an infant's nutritional requirements, including energy, and iron, whose stores from the prenatal period would have run out at about five months of age. In addition, some traditional foods might be lacking in certain micronutrients hence the need for fortified foods. Although an infant's energy needs keep increasing, hence the demand for energy-dense foods, free sugars are the least suitable energy source. Other nutrients, including oils and protein, could provide these additional calories (Dewey and Brown, 2003).

In addition, studies have shown that there is no nutritional requirement for free sugars, as demonstrated in children with fructose intolerance who had favourable health outcomes when sugar intakes were eliminated (Sheiham and James, 2014b). Instead, free sugars provide significant energy without specific nutrients (WHO and FAO, 2003). Due to such concerns, the WHO provided evidenced guidelines for free sugar consumption to be limited to 10% of the total energy intake and preferably a further reduction to less than 5% for dental health (WHO, 2015a).

In most SSA, there is a double burden of malnutrition, namely: the highly prevalent undernutrition and micronutrient deficiencies among infants and young children, and a gradual increase in over-nutrition as evidenced by an increase in OWO among children in SSA (Steyn and McHiza, 2014). This increase in obesity has been reported over the last decades in richer

countries like South Africa, (Popkin and Ng, 2022), with fewer reports from Uganda (Uganda Bureau of Statistics (UBOS) and ICF, 2018).

Malnutrition in Uganda

The latest Ugandan demographic and health survey (UDHS 2016) reported about five percent of children aged less than five years from rural and urban areas were overweight or obese, and four percent for wasting in the age group, rather low national figures. Conversely, 24% of females aged 15-49 years were overweight or obese (Uganda Bureau of Statistics (UBOS) and The DHS Program (ICF), 2018). The national trends over the past two decades among under-fives show that undernutrition (stunting and underweight) has reduced significantly while over-nutrition has remained stagnant. Since there were fewer urban responses, this could under-estimate the current urban and national statistics among very young children. Nevertheless, going by the adult reports of greater proportions of over-nutrition among urban than rural females (34% vs 20%) this can be used to infer that, similarly, this could be happening in younger children. Given the changing trends in diet, especially among urban populations, if no public health interventions are taken, even Uganda might soon be faced with similar challenges of increasing over-nutrition among children and an established double burden of malnutrition.

Primarily, most of the efforts in Uganda, including research, nutritional interventions, and policies, have focused on under-nutrition—about 44% among 6-59 months olds (UBOS, 2018; ICF, 2018). This, therefore, has left a gap in addressing a public health challenge of other nutrition-related NCDs like dental decay and over-nutrition that is steadily and insidiously affecting the infant and child population. Although the last UDHS recorded only four percent of the Ugandan population of 6-59 months old as OWO (Uganda Bureau of Statistics (UBOS) and The DHS Program (ICF), 2018), it is possible for the urban, affluent populations, to have a bigger burden of this condition may have been found (Ngaruiya *et al.*, 2017).

Consumption of processed foods

One major reason for the increased use of CACF could be the economic growth experienced in some subpopulations within these countries (Popkin, Adair and Ng, 2012). Furthermore, urbanisation, food industry marketing, trade liberalisation policies (Kearney, 2010), and the change in gender roles of mothers from primary caregiving to working away from home, especially among the educated in SSA (Mushaphi *et al.*, 2017; Nieuwoudt, Manderson and

Norris, 2018). Additionally, the increasingly busy lifestyles that warrant speedy and convenient alternatives to freshly prepared, time-consuming options have greatly influenced dietary behaviours (Sharma *et al.*, 2019).

The increased CACF consumption has raised growing concerns over the potential health effects of added chemicals on children's well-being (Euromonitor International, 2015), the replacement of more nutritious foods with relatively non-nutritious snacks and beverages (Pries *et al.*, 2017), and the tendency for CACF especially early introduction, to replace breast feeding (WHO, 2017a).

International recommendations on commercial baby foods

Over the years, international bodies, including the WHO and several countries' IYCF expert bodies, have drawn up evidence-based recommendations to address the concerns about using commercial baby foods during the complementary period. Some of these have been translated into regulations over nutritional content, packaging, distribution, marketing, promotion and labelling. Some countries have adopted mandatory policies with strict regulation, while for others, there is limited implementation and a lack of monitoring (Bridge, Lomazzi and Bedi, 2020; Lutter, 2013). Unfortunately, in some cases, the CACF manufacturers have influenced the formulation of some of the national policies, which might create a bias toward promoting their products rather than infants' health (Bridge, Lomazzi and Bedi, 2020).

Various international platforms, such as the World Health Assembly, have issued calls for action to promote healthy diets and limit excessive intake of energy, sodium, unhealthy fats, and free sugars. The WHO supports countries in implementing evidence-based interventions to reduce the double burden of malnutrition. However, given the changing trends in diet, especially among urban populations, if no public health interventions are taken, Uganda will soon be faced with a high burden of NR-NCDs. Primarily, all efforts, including research, nutritional interventions, and policy, have focused on under-nutrition (Namugumya *et al.*, 2020; Ngaruiya *et al.*, 2017).

Ugandan policy on infant and young child feeding

For instance, in the current Ugandan Policy Guidelines on Infant and Young Children Feeding (Uganda MoH, 2009;2021), the aspects covering breastfeeding initiation, exclusive

breastfeeding for the first six months, and the minimum standards of complementary feeding are well articulated. However, there is only a single statement that addresses the consumption of foods with high sugar, salt and fat. Other than that, there is no further clarification on guidelines for commercially produced complementary foods nor an acknowledgement that the population might be using foods that may not be home-prepared. Moreover, some of these complementary foods might contain substantial amounts of content that pose a risk for several NCDs. The gap in these aspects of complementary feeding is probably due to a lack of data on infant and young child feeding practices regarding commercial products. On the other hand, there is substantial literature on research and interventions among vulnerable groups, low socio-economic groups, and rural communities covering undernutrition (Government of Uganda, 2019).

The present work, therefore, investigated infant and young child feeding practices among urban/peri-urban aged 6-36 months with a special focus on commercial baby food consumption. It further examined the compliance of food labels with selected international and national guidelines and assessed if the commercial baby foods available in the Ugandan market are nutritionally suitable to be promoted for IYC nutrition.

CHAPTER 2

LITERATURE REVIEW

Introduction

The period from birth to two years has been referred to as a "critical window" for promoting optimal growth, health and behavioural development (PAHO and WHO, 2003). For this to happen, adequate feeding practices that include exclusive breastfeeding for the first six months, followed by complementary feeding, should be achieved. The WHO (WHO, 2005) has defined complementary feeding as "the transition from breast milk alone to include other food including family food" and further emphasises that complementary food should be nutritionally adequate and safe. WHO recommends starting from six months when breast milk or breast milk substitutes are no longer sufficient to meet the infant's nutritional requirements as the nutritional needs increase (Quinn *et al.*, 2010a). Complementary feeding should continue through early childhood until about 24-36 months (FAO and WHO, 1981a) and provide both macro- and micronutrients to complement breast milk.

Not only does complementary feeding provide nutritional benefits, but it is also important for non-nutritional reasons. The non-nutritional benefits include allowing the infant to transition from a liquid to a family diet, with non-nutritional quantities of food potentially inducing tolerance for allergy prevention and influencing taste and food preferences in later life (Theurich *et al.*, 2022).

Several health experts and bodies have done much work and made recommendations for improving IYCF over the years. For example, the WHO has complementary feeding guidelines for breastfeeding and non-breast-feeding children (PAHO and WHO, 2003; WHO, 2005), which form the basis of complementary feeding recommendations. However, not much was mentioned in these guidelines about commercial foods except the avoidance of sugary drinks of low nutrient value and condensed milk because of their high sugar content. However, in subsequent publications, such added sugars were discouraged in commercial foods (WHO, 2019b).

Other WHO guidelines—not specific to IYCF—recommend that the daily sugar intake should not exceed 10% of the total energy (WHO, 2015a). Unfortunately, baby formulas have free sugars of some type to provide calories for the energy required by infants or young children.

The preferred sugar for infant formula (used from birth to 6 months) and follow-on formula (from 6-12 months) is lactose because this is like breast milk content. However, other sugars like sucrose and fructose, which are sweeter, may be used instead of lactose, which sugars are highly cariogenic (Baker *et al.*, 2016), and also increase the risk for OWO (Tzioumis *et al.*, 2015b). When sweeter sugars are used, they also increase the preference for sweet-tasting food from early childhood, which may carry on later in life, exposing the individual to other health risks (Koletzko *et al.*, 2012). Therefore, it is important to limit the free sugar content of all foods used in infancy and early childhood, including formula.

Other bodies and national guidelines discourage the use of free sugars in baby food and recommend avoiding sweet snacks, fruit juice and sweet beverages to ensure that the threshold for sweet taste is at lower levels and to prevent tooth decay at a very early age. Such recommendations are very important; for example, in studies from Europe and specifically the UK, baby foods labelled as 'without added sugars' were found to have high free sugar, including high fructose corn syrup (HFCS), honey, fruit concentrates (Garcia *et al.*, 2020; Pombo-Rodrigues *et al.*, 2020; WHO, 2019a;2019b;2021). Reports from the United States revealed that there are a lot of "hidden sugars" in commercial baby foods because of laxity in regulations (Cogswell *et al.*, 2015). In some countries like the UK, some public health experts have even recommended the introduction of a tax on baby foods that have added sugar ("Give children 'less sugar and more veg in baby food' (Quote from public health experts)," 2019).

Commercial foods used during the complementary feeding period include a range of snacks, cereals, desserts, baby porridge, sugar-sweetened beverages (SSBs), baby fruit juice, concentrates, yoghurt, purees, and many others, depending on their availability and affordability. These foods have been reported to be widely used by one recent South African study (Marais *et al.*, 2019) and are increasing found in Ugandan supermarkets.

Although some health experts generally discourage the use of commercial baby foods and promote home-prepared/family foods, the need for CBFs has increased due to mothers' (the usual primary caregivers) busy lifestyles as they enter employment. They can purchase convenient and ready-to-eat foods and beverages as their incomes improve. Some of these are explicitly marketed for IYC, the commercially available complementary foods (CACF). The use of CACF is a relatively new phenomenon in some SSA who have been depending on home-made preparations for complementary feeding. It is also an indicator of the nutrition transition

that has gradually increased following urbanisation and modernisation, especially among the educated and high socio-economic groups.

IYFC recommendations have emphasised the messages that should be displayed on CACF labels; - suitable at six months of age and must include that breastmilk is the preferred option up to 2 years rather than formula and specify the target age for each product. It is also important that labels do not include health and structural claims that are not backed by robust evidence. CBF also ought to have clear, consistent, and honest labels of nutritional composition, including a front-of-pack label (FOP), while also using appropriate names for those with a major component to avoid misleading the public (Quinn *et al.,* 2010a).

Regarding promotion, enforcing the WHO International Code of marketing breast milk substitutes is upheld, and this ought to include social media that currently seems to have no regulation (Euromonitor International, 2015). Other experts recommend that snacks and beverages with sugar should not be marketed to children through the use of illustrations like cartoon characters that would indicate that they are suitable for children under five years of age (WHO, 2017a).

Some of the challenges directly facing complementary feeding practices in SSA have been due to inadequate attention by stakeholders and research institutions. This is partly because of the greater focus on promoting and protecting breastfeeding during infancy (WHO, 2017a).

Nutrition Transition

The nutrition transition has been a global concern for over six decades, particularly in LMICs, where it has been drastic (Kearney, 2010). As nations experience economic growth, dietary patterns gradually change from the traditional diets towards once upon-a-time “western diets” characterised by processing and high consumption of animal-source foods, free sugars, fats, and refined carbohydrates (Popkin, Adair and Ng, 2012). In a review of global trends, Kearny (Kearney, 2010) noted that between 1963 and 2003, LMICs had an enormous rise in the available consumption of calories from meat (119%), sugar (127%) and vegetable oils (199%). In the younger age groups of LMICs, the nutrition transition is characterised by the frequent use of commercial snack foods and beverages that are usually energy-dense and micronutrient-poor (Pries, Filteau and Ferguson, 2019).

Popkin (1993) described five stages in the nutrition transition, and Abrahams *et al.* (2011) explained these further in the SSA context. The first stage (hunter-gatherer) was characterised by diets that were high in carbohydrates and fibre and low in fat. During the second stage (famine), food was scarce, and dietary diversity was low. The third stage (receding famine) was marked by a reduction in carbohydrates in the diet; however, the consumption of fruit, vegetables and protein increased. Physical activity levels were high in the first two stages but started to wane during the third stage. The fourth stage (NR-NCD) is characterised by a diet high in refined carbohydrates, sugar, fat, and cholesterol and low in fibre. Low physical activity levels and a high obesity prevalence also characterise the fourth stage. The fifth and final stage (behavioural change) is characterised by diets with an increase in complex carbohydrates, fruit and vegetables. There is also a concomitant reduction in fat, processed foods, meat and dairy products (Popkin, 2002). This final stage is an outcome of an aspiration to prolong health and prevent degenerative diseases that are characteristic of stage four.

At any one point in time, different populations, or subpopulations, for example, rural vs urban, are at different stages even when located in the same geographical area. It is thought that most high-income countries are in the final stage (Popkin, 1993) while the LMICs are at different stages but mostly between the third and fourth stages; however, this can vary within the same country (Abrahams, McHiza and Steyn, 2011).

There are differences in the stages of the nutritional transition taking place across SSA. For example, South Africa, a middle-income country, is at the advanced stage of the transition (Ronquest-Ross, Vink and Sigge, 2015), which has been taking place for a longer time. In countries at the advanced stage, there is a higher burden of OWO and NCD mortality, a reduction in infant mortality and stunting (Adair *et al.*, 2013; Adair *et al.*, 2009; Martorell R *et al.*, 2010; Monyeki *et al.*, 2015; Rossouw, Grant and Viljoen, 2012). On the other hand, Uganda and some other low-income countries (LICs) lie at the other extreme, with more indicators of undernutrition than over-nutrition (OWO). However, these are already on the trajectory of nutritional transition (Abrahams, McHiza and Steyn, 2011; Auma *et al.*, 2019) and should be more advanced than what Abrahams *et al.* (2011) described using older data (WHO Global Health Observatory Database of 2000-2008) from two decades ago.

Drivers of the nutrition transition in populations

The following expounds on the proposed drivers of nutritional transition in LMICs like those within sub-Saharan Africa (SSA). The main factors that shape dietary patterns in SSA are availability and accessibility (Steyn and Damasceno, 2006). Thus, each of the factors below has played a role in either process to increase the consumption of processed foods.

The economic growth, especially income per capita, has led to individuals being able to afford a variety of foods, which has inevitably led to increased consumption of foods that contain high amounts of fat and sugar and edible oils as opposed to the local staple foods (Amuna and Zotor, 2008; Burggraf *et al.*, 2015). Economic growth is always related to increased urbanisation.

Urbanisation is reported to occur at a much higher rate among countries that were predominantly rural, like in SSA, where it is reported to be greater than four percent, much higher than in all other regions (Kearney, 2010). It is expected to reach 60% in SSA by 2050. The last census reported the Ugandan levels at 24% (Uganda Bureau of Statistics (UBOS), 2016) and an estimated annual urbanising rate of over eight percent (Tumwesigye *et al.*, 2021). It has been noted that urbanisation has led to new and improved marketing, including the use of mass media and technology, distribution infrastructure, attracts large supermarkets dominated by multinational corporations, and results in better transportation systems, thereby improving access to foreign suppliers and the importance of imports in the overall food supply. Urbanisation has also led to changes in dietary behaviours, including the provision of fast and convenient foods that are usually high in fat, sugar, and salt (Auma *et al.*, 2019; Popkin, 2003;2006).

The increased global presence of transnational food corporations (franchises and manufacturers), even those that make and distribute baby foods like Nestle´ are all drivers of the processed food market. The "Western" lifestyle has also become so widespread in developing countries (Cuevas García-Dorado *et al.*, 2019; Monteiro and Cannon, 2012). Other than the increased availability of processed foods from developed countries, LMICs are also making processed versions of traditional dishes. This has led to a further transformation from traditional diets to readily available and cheap forms that are characteristic of developed countries. Changes in the feeding culture may be the result of the globalisation of cultural aspects, including feeding practices brought about by the spread of communication technology and infrastructure that enables information to be shared more widely and faster. This then

causes changes in consumption patterns and the creation of a demand for new products and brands (Popkin, 2014).

Consumer attitudes, perceptions and beliefs are also important drivers of the nutrition transition and the use of processed foods. Among several African communities, consuming processed foods are perceived as a sign of a high social status, and thus individuals strive to include them on their menus, including SSBs (Brown *et al.*, 2015; Stupar *et al.*, 2012; Trübswasser *et al.*, 2021). Also, in certain African settings, including Uganda, OWO is prized and associated with being healthy. At the same time, normal or underweight are considered signs of ill health, and poverty, even for infants and young children (Sewannonda *et al.*, 2022).

Other factors include retailing, which has moved to large supermarket chains that provide a big proportion of food products especially in the urban areas (Popkin and Ng, 2022), as well as the increased food industry marketing following globalisation, which has garnered even wider audiences with the rapid spread of mass media and technological advances (Baker *et al.*, 2021; Kearns and Watt, 2019; Monteiro and Cannon, 2012; Moodie *et al.*, 2021). Regarding the baby food industry, this is a great driver for products that may not be categorised as specific to infants and young children, such as soft drinks and snack food products, which are not regulated with guidelines meant for baby foods (Huffman *et al.*, 2014; Pries, Filteau and Ferguson, 2019; Pries *et al.*, 2017).

Kleinman *et al*. (2012) showed that big beverage companies shifted selling heavily sugared products in the United States, where they are heavily taxed to the LMIC market. They found that there was an enormous jump in caloric intake from sugar-sweetened beverages (SSBs) in LMICs, including China and Brazil. This trend in LMICs is expected to accelerate as public pressure in higher-income countries forces these companies to market low-calorie beverages there, and the companies look for new SSB outlets (Popkin, 2014).

Specific to the use of CBF, the busy lifestyle of working mothers has increased the demand for convenient feeding methods, including ready-to-eat meals or those that require minimal preparation. Some of these foods are packaged as single servings, which can be conveniently used even outside the home environment (Reynolds, 2022).

This nutrition transition in SSA has led to a concomitant increase in the burden of NR-NCDs. Moreover, a number of studies have revealed that there is an association between dental caries

and a high BMI among children and infants (Manohar *et al.*, 2020). This could be due to the common causes related to dietary habits, specifically involving high free sugars (Fanzo *et al.*, 2019; Manohar *et al.*, 2020; Spiegel and Palmer, 2012). To date, Ugandan studies on this association are yet to be published.

Nutrition-related Health Conditions

Dental caries and overweight/obesity are both multifactorial disease conditions associated with poor dietary habits, referred to as nutrition-related NCDs (NR-NCDs). Several studies have highlighted the role of sugars, especially the frequent intake of "free sugars", as an important aetiological factor for both (Gupta *et al.*, 2013; Popkin, 2002; Steyn and Temple, 2012).

Dental disease

Experts defined dental decay as "a biofilm-mediated, sugar- driven, multifactorial, dynamic disease that results in the phasic demineralization and remineralisation of dental hard tissues, determined by biological, behavioural, and psychosocial factors linked to an individual's environment" (Tinanoff *et al.*, 2019). Dental disease or dental decay is the most common chronic disease and the main cause of tooth loss (Bagramian, Garcia-Godoy and Volpe, 2009; Petersen *et al.*, 2005). It is the most common NCDs globally among children affecting 60–90% of school-aged children in high and middle-income countries and the vast majority of adults (Petersen *et al.*, 2005). Data from LMICs shows that the prevalence of dental disease is gradually increasing (Teshome, Muche and Girma, 2021), and this has been attributed to an increase in the consumption of sugar amid limited exposure to the protective effects of fluoride (Petersen *et al.*, 2005). Caries being a chronic condition presents a unique scenario in which past experience with exposure to the risk factors, even at younger ages, may have cumulative effects later on (WHO, 2015a;2017b)

Dental caries is a very costly disease to treat, which is a direct cost but also involves other indirect costs, for instance, travel costs, the time taken seeking services, or time off work for the parent or school for older children. In LMICs, the treatment cost exceeds the total child health care cost (Kathmandu, 2002), and moreover, many of the children are left with untreated disease (Petersen *et al.*, 2005). Individual impacts of dental disease among children include pain and discomfort, and difficulty chewing and swallowing, which compromise nutrition (Casamassimo *et al.*, 2009; Nora *et al.*, 2018). The consequences of dental caries in young children include a reduction in their growth and weight gain (Large and Marshman, 2022;

Sheiham, 2006), with reports of children with dental caries weighing 1kg less than the control group (Acs *et al.*, 1992). Dental disease can progress into more serious, potentially fatal complications (Rathee and Sapra, 2022). A Ugandan study reported 61.7% of children living with HIV/AIDs with pain (Nabbanja *et al.*, 2013). This pain also creates anxiety and sleepless nights, consequently complicating general health. If time is taken off school, this could affect school performance (Casamassimo *et al.*, 2009).

Aetiology of dental disease

Dental caries is an infectious condition characterised by demineralisation of the tooth. Dental disease has a multifactorial aetiology that includes microbial, host (salivary components and tooth morphology), and dietary determinants, specifically the availability of fermentable carbohydrates. Several bacteria have been implicated in the decay process; however, *Streptococcus mutans*, a Gram-positive facultative anaerobe, is the main cause of dental caries (Lamont and Egland, 2015; Loesche, 1986). This organism has both acid tolerance and acid generation, which are essential characteristics of a cariogenic agent. Several mechanisms that keep the bacterial cytoplasm's pH at a physiological level contribute to acid tolerance (Matsui and Cvitkovitch, 2010). A variety of dietary carbohydrates can be transported and fermented by *S. mutans*, which results in the generation of organic acids, chiefly lactic acid, which demineralises the cementum, dentin, and enamel of teeth (Bowen and Koo, 2011; Loesche, 1986). The capacity to produce extracellular polymers of insoluble glucan, which aid in retention on the tooth surface and serve as a reserve food source, as well as adhesins with selectivity for salivary components and glucan polymers are additional virulence factors (Bowen and Koo, 2011; Nobbs, Lamont and Jenkinson, 2009).

The role of sugar was initially studied in the lab and on animal models. Over time it was established that bacteria metabolise fermentable carbohydrates to form organic acids, including lactic, acetic, formic and propionic, all of which have been shown to easily dissolve the enamel and dentine minerals made up of carbonated hydroxyapatite with a complex crystal structure (Featherstone, 2008). The fermentable carbohydrates, also commonly referred to as sugar, include both free sugars and added sugars, either very simple sugars (monosaccharides) or disaccharides (WHO, 2015a).

The landmark paper on dental caries and sugar brought to light the role of fermentable carbohydrates as the principal aetiological factor in the development of caries and ***necessary***

for the initiation of the disease process (Gustafsson *et al.*, 1954). Other than the quantity of sugar consumed being an important factor, the study highlighted that sticky forms and consumption in-between meals (snacking) were greater risks for the development of caries. The Vipeholm study was carried out in the late 1940s and included 436 patients who were institutionalised and thus could be followed up for a long period of time, and their dietary conditions could be well-controlled and monitored.

Thereafter, several studies followed which have not departed much from the same message, including the role of acidogenic bacteria especially *Streptococcus mutans* in dental plaque (Al-Shahrani, 2019; Bradshaw and Lynch, 2013; Philip, Suneja and Walsh, 2018), the relatively long time over which decay progresses and the tooth morphology which makes specific types more susceptible to decay than others (Giacaman, 2018; Pitts *et al.*, 2017). Recent publications have re-emphasised the role of sugar in caries development (Chi and Scott, 2019; Echeverria *et al.*, 2022; Giacaman, 2018; WHO, 2017b), including observational studies and those where the sugar amounts and frequency are reduced.

In high- and middle-income countries, many studies report that sugar-sweetened beverages, including milk-based sweetened and fruit-based drinks and 100% fruit juices, are the main sources of free sugars. Confectionery, cakes, biscuits, sweetened cereals, sweet desserts, table sugar, honey, and syrups are also common sources of free sugars (WHO, 2017b).

Dietary "free sugars" being the most important risk factor for dental caries led the WHO to issue guidelines recommending that intake of free sugars should provide ≤10% energy intake and suggested further reductions to <5% to protect dental health throughout life (WHO, 2015a). A systematic review informed these recommendations of the evidence pertaining to the amount of sugars and dental caries risk, which showed evidence of moderate quality from cohort studies that limiting free sugars to ≤10% of energy, reduced but did not eliminate dental caries (Moynihan, 2016; Moynihan and Kelly, 2014).

The impact on an individual's quality of life on caries increases with the severity of the disease. However, even low or moderate levels of dental caries in children are of great concern because caries is a lifelong progressive and cumulative disease. Therefore, although it is common in all age groups, focus on prevention in the younger age groups (infants and young children) is even more important to promote future oral health. As such, apart from emphasising a daily intake of <10%, the systematic review on the effect of sugars and oral health further explored if there

were more benefits if the intake of free sugars was limited to <5% of energy. The findings revealed that populations with free sugar intake of <5% of energy had lower dental caries compared with those whose intake was >5% but ≤10% of energy (Moynihan and Kelly, 2014). These findings became the basis of the WHO recommendations on setting a recommended threshold for the intake of sugars meant to inform national policymaking processes with regard to the dental health of the population.

Food Processing and *NOVA* Food Classification

NOVA is the food classification where foods are categorised based on the extent and purpose of food processing instead of nutrients. With the increasing global attention on the role of food processing and dietary patterns on the NCD pandemic, it was necessary to describe the specific type of processing and how each type of processing modifies and influences health outcomes (Monteiro *et al.*, 2016).

The *NOVA* classification has four basic groups of food and food products and provides elaborate definitions and descriptions of each group's foods. These are the unprocessed or minimally processed foods in group 1, processed culinary ingredients in group 2, processed foods in group 3 and the fourth group, the ultra-processed foods (UPF). The details of this classification are shown in Box 1 and are adapted from publications by the group that initiated and defined this classification (Monteiro *et al.*, 2016; Monteiro *et al.*, 2017).

The classification readily identifies UPF and clearly shows that they are not modified foods; instead, they are formulations that have no resemblance in appearance or texture to traditional food (Monteiro *et al.*, 2012). They are generally energy-dense foods and considered unhealthy because of their content; - unhealthy fats, free sugars, salt, and refined starches. They are poor sources of protein, dietary fibre, and micronutrients (Monteiro *et al.*, 2017). When micronutrients are added to UPF, and health claims are made, food regulating authorities consider them to be “fake foods” (Popkin *et al.*, 2021).

NOVA has been widely used for public health research and nutrition in all age groups. It has been adopted by several countries in South America, some European countries and Food and Agriculture Organisation (Sarmiento-Santos *et al.*, 2022). Several studies have used this classification for identifying, nutritional profiling and other assessments on ultra-processed and processed foods used in IYC feeding (Batalha *et al.*, 2017; da Rocha *et al.*, 2021; Fangupo *et*

al., 2021; Giesta *et al.*, 2019; Grammatikaki, Wollgast and Caldeira, 2021; Lopes *et al.*, 2020; Pereira *et al.*, 2022; Relvas, Buccini and Venancio, 2019; Soares *et al.*, 2021; Soares *et al.*, 2022; Spaniol *et al.*, 2020; Sparrenberger *et al.*, 2015) with the majority originating from Brazil.

Although challenges in using the NOVA classification have been sighted (Drewnowski, Gupta and Darmon, 2020; Sarmiento-Santos *et al.*, 2022), this classification is more inclusive with guiding definitions on categorising foods irrespective of the target age group. It should become a more useful tool as nutrition-related research embraces it and becomes more popular within different contexts. The advantage is that the definitions are ubiquitous, irrespective of the food culture. One can still apply the elaborate definitions to classify foods used in their local context. However, most importantly, the definitions of UPF help guide users at all levels. Hopefully, countries like Uganda will also use similar tools in our nutrition guidelines and the multi-sectoral policies which affect nutrition and dietary habits.

Box 1. The *NOVA* classification

Group 1. Unprocessed or minimally processed foods

This first *NOVA* group of unprocessed and minimally processed foods.

Unprocessed foods are edible parts of a variety of natural foods after separation from nature.

The main purpose is to preserve natural foods and prolong their shelf life or make them safe of edible. These foods are natural foods altered by processes such as removal of inedible or unwanted parts, drying, rushing, grinding, fractioning, filtering, roasting, boiling, pasteurisation, refrigeration, freezing, placing in containers, vacuum packaging, or nonalcoholic fermentation.

None of these processes adds substances such as salt, sugar, oils or fats to the original food

They include fresh, squeezed, chilled, frozen or dried fruits and leafy and root vegetables, grains, legumes, starchy roots and tubers, fungi such as fresh mushrooms; meat, poultry, fish and seafood; eggs; milk, pasteurised orpowdered; fresh or pasteurised fruit or vegetable juices without added sugar, sweeteners or flavours; grits, flakes or flour made from corn, wheat, oats or cassava, flakes or grits andwater (maize porridge); tree and ground nuts and other oil; spices and herbs; plain yoghurt; tea and coffee with no addedsugar; drinking-water.

Group 2. Processed culinary ingredients

This second *NOVA* group of processed culinary ingredients. These are substances obtained directly from group 1 foods or from nature by processes such as pressing, refining, grinding, milling, and spray drying. The main purpose is to make durable products that are suitable for preparing, seasoning, and cooking unprocessed and minimally processed foods. Includes vegetable oils crushed from various seeds or nuts or fruits such as olives; butter; starches extracted from corn and other plants; sugar and molasses obtained from cane or beet; honey extracted from combs and syrup from maple trees; and salt mined or from seawater.

Group 3. Processed foods

This third *NOVA* group of processed foods. These are relatively simple products made by adding sugar, oil, salt or other group 2 substances to group 1 foods. Most processed foods have two or three ingredients. Processes include various preservation or cooking methods and, in the case of breads and cheese, non-alcoholic fermentation. The main purpose is to increase the durability of group 1 foods or to modify or enhance their taste and texture. They include canned or bottled vegetables, fruits and legumes, salted or sugared. The variety and increased availability of processed foods have influenced the population's eating patterns, especially young children, within the first few years of life, a time when eating habits are created and could remain for the rest of one's lifetime nuts and seeds; salted, pickled, cured or smoked meats and other animal foods; canned fish; fruits in syrup;cheeses; and unpackaged freshly made breads.

Group 4. Ultra-processed foods

This fourth *NOVA* group is of ultra-processed food and drink products. These are industrial formulations typically with five or more and usually many ingredients. Such ingredients often include those also used in processed foods, such as sugar, oils, fats, salt, anti-oxidants, stabilisers, and preservatives. **Group 1 foods are a small proportion of or are even absent from ultra-processed products.** The main purpose is to create products that are ready to eat, to drink or to heat (convenient), attractive (hyper-palatability). They are also characterised by multimedia marketing to children and adolescents, health claims, high profitability, and branding and ownership by transnational corporations. When products made solely of group 1 or group 3 foods also contain cosmetic or sensory intensifying additives, such as plain yoghurt with added artificial sweeteners, they are classified in group 4. A multitude of processed; combines calories and nutrients derived from foods with additives eg preservatives, anti-oxidants, stabilisers, colourings, artificial flavours, non-sugar sweeteners, carbonation). Includes carbonated drinks; sweet or savoury packaged snacks; ice cream, chocolate, candies (confectionery); mass-produced packaged breads, buns, cookies (biscuits),pastries, cakes and cake mixes; breakfast *'*cereals*'*, *'*cereal*'*and *'*energy*'* bars; margarines and spreads; sugared milk drinks, sugared *'*fruit*'* yoghurts and *'*fruit*'* drinks; sugared cocoa drinks; meat andchicken extracts and *'*instant*'* sauces; infant formulas, follow-on milks and other baby products (which may include expensive ingredients); *'*health*'* and *'*slimming*'* products such as powdered or *'*fortified*'* meal and dish substitutes; and many ready-to-heat products noodles and desserts.

"Hidden Sugars" and Public Health Awareness

"Hidden sugars" is a term used to describe free sugars either as "added sugars" or those derived from processed foods with intrinsic sugars like fruits. These are called "hidden" because of the low public awareness of their actual contribution to the diet when consumed. In some cases, the labelling uses uncommon terms to specify the types of added sugar, for example, dextrose for glucose and modified starch for high fructose syrup, in the ingredient list, which the public might not understand. Small fonts, unfamiliar complex names, and confusing formats make many ingredients lists hard to read or understand (Kessler, 2014). At such times a lot of nutritional information in the ingredient list is not very useful, leaving a consumer unaware of what they are committing to buy.

The other challenge is that there is no consensus on whether to include "added sugar" in the nutrition declaration or not, with the major impediment forwarded being that "free sugars" (naturally occurring), for example, those found in fruit juices, are hard to distinguish from "added sugars". Therefore, they are hard to test and monitor (Murphy and Johnson, 2003). Some countries, like the USA, have a new regulation for "added sugars" to be included in the nutrition declaration. However, this is yet to be seen elsewhere, including in Europe. This debate may not yet have reached our doorstep in countries like Uganda.

The Ugandan standards only mention "total sugar", and none of the standards that cover nutrition labelling mention "added sugar" quantification on labels. The Ugandan standard on nutrition labelling states carbohydrates and "total sugar" as the only mandatory information (UNBS, 2014a). In the face of rising NCDs in Uganda, stemming from high and frequent sugar consumption in processed foods, details on "added sugar" would be important to inform consumers and influence their dietary behaviours at the point of purchase (Tierney *et al.*, 2017).

Sugars can also be 'hidden' when their source is considered "healthy", for example, when fruit juice, concentrates and purees use added sugar, or in ultra-processing where "natural fruit juice" has a high sugar content from intrinsic sugars in the cell wall that is broken down to release 'free sugars'. While the labels indicate "natural fruit juice", "no added sugar", or "only natural sugar", and "fruit concentrate" in the ingredient list, all such items have a very high sugar content than is reflected on the labels. This was also demonstrated in several studies on baby foods (Bridge *et al.*, 2021; Erzse *et al.*, 2019).

Another concern lies with the ingredient list, which requires that all ingredients are listed in descending order by weight. Items with multiple "added sugars", with each in relatively smaller amounts than the non-sugar content, will appear at the end of the list. Yet if all these "added sugars" were put together, most lists would have them among the first items because of the total "added sugar" content (Kessler, 2014). Therefore, the current guidelines mislead consumers if a product has more than one added sugar in the ingredient list.

Ontogeny of Taste Preferences

A review by Menella (2014) highlighted the fact that healthy habits like good nutrition and physical exercise can prevent NR-NCDs, including childhood obesity and dental caries. The literature indicates that simple sugars, saturated fats and salty diets have sensory properties that make them more palatable than fruits and vegetables, which tend to have bitter tastes. Yet, the more palatable foods are unhealthier (Cooke, 2007). For infants and children, such unhealthy diets take the form of French fries, sweet and salty snacks, and sugar-sweetened beverages, which are now commonly consumed globally (Elliott, 2011).

It is believed that humans have an innate propensity to consume sweet and salty foods but avoid bitter tastes. However, genetic differences and environmental experiences ensure that, eventually, an array of tastes are developed. Hence the need for early exposure to nutritious foods and flavours that would naturally be unpleasant increases the likelihood of healthier food choices as the child develops and later on in life (De Cosmi, Scaglioni and Agostoni, 2017).

Older longitudinal studies on dietary preferences by Northstone and Emmett (2008) and Skinner *et al*. (2002) reported that the best age to influence tastes, such that even the unpleasant tastes are acceptable, is from early infancy to about three years of age. After that, dietary habits are more stable and harder to change, hence the need to get children on the right track as early as possible. Some factors that influence acceptance of healthy foods during later childhood are the taste of food, how long a child breastfed if the mother ate these foods and if a child had exposure earlier on in life. Cooke (2007) summarised this as "children like what they know and eat what they like".

A poor diet during infancy and early childhood, a critical time for establishing food preferences and dietary patterns, can have an impact not only in childhood but even into adult life (Koletzko *et al.*, 2012). Early exposure to refined sugars may increase the risk of developing several conditions like dental caries, OWO early in life that may continue until adulthood and later in

life, resulting in conditions such as metabolic syndrome and mortality from CVD. This has led to the focus on the life-course approach, which highlights the need for approaches on prevention and research into early-life exposures to tackle some chronic conditions that develop later through the course of one's lifetime (Mennella, 2014).

Due to the evidence of taste development being an important influencer and a modifiable factor, the public health perspective on controlling NR-NCDs like obesity and caries also needs to focus on the time period when to start modifying behaviour for healthier food choices rather than only providing education on nutritional quality foods. Thus, exposure to a wider range of tastes and textures is important for future nutrition. Such interventions should preferably be done from infancy until early childhood (Cornwell and McAlister, 2011).

Social Determinants of Health

A seminal paper known as the "Black Report" first presented the observations that there were wide differences in health and health outcomes seen among populations, which occurred within and between countries (Department of Health Social Security and Health., 1980). This led to an inquiry into the social determinants of health (SDH) (Marmot, 2005). This perspective of considering the cause of ill health goes beyond the biological, behavioural, and genetic causes. Instead, it considers the broader social, political and health environment context of individuals, families, and communities within which they live and work. The factors influencing health status and outcomes at a broader/macro level are referred to as structural determinants. Unfortunately, even at the macro-level, these influences usually affect the most vulnerable and deprived individuals/communities (Marmot, 2005; Sisson, 2007) and further emphasise the socio-economic gradients in mortality and morbidity within the same country (Marmot, 2005). This is what is referred to as health inequalities.

Theories on how social determinants influence health have been summarised as psychosocial, eco-social and social production of disease, also known as the political economy of health (Solar and Irwin, 2010). These social determinants include; - social gradient, early life, stress, social inclusion or exclusion, education, earnings/disposable income, and employment, among others. All these may directly or indirectly affect an individual, family or community in making health-related decisions, their power of choice, behaviours, accessing health care, level of health risk, and many other ways that either promote or impede health (Solar and Irwin, 2010).

SDH influence health through several mechanisms; - social selection, social causation and the life course perspective (Krieger, 2001; Solar and Irwin, 2010). Some perspectives are still controversial, with more research needed to support them. However, the social causation and life course perspectives could explain better health inequalities regarding NCDs.

The social causation perspective suggests that social position determines health through intermediary factors: material, psychosocial, behavioural and the health system. Material factors include housing, physical working conditions, and other related resources like money, power, and social connections, which render an individual at less risk because of having access to better protective strategies (Link *et al.*, 1998). However, this might not be entirely true for some disease conditions, especially in LIC, where individuals from higher socio-economic groups are faced with a greater risk of developing specific NCDs. Higher socio-economic groups, usually in urban areas, are more exposed to the risk factors like unhealthy diets, sedentary lifestyles and harmful use of alcohol (Ngaruiya *et al.*, 2017; Ordunez *et al.*, 2005; Wamala *et al.*, 2009).

The psychosocial factors act as intermediary factors; for example, lack of social support, stressful living, and negative life events can lead to unhealthy behaviours like smoking, alcoholism, etc. These unhealthy behaviours act as degenerative determinants of diseases. Generally, behavioural factors like smoking, unhealthy diets, alcohol consumption, and lack of physical exercise are some of the determinants of health directly associated with NCDs. It was observed that there is a social gradient with the lower socio-economic groups adopting unhealthy behaviours more than the higher socio-economic groups, including smoking, and poor diets, leading to obesity, especially in high-income countries. However, the reverse has also been seen in some LMICs (Allen *et al.*, 2017; Hosseinpoor *et al.*, 2012). For example, in southern Europe, smoking and obesity are more common in the higher income groups (Gewa, 2010), and dental caries is higher in urban children in LIC (Gathecha *et al.*, 2011; Kutesa *et al.*, 2015), who tend to come from the higher income groups. In SSA, this is generally more common for the NR-NCDs due to the nutritional transition where individuals from higher socio-economic groups feed on high sugar and fat diets than the lower groups, hence the term "diseases of affluence' applies (Stringhini and Bovet, 2017). Thus, the psychosocial perspective may not explain inequalities in some health conditions that do not currently follow the social gradient.

Lastly, the life course perspective brings to the forefront the importance of time and timing in explaining the causal links between exposure and health outcomes within an individual's life course across generations and in population-level disease trends.

Life Course Approach

The life course approach to chronic disease epidemiology has been defined as "the study of long-term effects on chronic disease risk of physical and social exposures during gestation, childhood, adolescence, young adulthood and later adult life" (Kuh and Shlomo, 2004). It includes studies on how the behavioural, biological and psychosocial pathways operate throughout an individual's life course and across generations to influence the development of chronic diseases (Ben-Shlomo and Kuh, 2002; Kuh and Shlomo, 2004).

The life course explanation reveals that SDH act sequentially at every development level: the prenatal period, early childhood, childhood, adolescence, and adulthood. These may be immediate influences or affect later health and illness. Thus, even any exposure in early childhood may follow a latency period without any disease condition until later in life when clinical manifestations appear (WHO and FAO, 2003).

There are two major models suggested by the life course perspective. The first model assumes that biological programming during "critical periods" of development, either peri-natally or during infancy, leads to a risk of chronic disease later in life. The model postulates that exposure during such times has lifelong effects on the structure and function of different organs and systems (Ben-Shlomo and Kuh, 2002). However, even when early exposures at critical periods occur, sometimes there are also later-life effect modifiers that reduce the risk of chronic diseases. This is the premise upon which the critical period with an effect modifier model rests (Nicolau *et al.*, 2007; Solar and Irwin, 2010). The modifier either enhances or reduces the risk of chronic diseases.

The second model suggests an "accumulation of risk" throughout the life course. The model explicitly emphasises a greater range of biological and social experiences in childhood, adolescence and early adulthood than the lifestyle and programming models. This model highlights that either the exposures act independently of one another, creating "chains of risk" probabilistic and sequential in nature or cluster together to influence health and disease later in life (Ben-Shlomo and Kuh, 2002).

Most oral diseases are chronic, with multifactorial aetiological and associated risk factors. Therefore, some of the proposed theoretical frameworks can be used to explain the differences in oral diseases and other health outcomes. Other NR-NCDs also develop over a very long time, and there is a long duration between the exposure, disease initiation and clinical recognition. For some of these conditions, overweight and obesity are the precursors, which might occur much earlier in life (Aristimuno *et al.*, 1984; Chi, Luu and Chu, 2017; Makkes *et al.*, 2013).

The life-course approach to epidemiology and prevention of NR-NCDs is crucial because some known risk factors are either socially developed or behavioural. Therefore, identifying modifiable factors like diet could be a target for behaviour modification. For example, the feeding patterns during the antenatal period to childhood influence future health, including the development of overweight or obesity, hence the importance of a life-course approach in preventing the NR-NCDs.

Commercial Determinants of Health

Commercial determinants of health (CDoH) is a recent term used to refer to "strategies and approaches used by the private sector to promote products and choices that are detrimental to health" (Kickbusch, Allen and Franz, 2016). Also, CDoH have been identified as "factors that adversely influence health, which stems from the profit motive" (de Lacy-Vawdon and Livingstone, 2020). Usually, this concerns NCDs and conditions like overweight and obesity. However, some concerns have been that the new concept of CDoH has been ignored in the existing social determinants of health frameworks.

Jahiel and Babor (Jahiel and Babor, 2007) had earlier coined the term "industrial epidemics", where the manufacturers and corporations were described as the "vectors" of NCDs, and the unhealthy commodities they produce, for example, the ultra-processed foods as the "agents" while the individuals remained the "hosts". Among the commercial determinants of NCDs and conditions that act as precursors to NCDs like OWO, unhealthy diets are described as the overconsumption of ultra-processed food products.

The importance of the concept of CDoH is that it focuses on the role of corporations and every action they undertake, beyond just the production, to facilitate the negative public health drivers of ill health. Acknowledging the enormous influence of the environment takes the

responsibility of making independent choices away from the individual, which helps to focus public health interventions in the right places (Diderichsen, Dahlgren and Whitehead, 2021). Some corporations' core actions to profit from their commodities include business practices, market practices, and political practices (Kickbusch, Allen and Franz, 2016).

The business practices involve all efforts geared towards running corporate activities. For example, in the baby food industry, establishing outlets and retailers and transnationals establish a local presence beyond the country of manufacture. In addition, every action that is used to control the supply chain and market concentration is referred to as a business practice. In short, these are practices that corporations use to run their activities (Kickbusch, Allen and Franz, 2016; Mialon, 2020).

Market practices are the actions taken to develop, produce and sell commodities (Mialon, 2020). For example, in the baby food industry, this includes branding, production of several commodities, aggressive advertising and promotions in places where caregivers or children are likely to visit often. Labelling is another way in which ultra-processed foods promote products with attractive graphics like cartoons, claims that attribute the commodities to gainful health or superior composition, and any other claims that may portray them as healthy foods (Garcia, Menon and Parrett, 2022; García *et al.*, 2019).

Another marketing practice is product research and development (Mialon, 2020). Food corporations, for example, conduct extensive research on what foods or beverages are acceptable, tastes and sights which would appeal to their target populations, and what content is considered undesirable. Then they respond by developing products and strategies that will promote the purchase of their products (Hastings *et al.*, 2003). Unfortunately, these strategies often include marketing unhealthy foods and beverages, which have been reported to influence dietary preferences among children and adolescents (Hastings *et al.*, 2003; Sadeghirad *et al.*, 2016).

Political practices are rarely obvious—often hidden—and yet very effective in keeping these corporations going about their business, even when it is known that their commodities are a risk factor for ill health. Corporations employ political practices to create a favourable policy environment for them (Hillman, Keim and Schuler, 2004). For example, corporations, especially transnationals, work towards weakening and frustrating efforts aimed at controlling their activities. Such actions have been observed in Uganda when transnationals that produce

soft drinks were influential in framing the tax debate on SSB and even appealed the increased tax on soft drinks till the Ministry of Finance gave in and reduced this tax (Ahaibwe *et al.*, 2021). Generally, corporations can impact policies but also influence regulation (Maani, Collin, *et al.*, 2020). Other political practices by transnationals include; - controlling trade agreements, initiating partnerships and extensive networks with public sector agencies (Maani, Collin, *et al.*, 2020)

Kearns and Watt (2019) articulated the actions and impact of transnationals in the sugar industry on oral health policy formulation. In their paper, they elaborate on how the key actors—expanders (public health advocates) and containers (transnational corporations)—promote or impede policy action on sugar. The transnational corporations employ several strategies to prevent the sugar policy by counteracting any efforts by public health advocates to describe public health problems. Such actions go as far as providing contradicting statistics, downplaying the severity of health conditions, and when solutions are proposed, they claim they are too costly and impractical.

Kearns *et al.* (2015)also described the sugar industry's role in influencing the public health narrative by altering the research agenda to focus on strategies other than sugar restriction for dental caries prevention. These actions allegedly took place in the 1970s as the National Institute of Dental Research was setting up a national caries programme. The sugar industry is reported to have used several underhanded methods to advance its agenda. For example, funding research on other causes of decay besides sugar, research on a vaccine, creating a conflict of interest within the institute leadership, and many other ways that are thought to have swayed them from targeting the sugar industry. It has also been noted that many corporations are based in high-income countries, yet the health impacts mostly affect the LMIC, and this is expected to continue as the markets in high-income countries stagnate, and the corporations seek alternative markets (Maani, McKee, *et al.*, 2020).

CDoH emphasise that individuals and lifestyle cannot be blamed for disease and poor health outcomes. Corporations' role in marketing, increasing access and availability, and influencing policy formulation and product regulation are key factors in determining unhealthy diets. Therefore, SDH frameworks that exclude CDoH deflect the attention away from private sector players to other social determinants of health. It is thought that the exclusion of CDoH in public health prevention strategies is a major factor in the slow and disappointing progress in tackling NCDs (Diderichsen, Dahlgren and Whitehead, 2021).

Common-Risk Factor Approach

The Common Risk Factor Approach (CRFA) is a health policy recommendation that has been promoted since 1980 by WHO (WHO, 1980). It emphasises an integrated approach to the prevention of chronic diseases because many of them have common risk factors. Using disease-specific interventions would be a duplication, wasteful, inefficient and sometimes contradictory messages promoted by the different specialist groups (Sheiham and Watt, 2000)

Oral health policymakers embraced this recommendation because several oral diseases, including dental caries, share these risk factors. CRFA also promotes integrating oral health into general health, thus reducing isolation (Petersen, 2009; Watt and Sheiham, 2012). In addition, oral health usually attracts fewer resources for prevention and promotion; thus, teaming up through the integration of interventions and adopting shared solutions to health promotion would be more effective and efficient (Sheiham and Watt, 2000; Watt and Sheiham, 2012).

Dental caries and overweight or obesity (OWO), although they have multifactorial causes, share diet as a common aetiology. Therefore, looking at the proximal determinants or immediate causes—of these NR-NCDS lifestyle behaviours and diet are important epidemiological common risk factors that can be targeted. Several meta-analyses report that the two conditions are linked in early childhood, with a positive association between OWO and early childhood caries (Angelopoulou, Beinlich and Crain, 2019; Hegde, 2020; Manohar *et al.*, 2020) with postulations about this relationship being pinned on dietary habits.

The relative advantage of material factors in LMIC is associated with increased risk for dental caries and OWO or over-nutrition. In contrast, undernutrition is more common among children that are deprived. This social gradient related to the health outcomes of chronic diseases is not surprising as the two are on the opposite continuum (Eckersley, 2015; Keino *et al.*, 2014; Marmot, 2005; Miranda *et al.*, 2008). OWO among children in SSA has been associated with working mothers, educated parents, and urbanisation which are all related to greater affluence and higher social status in such settings (Ayoola *et al.*, 2009; Keino *et al.*, 2014). Similarly, although more widely spread in the different subpopulations, childhood dental caries has also been associated with urbanisation, and other factors that indicate a higher socio-economic status like maternal education.

An example of a CRFA intervention is a childhood obesity prevention campaign dubbed 'Sugar Smart' which was launched in the UK to raise parents' awareness of dietary sugar in response to the high sugar content in children's food. The campaign effectively raised awareness and reduced sugar intake a year later. However, the impact was short-lived because of the challenges reported by parents, which included;- the cost of healthier options, hidden sugars and habits that had been formed earlier(Gardner *et al.*, 2018).

Other than focussing on only lifestyle and individual behaviours through health education, more comprehensive strategies proposed by the Ottawa Charter for health promotion are considered more appropriate to target the different levels of underlying determinants (WHO, 1986). The strategies might include community action and support, legislation, empowering people to become stakeholders in society, and food policy development (Sheiham and Watt, 2000). Some of the actions would require a range of stakeholders and players on both the supply and consumer side, for instance, health professionals, parents, researchers, academics, nutritionists, food regulators, and policymakers.

To target commercial determinants of health, food-related policies and legislation targeting commercial baby foods, including their free sugar content, production, distribution, and consumption, would be a worthwhile strategy to address common risk factors for both early childhood caries and OWO. Where regulation is non-existent, discourse and the development of guidelines would be the starting point. If operational guidelines are already in place, the monitoring and regulatory processes should be evaluated and reinforced or modified where necessary. Evidence regarding common risks and the multifactorial aetiological nature of dental decay and OWO call for multiple strategies encompassing both the upstream and downstream preventive approaches. Recommendations should be translated into policy and practice using inter-sectoral platforms (Moynihan, 2016; Moynihan and Kelly, 2014; Schwartz *et al.*, 2014).

The Ugandan Context

Uganda is a low-income country that has only started paying attention to NCDs recently. Predominantly, infectious diseases like HIV and malaria have been of greater public health concern. With regard to IYFC, the focus to date has been on undernutrition and micronutrient deficiencies, which greatly plague the child population, the majority of which is from low

socio-economic backgrounds. Most of the research to date has focused on under-nutrition, tenfold more than those on OWO (Ngaruiya *et al.*, 2017).

There are hardly any recent publications on the relationship between complementary feeding and NR-NCDs, and none of these has inquired explicitly about the use of sugar or CBF. However, there are studies that have shown an association between caries experience and sugar consumption among children (Kutesa *et al.*, 2015; Musinguzi, Kemoli and Okullo, 2019).

The recent Uganda Demographic and Health Survey (2018) reported on EBF, its duration, and minimum acceptable diet (WHO, 1986). However, there is no mention of CBF nor intake of sugar and other dietary elements like fat that are associated with over nourishment or NR-NCDs. It was found that non-breastfed infants and young children were more likely to consume a variety of complementary foods compared to breastfed children.

Many of the nutrition policies are intended to achieve food security, improve the nutrition of the undernourished populations, and the availability of important micronutrients during infant and young child feeding to prevent the morbidity and mortality of those under five years. There has been a glaring gap in the policy outputs since 2006 that cover NR-NCDs (Namugumya *et al.*, 2020).

Complementary feeding

The Uganda Demographic and Health Surveys document some complementary feeding indicators, including continued breastfeeding at one year, consumption of iron-rich or iron-fortified foods, and the minimum acceptable diet. The latter includes these aspects; - the minimum meal frequency and the minimum dietary diversity (foods from at least three food groups a day) with a specific focus on home-prepared foods which are promoted in contexts like Uganda (UNICEF, 2020). To date, none of the demographic and health (DHS) surveys has used indicators outside of these foods for complementary feeding.

However, the latest version of DHS-8 includes some survey questions on the consumption of questions on sugary drinks and unhealthy foods for children. This was after the acknowledgement that there is an increasing prevalence of overweight and obesity among infants and young children (Demographic and Health Survey Program and ICF, 2019; UNICEF, 2020).

A household cross-sectional study among 349 caregivers of 6-23-month-olds from a rural northern Ugandan district (Lamwo) used a composite variable with nine indicators of complementary feeding was used to measure adherence. Only 47% had initiated CF at six months, with the number of complementary meals ranging from 1-4 meals per day with a mean of 3 (SD=0.8) meals per day. Just over half (55.8%) of the children were given less than the recommended amount of food, and only 40% of the caregivers were adherent to complementary feeding guidelines. Some of the factors positively influencing adherence were having younger children (6-8 months) (OR = 4.68, 95% CI: 1.91-11.48), fathers with more than seven years of formal education (OR = 2.27, 95% CI: 1.22-4.19), and caregivers with two children under five years (OR = 5.46, 95% CI: 1.46-20.36) (Aber, Kisakye and Babirye, 2018).

Another cross-sectional study is from northern Uganda (Acholi) among caregivers of 6-23-year-olds in a post-conflict area. The majority of community members had received nutrition education as part of capacity building to improve knowledge, attitude, and practices to enable them to manage maternal and child nutrition issues during the post-conflict development phase. The findings revealed that most caregivers had good knowledge (88%) and attitude (90.1%) toward complementary feeding. Only half (50%) of them practised correct nutrition behaviour. The education status of the household head influenced both knowledge and attitudes (Bekele and Turyashemererwa, 2019).

Cross-sectional studies in the western part of the country (Fort Portal, Kabarole district) among caregivers of 6-23-month-olds reported the prevalence of appropriate complementary feeding was 21.4%. Factors positively influencing appropriate complementary feeding practices were formal employment (PR= 7.05; CI:1.69-29.36), cohabiting (PR= 2.15; CI: 1.10-4.18) and having no child illness (PR= 1.85; CI: 0.88-4.35). Qualitative results showed that inadequate information and low income as major challenges towards appropriate complementary feeding practices (Bagaaya, Wamani and Kajura, 2019).

A study from a rural population in central Uganda (Luwero district) revealed that most caregivers (57%) of 232 children aged 0-24 months started complementary feeding before the recommended six months of age. The caregivers reported that they gave their children solid foods and fluids or semisolids such as plain milk, milk tea, dry tea, and porridge. Most caregivers did not take into consideration the age appropriateness of the feeds, and there was no proper transition time from liquids to semisolids and to solid feeds as recommended. The majority of the caregivers introduced solid foods at the age of 6 months, and the most

commonly used complementary foods were maize porridge, millet porridge, and cassava flour porridge (Nankumbi, Muliira and Kabahenda, 2012).

Smaller Ugandan surveys have generally focussed on adherence to IYCF practices that follow the current policy guideline in rural or sub-rural populations in the age of up to two years, while others concentrated on undernourishment. This literature review revealed no published studies on commercial complementary feeding practices. Moreover, most of the studies have focussed on rural populations.

Therefore, the present study aims to establish a situation analysis on the consumption of commercial foods, including unhealthy snacks and beverages, in an urban population, which should also have a substantial representation of infants and young children with NCDs resulting from these practices, including dental caries and overweight/obesity.

Policy Guidelines on Infant and Young Feeding in Uganda

The first Ugandan policy guidelines on IYCF were published in 2009 (Government of Uganda, 2009) and clearly mentioned the association between child malnutrition and inappropriate feeding practices. The focus was on three major areas: feeding under "normal" circumstances, in situations of HIV exposure, and other exceptionally difficult circumstances.

These guidelines were derived in response to the Uganda Demographic and Health Survey 2006 (Uganda Bureau of Statistics (UBOS) and Macro International Inc., 2007), which highlighted that substantial numbers of the infant and child population were not receiving optimal nutrition with the following specific findings: initiating breastfeeding within an hour after birth - 66%, exclusive breastfeeding (EBF) till the first six months of age - 61%, and timely complementary feeding – 80%, with the minimum acceptable diet (MAD) - 28%.

Subsequently, the latest survey (Uganda Bureau of Statistics (UBOS) and ICF, 2018) revealed that trends in undernutrition indicators among under-fives had gradually improved over the two decades except for wasting, which had remained stable between 4-5%. Overweight in the same population had also remained between 4-5%. This survey also reported that at least two-thirds of the children had timely breastfeeding initiated, and two-thirds had EBF for up to six months of age. However, only 15% got the MAD, with this proportion rising with improving maternal

education (10% among non-educated mothers and 26% among children with mothers who had more than a secondary education).

Findings from other parts of the world have also shown that the reverse is true with regard to over-nutrition, with several studies reporting increased risk for OWO as maternal education increases (Keino *et al.*, 2014; Pries *et al.*, 2017). Specific to complementary feeding, represented by policy guideline number 2, is captured as:

> *Parents shall be counselled and supported to introduce adequate, safe and appropriately fed complementary foods at six months of the infant's age while they continue breastfeeding for up to 2 years or beyond (p.xi)*

This policy is silent on commercial complementary foods, yet international guidelines (WHO, 2017a) recommend that countries adopt some of these, including the quality, nutritional content, sugar content, labelling, and promotion and ensure that standards and regulations are in place to legalise these guidelines. That way, even penalties can follow those that fail to abide by the mandatory regulations. In some cases, fiscal taxation might be necessary to protect the population. The subsequent guideline does not cover processed complementary foods either. However, it includes a recommendation warning against the use of drinks and foods high in sugar, salt and fat (Uganda MoH, 2021).

Therefore, this study represents part of the efforts that will provide evidence for Ugandan policymakers and other stakeholders and highlight the need to update the guidelines in the country while taking into consideration the different spectra and socioeconomic groups that need to be protected.

Conceptual Framework

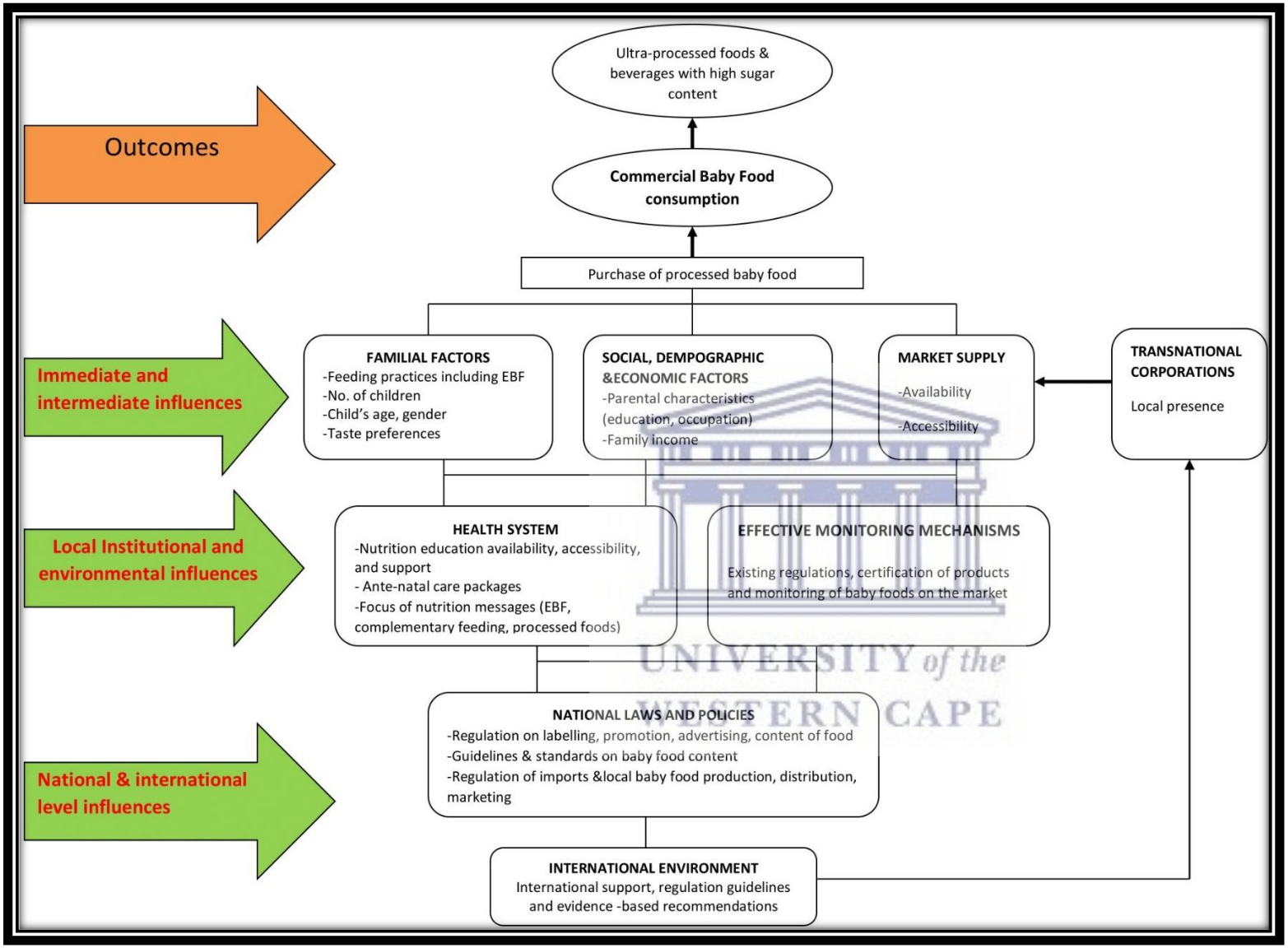

Figure 1: Conceptual framework for multilevel influences of commercial baby food composition and consumption in sub-Saharan Africa

The conceptual framework guided the choice of the research design, selection of variables, analysis, and interpretation of the study findings (Figure 1). It is adapted from several models and literature reviews on the factors that influence infant and young feeding practices in low and middle-income countries (LMIC) (Allen *et al.*, 2017; Batalha *et al.*, 2017; Lessa *et al.*, 2017; Lioret *et al.*, 2015; Lopes *et al.*, 2020). The framework illustrates complex, multidimensional, and multilevel influences of commercial complementary feeding that are classified as the child/familial/caregiver level, community level, local institutional and environmental factors, and macro-level national and international level influences.

At the macro-level, the international recommendations and national policies determine the expected standards and set guidelines that promote optimal IYCF practices and thus promote health in the population (Marmot *et al.*, 2008; WHO, 2008). These are usually drawn from research findings of both relevant situation analyses and systematic reviews whereafter evidence-based practices are recommended (PAHO and WHO, 2003). Local research, usually from academic institutions and relevant government ministries, generates locally relevant evidence and is a basis for IYCF lobbying and advocacy. The extent to which the health system is involved will influence the uptake of some of the guidelines, including the knowledge and attitudes of health providers who usually act as gate-keepers to health-related information. Therefore, the health system creates access or barriers to health services, including providing knowledge and support regarding IYFC practices (WHO, 2009). Furthermore, at the local institutional level, agencies/bodies like the national regulatory agencies ensure the implementation of the different optimal IYCF guidelines/policies and should regularly monitor compliance by the other players like corporations, vendors, and retailers. The recommendations relating to IYCF practices, specifically CACF have focused on labelling, promotion, marketing and advertising, and baby food composition (Marais *et al.*, 2019; Sweet, Jerling and Van Graan, 2013b; WHO, 2017a). This should also include regulation of commercial baby food imports and locally processed foods.

Evidence from health studies highlights that health behaviours and outcomes are influenced by individual factors and social and economic factors (Marmot *et al.*, 2008). These social determinants create and shape social hierarchies such as educational systems and cultural and societal values that, in turn, stratify society into classes, thus defining individual socio-economic positions. Socio-economic positions are depicted by income, education, occupation, social class, and gender (Solar and Irwin, 2010). These, in turn, can influence health-related choices and behaviours, including food choices (Pries *et al.*, 2017).

Social determinants are underlined by a set of the intermediary (family level) determinants of health such as family health behavioural practices and lifestyles; social support, family coping skills; material circumstances such as housing, household environment, culture, feeding practices and the health-related behaviours (Marmot *et al.*, 2008).

Another important aspect specifically related to IYCF in SSA is maternal education, age and employment status, which may differ depending on the type of baby food, whether breastmilk substitutes or CACF or commercially produced snacks (Keino *et al.*, 2014; Pries *et al.*, 2017). As mothers move into busy lifestyles that involve working away from home, they consider easier and more convenient alternatives to home-prepared complementary foods (Sharma *et al.*, 2019). These social and intermediary determinants influence caregiving behaviours, including IYCF practices.

Other intermediary factors are directly related to factors that increase the availability, affordability, and access to commercially produced baby foods. Some indirect drivers of the nutrition transition include urbanisation, economic growth, local presence of transnational companies, increased local production of processed foods and big supermarkets that attract all kinds of retail products and buyers (Cuevas García-Dorado *et al.*, 2019; Kearney, 2010). As such, international companies make a relatively big contribution by directly supplying and marketing their products or indirectly by influencing the political environment that allows them to thrive. Additionally, transnational corporations look for alternative markets in LMIC when the fiscal laws in high-income countries are no longer conducive and reduce their profit margins (Kleiman, Ng and Popkin, 2012; Popkin, 2014).

Scope of the two studies

The studies were guided by the research conceptual framework to bring to light the multifaceted factors associated with the consumption of commercial baby foods. Study 1 focussed on the intermediary and immediate factors, including family/caregiver and child characteristics that influence the consumption of commercial baby foods using quantitative methods. The contextual aspects underlying mothers' nutrition knowledge and past experiences with access to nutritional education and information were also assessed. Study 1 also established the commercial baby foods available in the Ugandan market by capturing the diet records of IYC, who were surveyed.

The literature has shown that sweet tastes significantly influence food preferences and consumption in early childhood (Pries *et al.*, 2017). Therefore, Study 2 focussed explicitly on examining the sugar content and taste properties like flavours and sweeteners declared on food labels of CACF and other commercial food products commonly consumed by IYC in the Ugandan context. Food labels are meant to provide consumers with nutrient-related information and other product information in order to assist them in making their food choices. Therefore, food labels were also assessed for compliance with national and international recommendations and guidelines.

The effectiveness of regulatory mechanisms was indirectly determined from label assessments of products in the Ugandan market. Furthermore, the purchased products were a direct indicator of foods that are available and accessible, either locally produced or imported. The local presence of transnational corporations was demonstrated by several products of the same brand available on the Ugandan market.

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CHAPTER 3

AIM AND OBJECTIVES

3.0 Overall Aim

To investigate infant and young child feeding (IYCF) practices among urban/peri-urban caregivers of 6-36 months old children focusing on commercial baby foods and determine whether commercial baby foods in the Ugandan market are nutritionally suitable and comply with label guidelines.

3.1 Specific Aims

There were two specific aims of the present study, and they were as follows:

3.1.1 Study 1 Aim: To determine the level of commercial baby food use and the associated factors in an urban/peri-urban Ugandan sub-population of children aged 6-36 months in Kampala.

Primary objective

i. To determine the proportion of children aged 6-36 months that consume commercial baby foods in Kampala

Secondary objectives

ii. To assess the factors associated with the consumption of commercial baby foods among children aged 6-36 months in Kampala;
iii. To determine the consumption frequency and patterns of ultra-processed foods among 6-36-months old in Kampala;
iv. To assess the family and child factors associated with the frequency of consumption of ultra-processed foods among children aged 6-36 months in Kampala and
v. To estimate the proportion of children aged 6-23 months that meet the minimum infant and young child feeding practices using selected WHO indicators

3.1.2 Study 2 Aim: To ascertain the extent to which commercial baby foods adhere to the selected labelling guidelines and their nutritional suitability for optimal infant and young child nutrition with respect to their sugar content

Primary Objectives

i. To assess the compliance of labelling of commercial baby foods with selected aspects of national and international guidelines that promote optimal infant and young child feeding;
ii. To determine the sugar and energy content of commercial baby foods declared on labels;
iii. To assess the nutritional suitability of commercial baby foods based on their taste, sugar and energy content declared on labels and
iv. To identify inappropriate label practices on commonly used foods and beverages that could lead to their misrepresentation as suitable for infant and young child consumption

3.2 Research hypotheses/ Statements of purpose

1. There is a high consumption of commercial baby foods by infants and young children in Kampala metropolitan area during the complementary period
2. The commercially available complementary foods in the Ugandan market do not fully comply with international and national label guidelines
3. The commercial baby foods available in the Ugandan market are not nutritionally suited to be promoted for optimal infant and young child feeding regarding their taste, sugar, and energy content

3.3 Research rationale

The nutrition transition is gradually creeping onto populations from low-income countries (Fanzo *et al.*, 2019; Kearney, 2010). This transition commonly exists in urban areas and varies in the different age groups (Auma *et al.*, 2019; Popkin, 2003;2006). Some urban infant and young child populations are characterised by high consumption of commercially produced snacks, which tend to be energy-dense and nutrient-poor (Pries, Filteau and Ferguson, 2019). These snacks could replace breastfeeding and the consumption of traditional local foods during the complementary period (Pries *et al.*, 2017; Quinn *et al.*, 2010b). Such snacks, other foods, and beverages that are usually ultra-processed tend to have added sweeteners which exposes

infants at a very early age to sweet tastes and sets them up for poor food choices later in life (Koletzko *et al.*, 2012). Additionally, consuming ultra-processed foods high in sugar has been associated with an increased risk for early childhood caries and overweight or obesity among young children (Baker *et al.*, 2016; Tzioumis *et al.*, 2015a). Being overweight or obese in early childhood is associated with obesity in later years and increases the risk of NCDs later in life (De Onis, Blössner and Borghi, 2010; Koletzko *et al.*, 2012; Zhang *et al.*, 2013).

National and international guidelines discourage the consumption of foods and snacks high in sugar, salt and fat by infants and young children, as well as recommend label information that can guide consumers (caregivers) on making appropriate food choices. Failure of manufacturers to comply with these recommendations impedes optimal infant and young child nutrition. It was unknown to what extent infants and young children in Uganda were being fed commercial baby foods, especially ultra-processed foods and beverages that are unhealthy. It was also unclear whether the urban child in Uganda had similar consumption patterns of ultra-processed foods as had been reported in other populations.

It was also not documented whether the commercially available complementary foods comply with the labelling guidelines, meant to promote optimal infant and young child feeding practices, or if their sugar and energy content was suited for this age group. These are indicators of the health environment to which young children are exposed and, by implication, the level of monitoring and regulation of commercial baby foods in the Ugandan market.

Therefore, the ultimate goal of the present research study was to provide baseline evidence for key players to consider the need to revisit IYCF guidelines and standards that cover commercial foods. These guidelines should align with international recommendations, contextually specific and appropriate for the Ugandan setting. This work would also contribute to food policy formulation that targets ultra-processed foods and beverages commonly used in the younger ages to provide a health-promoting environment. Lastly, the intention was to highlight the gaps in the Ugandan setting on optimal infant and young child feeding practices and provide alternatives to consider to improve this situation while taking targeted and population-wide interventions.

CHAPTER 4

METHODOLOGY

4.0 RESEARCH DESIGN

4.1 Overview

The present research study consisted of two studies, each with different approaches using primary data. As one of the first contextual research works on infant/child nutrition and processed foods in Uganda, it was necessary to design different studies to triangulate data from several aspects. These included the population dynamics, the kinds of foods and products being consumed, and the assessment labels using the guidelines that regulate the quality of the foods. In addition, this approach was taken to allow for the collection and synthesis of meaningful data to provide baseline evidence for policy formulation or review and to establish the extent to which the current regulations could be considered effective in promoting optimal infant and child feeding practices.

Consequently, multiple research strategies were used that included:

1. a cross-sectional survey of an urban population: to establish complementary feeding practices with a focus on the consumption of processed baby foods. This study further informed the conduct of the second investigation by providing context and details on the products to be included during sampling;
2. a cross-sectional survey of labels found on processed baby food products locally available in the Ugandan market.

4.2 Definition of commercial baby foods

As pertains to the present study, commercial baby foods (CBF) were defined as commercially available complementary foods (CACF) and commercial food products (CFP). CACF were further defined as processed and packaged products with a label indicating that the product is intended for young children less than three years old. This definition also included products with images of at least one child who appears to be younger than three years or with a picture of an infant feeding (Sweet *et al.*, 2016). This definition excludes infant formula because these are considered breast-milk substitutes which could be used from birth for supplementation or

total replacement of breast milk, and thus would not be considered as complementing breastfeeding.

The CFP were defined as industrially manufactured foods intended for consumption among the general population, not only young children (Pries, Huffman, Mengkheang, *et al.*, 2016). These included snack food products, sugar-sweetened beverages, and processed foods commonly fed to infants and young children in Uganda. The list of these foods included: cookies, cakes, pies/ pastries, sweetened bread/baked products, candy, desserts, ice cream, sugars, syrups, jelly, fruit drinks, soft drinks, sweetened tea/coffee, sweetened and flavoured yoghurt and dairy beverages, breakfast cereals, biscuits, artificially sweetened beverages, grain snacks, sweetened purees, doughnuts. Other context-specific snacks/foods and beverages were elicited from a pilot study among mothers in the same geographical area. Visits to local grocery stores and supermarkets provided information on the kinds of commercial baby foods available, and observations were made in busy, high-traffic supermarkets, where the researcher interacted with buyers selecting items from the baby food sections. Products on display within the food and beverage sections that carried images (like cartoons) attractive to buyers with young children were also included.

4.3 STUDY 1: COMMERCIAL BABY FOOD USE AND COMPLEMENTARY FEEDING

4.3.1 Study Design

A cross-sectional descriptive survey was carried out from October to December 2021.

4.3.2 Study site and study setting

Kampala is a district and the capital city of Uganda. It is in the central region, and its metropolitan area extends about 20-30 kilometres from the general post office to include parts of the neighbouring Wakiso and Mukono districts. Kampala district is fully urbanised, while the neighbouring districts' urbanisation rates are 40% and 50% in Mukono and Wakiso, respectively. Kampala district is further divided into five administrative divisions: Rubaga, Nakawa, Kawempe, Makindye, and Central Division. Kampala district has an estimated population of 1.6 million inhabitants with a population density of 7925 per square kilometre (Uganda Bureau of Statistics (UBOS), 2016). Except for Kampala, most of the working population travels from neighbouring peri-urban areas to the capital city for work and to access

several amenities or services, including grocery shopping and seeking health care.

Kampala metropolitan has a heterogeneous population comprising more than 30 ethnic groups that speak different languages. English is the official language of communication, but the majority of the indigenous population speaks Luganda. In 2019, Kampala city population was estimated to be 1.7 million, while along with the rest of the neighbouring districts, the population was estimated at 6.7 million (Kampala City Council Authorirty (KCCA) and UBOS, 2019; UBOS, 2020).

There are over 1334 health facilities in Kampala, of which 26 are government-owned, 54 private-not-for-profit, and 1254 private-for-profit (Uganda MoH, 2018). The health facilities are classified based on the range of services they offer, with health centre IIIs (HCIIs) offering essential health promotive services and the complexity increasing from HCIIIs, and HCIVs to hospitals. The referral hospitals are government facilities. Kampala has five referral hospitals located in the five subdivisions.

4.3.3 Study population

The target population was the caregivers of 6-36-month-old children attending selected health facilities during the study period. Caregivers in the Ugandan context are principally mothers or hired nannies. Even when nannies are the principal caregivers, it is assumed that the mothers make decisions about their children's feeding practices. The 6-36-month-old was the target age group, with the lower limit representing the WHO-recommended age to commence complementary feeding (WHO, 2005). The upper limit is based on the "Codex Guidelines on formulated complementary foods for older infants and young children", which defines young children as those up to three years of age (FAO and WHO, 1981a).

4.3.3.1 Sample size

The formula for calculating survey proportions was used to get the sample size while considering the design effect due to clustering.

$$n = \frac{Z_{\alpha}{}^{2}\, P\,(1-P)}{d^{2}}$$

Where n=sample size, Z=statistical level of confidence, P=expected proportion, and d= precision. If Z=1.96 (95% confidence), and using a prevalence of 23.1% of 6-23 months old

taking commercial snack foods reported in Dar-es-Salaam (Vitta *et al.*, 2016), P=0.23 and d=0.06, then n =189.

A factor of 2 was used as a multiplier to adjust for the design effect due to multi-stage cluster sampling, increasing the sample size to give n=378. Additionally, 10% were added to cater for nonresponse, giving a final sample size of **416.**

4.3.3.2 Sampling procedure

A multi-stage cluster sampling technique was used to select the primary sampling units, the caregivers. Multi-stage cluster sampling technique was used to select the study participants. The stages of sampling were as follows:

Stage 1: Three out of the five divisions in Kampala were randomly selected from a list where each was given a number 1-5. One health facility was selected purposively based on the type, size, and utilisation rates of child health services from each of the three selected divisions. The facilities sampled were from the HCIII to the hospital level. Three facilities were purposively selected to represent the type of facility and care level. These were: private (central division), private-not-for-profit (Rubaga division), and government-owned facilities (Kawempe division). Additionally, a private paediatric clinic from Wakiso district was selected to represent the more urbanised neighbouring district and the Kampala metropolitan population. The details of the health facilities and their characteristics are included in Table 4.1.

Table 4.1 Health facilities selected for the study

	Label	Type	Level	Location*	Total (n)
Naalya	HF1	Private	Paediatric clinic	13km, NE	90
Mengo	HF2	PNFP	General Hospital	5 km, W	125
Nakasero	HF3	Private	General Hospital	3km, N	121
Komamboga	HF4	Public	HCIII	10km, N	74

*Reference point is the General Post Office in Kampala

Stage 2: The average monthly utilisation rates of child health services of the selected health facilities were determined based on the total number of child health visits at the outpatient departments and immunisation between August and October 2021. These rates were used to allocate clusters using probability proportional to size from each of the selected four facilities. The size of each cluster was drawn up to achieve an even distribution of child ages across the first three age categories (6–11.9, 12–17.9,18–23.9), and the last category, 24-36 months, had an extra 20% to cater for the fact that the group covered a more considerable age range compared to the younger age groups.

Stage 3: number of caregivers (n) from the selected health facilities was selected using systematic random sampling. The sampling interval at this stage was determined by dividing the monthly average utilisation rate by the required number of individuals.

4.3.3.3 Selection criteria

All caregivers of infants aged 6-36 months residing within the Kampala metropolitan area and seeking services from the paediatric outpatient and vaccination departments at the selected healthcare facilities were included. The following caregivers were excluded: those who refused to participate in the study, younger than 18 years old, those who could not communicate in English or the most common local language (Luganda) and those with very ill children.

4.3.4 Data Collection

Caregiver-child pairs were recruited from the outpatient departments and vaccination points at health facilities. If the caregiver had more than one child in the age group, the younger child was considered. The recruitment procedures and the research tools were piloted and tested at a nearby government health facility that was not selected for the main study (Appendix 1A). A researcher-administered standardised structured questionnaire was used in an electronic data collection form (Open Data Kit Collect), and this was translated into Luganda (the local language widely used in the geographical study area) and pilot-tested (Appendix 1B). In addition, an open-ended researcher-administered paper-based data collection form for the 24-hour diet recall was used as part of the same questionnaire. The entire questionnaire was a modification of standardised questionnaires from previous studies (Olatona *et al.*, 2017; Pries *et al.*, 2019; Xazela, Chinyamurindi and Shava, 2019).

The respondents were interviewed in either English or Luganda on all days of the week to ensure that there was no bias with the 24-hour recall due to the day-of-the-week effect at the group level (Pries *et al.*, 2019). A pictorial food chart of the common foods determined through piloting was also used to aid the 24-hour recall where necessary.

If the caregiver had not been with the child in the last 24 hours, an appointment to follow up the next day on the phone was made, or the primary caregiver was called during the interview to fill in the relevant sections on feeding the child.

The sampling included all three different types of health facilities (public, private and PNFP) to avoid selection bias and hence have a fair representation of the urban population in Metropolitan Kampala. The data was collected by three trained research assistants fluent in both languages. The structured questionnaire (Appendix 1A and 1B) consisted of six sections: i) socio-demographics section, ii) general infant and child feeding practices, iii) maternal nutrition education, iv) commercial baby food consumption practices in the previous week, v) nutrition label use and vi) 24-hour diet recall for the young child or infant.

4.3.4 Data management and analysis

Study data were checked for accuracy, completeness, and consistency at the close of each day, and any identified errors were corrected. Completed forms were saved using an electronic format on a dedicated server. Thereafter, data on the server was saved and exported in the comma-separated values (CSV) file format, downloaded, saved as XLS in Microsoft Excel (version 2019 Microsoft, Redmont USA), and exported to a data analysis software Stata version 16.0 (Stata, College Station, Texas, USA). Double data entry of the 24-hour recall paper data was done and validated using Microsoft Excel. This data was merged in Stata with that collected electronically using the unique identification of each entry.

Continuous variables like age were summarised at univariate analysis using means and standard deviations or medians and interquartile ranges for those that were non-normally distributed. Categorical variables were described using frequencies and proportions with 95% confidence intervals. One of the variables, socioeconomic status, was derived with tertiles (three equal groups:-first/lowest, middle and the highest) using principal component analysis of five household characteristics used by Uganda National Bureau of Statistics (UNBS) in demographic health surveys (Uganda Bureau of Statistics (UBOS) and ICF., 2018). The five

characteristics were home ownership, floor type of home, fuel type used for cooking, typology of sanitation, and land ownership. The primary outcome variable—consumption of at least one commercial baby food item on the preceding day was measured as a binary outcome (Yes or No). The secondary outcome was the consumption frequency of ultra-processed baby foods the week before the interview, which was an ordinal outcome. The secondary outcome was categorised as; frequently (4-7 days a week), rarely (1-3 days a week) or never. The definition of ultra-processed (group 4) foods was derived using the NOVA classification (Monteiro *et al.*, 2016). This definition excludes the locally minimally processed cereals without additives, commonly used for porridge and require boiling during preparation.

For the bivariate analysis to determine the factors associated with consuming commercial baby foods within 24 hours, all independent study variables were categorised as either ordinal or nominal. The statistical test used was Chi-square and/or Fisher's exact tests when one or more categories had an expected frequency of 10 or fewer.

For a variable to qualify for multivariate analysis, it was selected based on literature or those associated with a level of p-value less than 0.2 at bivariate analysis. After that, modified Poisson regression was used because the outcome was prevalent (proportion of consumption greater than 10%). Both bivariate and multivariate analyses employed ordinal logistic regression to assess factors associated with the previous week's consumption frequency. The analysis included checking for collinearity and outliers. The chunk test was used to check for interaction. Stratified analysis was used to control for confounding; if a variable had a percentage difference of 10 or more between the crude and adjusted incidence rate ratio **(**IRR) for multinomial regression or odds ratio for ordinal regression, it was considered to confound the relationship. Overall, 95% confidence intervals or 5% error levels were used to determine their statistical significance.

The latest version of WHO infant and young child feeding indicators (WHO and UNICEF, 2021) were used to determine the proportion among the 6-23-month-olds who were currently breastfeeding, feeding on solids/semi-solids, feeding on egg or flesh, who consumed no vegetable and fruit, and those who met the minimum complementary feeding indicators within the 24 hours. Eight of the nine complementary feeding indicators were included in the present study. In addition, a modified measure for the 24-36-month age group, minimum dietary diversity, was defined as consumption of at least four out of seven food categories, excluding breastfeeding.

4.3.5 Ethical considerations

The study protocol received the following ethical approvals: Biomedical Research Ethics Committee (BMREC) of the University of Western Cape (Ethics Reference No. BM21/3/16 – Appendix 2), Makerere University-School of Health Sciences Higher Degrees and Research Ethics Committee (Ethics Reference No. MAKSHSREC-2021-138 – Appendix 3), and the Uganda National Council of Science and Technology (UNCST) (Research registration No. HS1784ES – Appendix 4).

All study participants provided written consent before data collection. Participation was voluntary, and participants were informed that they could withdraw from the study at any stage with no repercussions for those that chose not to respond. Some study participants sought further clarification, and the researcher was readily available, even after participating.

In addition, permission was sought and obtained from the health facility administrations for permission to carry out research on their premises and among their clients. The survey was anonymous to ensure the privacy and confidentiality of the information obtained. When the caregiver was not a relative, consent was sought from both or one parent (by telephone if not physically present) and the caregiver. The informed consent forms and the Luganda translations are attached as Appendices 5A and 5B: Informed Consent Form for the survey.

4.3.6 Covid-19 Risk Management

When face-to-face interactions with study participants took place, there was physical distancing. Additionally, face masks and alcohol rubs were utilised. The research team provided these for the research participants during these interactions.

4.3.7 Dissemination

Key findings were disseminated to the interested participants through a mode of their preference they mentioned during data collection (WhatsApp or email). Additionally, dissemination activities will target other key health stakeholders, for instance, the Ministry of Health, the civil society with special interests in child nutrition, and other health non-governmental organisations concerned with child welfare. The findings will be published in peer-reviewed journals and presented in health workshops and conferences.

4.4 STUDY 2: LABEL PRACTICES AND SUGAR CONTENT

4.4.1 Study Design

The design was cross-sectional and used objective criteria and scores for data analysis.

4.4.2 Inventory, purchase and handling of CBF

An inventory of locally available CBF was made using online searches, information from whole sellers, retailers, and visits to local stores to take stock of available CBF. The researcher (CLM) also had informal discussions on social media platforms to gain insight into the range of products that the urban population feeds their young children. Additionally, more information was mined from Study 1 especially concerning products not explicitly marketed for children under three years of age.

From the inventory, eight categories of 161 products were derived while maintaining the same study definitions of CBF and the two broad groups: commercially available complementary foods (CACF) and commercial food products (CFP) for the general population. The equivalent WHO Europe categories (WHO, 2019b) and *NOVA* classification (Monteiro *et al.*, 2016). The locally produced food and beverages were grouped based on the most fitting description (Table 4.2).

Seven stores were purposively selected, and five shops were conveniently selected from the Kampala metropolitan area. At least 90% of the items were representative of the branded food and beverage items from Study 1. In contrast, the others were randomly selected to make up 9-10 items for each category. Products that varied by brand/sub-brand and various flavours of the same product were considered to be unique products. In such instances, the number of purchased samples of the same brand depended on the number displayed and the availability of other brands in the same category. Efforts were made to capture as many products from Study 1 as possible. Confectionaries like cakes, bread, and doughnuts were excluded items because they tended not to have detailed information and were rarely branded. The overall target sample size included at least 80% of the inventory.

A list of all purchased products was entered into an excel sheet with information on the manufacturer, product/brand name, descriptive name, weight, date of expiry, type of packaging, ingredients, and store where it was purchased. The list is attached as Appendix 6.

Table 4.2. Types and categories of food products surveyed for the study

Type of food	Broad categorisation	Specific categorisation	WHO Europe NPM food category	NOVA classification
Commercially available complementary foods	Dry cereals	Dry instant cereal/porridge, including breakfast cereals specifically marketed for children under three years	1.1	Group 4
		Fortified cereal/other porridge	1.2	Group 3
	Ready-to-eat soft foods	Dairy-based desserts and cereal products	2.1	Group 4
		Fruit purees	2.2	Group 4
		Vegetable only purees	2.3	Group 4
Commercial food products	Sweetened beverage/dairy-based product	Dairy-based sweetened or flavoured yoghurt	n/a	Group 4
		Cow's milk and milk alternatives with added Sugar or sweetening agent	n/a	Group 4
		Ready-to-drink juice	n/a	Group 4
	Sweet snack for general consumption (Snack)	Biscuits and other finger snacks	n/a	Group 4
		Breakfast cereals	n/a	Group 4

4.4.3 Data collection, management, and analysis of labelling

All the product photographs were coded with a number and stored in folders for further assessment. The following were included (i) nutritional information; (ii) visual information; (iii) health and nutrition claims; (iv) images of the products; (v) ingredient list; (vi) details on the sugar content and flavours and (vii) instructions on the preparation of the product.

To develop a questionnaire, the researcher reviewed several international standards (FAO and WHO, 1981c) (FAO and WHO, 1981a;1981b), the European guidelines (WHO, 2019b), WHO guidelines (WHO, 2015a), sub-Saharan Africa country guidelines (South Africa Department of Health, 2010;2012;2014). The Ugandan standards were reviewed for aspects related to infant and child feeding, nutrition labelling, sugar content, energy, sweeteners and flavouring (Uganda MoH, 2021; UNBS, 2014a;2014b;2017;2019a;2019b;2020;2021).

East African standards were reviewed and determined to be similar to the Ugandan standards from which they are adopted and modified for the Ugandan context. All the documents were downloaded online, except for the Ugandan Standards purchased from the Uganda National Bureau Standards online bookstore.

The final questionnaire (Appendix 7) for data entry was an amalgamation of the following:

A. A modification of a CACF labelling practices checklist used by Sweet *et al.*(2016) to analyse our countries, two of which were Sub-Saharan and covered
   i) age-related recommendations and images,
   ii) and serving size and daily ratio
B. Other visual information that relates to the promotion of infant and children's foods (WHO, 2019b)
C. The ingredients list and nutrition declaration for information on energy per serving or per 100g, sugar amount (total and added), sweeteners, flavouring, and the energy contribution from sugars for all foods (FAO and WHO, 1985; UNBS, 2014a; WHO, 2019b)
D. Sugar limits and energy contribution in processed infant foods (FAO and WHO, 1981c; UNBS, 2021; WHO, 2019b)
E. Instructions on the number of feedings/servings per day and the addition of sugar to food (FAO and WHO, 1981a)
F. Presence of health and nutrition claims on CACF (FAO and WHO, 1997; Koo, Chang and Chen, 2018; UNBS, 2014b; WHO, 2019b)
G. Ugandan standards which cover dairy-based, and fruit drinks, nutrition and health claims concerning sugar and energy (UNBS, 2014b;2019a;2019b;2020)
H. Inclusion of cartoon characters (South Africa Department of Health, 2014).

Two assessors were calibrated over a five-day period, and an electronic version (ODK Collect) of the questionnaire was used to extract data. All relevant information from the product labels was entered. Computations on energy and sugars were automatically done, having been included during the design of the questionnaire as determined from the literature and standards. The double entries were compared after exporting the data to Microsoft excel. Whenever the entry did not match, the item was reviewed until the assessors reached an agreement. Some of the data was open-ended and thus did not require a validation check, for example specifying a certain product or claim, or message.

Errors in the numerical data were corrected at this point of data validation and cleaning. Stata Version 14 was used for analysing the data, where first threshold computations and thereafter categorisations were made based on different criteria applied to the relevant food types.

Categorical data were summarised in proportions by type and subtype. Differences in proportions of products were tested using the Pearson chi-square test, with significance defined as $P < 0{\cdot}05$. After confirming the non-normal distribution of continuous data using the Shapiro-Wilk test, they were summarised with medians, interquartile ranges, and group comparisons made using the Kruskal–Wallis test or Wilcoxon rank sum test. "Total sugar" was estimated to be the same as the total carbohydrate for fruit juices without "total sugar". For serving recommendations with tablespoon measurements, each tablespoon was estimated to be equivalent to 7.8g of cereal flour (https://www.traditionaloven.com/culinary-arts/flours/all-purpose-flour/convert-table-spoon-to-gram.html).

Compliance with the selected labelling guidelines was quantified using a percent score based on up to seven items where "1" represented compliant/suitable and 0 the opposite. The items were the inclusion of the following scored as one:

i) nutritional information with ii) energy in kilojoules or kilocalories and iii) total sugar in grams
iv) an ingredients list,
iii) appropriate age recommendations,
iv) recommended serving
v) no nutritional and/or health claims

Compositional claims like "no preservative", "no artificial flavour", and "no colourants" were not considered for the present study.

The nutritional suitability was determined based on the sugar, energy content and taste properties. A percent score was derived based on up to eight items where "1" represented compliant/suitable and "0" the opposite. Thus, if a product scored 8/8 or 100%, it was assessed for all eight items and was fully compliant. The same criteria were used to score both CACF and CFP except for four measures: fruit content and recommended energy for the three different age groups were excluded for CFP. The energy recommendations were excluded since those on labels are adult recommendations. When one of the items was not relevant to a

particular product/type/food category, it was excluded from both the denominator and numerator.

A minimum of three items were scored. The items were: i) no sweetener, ii) no flavour (WHO, 2019b), ii) percentage energy from total sugar was based on different cut-offs: <15% for snacks, <30% for dry cereals and breakfast cereals, <40% for fruit and vegetable purees and dairy-based yoghurts, iv) three items for recommended energy intake for the three age categories (6-8.9,9-11.9,12-23.9 months, v) low or no fruit (<10% for dry cereals, ≤5% for dairy-based desserts and cereal products, and no added fruit for vegetable purees), and vi) energy density of cereals and purees.

Energy density was assessed using two cut-offs, ≥0.8Kcal/g for dry cereals (UNBS, 2021) and ≥0.6Kcal/g for fruit and cereal-based purees (WHO, 2019b). Fruit juices were not considered for flavours. For fruit purees, those with more than one fruit were considered flavoured, and vegetable purees with fruits were scored as flavoured due to the recommendations for single-flavour foods and refrain from masking vegetables with sweet purees or sweet flavours (WHO, 2019b). Fruit purees were not scored for fruit content.

CHAPTER 5

RESULTS: STUDY 1

COMMERCIAL BABY FOOD USE AND COMPLEMENTARY FEEDING

5.1 Socio-demographic characteristics of parents/caregivers and children aged 6-36 months

Among the 449 caregivers of 6 to 36-months olds identified, 17 (3.8%) could not participate due to time constraints, and another 22 (4.9%) were excluded for other reasons shown in Figure 5.1. Finally, between October and December 2021, 410 parents/caregivers of children aged between 6-36 months were randomly recruited into the present study. Of the 410 parents/caregivers, 93.9% (n=385) were mothers, and 89.7% (n=358) were married or staying with a partner. Demographic characteristics were collected on 394 mothers. Their age range and mean (SD) were 18-48 years and 30.7 (±5.3) years, respectively. More than half (59.1%, n=233) had attained a college/university education. In addition, the majority of the fathers (73.2%, n=262) had attained college/university education, 57.1% (n=206) were professionally employed, and 29% (n=115) were in the highest socio-economic class.

Of the 410 children recruited into the study, just over half (51.2%, n=210) were female, 42.7% (n=175) were aged between 13-23 months, and 32.9% (n=135) had no siblings. The median age (lower quartile (LQ), upper quartile (UQ)) was 18 (12, 25) months. Table 5.1 summarises the socio-demographic characteristics of the parents/caregivers of children aged between 6-36 months attending selected health facilities in Kampala, Uganda, between October and December 2021.

Most mothers (87.3%, n=336) reported having attended antennal care during pregnancy, and 36% (n=121) of these reported attending an infant/child nutrition class during antenatal care. Of the 113 that participated in a nutritional class, almost all (97.3%, n=110) had lessons on exclusive breastfeeding. In comparison, only about a third (34.5%, n=39) reported having information on the use of processed foods for IYC feeding.

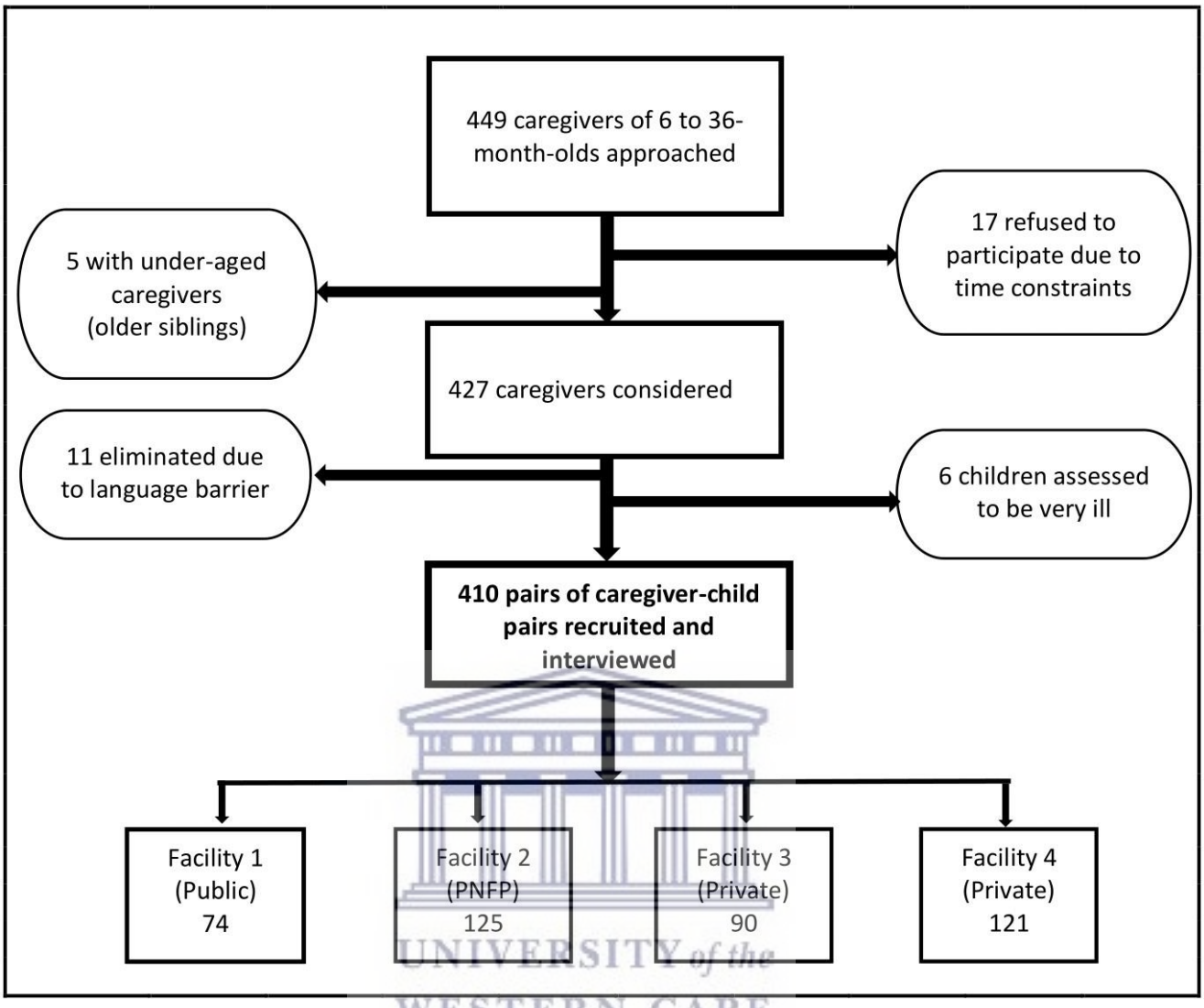


Figure 5.1 Flow diagram for participant recruitment from the four health facilities

Table 5.1: Socio-demographic characteristics of parents and their children aged 6-36months (n=410)

Variable	n	%
Marital status (n=409)		
Married	358	89.7
Unmarried	41	10.3
Maternal age (n=394)		
≤25 years	65	11.5
26-30 years	135	34.3
31-35 years	123	31.2
≥ 36 years	71	18.0
Maternal education level (n=394)		
None/primary level	45	11.4
O levels completed	54	13.7
A levels/Technical/Vocational	62	15.7
College/University	233	59.1
Paternal occupation (n=361)		
Unemployed	20	5.5
Business	97	26.9
Skilled, sales, services	38	10.5
Professional	206	57.1
Paternal education level (n=358)		
O levels or less completed	61	17.0
A levels/Technical/Vocational	35	9.8
College/University	262	73.2
Parental income (n=285)		
Irregular	37	13.0
Regular	248	87.0
Socio-economic status (n=395)		
1st (lowest)	133	33.7
2nd(middle)	147	37.2
3rd (highest)	115	29.1

Child's sex	210	51.2
Female	200	48.8
Male		
Child's age (n=410)		
6-12 months(infants)	116	28.3
13-23 months	175	42.7
24-36 months	119	29.0
Sibling number (n=410)		
No sibling	135	32.9
1 sibling	144	35.2
2 or more siblings	131	31.9

SES was derived from a principal component analysis of home ownership, floor type, fuel type, toilet type, and land ownership with initial categorisation similar to those used to describe household characteristics by Uganda National Bureau of Statistics(UNBS) in demographic Health surveys (Uganda Bureau of Statistics (UBOS) and ICF., 2018).

Table 5.2: Maternal health care and nutritional education-related characteristics of mothers of 6-36 months old children who attended selected health facilities in Kampala, (n=385)

Variable	n	%
Mother ever attended antenatal care (ANC) (n=385)		
No	49	12.7
Yes	336	87.3
Mother ever attended a nutritional class during ANC (n=336)		
No	215	64.0
Yes	121	36.0
Source of nutritional information(Yes)		
Family (n=381)	226	59.3
Friends (n=384)	178	46.4
Social media (n=375)	142	37.9
Magazine (381)	36	9.5
Television (n=380)	119	31.3
Internet (n=379)	183	48.5

Read baby food labels (n=258)		
Always	105	40.7
Never	113	43.8
Sometimes	40	15.5
Nutrition information as a determinant for baby food choice (n=145)		
Yes	110	75.9
Sometimes	20	13.8
Never	15	10.3
Understanding of nutrition information on labels (n=145)		
Always	79	54.5
Sometimes	58	40.0
Never	8	5.5

Other than health facilities, the sources of information on infant and young child nutrition for mothers were: family, which was the most common source (59.3%, n=226), closely followed by the internet (48.5%, n=183) and friends (46.3%, n=178). Magazines (9.5%, n=36) were a minor source of information. Among the respondents that reported the use of packaged foods, over a third (40.7%, n=105) said that they always read the labels on baby foods, and three-quarters (75.9%, n=110) stated that they made choices of baby foods to purchase based on the information on the labels. Just over half (54.5%, n=79) of the 145 who read the labels believed that they always understood the nutrition information on labels, and 40% (n=58) understood them only on a few occasions (Table 5.2).

Table 5.3: Health facilities selected for the study and distribution of participants by socioeconomic status

Facility	Type	SES			
		Upper (1st)	Middle (2nd)	Lower (3rd)	Total (n)
Komamboga	Public	4(3.5)	8(5.4)	56(42.1)	68
Mengo	PNFP	22(19.1)	48(32.7)	55(41.4)	125
Naalya	Private	32(27.8)	45(30.6)	12(9.0)	89
Nakasero	Private	57(49.6)	46(31.3)	10(7.5)	113
Total		115	147	133	395

The health facilities were drawn from all three types; private (2), a public and a private-not-for profit (PNFP). The attendance of health facilities among the participants recruited reflected the socioeconomic distribution, with the private facilities having less than a tenth of their population in the lowest tertile and the public facility and PNFP having the majority, 42% and 41%, respectively, from the lowest tertile (Table 5.3).

5.2 Objective 1: To determine the proportion of children aged 6-36 months that consume commercial baby foods in Kampala

Overall, among the 403 infants and young children, 80.9% [95%CI 76.7-84.4] of the caregivers reported using at least one commercial baby food (CBF) or beverage within the previous 24 hours, with 12.2% (n=49) consuming more than three processed food items. Among the 403 children, 44.9% (n=181) consumed commercially available complementary foods (CACF), which was packaged cereal porridge. The reasons given by caregivers for the use of cereals were affordability (63%, n=114), availability (44.8%, n=81) and "child likes it" (75.7%, n=137). Specific to instant porridges was the ease and convenience of preparation (77.9%, n=141).

One hundred and forty-two children (35.2%) had at least one sugar-sweetened beverage (SSB), which increased with age, with half of these in the 11-23-month age group. Consumption of SSB in this age group was significantly higher than among infants (p=0.02). The commonest SSB—sweetened yoghurt—was given to 26.6% (n=107). On the other hand, juice drinks and soft drinks were consumed by only 5.5% (n=22) and sweetened yoghurt by 31.8% of the 6-23-month age group. Among the reasons given for the use of yoghurt were: "child likes it" (72.9%, n=78), it is healthy (58.9%, n=63), and a good alternative for children with poor appetite (28%, n=30).

Among all three commercial baby food categories, snacks had the lowest consumption, by almost a third (32%, n=129), with confectionary consumed by 23.3% (n=94) overall and only 16.1% (n=46) by 6-23 months old children. However, the consumption of snacks increased considerably with age, 11.4% (n=13) among the 6-12-months old, a third (33.7%, n=58) among those aged 13-23 months and almost a half (49.6%, n=58) aged between 24-36 months. This increase in consumption was statistically significant ($p<0.001$, $\chi^2(2) = 39.056$). Among the 286 children aged 6-23 months, those who consumed commercial baby foods combined (CACF, snacks, and SSB) were 79.9% (N=228), 46.5% (n=133), 24.8% (n=71) and 35.7% (n=102), respectively.

Generally, the use of commercial baby foods was highest among mothers aged 31-35 years, 87.5% (n=105) [95%CI 80.2-92.3], and those that have attained college/university level 87% (n=200) [95%CI 81.9-90.7]. Table 5.4 summarises the use of commercial foods for some of the socio-demographic and health-related characteristics.

Table 5.4: Percentage of commercial baby food consumption within 24 hours by health facility, parental and child characteristics among 6-36-month-old children (n=403[#])

Variable overall	No (n/%)	Yes (n/%)	95%CI	Chi-square
	77 (19.1)	326 (80.9)	76.7-84.4	*p-value*
Health facility (n=403)				
HF-1	27(36.5)	47(63.5)	51.9-73.7	<0.001*
HF-2	23(18.9)	99(81.1)	73.2-87.2	
HF-3	14(15.7)	75(84.3)	75.1-90.5	
HF-4	13(11.0)	105(89.0)	81.9-93.5	
Marital status (n=392)				
Unmarried	7(17.1)	34(82.9)	68.0 - 91.7	0.755
Married	67(19.1)	284(80.9)	76.4 - 84.7	
Maternal age (n=387)				
≤25 years	20(31.3)	44(68.8)	56.3 - 88.5	
26-30 years	26(19.6)	107 (80.5)	72.8 - 86.3	0.021*
31-35 years	15(12.5)	105(87.5)	80.2 - 92.3	
≥ 36 years	12(17.1)	58(82.9)	72.1 - 90.0	
Maternal education level (n=387)				
None/primary level	10(22.2)	35(77.8)	63.2 – 87.7	
O levels completed	20(39.2)	31(60.8)	46.7 - 73.3	<0.001*
A levels/Technical/Vocational	13(21.3)	48(78.7)	66.5 - 87.3	
College/University	30(13.0)	200(87.0)	81.9 - 90.7	
Paternal education level (n=352)				
O levels or less completed	16(26.7)	44(73.3)	60.6 – 83.1	
A levels/Technical/Vocational	10(28.6)	25(71.4)	54.2 - 84.1	0.041*
College/University	40(15.6)	217(84.4)	79.4 - 88.4	
Paternal occupation (n=354)				
Unemployed	4 (20.0)	16(80.0)	56.4 - 92.5	
Business	20(20.8)	76(79.2)	69.8 - 86.2	0.273**
Skilled, sales, services	10(26.3)	28(73.7)	57.3 - 85.4	
Professional	30(15.0)	170(85.0)	79.3 - 89.3	
Parent's income (n=281)				
Irregular	10(27.0)	27(73.0)	56.3 – 85.0	0.060*
Regular	36(14.8)	208(85.3)	80.2 – 89.2	
Socio-economic status (n=395)				
1st (lowest)	31(23.9)	99(76.2)	68.0 - 82.7	0.276
2nd (middle)	25(17.4)	119(82.6)	75.5 - 88.0	
3rd (highest)	19(19.3)	313(80.7)	75.2 – 89.1	
Child's sex (n=403)				
Female	39(18.9)	167(81.1)	75.1 - 85.9	
Male	38(19.3)	159(80.7)	74.5 - 85.6	0.927

Child's age (n= 403)				
6-12 months (infants)	27(23.7)	87(76.3)	67.6 - 83.3	
13-23 months	31(18.0)	141(82.0)	75.4 - 87.1	0.317
24-36 months	19(16.2)	98(83.8)	75.8 - 89.4	
Sibling number (n=403)				
No sibling	30(22.2)	105(77.8)	69.9 - 84.0	
1 sibling	21(15.0)	120(85.1)	78.2 - 90.1	0.270
2 or more siblings	26(20.5)	101(79.5)	71.5 - 85.7	
Ever used formula (n=400)				
No	40(21.6)	145(78.4)	50.3 - 98.7	0.215
Yes	36(16.7)	179(83.3)	76.4 - 84.4	
Baby breastfed last night (n=403)				
No	36(18.0)	164(82.0)	76.0 – 86.8	0.575
Yes	41(20.2)	162(79.8)	73.7 - 84.8	
Attended antenatal care (n=379)				
No	13(26.5)	36(73.5)	59.3-84.0	0.119*
Yes	57(17.3)	273(82.7)	78.2-86.4	
Mother's past nutritional class attendance (n=330)				
No	34(16.0)	178(84.0)	77.9 - 87.1	0.426
Yes	23(19.5)	95(80.5)	71.5 – 85.5	

#Seven children were excluded from analysis because they were sick or changed their regular feeding *p-value ≤0.2Fischer's exact test**

5.3 Objective 2: To assess the factors associated with the consumption of commercial baby foods among children aged 6-36 months attending selected health facilities in Kampala

Using bivariate analysis, all variables that showed an independent association with consumption of commercial baby food the previous day (i.e. had a *p-value* ≤ 0.2) were taken into the multivariable model. Health facilities as a variable was collinear with socioeconomic status, and thus, only socioeconomic status was retained in the model. The variables that were considered were maternal age, maternal education level, regularity of income, paternal education level, socio-economic status, child's age, sibling number, food purchase decision, and whether the mother attended antenatal care. Table 5.5 summarises the independent associations of the different motivators.

Table 5.5: Factors associated with commercial baby food consumption within 24 hours by 6-36-month old children that attended selected health facilities in Kampala (n=403)

Variable overall	Unadjusted PR	95%CI	*p-value*
Marital status (n=392)			
Unmarried	Ref	Ref	
Married	0.97	0.84-1.30	0.745
Maternal age (n=387)			
≤25 years	Ref	Ref	Ref
26-30 years	1.17	0.97-1.40	0.097*
31-35 years	1.27	1.06-1.52	0.008*
≥ 36 years	1.20	0.92-1.46	0.063*
Maternal education level (n=387)			
None/primary level	Ref	Ref	Ref
O levels completed	0.78	0.60-1.02	0.074*
A levels/Technical/Vocational	1.01	0.83-1.24	0.911
College/University	1.12	0.95-1.32	0.183*
Paternal occupation (n=354)			
Unemployed	Ref	Ref	Ref
Business	0.98	0.77-1.26	0.933
Skilled, sales, services	0.92	0.68-1.23	0.579
Professional	1.06	0.84-1.33	0.601

Parent's income regularity (n=281)			
Irregular	Ref		
Regular	1.17	0.95-1.43	0.134*
Paternal education level (n=352)			
O levels or less completed	Ref		
A levels/Technical/Vocational	0.97	0.75-1.26	0.842
College/University	1.15	0.98-1.35	0.087*
Socio-economic status (n=388)			
1st (lowest)	Ref	Ref	Ref
2nd (middle)	1.08	0.96-1.22	0.189*
3rd (highest	1.09	0.96-1.24	0.163*
Child's sex (n=403)			
Female	Ref	Ref	Ref
Male	0.99	0.90-1.09	0.927
Child's age (n= 403)			
6-12 months (infants)	Ref	Ref	Ref
13-23 months	1.07	0.94-1.21	0.259
24-36 months	1.09	0.96-1.24	0.160*
Sibling number (n=403)			
No sibling	Ref	Ref	Ref
1 sibling	1.09	0.97-1.22	0.121*
2 or more siblings	1.02	0.90-1.16	0.730
Ever used formula (n=400)			
No	Ref	Ref	Ref
Yes	1.06	0.96-1.17	0.222
Baby breastfed last night (n=403)			
No	Ref	Ref	Ref
Yes	0.97	0.88-1.07	0.575
Attended antenatal care (n=379)			
No	Ref	Ref	Ref
Yes	1.12	0.94-1.34	0.185*
Mother's past nutritional class attendance (n=330)			
No	Ref	Ref	Ref
Yes	0.95	0.85-1.05	0.358

Ref is the comparative baseline group whose unadjusted PR is "1". *p-value ≤0.2

Multivariate analysis of the association between commercial baby food use and family/child characteristics

In the adjusted model, the maternal level of education was significantly associated with the use of commercial baby food the previous day (PR=0.71, 95%CI 0.50-0.99, *p=0.042*). Mothers who had attained an ordinary level of education were 30% less likely to use commercial baby food than those who had attained a primary level or no formal education. The parent's regularity of income, however, confounded this association. Table 5.6 summarises the multivariate analysis of the factors associated with the use of commercial baby food.

Table 5.6: Multivariate analysis of factors associated with commercial baby food consumption within 24 hours among 6-36-month olds (n=281)

Variable	Adjusted IRR/PR	95%CI	*p-value*
Maternal education level			
No education/primary level	Ref		
O levels completed	0.71	0.50-0.99	0.042*
A levels/Technical/Vocational	0.95	0.74-1.21	0.673
College/University	1.00	0.81-1.24	0.942
Parent's income regularity			
No	Ref		
Yes	1.14	0.93-1.39	0.219

Ref is the comparative baseline group whose adjusted PR is "1". *p-value < 0.05

5.4 Objective 3: To determine the consumption frequency and patterns of ultra-processed foods among 6-36-month old children in Kampala

When consumption of any ultra-processed food and beverage (UPFB) was determined, 83.9% (n=344) had consumed at least once a week. A further detailed breakdown revealed that 79.3% (n=325), 63.9% (n=262), and 71.2% (n=292) consumed at least once commercially available complementary foods (CACF), snacks, and sugar-sweetened beverages (SSB), respectively. Among the 291 children aged 6-23 months, those who consumed CACF, snacks, and SSB in the previous week were 82.8% (n=241), 36.8% (n=107), and 49.8.7% (n=145), respectively.

When the frequency of consumption was determined, the majority, 69.0% (n=283) [95%CI 64.4-73.3], of the caregivers reported that the children consumed at least one ultra-processed food frequently (4-7 days a week). Confectionery was the most frequent snack (37.4%, n=153/409), and sweet/candy was the least frequently consumed within the week (15.0%, n=61/408). Almost a quarter (23.2%, n=93/401) consumed breakfast cereal at least once, and 15.2% (n=61/401) for more than three days within the previous week (Figure 5.2). Breakfast cereals were frequently consumed in all three age groups, whereas the frequency of consumption of other snacks increased with age.

On the other hand, nearly two-thirds (65.2%, n=260/399) consumed at least one sweetened dairy beverage once or more within the week, and almost half (45%, n=117/260) consumed them daily. Although the least consumed SSB was soft drinks (13.3%, n=53/398), a more significant proportion (64.2%, n=34/53) consumed it daily (Figure 5.3). Overall, there was more frequent consumption of SSB (50.2%, n=206/410) than snacks (43.9%, n=180/410) in the previous week (Figure 5.4). Overall, the frequency of consumption of SSB increased with age. However, the opposite trends were observed for instant porridge cereals.

When consumption within 24 hours and frequency of 4-7 days a week were compared, the proportion of children that consumed them frequently was higher for all the three categories: 44.9% versus 70.5%, 32% versus 43.9% and 35.2% versus 50.2% for commercially available complementary foods (cereal for porridge), snacks (including breakfast cereal) and sweetened beverages, respectively (Figure 5.4).

Generally, the frequent consumption of ultra-processed foods was highest among children whose fathers had attained college/university education 74.1% (n=194/358) [95%CI 68.4 -79.0], or who were professionals 74.3% (n=153/361) [95%CI 67.8 -79.8] and children who had ever been formula fed 75.1% (n=163) [95%CI 68.9 – 80.4]. Table 5.7 summarises the consumption patterns of commercial baby foods with respect to sociodemographic and health-related characteristics.

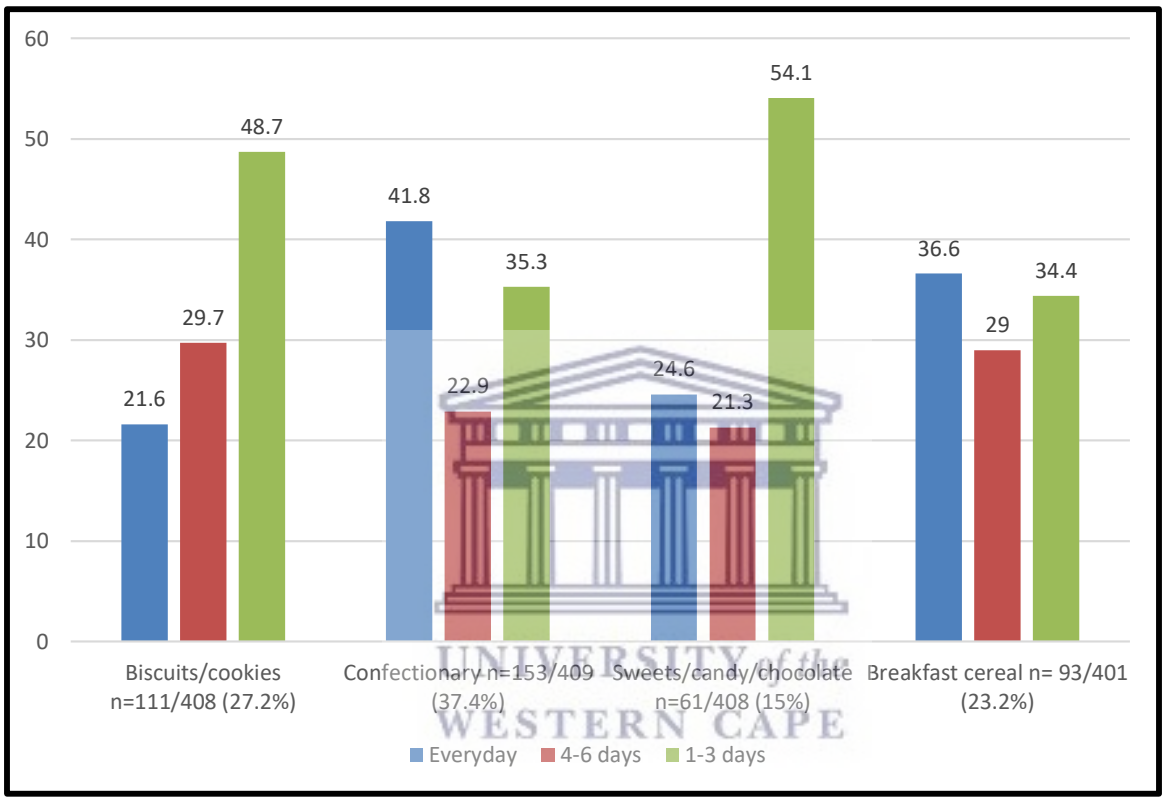


Figure 5.2 Frequency of snacks consumption in the week prior to the interview

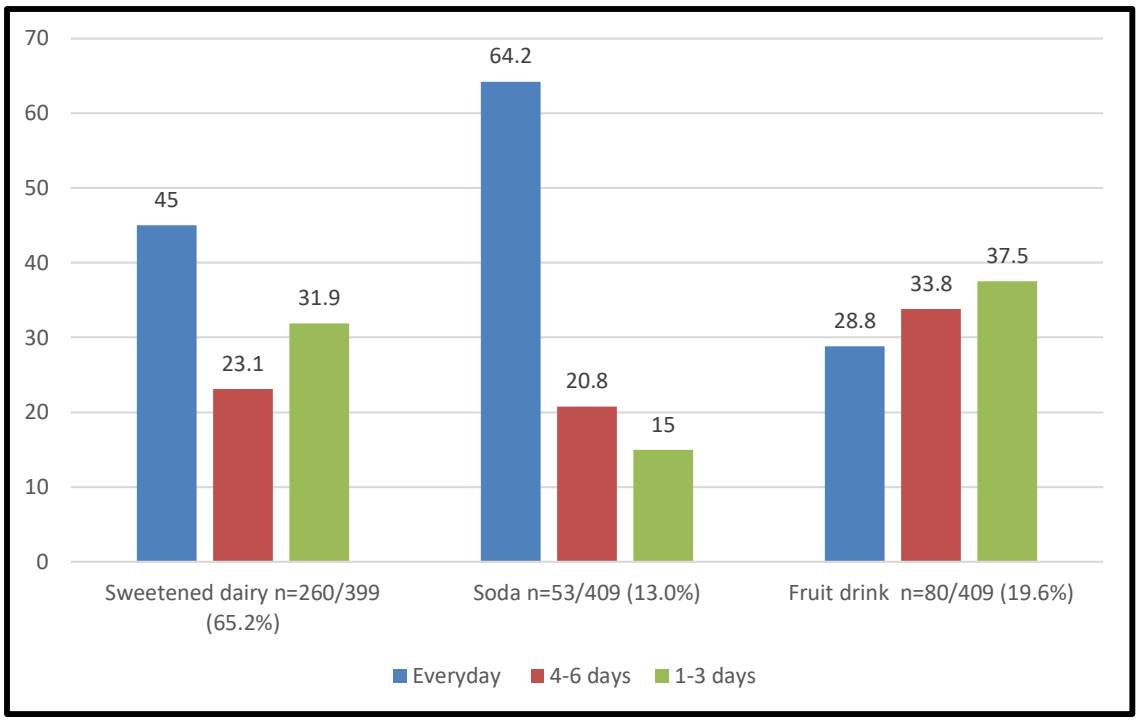


Figure 5.3 Frequency of SSB consumption in the week prior to the interview

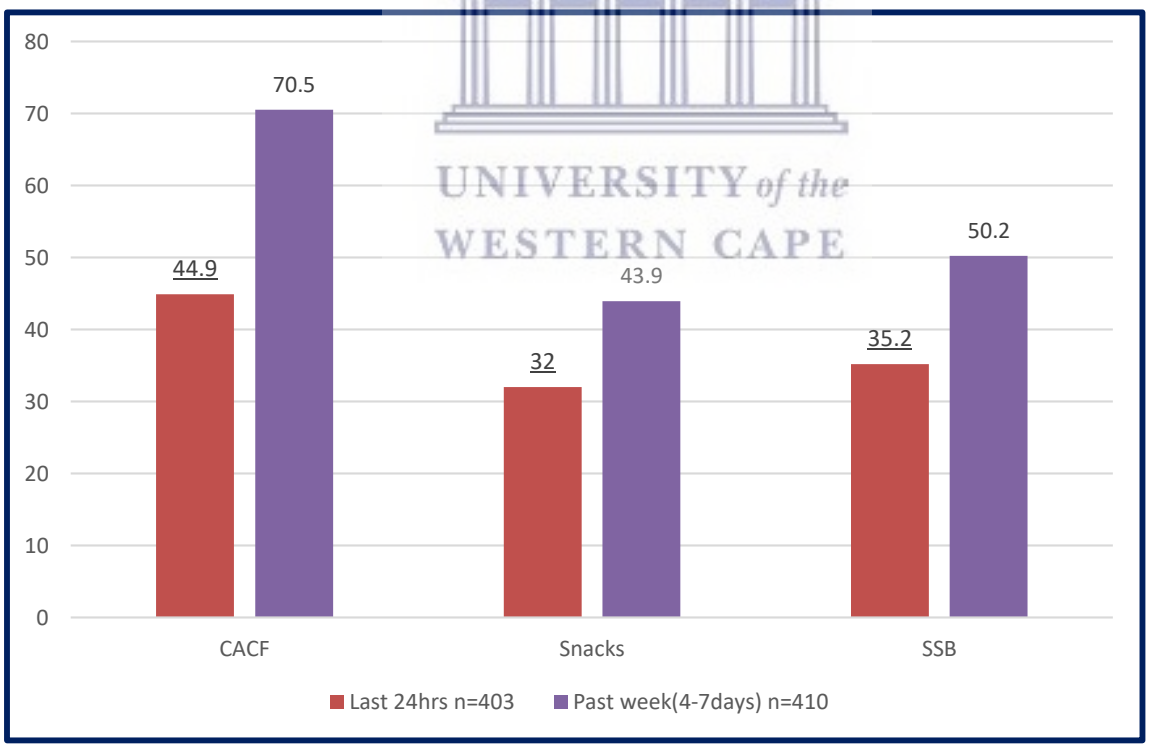


Figure 5.4 Consumption of commercial baby foods by category on the day and week before the interview

Table 5.7 Frequency of weekly consumption of ultra-processed foods among 6-36-month old children that attended selected health facilities in Kampala (n=410)

Variable	Never n (%)	Rarely n (%)	Frequently n (%)
overall	**66(16.1)**	**61(14.9)**	**283 (69.0)**
Marital status (n=399)			
Unmarried	12.2(11.9-31.6)	14.6(6.6-29.2)	73.2(57.7-84.6)
Married	16.6(13.2-21.0)	15.1(11.7-19.2)	68.1(63.1-72.8)
Maternal age (n=394)			
≤25 years	20.0(11.9-31.6)	15.4(8.4-26.4)	64.6(52.2-75.3)
26-30 years	17.8(12.2-25.2)	20.7(14.7-28.5)	61.5(52.9-69.3)
31-35 years	15.4(10.0-23.0)	13.0(8.1-20.2)	71.5(62.9-78.8)
≥ 36 years	7.0(2.9-15.9)	7.0(2.9-15.9)	80.3(69.3-88.0)
Maternal education level (n=394)			
None/primary level	33.3(21.0-48.4)	24.4(13.9-39.2)	14.2(28.6-57.1)
O levels completed	22.2(12.9-35.4)	18.5(10.2-31.3)	59.2(45.6-71.6)
A levels/Technical/Vocational	17.7(10.0-29.4)	12.9(6.5-23.9)	69.3(56.7-79.6)
College/University	11.6(8.1-16.4)	12.9(9.1-17.8)	75.5(69.6-80.6)
Paternal education level (n=358)			
O levels or less completed	27.9(17.9-40)	21.3(12.7-33.5)	50.8(38.3-63.2)
A levels/Technical/Vocational	14.3(5.9-30.4)	25.7(13.8-42.8)	60.0(42.9-74.9)
College/University	12.9(9.4-17.6)	12.9(9.4-17.6)	74.1(68.4-79.0)
Paternal occupation (n=361)			
Unemployed	20.0(7.5-43.6)	35.0(17.3-58.1)	45.0(24.8-66.9)
Business	16.5(10.3-25.3)	18.5(11.9-27.6)	64.9(54.9-73.8)
Skilled, sales, services	21.0(10.8-37.1)	26.3(14.6-42.7)	52.6(36.7-67.9)
Professional	14.1(9.9-19.5)	11.6(7.9-16.8)	74.3(67.8-79.8)
Parent income regularity (n=285)			
Irregular	13.5(5.6-28.9)	10.8(4.0-25.8)	75.7(59.1-86.9)
Regular	14.9(10.9-19.9)	14.9(10.9-19.9)	70.2(64.1-75.5)
Socio-economic status (n=395)			
1st (lowest)	24.8(18.2-32.9)	21.1(14.9-28.9)	54.1(45.5-62.3)
2nd(middle)	12.2(7.8-18.6)	13.6(8.9-20.2)	74.1(66.4-80.6)
3rd (highest	12.2(7.3-19.6)	6.9(3.4-13.3)	80.9(72.6-87.1)
Child's sex (n=410)			
Female	14.3(10.1-19.7)	13.3(9.3-18.7)	72.4(65.9-78.0)
Male	18.0(13.2-23.9)	16.5(11.9-22.3)	65.5(58.6-71.8)

Child's age (n=410)			
6-12 months (infants)	31.9(24.0-40.9)	17.2(11.4-25.3)	50.9(41.87-59.9)
13-23 months	10.9(7.0-16.4)	14.3(9.8-20.3)	74.8(67.9-80.8)
24-36 months	8.4(4.5-15.0)	13.4(8.4-20.9)	78.1(69.8-84.7)
Sibling number (n=410)			
No sibling	19.2(13.4-26.8)	14.1(9.1-21.1)	66.7(58.2-74.1)
1 sibling	6.9(3.7-12.5)	15.9(10.8-22.9)	77.1(69.5-83.2)
2 or more siblings	22.9(16.5-30.9)	14.5(9.4-21.8)	62.5(53.9-70.5)
Ever used formula (n=407)			
No	20.5(15.3-26.9)	16.3(11.7-22.3)	63.2(56.0-69.7)
Yes	11.5(7.9-16.5)	13.4(9.4-18.6)	75.1(68.9-80.4)
Baby breastfed last night (n=410)			
No	6.9(4.1-11.4)	16.3(11.8-22.1)	76.7(70.4-82.1)
Yes	25.0(19.6-31.4)	13.5(9.4-18.8)	61.5(54.7-67.9)
Attended antenatal care (n= 385)			
No	16.3(8.3-29.6)	10.2(4.3-22.5)	73.5(59.3-84.0)
Yes	16.7(13.0-21.0)	16.1(12.5-20.4)	67.2(62.0-72.1)
Mother's past nutritional class attendance (n=336)			
No	15.3(11.1-20.8)	16.7(12.3-22.4)	67.9(61.3-73.8)
Yes	19.0(12.9-27.0)	14.9 (9.5-22.4)	66.1(57.2-74.0)

Descriptive statistics: frequency(n)and proportions(%) and confidence intervals of proportions

5.5 Objective 4: Association between family/child characteristics and weekly frequency of consumption of ultra-processed foods among 6-36-month old children in Kampala

To determine factors associated with the weekly consumption of ultra-processed commercial baby foods, both bivariate and multivariate analyses were performed. Following bivariate analysis, all variables with a *p-value* ≤ 0.2 were taken into the multivariable model. Some of the variables that were considered were the mothers' age, mothers' education level, fathers' education level, socio-economic status, child's age, and sibling number, among others. Table 5.8 summarises the independent associations of the different factors.

Using multivariate analysis, the odds of more frequent consumption for the 13-23-month olds and the 24-36-month olds were 2.87 times and 3.68 times, respectively, greater than the odds for infants [(OR=2.87, 95%CI 1.62-5.08, *P* <0.001), and (OR=3.68, 95%CI 1.88-7.20, *P*<0.001)]. Also, the odds of more frequent consumption of UPF for children whose mothers had a minimum college education were 2.85 times greater than the odds of those whose mothers had completed only primary education [OR=2.85, 95%CI 1.02-7.96, *p*=0.045] (Table 5.9). The socio-economic score confounded the relationship between maternal education level, sibling number, and the frequency of ultra-processed food consumption. Paternal education level confounded the association between maternal education level and the frequency of ultra-processed food consumption.

Table 5.8: Factors associated with consumption frequency of ultra-processed foods among 6-36-month old children attending selected health facilities in Kampala (n=410)

Variable overall	Unadjusted OR	95% CI	*p-value*
Marital status (n= 399)			
Unmarried	Ref	Ref	
Married	0.77	0.38-1.57	0.473
Maternal age (n= 394)			
≤25 years	Ref	Ref	Ref
26-30 years	0.93	0.51-1.70	0.821
31-35 years	1.38	0.73-2.59	0.315
≥ 36 years	2.18	1.01-4.69	0.047*
Maternal education level (n=394)			
No education/primary level completed	Ref	Ref	Ref
O levels completed	1.90	0.88-3.99	0.09*
A levels/Technical/Vocational	2.84	1.33-6.07	0.007*
College/University completed	4.02	2.16-7.44	<0.001*
Paternal occupation (n=361)			
Unemployed	Ref	Ref	Ref
Business	1.85	0.76-4.50	0.173*
Skilled, sales, services	1.19	0.14-3.19	0.731
Professional	2.77	1.18-6.46	0.018*
Parent income regularity(n=285)			
Irregular	REF	Ref	Ref
Regular	0.77	0.35-1.77	0.527
Paternal education level (n=358)			
O levels or less completed	REF	Ref	Ref
A levels/Technical/Vocational	1.61	0.72-3.58	0.246
College/University	2.74	1.58-4.75	<0.001*
Socio-economic status (n=395)			
1st (lowest)	Ref	Ref	Ref
2nd (middle)	2.38	1.45-3.88	0.001*
3rd (highest	3.34	1.89-5.90	<0.001*
Child's sex (n=410)			
Female	Ref	Ref	Ref
Male	0.73	0.48-1.10	0.137*
Child's age (n= 410)			
6-12 months (infants)	Ref	Ref	Ref

13-23 months	3.13	1.92-5.09	<0.001*
24-36 months	3.78	2.16-6.60	<0.001*
Sibling number (n=410)			
No sibling	Ref	Ref	Ref
1 sibling	1.82	1.08-3.06	0.024*
2 or more siblings	0.82	0.50-1.34	0.441
Ever used formula			
No	Ref	Ref	Ref
Yes	1.80	1.18-2.74	0.006*
Baby breastfed last night			
No	Ref	Ref	Ref
Yes	0.43	0.28-0.66	<0.001*
Attended antenatal care (n=379)			
No	Ref	Ref	Ref
Yes	0.78	0.40-1.52	0.462
Mother's attendance of nutritional class(n=336)			
No	Ref	Ref	Ref
Yes	0.89	0.56-1.41	0.620

Ref is the baseline comparative group whose unadjusted OR is "1". *p-value ≤0.2

Table 5.9: Multivariate analysis of factors associated with ultra-processed food consumption frequency among 6-36-month old children attending selected health facilities in Kampala (n=334)

Variable	Adjusted OR	95%CI	p-Value
Child's age			
6-12 months (infants)	Ref	Ref	ref
13-23 months	2.87	1.62-5.08	<0.001*
24-36 months	3.68	1.88-7.20	<0.001*
Maternal education level			
No education/ Primary level completed	Ref	Ref	Ref
O levels completed	2.37	0.90-6.23	0.079
A levels/Technical/Vocational	2.50	0.85-7.37	0.096
College/University	2.85	1.02-7.96	0.045*
Ever used formula			
No	Ref	Ref	Ref
Yes	1.58	0.9-2.7	0.098
Sibling number			
No sibling	Ref	Ref	Ref
1 sibling	1.81	0.94-3.47	0.074
2 or more siblings	0.83	0.45-1.51	0.549
Paternal education level			
O levels or less completed	Ref	Ref	Ref
A levels/Technical/Vocational	1.21	0.49-3.03	0.669
College/University	1.23	0.54-2.82	0.624
Socio-economic score			
1st (lowest)	Ref	Ref	Ref
2nd(middle)	1.25	0.62-2.51	0.525
3rd (highest)	1.80	0.80-4.03	0.155

Ref is the comparative baseline group whose adjusted OR is "1".*p-value <0.05

5.6 Objective 5: To estimate the proportion of 6-23 month-old children that meet the minimum infant and young child feeding practices using selected WHO indicators

Breastfeeding, formula use and complementary feeding practices

Nearly all caregivers/parents (97.6%, n=400/410) reported having breastfed their infants and children since birth. However, at the time of the study, the proportion of children still breastfeeding had reduced to 50.7% (n=208), with half of them aged between 6-12 months and only ten (4.8%) between 24-36 months. For the 6-23 months' group, only 68% (n=198/291) were still breastfeeding. The drop in breastfeeding with age was significant in both the 13 to 23- and 24-to-36-month age groups ($p<0.001$). The median (LQ, UQ) breastfeeding age was 12.5 (9, 17) months, with the oldest breastfeeding child aged 34 months. Over half (53.3%, n=217) reported having ever formula-fed their infant or child. At the time of the study, the number of formula-feeding children had greatly reduced to about 5% (n=20/410). These included 6.5% (n=19/291) of 6-23 month-olds who were feeding on formula at the time of the study. Two-thirds (n=272/408) of 6-36 months and 69.8% (n=203/291) of 6-23 months old had consumed milk within the last 24 hours. The introduction of solids before six months was reported for 11.2% (n=46/409). Among the 6-23-months old, 57.3% (n=164/286) consumed flesh or egg, and 39.5% (n=113/286) did not eat any vegetables or fruit the day before (Table 5.10).

Table 5.10: Breastfeeding, formula use and complementary indicators among 6-36-month old children that attended the selected health facilities in Kampala (n=410)

Characteristic	Total	Yes	%
Ever breastfed	410	400	97.6
Currently breastfeeding			
6–12 months	116	104	89.6
13–23 months	175	94	53.7
24–36 months	119	10	8.4
Overall	410	208	50.7
^***Continued breastfeeding (6-23 months)***	291	198	68.0
^***Solid/semi-solid foods (6-8 months)***	48	33	68.8
^***Egg and/or flesh consumption (6-23 months)***	286	164	57.3
^***Zero vegetable or flesh consumption (6-23 months)***	286	113*	39.5**
Age at solid food introduction (n=409)			
Before six months		46	11.2
At six months		300	73.4
After six months		63	15.4
Ever formula fed	407	217	53.3
Currently using formula			
6–23 months	291	19	6.5
24-36 months	119	1	0.8
Overall	410	20	4.9

^ Calculated based on WHO infant and young child feeding indicators (WHO and UNICEF, 2021)
*** "No" consumption **Percentage of no consumption**

Complementary feeding indicators

Consumption of home-prepared food within 24 hours among children aged 6-36 months was 93.8% (n=378/403), with 86.4% (n=348/403) as a complete home-made meal (meat stew or pulses and starchy food). On the other hand, 9.7% (n=39/403) consumed only commercial baby foods and no home-prepared meals. In addition, 89.6% (n=361/403) of 6-36 months old children consumed sugar in either porridge or homemade juice, similar in all three age groups, while 58.6% (n=236/403) took at least one meal of cereal porridge. Children aged 6-23 months were further assessed to determine whether they met the minimum complementary feeding indicators.

Overall, just over a third (37.1%, n=106/286) met the minimum dietary diversity (MDD), nearly all (97.2%, n=278/286) met the minimum meal frequency (MMF), while about a third (33.9%, n=97/286) met the minimum acceptable diet (MAD). However, 50.3% (n=144/286) of the children consumed ultra-processed foods and did not meet the MAD. Among children between 24 and 36 months, 29.1% (n=34/117) met the MDD using a modified measure. Table 5.11 summarises the percentage of children meeting the minimal complementary feeding indicators.

The data in Table 5.12 shows that children from families with middle and high socio-economic scores (SES) were more likely to meet MDD and MAD requirements than those from low SES. Children who had breastfed were 2.5 times more likely to meet the MDD and 1.7 times more likely to meet the MAD than those who were not presently breastfeeding. Maternal education was positively associated with achieving both MDD and MAD, with the highest two levels significant for MDD. Children that frequently consumed ultra-processed foods and beverages were 1.7 times, and those who rarely consumed were almost twice more likely to meet the MDD

Table 5.11: Percentage of children 6–23 months of age meeting minimum complementary feeding indicators (n=286)

Indicator	**Overall n (%)**	**Categories**	
Minimum dietary diversity, %†	106 (37.1)	***6-12 months (n=114)*** 36 (31.6)	***13-23 months (n=172)*** 70 (40.7)
Minimum meal frequency %‡	278 (97.2)	***6-8 months (n=48)*** 45 (93.8)	***9-23 months (n=238)*** 233 (97.9)
Minimum acceptable diet % $	97 (33.9)	***Non-breastfed (n=94)*** 16 (17.0)	***Breastfed (n=192)*** 81 (42.2)

All calculations were based on WHO infant and young child feeding indicators †minimum dietary diversity was defined as consumption of at least five out of eight food categories by 6-23 months old, including breastfeeding as a meal. ‡ Calculated based on World Health Organization infant and young child feeding indicators; minimum meal frequency was defined as at least two times for breastfed children 6–8 months, at least three times for children 9–23 months and at least four times for non-breastfed children 6–23 month. $The minimum acceptable diet is defined as •for breastfed children: receiving at least the minimum dietary diversity and minimum meal frequency for their age during the previous day; •for non-breastfed children: receiving at least the minimum dietary diversity and minimum meal frequency for their age during the previous day as well as at least two milk feeds (WHO and UNICEF, 2021).

Table 5.12: Bivariate analysis of the association between complementary feeding indicators and socio-demographic characteristics among 6-23-month old children in Kampala (n=286)

Variable overall	MDD PR, 95% CI, *p-value*	MAD PR, 95% CI, *p-value*
Maternal education level (n=278)		
No education/primary level completed	Ref	Ref
O levels completed	2.99,0.93-9.59,0.065	2.53,0.77-8.30,0.125
A levels/Technical/Vocational completed	3.60,1.48-11.26,0.028*	3.15,0.99-10.00,0.052
College/University completed	4.24,1.43-12.28,0.009*	4.00, 1.35-11.91,0.012*
Socioeconomic status (n=275)		
1st (lowest)	Ref	Ref
2nd (middle)	1.72,1.14-2.59,0.009*	1.88,1.21-2.92,0.005*
3rd (highest)	1.63,1.06-2.51,0.024*	1.71, 1.07-2.72,0.024*
Currently breastfeeding (n=286)		
No	Ref	Ref
Yes	1.67,1.14-2.45,0.008*	2.48,1.53-3.99,<0.001*
Mother attended nutritional class (n=237)		
No	Ref	Ref
Yes	0.92,0.63-1.32,0.647	0.85,0.57-1.26,0.413
Consumption of CBF on day before (n=286)		
No	Ref	Ref
Yes	1.54,0.97-2.45,0.067	1.64,0.99-2.73,0.056
Frequency of CBF consumption in the week before (n=286)		
Never	Ref	Ref
Rarely	1.96,1.08-3.56,0.027*	1.78,0.96-3.26,0.069
Frequently	1.73,1.02-2.95,0.041*	1.57,0.92-2.68,0.096

Ref is the baseline comparative group whose adjusted PR is "1". *p-value <0.05

CHAPTER 6

RESULTS STUDY 2

LABELLING PRACTICES AND SUGAR CONTENT

6.1 General characteristics of surveyed commercial baby foods

The results presented in this chapter are based on information collected from commercial baby food and beverage (CBF) labels. The present study used selected guidelines that cover commercially-available complementary foods (CACF). However, these same guidelines were extrapolated to include the products categorised for the general population but found to be commonly used for children in the 6-36-month age group in Study 1, and hence referred to as other commercial food products (CFP).

The nutritional labels of one hundred and thirty-five (n=135) foods and beverages were assessed. Details of the products depicted in Table 6.1 show that 44.4% (n=60) were assorted CACF, 25.2% (n=34) were sweetened beverages (dairy products and fruit juices), and 30.4% (n=41) were altogether referred to as "Snacks". Snacks consisted of biscuits, sweet finger snacks, ready-to-eat breakfast cereals, and fortified cereals (not marketed for young children). The CACF consisted of 45% (n=27) instant cereals, 23.3% (n=14) fortified cereals and 31.7% (n=19) fruit/vegetable purees.

More than half (58.5%, n=79) of these labels showed that they were imported products. The greatest supply of imported products came from South Africa, 28 (20.7%), and was composed of purees (n=20) and ready-to-eat cereals (n=8), closely followed by Kenya, with 11 (8.2%). Overall, Africa was the biggest contributor, including local Ugandan products with 102 (75.6%), followed by Europe (n=18, 13.3%). All 14 fortified porridges under CACF were locally produced by local companies, while 88.5% (n=23/26) of CFP breakfast cereals were imported.

Table 6.1: General characteristics of the sampled Commercial Baby Foods from Kampala (n=135)

Characteristic	n (%)
Type (n=135)	
CACF	60 (44.4)
SSB	34 (25.2)
Snacks	41 (30.4)
Snacks (n=41)	
Biscuits	15 (36.6)
Breakfast cereals	26 (63.4)
CACF (n=60)	
Instant	27 (45)
Fortified	14 (23.3)
Puree	19 (31.7)
SSB (n=34)	
Yoghurt	12 (35.3)
Milk	8 (23.5)
Juice	14 (41.2)
Import (n=135)	
No	56 (41.5)
Yes	79 (58.5)
Continent of imports (n=79)	
Africa	46 (58.2)
Asia	10 (12.7)
Europe	18 (22.8)
North America	5 (6.3)
Manufacturers of CACF (n=60)	
Imported (n=40)	
Tiger Consumer Brands Ltd (PURITY)	14 (23.3)
Nestle South Africa(Pty)Ltd	7 (11.7)
Nestle	3 (5)
France Lait	5 (8.3)
Cow&Gates	3 (5)
H.J.Heinz Foods UK Ltd	3 (5)
Rhodes Quality Ltd	3 (5)
Other	2 (3.3)

Locally produced (n=20)	
Maganjo Grain Millers	5 (8.3)
Ankole Basic Food	4 (6.7)
Yellow Star	4 (6.7)
Kirunga Group	3 (5)
Other	4 (6.7)
Cartoons (n=135)	
No	103 (76.3)
Yes	32 (23.7)
Type of food with cartoon	
CACF n=60	10 (16.7)
SSB n=34	6 (17.6)
Snack n=41	16 (39.0)
Age minimum (for Snack & SSB) (n=75)	
No	70 (93.3)
Yes	5 (6.7)
Recommend addition of sugar in CACF	
Instant n=27	0 (0)
Fortified n=14	10 (71.4)
Pureed n=19	0 (0)

6.2 Objective 1: To assess the compliance of commercial baby foods food labels with selected aspects of national and international guidelines that promote optimal infant and young child feeding

Age, images, and claims recommendations for CACF only

The majority (91.7%, n=55/60) of the CACF recommended six months or older as the age of introduction of these food products (Table 6.2). Among these, eight (14.5%) products did not clearly display the recommended age (Figure 6.1). Four Ugandan products did not indicate a suitable age, two of which were certified by the national foods certifying body—Uganda National Bureau of Standards (UNBS). One UK product recommended an age of below six months. The Ugandan products that displayed age were sometimes ambiguous, with four products having "unclear" images, including those of infants younger than six months of age, which may imply that they are not specific to young children. Some of these products had age-related messages like "for children and adults", "for all ages", "for the whole family", and yet, they qualified to be classified as CACF from the present study definition. Some of these are depicted in Figure 6.1. Additionally, nearly two-thirds (60%, n=36/60) of the CACF had nutrition and/or health claims (Table 6.2). A breakdown revealed that there were 13 local and 23 imported CACF. Among these were claims such as: "1 of your baby's 5 a day" from two imported products, and "adequate to cater for all child needs", from both local and imported products. Figure 6.2 depicts some of such claims.

Nutrition information, ingredient list, sugar composition, and servings

The majority, 94.8% (n=128/135) of the sampled products and 93.3% (n=56/60) of CACF had nutritional information (Table 6.2). All seven products without information were Ugandan products, with four marketed as CACF (fortified porridge). The only two products without a list of ingredients were also Ugandan products. Among the 117 items with sugar in their content, only 65.8% (n=77) overall and 72.3% (n=34/47) of CACF declared the amount of "total sugar" (Table 6.2). In contrast, 6.8% (n=8) of products with sugar did not include the "added" sugar in their ingredient list, and one juice drink had an artificial sweetener.

Also important to note is that all the 20 locally produced CACF did not show clear recommended servings on their labels in the nutrition information. The servings were implied from measures like

the number of tablespoons in the preparation directions. On the other hand, all 40 imported CACF had details on recommended servings or were packaged as one portion. However, only five (8.3%) of the imported CACF gave details on daily rations.

Figure 6.1 Images of CACF products that did not display age and age-related confusing messages

Table 6.2: Selected label requirements and general nutritional labelling of commercially available complementary foods in Kampala (n=60)

	Age <6 months		Age ≥6 months		Images of babies < 6 months		No health or nutritional claims		Nutritional information presence		Ingredients list Presence		Energy information presence		Total sugar composition information presence			Serving recommend-ations	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n (N)	%	%	n	%
Overall									128	98.4	133	98.5	120	88.9	77 (117)ǂ	65.8 ǂ	57.0	93	68.9
***CACF* n= 60**	1*	1.7	55	91.7	4*	6.6	24	40.0	56	93.3	60	100	50	89.2	34 (47)ǂ	72.3 ǂ	56.7	40	66.7
Instant cereals n=27	1*	3.7	25	92.6	1*	3.7	1	3.7	27	100	27	100	26	96.3	15 (25)ǂ	60.0 ǂ	55.6	21	77.8
Local fortified cereals n=14	-	-	11	78.4	3*	21.4	6	42.9	10	71.4	14	100	5	35.7	0 (3)ǂ	0 ǂ	0	0	0
Vegetable/fruit purees n=19	-	-	19	100	-	-	17	89.5	19	100	19	100	19	100	19 (19)ǂ	100 ǂ	100	19	100
CFP																			
Sweetened beverages n=34									31	91.2	100	31	7.8		14 (33)ǂ	42.4 ǂ	41.2	34	100
Snacks including breakfast cereals n=41									41	100	95.1	39	63.3		29 (37)ǂ	78.4 ǂ	70.7	39	95.1

*Inappropriate/not recommended

ǂ Denominator excludes those that either had no sugar in their ingredient list or in their nutrition declaration

Figure 6.2 CACF products with nutrition and health claims

Ingredient list Health claim

Figure 6.4 Least compliant CACF with only an ingredient list

No age recommendations, no nutrition declaration, no energy information, and has health claim

Overall compliance of CACF with selected label practices

The compliance of each CACF was scored as a percentage. The median (LQ, UQ) scores were for all 60 CACF was 85.7 (66.7, 100) (Table 6.3). Overall, only 17 (28.3%) CACF were fully compliant with the selected key labelling requirements (Figure 6.3a) and all of them were purees (17/19=89.5%) (Figure 6.3d). The only two purees that failed to fully comply with the selected label practices included nutrient and/or health claims on their labels. Overall the CACF were most compliant with displaying nutrition information (93.3%, n=56/60) on the labels and least complied with excluding health and/or nutrition claims (40%, n=24/60). The least compliant product was a fortified locally-produced cereal with only an ingredient list (Figure 6.4).

Table 6.3. Label compliance score for CACF and nutritional suitability scores of Commercial Baby Foods (n=135)

Score characteristic	Product type	n	Median(LQ,UQ)	Range	Bivariate test	*p-value*
Compliance label practices	CACF overall	60	85.7(66.7,100)	16.7,100		
	Source					
	Ugandan	20	57.1(50,66.7)	16.7,83.3	Wilcoxon rank sum test	<0.0001
	Imported	40	85.7(85.7,100)	71,4,100		
Nutritional suitability	Overall	101	57.1 (40.7, 71.4)	0, 100		
	CACF	60	64.6(42.9, 75)	16.7, 100	Kruskal Wallis rank test	0.0001
	SSB	7	33.3(0, 33.3)	0, 33.3		
	Snacks	34	55(40, 60)	0, 100		
	CACF					
	Instant	27	57.1 (42.9, 71.4)	16.7, 87.5	Kruskal Wallis rank test	0.0001
	Fortified	14	100 (100, 100)	33.3, 100		
	Purees	19	57.1 (42.9, 71.4)	37.5, 85.7		
	Source					
	Ugandan	29	85.7 (57.1, 100)	0,100	Wilcoxon rank sum test	0.0003
	Imported	72	50 (40, 60)	0, 100		

Many of the instant cereals failed to meet the requirements because of having nutritional and /or health claims. Their compliance was between 57-86%. The 14 fortified cereals emerged as the poorest at complying and were all locally processed foods with a compliance score ranging from 17-83%, with 28.6% (n=4) scoring less than 50%. Fortified cereals are the only category among the CACF that scored that poorly (Figures 7.3a and 7.3c). All 14 fortified cereals had incomplete serving recommendations, the majority (n=8) had nutrition and/or health claims, and 10 included no information on energy. The ten fortified cereals with a nutrition declaration still had a lot of missing information, and some used formats that were not recommended in the standards. It was noted that the four least compliant products—all fortified cereals—did not bear the UNBS logo. Only two items (14%) among the 14 fortified cereals were certified.

A Wilcoxon Signed Rank Test was performed to determine if there was a statistically significant difference in the mean label compliance score between the imported and local CACF. The test revealed a statistically significant difference in mean score between the two groups ($z = -6.193$, $p < 0.0001$); that is, the locally produced CACF scored less than imported products (Table 6.3).

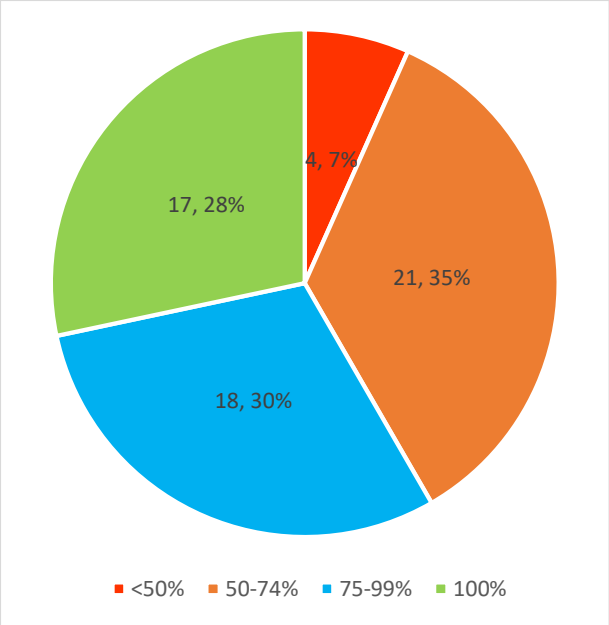


Figure 6.3a Compliance of CACF to labelling guidelines (n=60)

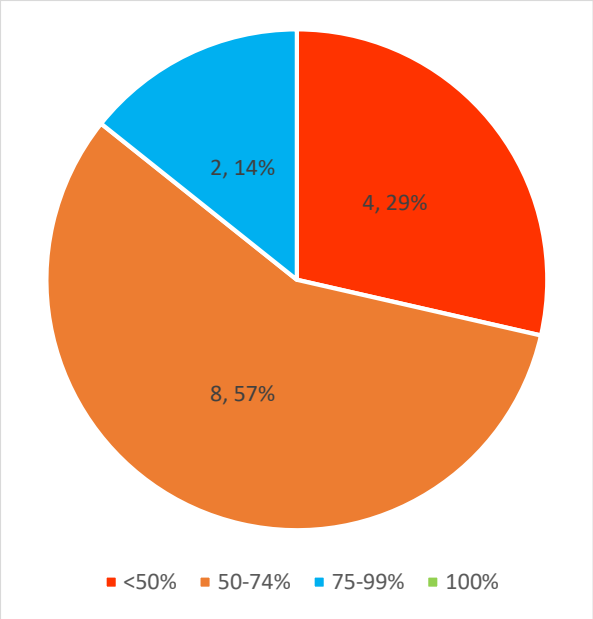


Figure 6.3c Compliance of locally produced fortified cereals to labelling guidelines (n=14)

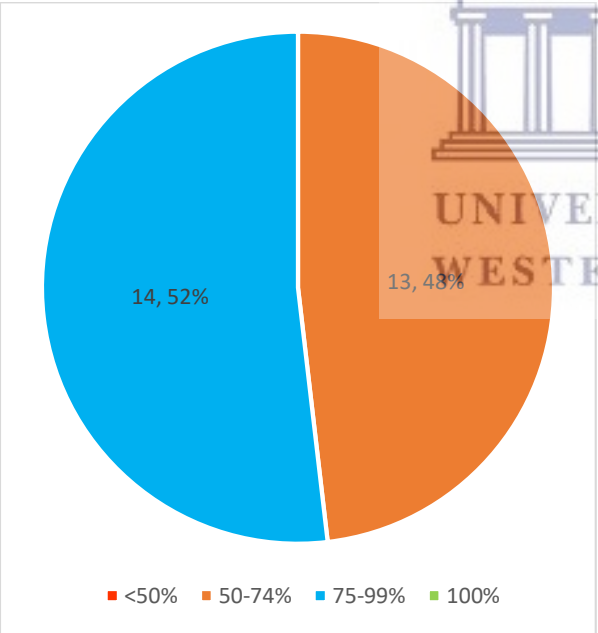


Figure 6.3b Compliance of instant cereals to labelling guidelines (n=27)

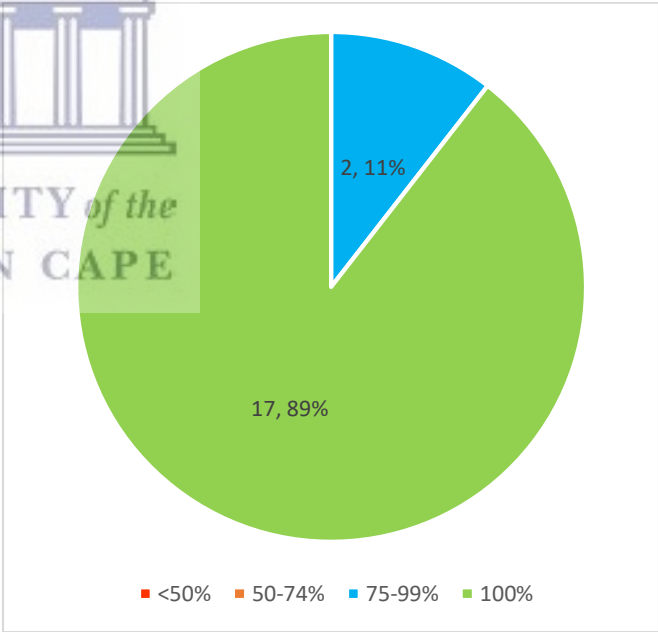


Figure 6.3d Compliance of purees to labelling guidelines (n=19)

6.3 Objective 2: To determine the sugar and energy content of commercial baby foods declared on labels

Eighty-two products were assessed for "total sugar" and 120 products for energy (Table 6.4). The median (LQ, UQ) of "total sugar" per 100g, "total sugar" per serving, and percentage energy were: 13.9g (9.5, 27), 11.1g (6.5, 13.5) and 34.6% (23, 73), respectively. The graphic presentations for comparisons among the commercial baby foods and CACF categories are included. For "total sugar" per 100g are shown in Figures 7.5a, 7.5b, total sugar per serving in Figures 7.6a,7.6b, percentage energy from sugar in Figures 7.7a, 7.7b, and energy density in Figures 7.8a, 7.8b.

The median "total sugar" content per 100g of Snacks was higher than that of CACF and SSBs (Figures 7.5a) and whereas the median "total sugar" per serving was highest in the SSB (Figures 7.6a). The Kruskal Wallis rank test showed that the median "total sugar" per 100g of Snacks was significantly higher in Snacks than in SSBs or CACF: $\chi^2(2) = 22.972$, $p = 0.0001$, df=2, with a mean rank of 35.6 for CACF, 27.0 for SSBs and 57.9 for Snacks. On the other hand, the "total sugar" per serving was significantly higher in SSB than in Snacks or CACF: χ^2 (2) = 21.364, p = 0.0001, df=2, with a mean rank of 37.4 for CACF, 63.2 for SSBs and 32.0 for Snacks.

When the percentage energy contribution from sugar was calculated, SSB had the greatest median contribution, followed by CACF, and Snacks had the least (Figure 6.7a). The Kruskal Wallis rank test revealed that the median percentage energy contribution in SSB was statistically significant: $\chi^2(2) = 24.659$, $p = 0.0001$, df=2.

The median (LQ, UQ) "total sugar" per 100g, "total sugar" per serving, and percentage energy from "total sugar" of the 34 CACF were: 12.1g (6.1, 23), 10.8g (6.5, 13.5), and 44.2% (25.6%, 63.7%), respectively. Among the CACF, only the "total sugar" content of instant cereals and purees was compared since all the fortified cereals did not declare "total sugar" information. The median "total sugar" per 100g was higher in instant cereals than in purees (Figures 7.5b), while it was slightly higher for "total sugar" per serving (Figures 7.6b). The median (LQ, UQ) "total sugar" per 100g, "total sugar" per serving, and percentage energy from "total sugar" of the 17 purees that contained at least one fruit were 9.5g (3.7,15.6), 10.8g (7.1,16.4) and 63.7% (48.6,82.8), respectively. The "total sugar" range per 100g was 3.7-15.6g.

The Wilcoxon Signed Rank test showed that the mean "total sugar" per 100g of instant cereals was significantly higher than that of purees (Z =4.459, p < 0.0001). Conversely, the mean "total sugar" per serving of purees was higher than instant cereals, but this was not statistically significant *(Z = 0.364, p=0.716)*. Further analysis of CACF revealed that the percent energy contribution of "total sugar" in purees was significantly higher than that of instant cereals (Z = -4.943, p < 0.0001).

Some special categories of interest included sweetened dairy products and fruit and vegetable purees without "added sugar". The "total sugar" per 100g, "total sugar" per serving, and percent energy contribution from sugar ranges for five dairy products were 6-11.9g, 15-23.8g, and 24-47.6%, respectively. The "total sugar" per 100g, "total sugar" per serving, and percent energy contribution from the sugar ranges for six purees were 3.7-15.6g, 3-17.7g, and 51.6-84.2%, respectively.

The median (LQ, UQ) energy density of 118 products was 3.55Kcal/g (0.8, 4), while that of 48 CACF was 3.75Kcal/g (0.6, 4.2). A Kruskal-Wallis H test was conducted to determine if the energy density of the CACF were different, $\chi^2(2) = 33.289$, $p = 0.0001$, df=2, with a mean rank of 33.8 for instant cereals, 27.5 for fortified cereals and 9 for purees. The puree energy density was significantly lower than the energy density of fortified and instant cereals.

Table 6.4 Total sugar and energy content of commercial baby foods sampled from Kampala (n=120)

		n	Median (LQ, UQ)	Range(min,max)	Test	*p-value*
Total sugar per 100g For CBF	Overall	82	13.9 (9.5,27)	3.3, 74		
	CACF	34	12.1(6.1,23)	3.3-37	Kruskal	0.0001*
	SSB	19	11.4(7.5,13.1)	3.8-15.7	Wallis rank	
	Snacks	29	27(19,31.9) e	4.4-74	test	
	CACF					
	Instant cereals	15	24(21, 28.4)	6, 37	Wilcoxon rank	<0.0001
	Purees	19	8.1(4.9, 10.8)	3.3, 15.6	sum test	
Total sugar per serving For CBF	Overall	82	11.1 (6.8, 18.4)	1.3, 69		
	CACF	34	10.8(6.5,13.5)	3.0,25.1	Kruskal	0.0001*
	SSB	19	19(16.8,37.5)	1.3-69	Wallis rank	
	Snacks	29	8(6,12)	1.7,44	test	
	CACF					
	Instant cereals	15	9.6 (6.2, 16.4)	3.5, 18.5	Wilcoxon rank	0.716
	Purees	19	8 (6, 12)	3, 25.1	sum test	
Energy per 100g for CBF	Overall	120	351.2 (74.1, 399.7)	35.4, 517		
	CACF	50	372.5(53.3,416)	28.7,454.8	Kruskal	0.0001*
	SSB	31	76(53,99.8)	38,329.3	Wallis rank	
	Snacks	39	388.9(363.5,457)	288.3,537.9	test	
Sugar contribution to energy (%)	Overall	82	34.6 (23, 73)	5.2, 100		
	CACF	34	44.2(25.6,63.7)	14.5,91.5	Kruskal	0.0001*
	SSB	19	92.3(39.5,99.6)	15,100	Wallis rank	
	Snacks	29	25.3(17.8,34.3)	5.2,74.2	test	
	CACF					
	Instant cereals	15	51.6 (47,82.8)	37.3, 91.5	Wilcoxon rank	0.0001*
	Purees	19	32.9 (22.4,80.9)	5.2, 100	sum test	
Energy density for CBF	Overall	118	3.6 (0.8, 4)	0.4, 5.2		
	CACF	48	3.75(0.6,4.2)	0.3,4.5	Kruskal	0.0001*
	SSB	31	0.8(0.5,1)	0.4,3.3	Wallis rank	
	Snacks	39	3.9(3.6,4.6)	2.9,5.4	test	
	CACF					
	Instant cereals	27	9.6 (6.2, 16.4)	3.5, 18.5	Kruskal	0.0001*
	Fortified cereals	4	8 (6, 12)	3, 25.1	Wallis rank	
	Purees	17	0.5 (0.5, 0.6)	0.3, 0.8	test	

**p-value < 0.05*

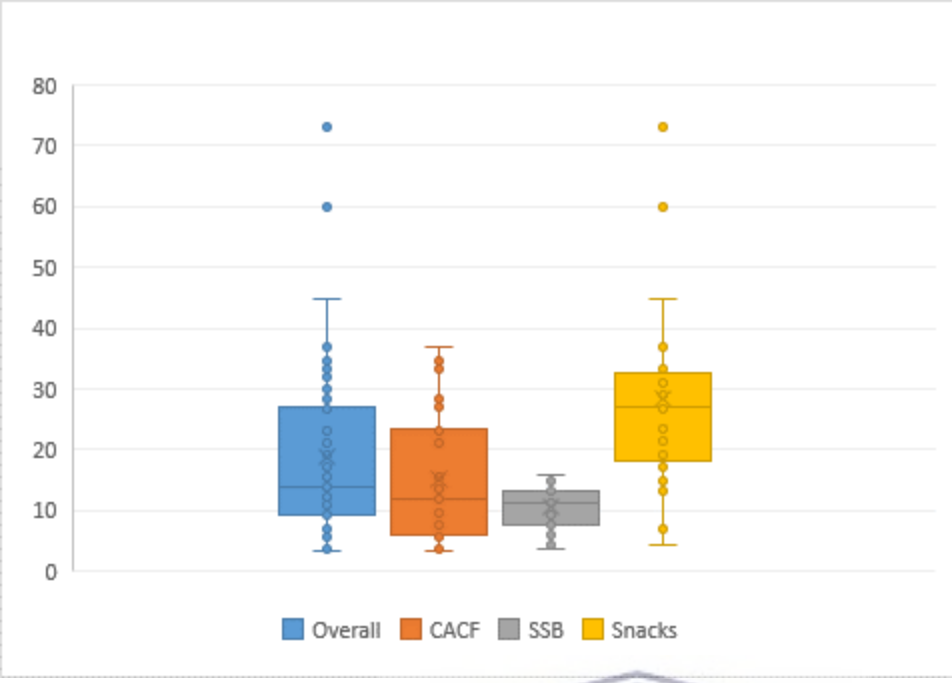


Figure 6.5a: "Total sugar" per 100g of commercial baby foods (n=82)

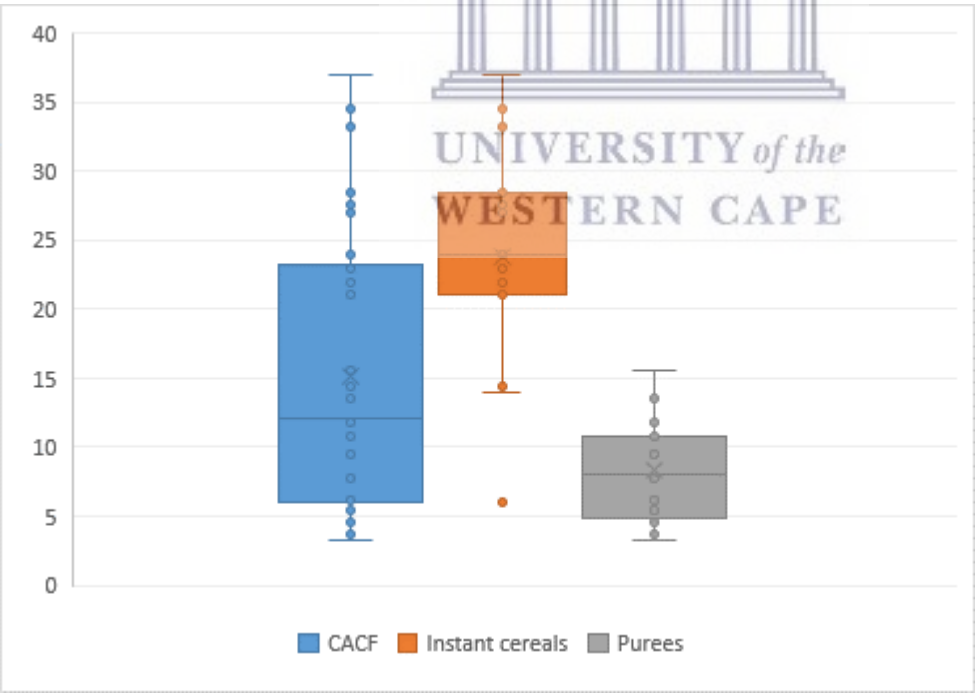


Figure 6.5b "Total sugar" per 100g of CACF (n=34)

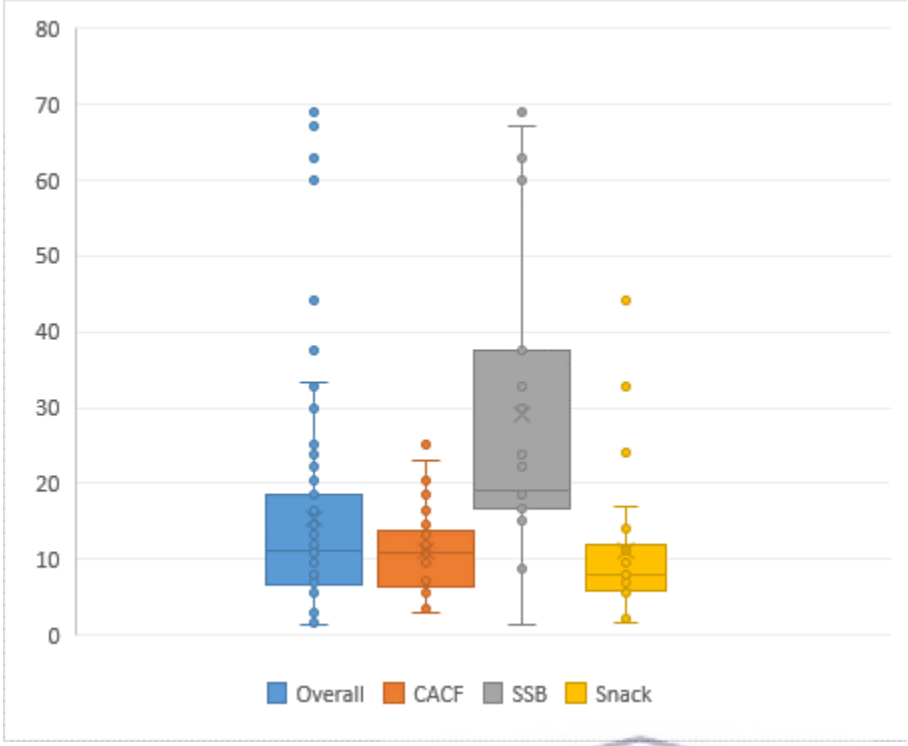


Figure 6.6a: "Total sugar" per serving for commercial baby foods (n=82)

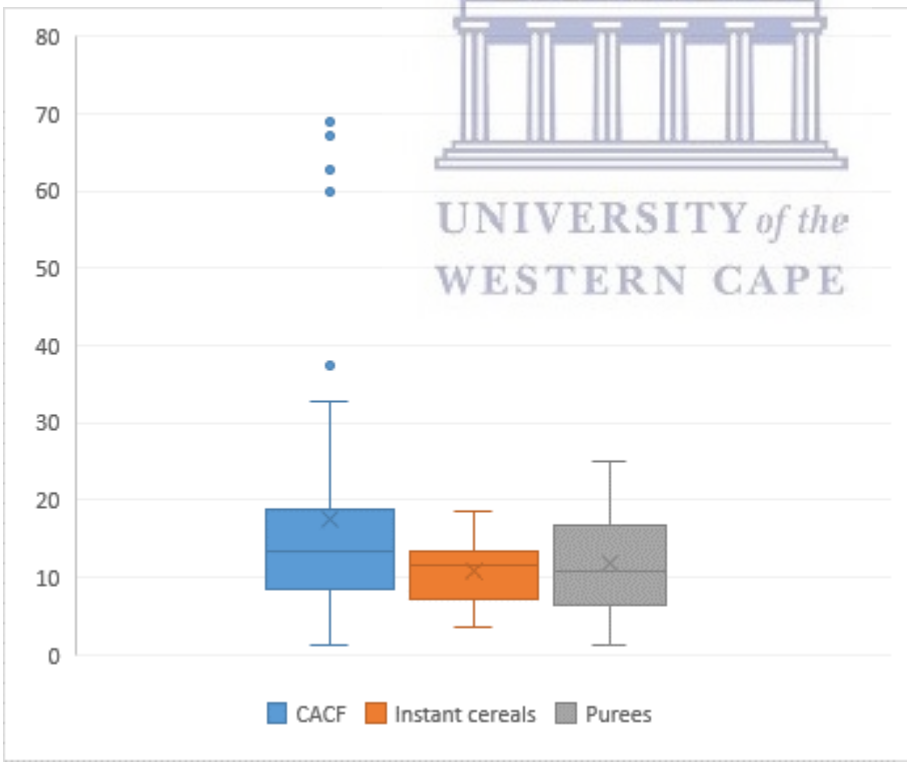


Figure 6.6b: "Total sugar" per serving of CACF (n=34)

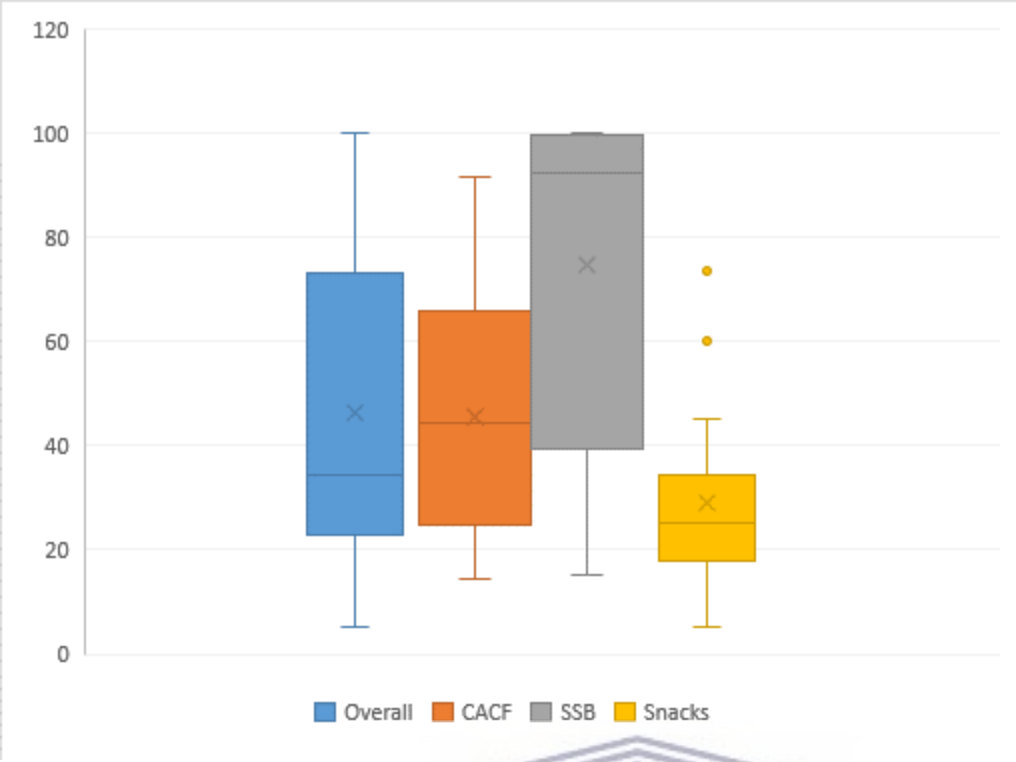


Figure 6.7a: Percent energy from "total sugar" for commercial baby foods (n=82)

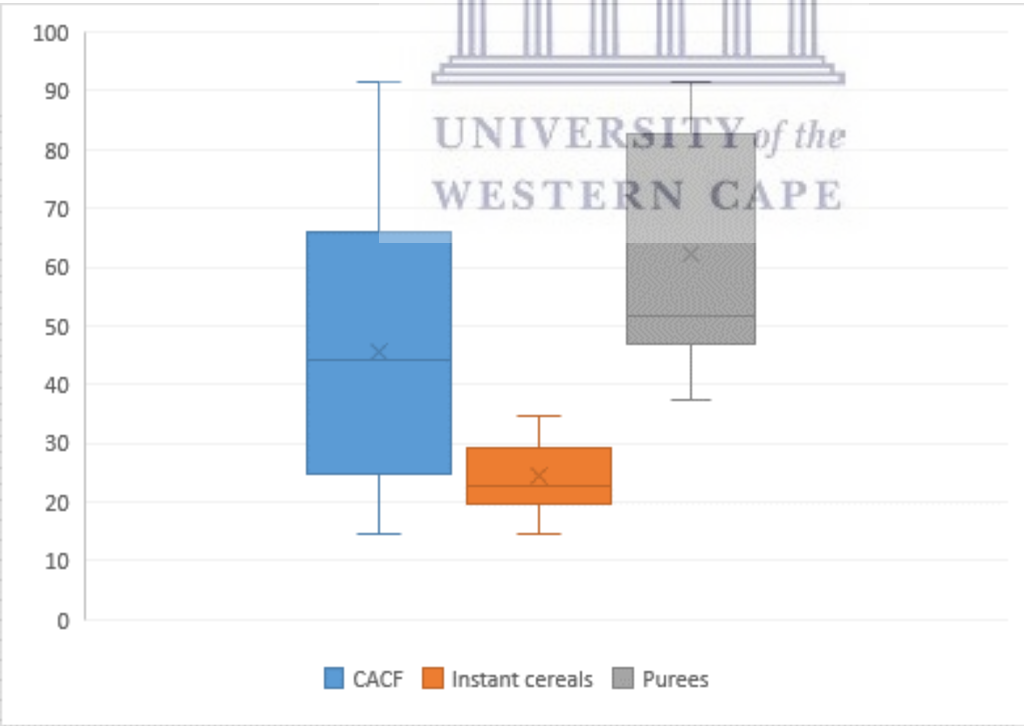


Figure 6.7b: Percent energy from "total sugar" for CACF (n=34)

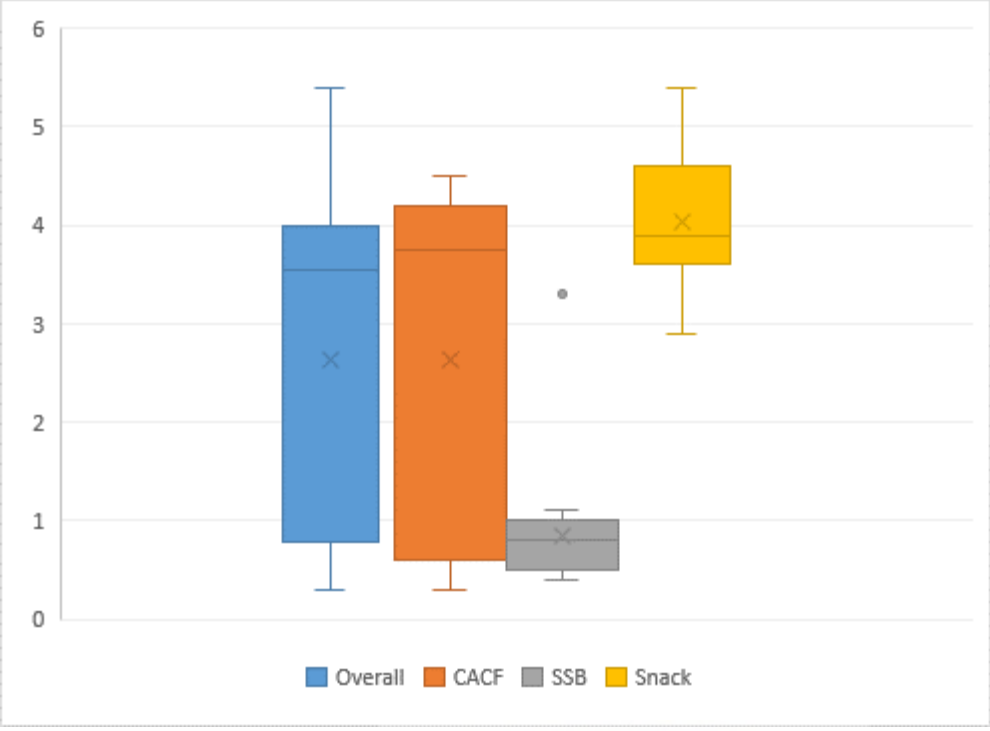


Figure 6.8a: Energy density of commercial baby foods (n=118)

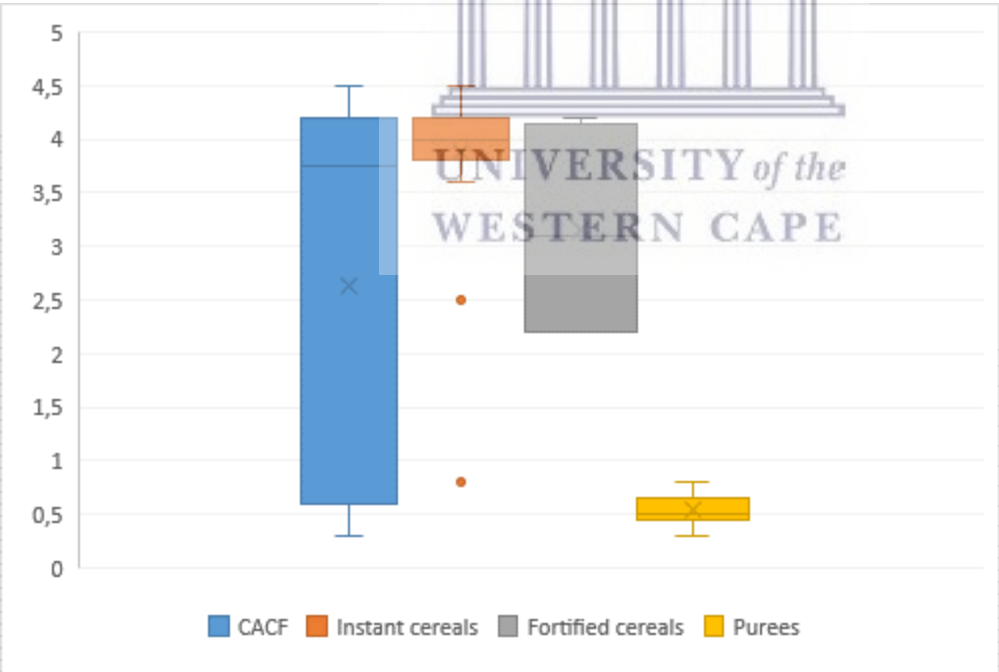


Figure 6.8b: Energy density of CACF, (n=48)

6.4 Objective 3: To assess the nutritional suitability of CBF based on taste, sugar and energy content declared on labels

Nutritional suitability based on taste characteristics, sugar and energy content of commercial baby foods

The products were further examined for nutritional suitability, covering taste, sugar, and energy content.

Added sugar/ sweetener

The taste and sweetness guidelines for CACF were used for all the products, including the CFP, and very few items did not have "added sugar": 31.7% (n=19/60) of CACF and overall 17.8% (n=24/135) of CBF. The products without "added sugar" were eight purees and 16 fortified cereals, 15 of which were locally produced. The locally fortified cereals included 11 CACF and four CPF. Among the eight purees, two were sweet vegetable-only purees, while six were fruit purees. These fruit purees had free sugars ranging from 3.7-15.6g per 100g. As expected, all the beverages and finger snacks/biscuits had a sweetener, and the only one recorded as not having was a "natural fruit juice" beverage. On the other hand, all the 22 CFP imported breakfast cereals, all 15 finger snacks/biscuits, and all 27 instant cereals had at least one sweetener.

The most common sweetener used was sucrose, commonly labelled as "sugar", in 88.3% (98/111) of CBF and 80.5% (33/41) of CACF. CACF also contained fructose in 26.8% (11/41) and lactose in 22% (9/41) of the products. In some of the products, these were in combination.

Fruit content

The majority (88.2%, n=67/76) of CBF had no or low fruit content based on different cut-offs. Excluding the 14 fruit purees, 89.1% of the 46 CACF had low or no fruit, and none of the fortified or breakfast cereals had any fruit content (Table 6.5). In addition, two instant porridges and all four yoghurts with fruit did not disclose information on the amount of fruit content.

Flavouring

When juice beverages (n=14) were excluded, overall, only 24.8% of the 121 products had no flavour, including 36.7% (n=22/60) of CACF (Table 6.5). Among the CACF scored as flavoured were 14 purees which were labelled with "no artificial flavouring" but were composed of more than one fruit (fruit purees) or contained fruit (vegetable purees). The fortified foods had the highest number of products that were not flavoured; 13/14 (92.9%). On the other hand, very few of the 26 Snacks were not flavoured, 8 (19.5%). In the CACF, the commonest flavours were fruity in 77.3% (n=17/22) and 54.5% (n=12/22) vanilla/vanillin.

Percent energy contribution of "total sugar"

The energy contribution of total sugar was below the limit in 41.4% (29/70) of CBF overall and in only 35.3% (12/34) of CACF (Table 6.5). Among the 15 instant cereals assessed, 80% (n=12) were below these limits. Conversely, 59% (n=41) overall and 64.7% (n=22) of CACF would need FOP labelling (Figure 6.10), but only eight had the FOP label, and none of these was a CACF.

The snacks (sugary snacks and breakfast cereals) category had 41% below the recommended limit, and these were 12 breakfast cereals (<30%). All eight sugary snacks were >15%. Five dairy products (yoghurt and milkshake) were <40% (Table 6.5).

The six fruit purees without added sugar, but only "free sugars", had the energy contribution from total sugars ranging from 14.8%-62.4%. All except the lowest were >20%. The two vegetable-only purees had very low total sugars per 100g, 3.3g and 4.5g; their energy contribution from total sugars was 13.2% and 18%.

Table 6.5: Nutritional suitability of Commercial Baby Foods using WHO Europe NPM and Ugandan guidelines on sugar, flavour, and energy assessment (n=135)

	No added sugar/ sweetener		Low/no added fruit		No flavours		Less than specific percent energy from total sugar		Energy density threshold		Daily ration energy appropriate for age					
											6-8.9 months		9-11.9 months		12-23.9 months	
	n	%	n	%	n	%	n/tot	%	n	%	n	%	n	%	n	%
Overall (n=135)	24	17.8	67/76[$]	88.2	30	24.8[C]	29/70*	41.4	60/72[€]	83.3						
***CACF* (n= 60)**	19	31.7	41/46×	89.1	22	36.7	12/34*	35.3	36/48[€]	75	30/44^	68.2	31/45^	68.9	38/38^	100
Instant cereals (n=27)	0	0	25/27ŧ	92.6	4	14.8	12/15*µ	80.0	27/27[#©]	100	10/24^	41.7	11/25^	44	18/18^	100
Local fortified cereals (n=14)	11	78.6	14/14ŧ	100	13	92.9	-	-	4/4[#]	100	0/1^	0	0/1^	0	0/1^	0
Vegetable/fruit purees (n=19)	8	42.1	2/5ǫ	40	5	94.7	0/19*Ω	0	5/17α	29.4	19/19	100	19/19	100	19/19^	100
CFP																
Sweetened beverages (n=34)	1	2.9[@]	0/4[@¥]	0	0	0[C @]	5/7*[@¥]	71.4	n/a	n/a						
Snacks, including breakfast cereals (n=41)	4	9.8[@]	26/26[@]ŧ	100	8	19.5[@]	12/29*[@]£	41.4	24/24[#@]	100						

$ Denominator includes only dry cereals, vegetable purees, snacks and yoghurt with fruit
× Denominator excludes fruit purees
ŧ Cut-off is <10% by weight dried/powdered fruit for dry cereals; the denominator has only dry cereals
ǫ Cut off is 0, that is no added fruit, the denominator excludes fruit purees
¥ Cut off is ≤ 5% by weight fruit puree (only yoghurt)
* Denominator includes only those with nutritional information on sugar
µ Cut-off is < 30% for dry or instant cereals
Ω Cut-off is < 40% for fruit and vegetable purees
¥ Cut off is < 40% for dairy based ready to eat desserts (yoghurts)
£ Cut off is < 15% for other snacks and < 30% for breakfast cereals
€ Denominator includes the different categories with their respective thresholds considered and only those with nutritional information on energy
Denominator includes only dry cereal-based products with nutritional information on energy; threshold is ≥ 0.8kcal/g
α Denominator includes only fruit purees with or without vegetables, threshold ≥ 0.6kcal/g, excludes vegetable-only purees
© One item was a cereal-based puree, threshold ≥ 0.6kcal/g,
^ Denominator includes only those with a recommendation on daily rations for the different age groups or generally
[@] The recommendation initially covers only CACF and is extrapolated to other food items
n/a The measure is not applicable to the food category
[C] Denominator excludes fruit drinks

Energy density and recommended energy serving

Additionally, 83.3% (n=60) of the 72 products met the energy density threshold, and the only products that did not meet this threshold were 12 purees. The five (29.4 %) fruit purees ≥ 0.6kcal/g were either a medley of fruits (the South African brands) or combined with yoghurt (the UK brands).

On the other hand, when considering the appropriateness of the recommended servings for energy rations for age, the purees were within the desired range for all age groups. Unfortunately, only one fortified cereal provided this information, but it was above the threshold for all three age groups. For the 12-23.9-month age group, all foods that included energy recommendations were appropriate, but for the lower age groups, fewer of the instant cereals were below the threshold; 10 (41.7%) and 11 (44%) for the 6-8.9 months and 9-11.9 months, respectively.

Nutritional suitability score

A total of 101 products were assessed to determine their nutritional suitability based on their sugar content, flavouring, and energy. The median (LQ, UQ) percent scores were 57.1 (40.7, 71.4) and 64.6 (42.9, 75) for the CBF and CACF, respectively (Table 6.3).

Only 14.9% (n=15) of products, which were locally produced cereals, had a suitable nutritional composition. These were 11 CACF (fortified cereals) and four fortified cereals from the CFP category (Figures 7.9a, 7.9b, and 7.9c). All the rest were nutritionally unsuitable, with the greatest contributor being the negative score for percentage energy from sugar (energy-dense foods) and having a sweetener or added sugar (sweet foods). Only five fortified cereals among those that scored 100% provided energy information used to calculate the energy density.

Among the CACF, 42% of CACF scored between 50%-71.4% (Figure 6.9b), while among the Snacks, 47.1% (n=16/34) scored between 0%-40%. All the seven SSB that were assessed scored least between 0%-33%. A significant number of products, 40% (n=41/101), did not meet half the criteria, including all the scored seven SSBs, 18 CACF, all the eight finger snacks/biscuits, and eight breakfast cereals.

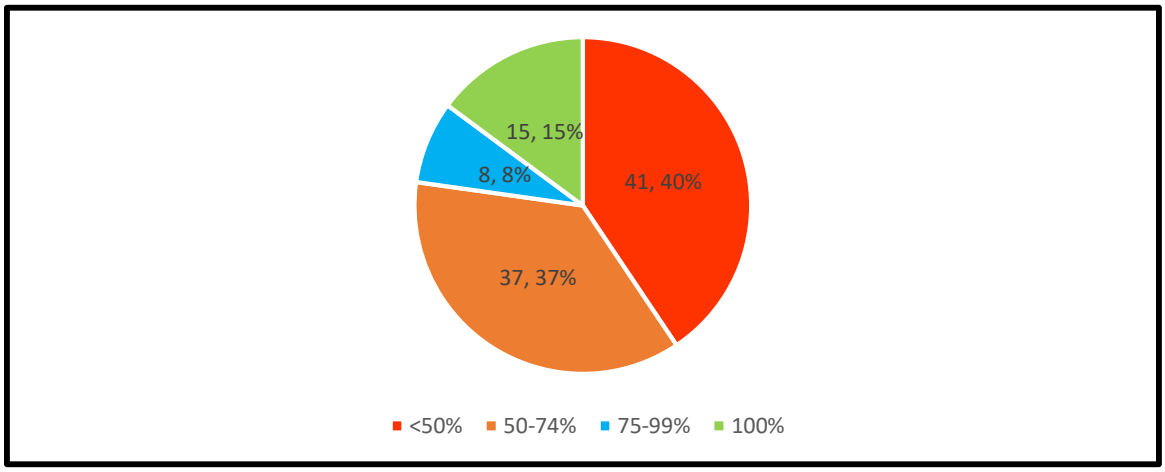


Figure 6.9a: Nutritional suitability based on the total sugar content, flavouring, and energy of commercial baby foods (n=101)

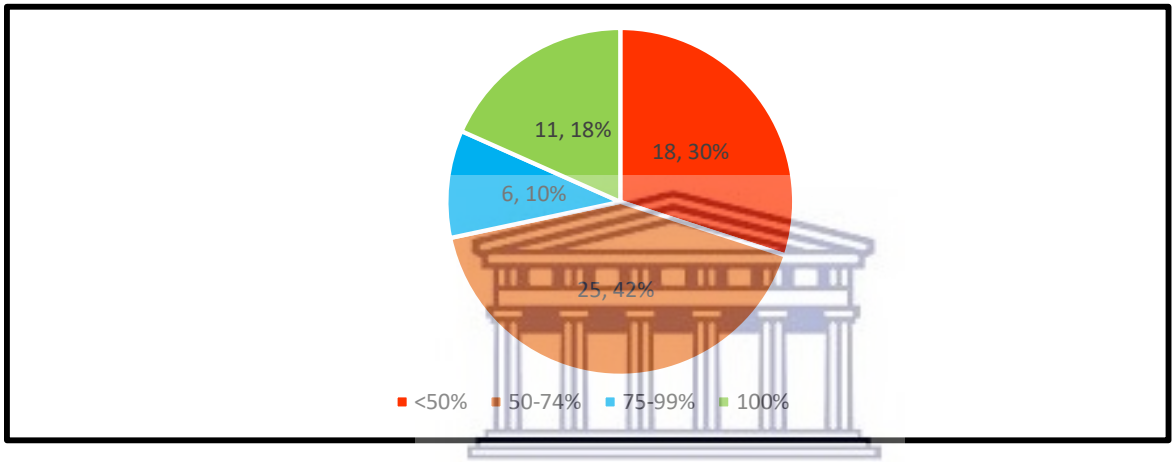


Figure 6.9b: Nutritional suitability based on the total sugar content, flavouring, and energy of CACF (n=60)

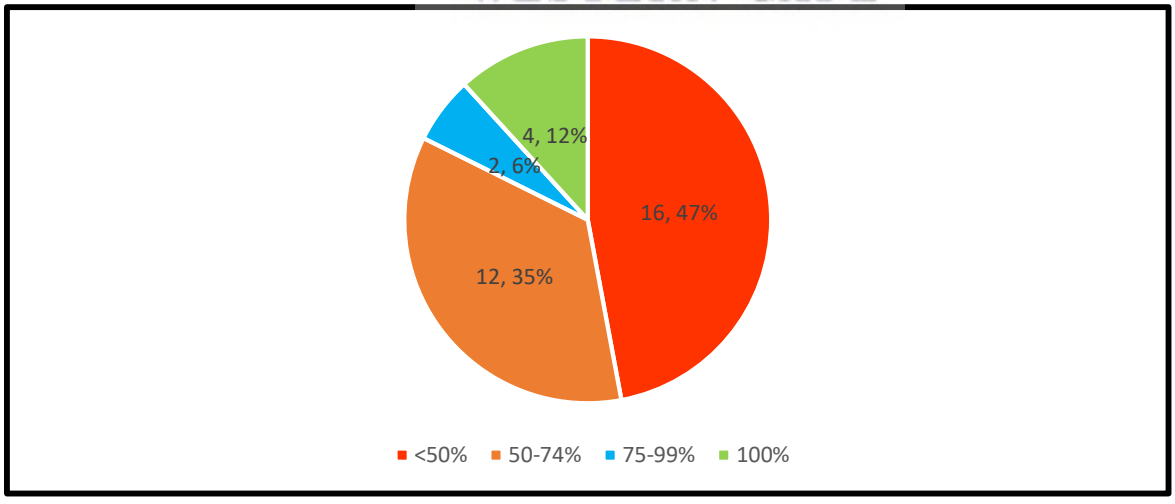


Figure 6.9c: Nutritional suitability based on the total sugar content, flavouring, and energy of CFP (n=34)

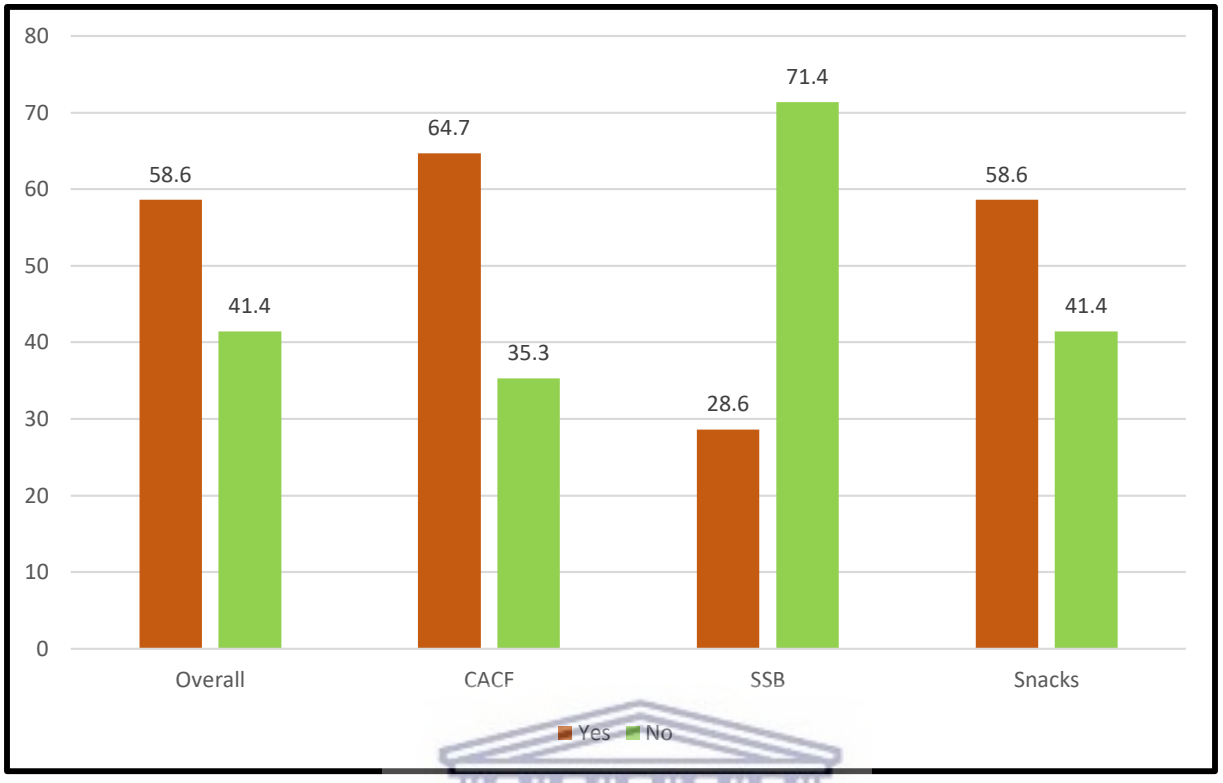


Figure 6.10: Front-of-pack labelling required from "total sugar" content for the commercial baby foods (n=70) *

*This included only items with total sugar declared and categories for which the European guidelines have determined the total sugar energy threshold above which the product should carry a front-of-pack label (≥ 30% for dry or instant cereals, ≥40% for fruit and vegetable purees and dairy-based ready to eat desserts (yoghurts), ≥15% for other snacks and ≥ 30% for breakfast cereals)

To summarise the key findings: considering the selected labelling practices, only 28% of the sampled CACF scored 100%, and the greatest number scored between 50% and 74%. Only 15% of 101 CBF and 18% of the 60 CACF were appropriate for promotion with respect to taste, energy and sugar content; these were all locally produced cereals. The rest were energy-dense sweetened foods. Overall for the 82 products with information on total sugar, the medians of total sugar per 100g, total sugar per serving, and percentage energy from sugar were 13.9g, 11.1g, and 34.6%, respectively. The median energy density of 118 products was 3.6 Kcal/g, while that of 48 CACF was 3. 8Kcal/g. For the 34 CACF with declared total sugar, the median of total sugar per 100g, total sugar per serving, and percentage energy from sugar were 12.1g, 10.8g, and 44.2%, respectively. The purees fully complied with the label practices but were sweetened and had a very low energy density. Among all the sampled products, none fully met both label practices and nutritional requirements for CACF.

6.5 Objective 4: To identify inappropriate label practices on commonly used foods and beverages that could lead to their misrepresentation as suitable for IYC consumption

The label practices that might be considered inappropriate were assessed for all CBF. These included the presence of cartoons, cross-promotional packaging/messages, small print on age recommendations, absence of age recommendations on CPF, and the recommendation to add sugar among CACF.

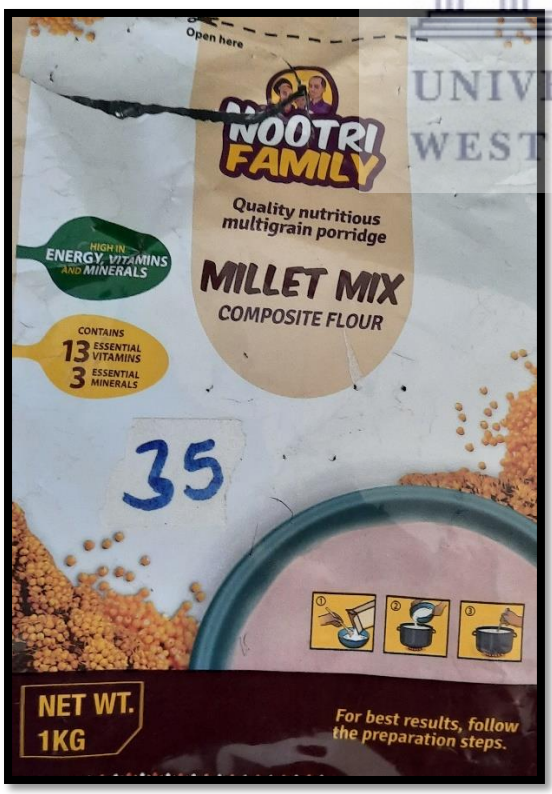
Almost one-quarter (23.7%, n=32/135) of products had cartoon characters, including 14 ready-to-eat breakfast cereals (not marketed for infants), seven instant cereals, and six sugar-sweetened beverages. Thirteen (9.6%) items with cartoons were local products; - seven CACF, three sweetened milks, one juice drink, and two biscuits. The imported products were three instant cereals, 14 breakfast cereals and two juice drinks. It was also observed that 53.3% (n= 72) of the sampled products (CFP) should not be marketed as suitable for the 6-36 age group based on the WHO Europe NPM (WHO, 2019b), but only five indicated age recommendations. The five CFPs, all ready-to-eat breakfast cereals from the same company, indicated a lower age limit of 36 months. However, the age recommendation was relegated to such small print that it was not visible. An objective comparison showed that the font size on age recommendations was a third of the size of the adjacent words. Figure 6.11 depicts a breakfast cereal commonly consumed by urban Ugandan children yet not recommended for the age group.

Furthermore, it was noted that certain brands, popularly known to have CACF cereals (from Study 1), also had other cereals (n=4) that indicated no age recommendations or showed images of a family with a young child. Figure 6.12 shows some of such items that presented challenges in classification and yet were reported as commonly used by the respondents from Study 1. Given the study definitions, they were classified as cereals for general consumption (CFP), even though the brand names or pictures imply that they are IYC foods. Concerning the addition of sugar to CACF, 10 (71.4%) of the 14 locally produced fortified cereals recommended the addition of sugar or honey before consumption (Table 6.1). Although none mentioned the actual amount, assuming that these have no sugar added.

Figure 6.11: Breakfast cereal displaying an age recommendation with very small print

Figure 6.12: Two products (46 &35) without age recommendations

Commonly used for the infants and young children because of other CACF from the same brand, implying cross-promotion or a lack of clarity on the intended use



CHAPTER 7

DISCUSSION

7.1 STUDY 1: COMMERCIAL BABY FOOD USE AND COMPLEMENTARY FEEDING

7.1.1 Summary of key results

The present study found that the consumption of commercial baby food among 6-36-month-old children in Kampala was very high at 81%. Consuming commercial baby food the previous day was significantly associated with maternal education level (p=0.04). However, the regularity of family income confounded this association. About one-tenth of the caregivers reported introducing semi-solids before six months, and only 37% and 34% of 6-23 months old children met the minimum dietary diversity and minimum acceptable diet, respectively. For consumption patterns over the previous week, 69% of the caregivers frequently fed their babies at least one ultra-processed food. The child's age and mother's education level ($p<0.05$) were significantly associated with the frequency of consumption of ultra-processed commercial baby foods. The socio-economic score and the father's education level confounded this relationship.

7.1.2 Socio-demographic characteristics of parents/ caregivers

Almost equal numbers of female and male children were studied, 51% females, similar to the national data (Uganda Bureau of Statistics (UBOS) and The DHS Program (ICF), 2018). However, all the parental socio-demographic characteristics differed from the national characteristics but were not expected to be nationally representative. Instead, it was meant to be representative of an urban population and was reasonably similar to those of households that dwell in Kampala (Uganda Bureau of Statistics (UBOS), 2021). Thus, the majority had higher maternal and paternal education levels, professional/formal employment, and older mothers than the national scores. Additionally, the majority of household characteristics (floor type, cooking fuel type, toilet type, land ownership, drinking water source and home occupancy tenure) were those related to the wealthiest quintile, which characterises the urban population (Uganda Bureau of Statistics (UBOS), 2021). More fathers had attained higher education than females, indicated by college education; 73% versus 59%, and hardly any fathers had attained only primary education or less.

These socio-demographics were similar to the national characteristics where males are more educated than females (Uganda Bureau of Statistics (UBOS), 2021; Uganda Bureau of Statistics (UBOS) and The DHS Program (ICF), 2018).

Efforts to include different socio-economic classes were achieved through the recruitment of participants from different types and levels of health facilities because socio-economic status in urban areas influences the type of health services utilisation. The representative health facilities were: a low-level public facility that provided free services, where the lowest social class (urban poor) is expected to seek services, and a private-not-for-profit (PNFP) hospital where cheaper services can be accessed by the lower classes (Uganda Bureau of Statistics (UBOS) and The DHS Program (ICF), 2018). In addition, one paediatric clinic and a private hospital were included to get a fair representation of those on the middle to the higher end of the continuum of socio-economic status. However, overall more participants were recruited from the facilities that were expected to have higher socio-economic groups because of the phenomenon under study, which is not associated with disadvantage.

Based on the type of health facility, the proportions recruited were reasonably representative of health-seeking behaviour in Kampala, where three-quarters sought services from private health facilities during the COVID period (Uganda Bureau of Statistics (UBOS), 2021). In the present study, 81% were recruited from private or PNFP facilities.

7.1.3 Consumption of commercial baby food among children 6-36 months on the day preceding the interview

In the present study, the first objective established that, among infants aged 6-36 months, 81% consumed at least one commercial baby food on the previous day. This outcome definition was composed of both processed and ultra-processed foods. Among the 6-23 months old, 80%, 47%, 36% and 25% consumed commercial baby foods combined, CACF, sweetened beverages, and snacks, respectively. The majority of the complementary feeding studies compared with the present study covered the 6-23 months age group.

The findings in the present study are consistent with those from Dakar, Senegal, where 49% were reported to consume CACF (Feeley *et al.*, 2016). However, the levels of CACF consumption were

far higher than those observed by Pries *et al.* (Pries, Huffman, Adhikary, *et al.*, 2016), who found a 25% CACF consumption in the Kathmandu Valley in Nepal. This may be due to the present study's definition that included both fortified cereals and instant porridges. In contrast, the Nepalese study only included instant cereals.

Other studies reported much lower consumption rates among 6-23-month-old children: 3% in Dar-es-Salaam, Tanzania (Vitta *et al.*, 2016), and 5% in Phnom Phenn, Cambodia (Pries, Huffman, Mengkheang, *et al.*, 2016), and higher (37%) among 0-35-month-old children in Bandung City, Indonesia (Green *et al.*, 2019). Social and cultural differences in feeding practices in various countries may explain these findings. Some cultures, like Uganda, might be more adaptable and embrace commercial complementary foods faster than those that feed on traditional local dishes, especially in early infancy and childhood.

Many European studies were not comparable because their measure was over three days rather than the 24 hours in the present study. However, as expected, the consumption of CACF in high-income countries was much higher since they have an established nutritional transition and use a wide range of CACF. For example, a study conducted in European countries (German, Belgium, Italy, Spain, and Poland) indicated CACF consumption of 100% at nine months and 68% at 24 months (Theurich *et al.*, 2020).

There is a paucity of literature reporting on the consumption of CACF and that the products defined as CACF vary based on the geographical, cultural, and economic situation. Except for the Senegalese study(Feeley *et al.*, 2016), no other study reported findings consistent with the present study.

When appropriately formulated, CACF can contribute to the improved nutritional status of children between six and 23 months. This is because CACF can provide micronutrients that could be missing from the local traditional foods, for example, minerals like iron, calcium, zinc, vitamins A, B, E, and many others (PAHO and WHO, 2003; Phu *et al.*, 2012; Pries, Huffman, Adhikary, *et al.*, 2016; WHO, 2005). However, some of the concerns emerging from such findings indicate that high consumption of CACF is problematic if the foods are nutritionally unsuitable, for example, with a high sugar content (Hutchinson *et al.*, 2021; Maalouf *et al.*, 2017; Marais, 2016; Walker

and Goran, 2015). Additionally, these foods are sometimes nutrient-poor, as has been shown, especially with cereals for porridge (Dimaria *et al.*, 2018). Moreover, in low-income counties, the most frequently used CACF are cereal-based (Aryeetey and Tay, 2015; Pries *et al.*, 2017; Sweet *et al.*, 2016) and tend to be used monotonously (Theurich *et al.*, 2022). If lacking in essential micro-nutrients, they will hamper a child's diet from meeting the nutrient requirements. Therefore, the high consumption of CACF by the urban Ugandan population has important implications for developing guidelines and regulating the nutritional composition of CACF. For those already in place covering standards of fortified products, systems must be developed to monitor the quality and composition of the present products.

The present study findings on SSB consumption of 36% concur with Pries *et al*..(Pries, Huffman, Mengkheang, *et al.*, 2016), who also found 32% in Phnom Pehn and Green *et al*. (Green *et al.*, 2019), who found 40% in Bagunda City. However, a study among children from several cities reported lower SSB consumption; 30% in Dakar, Senegal, 23% in Dar es Salaam, and 16% in Kathmandu Valley, Nepal (Pries *et al.*, 2017). It should be noted that, unlike other studies, sweetened yoghurts were included in the present study as SSBs, and they were the most consumed in the SSB category at 32%. In comparison, only 6% consumed the other beverages in the 6-23 month-age group. This was a surprisingly low finding for the other beverages and sweetened yoghurts compared to other LIC.

Yoghurt can be minimally processed if it is made from milk and culture, but once added sugar, flavour, colour or other additives are added during manufacturing, it is categorised as ultra-processed (Fangupo *et al.*, 2021; Monteiro *et al.*, 2016). Contrary to the sweetened yoghurt consumed in the Ugandan population, other LIC studies reported consumption of unsweetened yoghurt (minimally processed), which was a rare occurrence except for Dakar, Senegal, where two-thirds consumed it (Pries *et al.*, 2017). The closest comparison of sweetened dairy products is Bandung City, where a third of the 6-35 months consumed sweetened milk. However, sweetened milk was rarer than yoghurt in the present study. Other studies that have reported higher consumption of ultra-processed yoghurt are from high- or middle-income countries. In such settings, consumption was reported to be 85% among 12-24-month-old children in New Zealand (Fangupo *et al.*, 2021), 40% in Brazil (Spaniol *et al.*, 2020) and 88% among 24-month-olds (Batalha *et al.*, 2017). The reasons caregivers reported in the present study for using yoghurt

focussed on the perception that it is a "healthy" alternative and a good substitute for children who do not like milk or are picky eaters and, most importantly, that the children like it. The perception that sweetened yoghurt is healthy was demonstrated in a study from Uruguay where parents of infants were presented with labels of six ultra-processed foods; other than yoghurt, sweetened milk and fruit juice were also considered healthy (Vidal *et al.*, 2021).

The misconceptions found in the present study population present significant challenges because the children also like the sweet-flavoured taste of the ultra-processed yoghurts. This becomes a two-fold problem; first, getting infants and young children 'hooked' to the sweet tastes and pleasant flavours reinforces the preference for sweet foods. Secondly, where the sugar content is high, children risk consuming an energy-dense beverage with minimal nutritional benefits and the development of dental caries early in life with its frequent consumption.

Children liking a food item or beverage is the most common reason caregivers provide for purchasing commercial baby foods. For example, the study by Pries *et al.* (Pries, Huffman, Adhikary, *et al.*, 2016) from four countries reported that children liking a snack was the main reason mothers chose to feed commercially produced snacks for 6-23 months old children. Most of the types of snacks in the present study were mostly sweet, and a few were savoury. Such findings emphasise the importance of taste development and its contribution to the nutrition and health of the IYC. Thus, interventions need to address the aspect of developing tastes among IYC that will be health-promoting, including early exposure to bitter vegetables and bland tastes (Mennella, 2014). In essence, this would mean limited exposure to sweet tastes, including the addition of sugar to food or drinks at home, and an emphasis on the intentional introduction of varied vegetable tastes, even if unpleasant and traditional foods.

Snacks were the least consumed among the three categories, with only a consumption of a quarter among the 6-23 months old on the day before the interview. The most consumed snack was confectionery at 16%, with the rest, such as savoury snacks and other sweet snacks like biscuits and cookies, all contributing less than a tenth. The finding of high consumption of confectionery is similar (26%) to that reported in Cambodia (Pries, Huffman, Mengkheang, *et al.*, 2016).

A possible explanation for higher confectionery consumption in the present study could be the convenience of including an item for the general family in a child's diet. This is supported by the result showing that half the number who consumed confectionery were children aged 24 months and older. Additionally, studies have shown that environmental influences and feeding practices in the rest of the family, including older siblings (Reynolds, 2022; Vilela *et al.*, 2015) and parents' dietary behaviours (Larsen *et al.*, 2015), influence a young child's diet. Therefore, young children's high consumption of confectionery should not be surprising in an urban Ugandan population.

It is important to note that the complementary feeding period is meant to introduce the IYC to family foods. Therefore, as a child grows older, more family foods are introduced until a child's diet does not differ much from that of the rest of the family. Since confectionery is sweet, it goes without saying that children would love items like bread, doughnuts and cakes. White sweet bread and buns are the most common confectionery. This is part of the regular home meal in many urban homes in Uganda that in recent times have transitioned into processed foods diets (Auma *et al.*, 2019).

A Brazilian study revealed that mothers' high consumption of processed and ultra-processed foods was a proximal factor associated with consumption of the same among infants and young children (second tertile: OR =3.15, p=018; third tertile: OR= 4.59, p=.004) (Soares *et al.*, 2021). Similarly, confectionery is one of the ultra-processed food items that would be considered to fall into this category in the present study. This finding of lower commercial snack consumption is contrary to previous studies from other LIC settings, which reported consumption of snacks as high as 55%-74%. Only one city was found to have similar results; Dar es Salaam had 23% (Pries *et al.*, 2017). Dar-es-Salaam generally had the least consumption of commercial food products among the four cities and might not be an ideal comparator for the present study. The low results in the present study are likely to be related to a general perception that items like biscuits, cookies, candy, and cakes (other than confectionery) are unhealthy and can potentially cause dental decay. These findings are supported by the fact that 59% of the mothers were college graduates, a group bound to know about such health risks. Bread might be an exception to this perception because it may not be considered a 'sweet' snack but a 'harmless' snack since it has now become part of the urban household diet.

7.1.4 Factors associated with consumption of commercial baby food among children 6-36 months on the day preceding the interview

In the present study, the maternal level of education was the only factor significantly associated with the consumption of CBF (PR=0.71, 95%CI 0.50-0.99, *p=0.042*). Mothers that had attained an "Ordinary level" of secondary education were 0.3 times less likely to use CBF than mothers with primary or no formal education. Comparing the findings with those of other LIC studies from LIC confirms that maternal education is negatively associated with commercial food consumption. It is worth noting that no published studies in LIC used commercial baby foods combined; instead, most focussed on snack consumption, probably because it was a more common outcome.

When other studies are considered, the majority found an inverse association between maternal education and consumption of processed and ultra-processed foods in the 6-24 months age group (Batalha *et al.*, 2017; Passanha, Benício and Venâncio, 2021; Pereira *et al.*, 2022; Relvas, Buccini and Venancio, 2019). In LIC settings, studies revealed that uneducated or less educated mothers were more likely to feed children on snacks than more educated mothers by 2–3 times in Indonesia (Green *et al.*, 2019)and three times in Nepal (Pries *et al.*, 2017). In Senegal, mothers with a university education were 0.3 times less likely to feed babies on commercially produced snacks (Pries *et al.*, 2017) than those with lower levels.

Contrary to the present study findings, a study from five high-income countries showed no association between parental education level and the use of commercially produced complementary food (Theurich *et al.*, 2020). This inconsistency may be due to differences in the study populations because the present study is from a LIC, while Theurich *et al.* study population are from high-income countries (Theurich *et al.*, 2020).

There is substantial evidence supporting maternal education as one of the most critical factors in explaining differentials in child-health outcomes, including mortality (Sunder, 2015), especially in the LIC (Ickes, Hurst and Flax, 2015; Ngandu *et al.*, 2020). In addition, maternal education is believed to facilitate the acquisition of appropriate knowledge and attitudes about child health and nutrition (Frost, Forste and Haas, 2005; Ickes, Hurst and Flax, 2015). Some authors have suggested that the relationship between maternal education and infants' diet is mediated by maternal diet (Lioret *et al.*, 2015).

Educational attainment is a core indicator of socioeconomic position (Walsemann, Gee and Ro, 2013), influencing health throughout one's lifetime. Although the causal relationship is not fully understood in varied contexts (Montez and Friedman, 2015), some pathways through which education impacts health have been proposed (Montez and Friedman, 2015). Some indicate that education acts independently to influence health, while others identify it as a proxy to an individual's socio-economic status (Baker *et al.*, 2011). However, in Uganda, maternal education has been identified as an important socio-economic factor associated with IYC nutrition and several other LIC (Ickes, Hurst and Flax, 2015; Ngandu *et al.*, 2020).

Other factors that have been associated with high consumption of commercial baby foods among IYC include lack of breastfeeding (Soares *et al.*, 2022; Spaniol *et al.*, 2020), having older siblings (Vilela *et al.*, 2015), multi-parity, maternal age, maternal occupation, maternal consumption of ultra-processed foods, low household income, older children, a smaller household, and having another caregiver other than the mother. However, except for maternal consumption, maternal occupation, household number, and the type of caregiver (which were not explored), all the other factors were not found to be significantly associated in the present study.

Compared with other studies, the levels of snack and SSB consumption observed in this investigation are far below those observed in most other studies. However, in the present study, the greatest contributor to the composite measure of commercial baby foods was CACF, commonly represented by porridges from cereal. This might explain the differences in associations with other studies.

In bivariate analysis, there were independent associations between maternal age and parental education in the present study ($p<0.05$). Unlike in most of the previously published studies in which factors like maternal age (Passanha, Benício and Venâncio, 2021; Pereira *et al.*, 2022; Vilela *et al.*, 2015) and maternal education (Batalha *et al.*, 2017; Passanha, Benício and Venâncio, 2021; Pereira *et al.*, 2022; Relvas, Buccini and Venancio, 2019; Vilela *et al.*, 2015) were negatively associated with consumption of commercial baby foods (ultra-processed foods), the findings in the present study reveal that these were positively associated. Thus, any form of socio-economic advantage seems to influence the use of commercial baby foods in the urban Ugandan setting.

The positive association with maternal education is a unique finding that has been reported in fewer studies (Sparrenberger *et al.*, 2015). This contradiction could probably be due to cultural differences in food patterns, which can also be observed even in studies from different regions of the same country (Batalha *et al.*, 2017). However, this finding was found in the bivariate analysis.

Another possible explanation for these differences might be that the most common snacks (bread) and beverages (yoghurt) in the present study are generally not considered unhealthy in the present population. Thus, consumption might be driven by factors related to socioeconomic advantage. However, whereas most studies highlight an inverse relationship in social determinants of different health outcomes, this explanation seems not to hold in outcomes related to the nutrition transition in sub-Saharan Africa. For example, overweight and obesity in these settings are higher among children with working mothers, educated parents, and urbanisation, all related to affluence and higher social status in such settings (Ayoola *et al.*, 2009; Keino *et al.*, 2014).

These findings highlight a general lack of exposure to the health implications of ultra-processed foods, given that the more educated, who are expected to be more knowledgeable, were the greatest users of UPF. This is a public health concern that needs to be addressed in light of the ongoing nutrition transition.

Surprisingly, factors like maternal attendance of ante-natal care or attending a nutritional class were not associated with consuming commercial baby foods. The assumption would be that attending either is an opportunity for mothers to get nutritional counselling on optimal infant and young feeding practices. These findings imply that either few mothers have access to sound nutritional education or that the nutritional counselling presently offered excludes information covering the use of processed foods during the complementary period. This assertion is supported by the data showing that only a third of the mothers reported getting information on processed foods from health facilities from the same study. Yet, almost all of them got counselled on exclusively breastfeeding their children.

7.1.5 Patterns and frequency of the consumption of ultra-processed foods in the previous week

On the question of consumption in the previous week, the present study found that over 84% had consumed an ultra-processed food/beverage at least once, and 69% had consumed them frequently. Snacks were consumed by 64% and SSB by 71% at least once the week before the interview. These findings differed from Green *et al.* (Green *et al.*, 2019), who showed that more 6-35 months old Indonesian children from Bandung City consumed snacks than SSB, 90% versus 56%. Nevertheless, higher consumption of SSB than sweet snacks remains consistent even within the 24-hour consumption in this Ugandan study population.

The only similarity between the Ugandan and Indonesian populations is that the majority consumed sweetened dairy (Green *et al.*, 2019). However, the frequency of consumption of more than three days a week was far higher in the present study, with four-tenths compared to a fifth in the Bandung City study population (Green *et al.*, 2019). Furthermore, there was hardly any soft drink consumption in Bandung City, with only 1% reporting using it for their children the previous week. This finding is similar to findings in the present study that showed soft drinks as the least consumed beverage. However, the present study shows a much higher percentage of 13%, indicating that this is also of public health concern in the Ugandan urban population.

The data from the present study suggest that the frequent consumption of breakfast cereals is a unique finding in Uganda. Moreover, breakfast cereals were consumed by all age groups. This food item was not reported in studies from other LIC. Apart from a Brazilian study in Montes Claros, where 86% of the 415 children aged 6-24 months consumed breakfast cereals within the last 24 hours (Lopes *et al.*, 2020), hardly any other studies reported breakfast cereal intake in this age group. In the Ugandan population, breakfast cereal represents foods meant for the general population, which are used because they are ready-to-eat and, thus, very convenient.

However, the concerns surrounding the use of breakfast cereals are partly due to the high sugar content in some of the cereals and their low energy density when they contain high-fibre content, which is too complex to be digested. These cereals will satiate the young child because of their bulkiness but provide very little energy or nutrients for the IYC. It was observed that all age groups

consumed breakfast cereals, and this is an even more significant concern among infants because their energy needs are greater than at any other time of development (Dewey and Brown, 2003).

Furthermore, wholegrain cereals contain phytate, which binds to iron and zinc, inhibiting their absorption (Van Der Merwe *et al.*, 2007). Unless they are fortified with zinc and iron, unsweetened, or with low fibre, when mixed with fresh milk, this meal will not meet the nutritional needs of IYC. Although ready-to-eat breakfast cereals meant for older children and adults may have health benefits for these age groups (Fayet-Moore *et al.*, 2017; Panagiotakos *et al.*, 2008) these are generally discouraged from use in IYC (Van Der Merwe *et al.*, 2007).

Compared to findings by Pries *et al.* (Pries *et al.*, 2017), where the consumption of commercial sweet snacks among the 6-23-month olds ranged from 54%-91% among four LIC urban populations, the present study revealed a significantly lower consumption (37%) in the same age group. These findings may be partly explained by a diet that is still transitioning in urban areas, especially in the adult population (Auma *et al.*, 2019), characterised in general by lower consumption of items like biscuits and candy compared to the other populations.

The frequency measure of 4-7 days was considered more meaningful in establishing dietary habits than the 24-hour measure. This is because the 24-hour consumption could have been a one-off and not a fair representation of regular dietary habits. However, when the two were compared, a similar consumption pattern was noted between the 24-hour and weekly measure of consumption ≥ 4 days. The CACF were the most frequently consumed (71%), SSB by 50% of the children, and the least consumed were snacks by 44%.

When compared, the same foods and beverages identified as having been commonly consumed within the 24 hours were maintained as frequently consumed within the week (4-7 days): confectionery by one-fifth and sweetened yoghurt by over one-third. There was no difference in the proportion that frequently fed on confectionery and those who had eaten them the previous day. However, a larger proportion of children consumed sweetened yoghurt frequently in the week than the previous day (35% versus 27%). Therefore, the frequency measure appears to be a better indicator of unhealthy beverage consumption, highlighting the extent of risk to the related outcomes.

The study finding of frequent consumption of sweetened yoghurt appears unique to the Ugandan population compared with other LIC-published studies. As highlighted earlier, in a quest to feed children "healthy" dairy products, caregivers have unfortunately opted for sweetened yoghurt, which is of great concern since this is not produced for IYC but for the general population. The additives and ultra-processing turn yoghurt into a product with a pleasant taste but no actual nutritional value (Monteiro *et al.*, 2019; Spaniol *et al.*, 2020).

The finding on yoghurt intake calls for an urgent response from the concerned health stakeholders in generally discouraging the consumption of SSBs and explicitly promoting the consumption of minimally processed yoghurt, which is unsweetened. Similarly, although sweet snack consumption was consistently lower than in other studies, the proportions of children who frequently eat them are of great concern, especially confectionery. These findings highlight caregivers' misconception of considering unhealthy products as healthy needs to be addressed through nutritional education, nutritional counselling, and other appropriate public health campaigns.

Additionally, even the one-tenth that frequently consumed soft drinks and the other tenth who consumed fruit drinks, although few, are also a subpopulation of concern. This finding also calls for other population-wide interventions that promote optimal IYC feeding practices and discourage the intake of unhealthy drinks (WHO, 2017a;2019b). Such interventions in other countries, including those within Africa, have included strict label guidelines that include age recommendations and front-of-pack labelling that which indicates the sugar content of an item in a format that is easily understood (Erzse *et al.*, 2019). Other recommendations have been to restrict the promotion and marketing of such products in places that young children frequent (WHO, 2017a).

These findings also reveal that frequency measures from the week before the interview might be a more practical measure for infant and young child diets because these show habits rather than the occasional infrequent consumption of items represented in the 24-hour diet recall. This is especially useful for studies that are not conducted in the community, like the present study, where participants were recruited from facilities. When the frequency is measured, it better reflects at-risk groups for which targeted interventions can be specifically designed. The 24-hour diet recall

was modified with a three-day diet recall in European studies, and this, too, captured the dietary patterns better rather than the 24-hour recall that represents a single day's meals.

7.1.6 Factors associated with frequency of consumption of ultra-processed foods among children 6-36 months

The fourth objective of the present study was to identify the family and child factors associated with the frequent consumption of ultra-processed foods and sweetened beverages among 6-36-month old children. The results of the present study show that maternal education [OR=2.85, 95%CI 1.02-7.96, p=0.045] and the child's age; [13-23 months (OR=2.87, 95%CI 1.62-5.08, P <0.001), and 24-36 months (OR=3.68, 95%CI 1.88-7.20, P<0.001)], were significantly associated ultra-processed food consumption.

Frequency of consumption in the week prior was an ordinal outcome with three tertiles: 1- never, 2- rarely (1 to 3 days), and 3- very frequent (4 to 7 days), considered to provide additional information and determine if there were parental or child characteristics that were associated with consumption of ultra-processed foods. However, this outcome has not yet been used in published studies. As such, comparison with other studies is a challenge.

Other studies, mostly from different Brazilian populations, quantified consumption using several methods. For example, count data with cut-offs using the number of products consumed in 24 hours (Lopes *et al.*, 2020), energy contribution using three 24-hour recalls (Soares *et al.*, 2022) or the frequency-related quantitative methods (Batalha *et al.*, 2017) or actual amounts of foods consumed were measured (Sparrenberger *et al.*, 2015). One study also asked caregivers if a child consumed a specific item frequently or not, with "yes" or "no" responses (Pereira *et al.*, 2022). A Portuguese study also used almost the same measure of frequency. However, the frequency of consumption was converted into a daily estimated number of times per item, which was a numerical variable (Vilela *et al.*, 2015). These were the closest studies that were used for comparison to factors associated with consumption frequency in the present study.

Consistent with the literature, the present study found that older children were more likely to consume ultra-processed foods frequently (Batalha *et al.*, 2017; Lopes *et al.*, 2020; Soares *et al.*,

2021). The frequency of consumption of all UPF and beverages increased with age except for breakfast cereals and infant cereals.

The studies that have compared quantitative intakes of UPF among 6-24-months old Brazilian children reported greater odds among both intermediate and high consumers of UPF (OR=1.17, P<0.001) and (OR=1.23, P<0.001) than among low consumers (Soares *et al.*, 2022). Another Brazilian birth cohort study among 13-35-month old children revealed that higher consumption of processed and ultra-processed foods was present among 17-20-month old children (PR=1.37 95%CI 1.10-1.70) and 21-35 (PR=1.30 95% CI 1.07-1.59).

Some reasons that were gleaned from the qualitative study were that with increasing age, there is a more relaxed approach to feeding, hence, the introduction and frequent use of snacks. Sometimes, the snacks are used as treats by fathers who rarely stay with children to compensate for their lack of time with the children. At the same time, snacks and beverages meant for adult consumption become more permissible with increasing age (Reynolds, 2022).

It is also probable that as children grow older and become more verbally expressive and proactive in having their needs met, they can communicate their preferences. Given that most caregivers reported that they feed their children foods and beverages because "they like them", it is expected that even as the children grow older, they reinforce this behaviour from their caregivers. As expected, these items are sweet or with other pleasant tastes and thus preferred by young children.

In the present study, it is probable that parents become less mindful of what children eat as they grow older. For example, family snacks consumed by older siblings get introduced into the diets of younger children (Vilela *et al.*, 2015). This finding is supported by the bivariate analysis in the present study, where children with one sibling had greater odds of consuming ultra-processed foods more frequently than those who had no siblings. Moreover, the children with siblings tended to be second-born children, meaning that parents' feeding practices changed with subsequent births.

This is further explained by a qualitative Dutch study among mothers who characterised differences and the related reasons for snack choice between the youngest and oldest child. The mothers reported that the youngest child received unhealthy snacks at a younger age and was more

frequently provided with snacks. Some of the reasons given were that the youngest children wanted to eat the same as the oldest but that mothers were less strict with subsequent children following the first-born child (Damen *et al.*, 2020).

Ideally, infants and young children should become accustomed to healthy traditional family foods and their array of flavours and textures during the complementary period. Therefore, it is of great concern that there is an increase in exposure to unhealthy UPF and SSB instead. This sets them on a trajectory of poor food choices as they grow older and later in life.

In contrast to earlier findings, maternal education level was significantly positively associated with frequent UPF consumption. Other studies that have some form of quantification reported that fewer maternal years of schooling were associated with higher or more frequent consumption of UPF (Batalha *et al.*, 2017; Giesta *et al.*, 2019; Pereira *et al.*, 2022; Vilela *et al.*, 2015). Generally, low socio-economic characteristics in high and middle-income countries are correlated with poor feeding practices, including high consumption of UPF.

Since this trend of increasing maternal education occurred in bivariate analyses for both consumption and frequency, and as a significant factor for frequency of UPF consumption, it cannot be dismissed as a coincidental finding. It re-iterates the postulation derived in the present study that favourable socio-economic characteristics in the urban Ugandan setting influence unhealthy dietary habits of IYC related to ultra-processed foods. This is further demonstrated by the positive association with other socio-economic indicators in the present study at bivariate analysis; maternal age, paternal education, paternal occupation, and socio-economic score.

In high- and middle-income countries, increased schooling and other socio-economic characteristics are believed to present greater opportunities for caregivers to access information on healthy eating practices in such countries (Giesta *et al.*, 2019). Another reason that could explain why higher socio-economic characteristics like education are associated with better feeding practices is that higher education can be correlated with higher family income. Income increases access and affordability to healthier but more expensive foods like fruits, vegetables and meat (Relvas, Buccini and Venancio, 2019). On the contrary, in the present study, the most frequently consumed UPF—sweetened yoghurt, infant cereals (instant), breakfast cereals, and

confectionery—are more expensive items that might not be affordable for lower socio-economic populations.

Therefore, as highlighted by several authors concerning the nutrition transition in LIC, their economic growth has greatly influenced the transition, especially income per capita. This has led to increased affordability of a variety of processed and ultra-processed foods, which has inevitably led to increased consumption of foods that contain high amounts of fat and sugar, and edible oils as opposed to the local staple foods (Popkin, Adair and Ng, 2012; Vorster, Kruger and Margetts, 2011). This is further demonstrated by African (Adom *et al.*, 2019) and Ugandan (Nakaggwa, 2019; Nawangi, 2013) data from older age groups where children and adolescents in private schools—a proxy for higher socio-economic status—are likely to be overweight and obesity (OWO) compared to those from public schools.

The other factors that were only significant in the bivariate analysis were having ever used formula with a positive relationship and "presently breastfeeding", which was negatively associated with consumption. Spaniol *et al*. (2020) demonstrated lower odds of consuming yoghurt (OR=0.33 95%CI 0.12-0.88) among 6-12-month old children and processed juice (OR=0.60 95%CI 0.37-0.97) among 13-24-month old children than children who were not breastfed. Two Brazilian studies demonstrated higher consumption of UPF among non-breastfed children, among 231 children aged 6-24 months from Vicosa-MG (OR=3.83, *p*= 0.06)(Soares *et al.*, 2022) and among 540 0-24-months old children from Montes Claros (1.12 95% CI 1.04 – 1.20)(Lopes *et al.*, 2020).

Even though formula use in the past was not significantly associated with UPF consumption, it appeared as a significant factor before adjusting for confounding and other independent factors. For example, adopters of practices like formula feeding are likely to exclusively breastfeed for a shorter duration and continue breasting for a shorter time after six months than those that do not use formula. Thus, this relationship could have been confounded by breastfeeding practices. Moreover, many older children were neither breastfeeding nor using formula. Additionally, the use of formulas in the past could be mediated by income level and other socio-economic characteristics.

Other studies have also associated maternal age with the consumption of UPF and SSB, although the direction of association is a point of contention. For example, some reported that lower maternal age was associated with high consumption (Pereira *et al.*, 2022; Vilela *et al.*, 2015), while others showed that older mothers tended to give their children more UPF than their counterparts (Giesta *et al.*, 2019). However, in the present study, maternal age was not significantly associated. Furthermore, there were no trends in the bivariate analysis for both 24-hour consumption and frequency of consumption within the week.

7.1.7 Key WHO infant and young child feeding practices

7.1.7.1 Breastfeeding and formula use characteristics

The fifth and last objective of the present study was to establish the proportion of IYC who met the minimum complementary feeding practices and other indicators of optimal IYC nutrition. The discussion of these findings has been linked to the study's major aim on commercial baby food use and related factors.

Nearly all (98%) mothers in the present study reported ever breastfeeding their children. This finding is the same as the national reports (Uganda Bureau of Statistics (UBOS) and The DHS Program (ICF), 2018) and similar to surveys from other countries like Indonesia and Tanzania, where 99% of 6-35-month old and 99.7% of 0-23-month children had ever breastfed, respectively. The similarities in the study populations may explain the reason for this similarity, all being urban and from LIC, where breastfeeding is still a common practice. However, these rates are generally high in SSA countries based on demographic and health survey data (Gebremedhin, 2019).

However, as is expected, the percentage of breastfeeding children dropped as the children grew older. At the time of the study, 89.6%, 53.7%, and 8.4% of those aged 6-12, 13-23, and 24-36 months were still breastfeeding, respectively**.** These findings are the same at one year as the average breastfeeding rates in SSA (Gebremedhin, 2019). Focusing on the WHO indicator age group of 6-23 months, 68% were presently breastfeeding. This is surprisingly higher than those of SSA (54%) and the national findings of 43.2% among 6-23 months old (Uganda Bureau of Statistics (UBOS) and The DHS Program (ICF), 2018).

The higher breastfeeding rates suggest that the urban population could be more exposed and responsive to breastfeeding educational messages. Such information has increased over the last two decades with the aggressive breastfeeding campaigns supported by the Ugandan IYCF policy (Mangasaryan *et al.*, 2012; Uganda MoH, 2009;2021). Other than that, it is probable that longer breastfeeding duration could also be influenced by an increased interval between consecutive births (Bbaale, 2014). An increased interval is expected to occur in an urban population due to the greater exposure to family planning messages and access to contraceptives compared to the rest of the national population(Uganda Bureau of Statistics (UBOS) and ICF., 2018).

The percentage of 6-8-month old infants fed semi-solid/solid foods (69%) was similar to the SSA average(Gebremedhin, 2019). However, this is still lower than the national estimate of (81%)(Uganda Bureau of Statistics (UBOS) and The DHS Program (ICF), 2018) and those from other SSA countries like Tanzania, Congo Republic, and Mozambique that have more than 90% (Gebremedhin, 2019). These findings indicate that several urban children are experiencing suboptimal diets at an age when their bodies require the greatest energy contribution from foods other than breast milk which is insufficient by six months (PAHO and WHO, 2003; Pries, Huffman, Mengkheang, *et al.*, 2016; WHO, 2005).

The present study revealed that more than half of the children (53%) had been fed formula food since birth. This finding is higher than that observed by Feeley *et al.* (Feeley *et al.*, 2016). Feeley *et al.* (Feeley *et al.*, 2016) indicated that only 1 in 4 children in Senegal had ever fed on formula. It was further revealed that the present use of formula was very low at 6.5% among 6-23-month-old children. Pries *et al.* (Pries, Huffman, Mengkheang, *et al.*, 2016) reported formula use among 6-23-month old children ranging from 4.8%-29% from two African and two Asian cities. The lowest use of formula was from Dar-es-Salaam, somewhat similar to the present study findings and within the same geographical location. Whereas a higher proportion reported ever having used formula, these findings highlight that eventually, the majority abandon its use and consider alternative dairy products like fresh milk or yoghurt, whose consumption is much higher (70%) than formula. The high cost of formula could explain this in the LIC context, including Uganda (Maclean and Stringer, 2005; Sewannonda *et al.*, 2022), necessitating being replaced by cheaper alternatives.

The low use of formula was also observed in a facility-based Ugandan study from a peri-urban location within the same geographical area (Wakiso district) as the present study. Only 12% of 6-23-month-old children consumed infant formula versus 40% who consumed cow's milk before six months (Ssemukasa and Kearney, 2014). Although the findings were from a slightly different population, peri-urban to rural population, the formula cost was a potential factor for low use (Ssemukasa and Kearney, 2014). This is also reflected in the almost non-formula use of about one percent of the national data(Uganda Bureau of Statistics (UBOS) and ICF., 2018).

Since the majority of the population uses alternatives to formula as milk substitutes, IYC policy must go beyond stating the importance of dairy consumption but also, along with other multi-sectoral policy frameworks, support the safe and adequate use of dairy products during the complementary period. It is also necessary to encourage the population to use nutritionally suitable dairy products that are minimally processed and discourage unhealthy sweetened yoghurt as a milk alternative or breast milk substitute.

Although the IYC feeding recommendations implore mothers to continue breastfeeding for two years and beyond (PAHO and WHO, 2003), the Codex guidelines on formulated complementary foods define the complementary period as up to three years. From the above findings, it is safe to say that the actual complementary period of urban Ugandan children is about 6-24 months and does not stretch beyond the second year. This finding is essential for future studies in urban areas, setting the upper limit to just about 24 months. Otherwise, stretching the upper limit too far, like in the present study, might distort the picture of IYC practices but also presents challenges in comparing with other studies.

7.1.7.2 Minimal complementary feeding indicators

One of the WHO global indicators of optimum IYCF is the minimum acceptable diet (MAD) which is a combination of the minimum dietary diversity (MDD) and minimum meal frequency (MMF). The MMF definition differs for breastfed and non-breastfed children aged 6-23 months and varies for the different age groups (6-8 months and ≥9 months). An optimum MAD ensures appropriate growth and development (WHO and UNICEF, 2021).

MDD is a proxy measure for adequate micronutrient density of foods and an indicator of diet quality. It is measured as feeding the child food from at least five of the eight food groups, including breastfeeding. The cut-off is associated with better-quality diets for both breastfed and non-breastfed children. MMF is a proxy for a child's energy requirements which differs between a breastfed and non-breastfed child. For a breastfed child, this is the amount of energy needs that are not met by breast milk, and for a 6-8 months old, semi-solid/solid meals at least twice a day, and three times for a 9-23 months old. For non-breastfed children, the minimum is four times a day of solid or semi-solids and two milk feeds (WHO and UNICEF, 2021).

All three indicators were assessed, and the findings indicate that 37% of the children met the MDD, comparable to the national estimate (30%) and that of Kampala (39%)(Uganda Bureau of Statistics (UBOS) and The DHS Program (ICF), 2018). In contrast to the 2016 Uganda Demographic and Health Survey (UDHS 2016) findings, the MMF was higher than the national (41%), and Kampala (67%) estimates. Similarly, for MAD, the national (15%) and Kampala (16%) estimates were half the MAD in the present study (Uganda Bureau of Statistics (UBOS) and The DHS Program (ICF), 2018).

The MAD is a combination of MDD and MMF, so the significant differences in MMF could explain the MAD between the two surveys. A possible explanation for this might be that in the present study, data on commercial snacks were also included in the measure because of the overall study aim, which emphasis might not occur in the UDHS surveys. For example, in the UDHS report, other than fortified baby foods, there is no mention of commercial food products.

Data collection in the UDHS might focus on traditional home-prepared foods and other products like milk since it includes many rural populations. However, commercial foods cannot be ignored in an urban setting because they form a substantial part of IYC diets. As such, additional indicators on the consumption of unhealthy foods and beverages have been recently included (WHO and UNICEF, 2021). These indicators should be considered in the UDHS in the future, especially those in urban areas experiencing the nutrition transition.

If ultra-processed foods and beverages are unsuitable or do not qualify to be included in the MDD or MMF measures, then these definitions should be included to improve the present tool. For

example, rather than indicating that snacks, unless "trivial", should be included in the MMF, as is presently the case with the WHO version (WHO and UNICEF, 2021), the guidelines should elaborate the type of snacks; for example, if only homemade or "nutritious", and exclude the ultra-processed snacks or beverages in both the MDD and MMF measure. If clarified, this will allow the latest indicators on unhealthy snacks and beverages to capture ultra-processed foods. Otherwise, it is presently an ambiguous definition. For example, in the present study, ultra-processed yoghurt as a dairy product was included in the MDD, yet other authors chose to exclude it because of the additives and processing (Spaniol *et al.*, 2020).

Another explanation for the very high MMF could be the difference in wealth percentile of the present study participants compared to that of the UDHS (Uganda Bureau of Statistics (UBOS) and The DHS Program (ICF), 2018). Most of this urban population scored positively on the different household characteristics: homeownership, floor type, fuel type, toilet type, and land ownership, used as an indicator of wealth and socio-economic status. Previously, higher wealth percentile scores were reported to predict IYC nutrition indicators in Uganda (Ickes, Hurst and Flax, 2015).

It should also be noted that the definition of MMF in the 2016 UDHS (WHO and UNICEF, 2008) has since changed from considering four milk feeds for non-breastfed children to including at least one semi-solid non-milk feeding (WHO, 2021). This, too, could have affected the score. Given that most of the children took porridge in this population, and 86% ate at least one local meal, meeting the MMF is achievable for this urban population.

Despite a very high MMF indicating several meals that include either breastfeeding or milk feeds, the low MDD reveals that the majority of the 24-hour diets among the 6-23-month-old children were micronutrient poor and, therefore, deemed to be of poor quality. This is further explained by the high consumption of ultra-processed foods, especially snacks like confectionery, by one-quarter and an additional one-tenth that consumed commercial foods and no homemade meals. Additionally, the milk feeds composed of sweetened yoghurts and sweetened milk, although they fulfil the MMF and MDD criteria, are ultra-processed and, therefore, questionable as appropriate feeds for IYC.

Therefore, when IYC guidelines are being drawn up, it is vital to acknowledge the heterogeneity of populations, including those with access to and who can afford commercial ultra-processed foods/beverages. For such scenarios, emphasis should be put on aspects that cover the quality of these products while being contextually specific and relevant to these population differences (Theurich *et al.*, 2022; WHO, 2019b). For example, several studies have been conducted in different urban areas of Brazil and recent authors, when comparing their findings with others, noted the glaring differences in the frequency and quantities of consumed ultra-processed and SSB between the north and south of the country (Batalha *et al.*, 2017). Such geographical and cultural differences in IYC feeding practices should also be expected in the Ugandan setting, some of which have already been demonstrated in the demographic health surveys (Uganda Bureau of Statistics (UBOS) and The DHS Program (ICF), 2018).

Unfortunately, although helpful, the comparisons between the present study and the last UDHS are not ideal, especially concerning the minimum complementary indicators. Yet there might be no other published studies to compare with the present study because those published before 2022 used different WHO measures (WHO and UNICEF, 2008). The WHO indicators were recently updated to emphasise breastfeeding as one of the eight food groups contributing to the MDD, and changes to the MMF definition affect the MAD indicator (WHO and UNICEF, 2021).

One-tenth of the 6-23-month-old children consumed ultra-processed foods and no home-prepared foods, and one-third of infants aged 6-8 months did not consume semi-solids/solids the previous day. These two subgroups of great concern can potentially experience malnutrition by replacing micronutrient-rich local foods with nutrient-poor commercial products (Pries *et al.*, 2019). The same applies to half of the children who failed to meet the MAD but consumed commercial products.

It is also worrying that 43% did not consume meat or eggs and and 40% vegetables or fruits, yet 81% consumed at least one processed or ultra-processed food on the preceding day. This confirms the influence of the nutrition transition in this urban population that starts early in life with lower consumption of vegetables and fruits. Instead, SSB, for example, juice drinks, could mistakenly replace fruits in the diet (Abrahams, McHiza and Steyn, 2011; Popkin, Adair and Ng, 2012; Popkin, 2014; Steyn and McHiza, 2014).

In the present study, it is also of concern that 90% of the children consumed sugar or honey in their drinks, including cereal porridge, tea and homemade juice. This seems to be a widely practised habit in the Ugandan urban setting, which was also reported by Pries *et al*.(Pries, Huffman, Adhikary, *et al.*, 2016) in all four countries (Nepal, Indonesia, Tanzania and Senegal). Pries *et al*.(Pries, Huffman, Adhikary, *et al.*, 2016) reported consumption levels ranging from 23-70% and 24-80% among 6-11 months old and 12-23 months old, respectively. However, consumption in the present study is much higher than in the other four countries. It should be noted that among the four cities, the African cities Dar-es-Salaam (Tanzania) and Dakar (Senegal) had the highest consumption among the four cities. Dar-es-Salaam had 70% and 80%, while Dakar had 50% and 65% of the 6-11 months old and 12-23 months old, respectively. It appears that adding sugar to young children's drinks is a more common practice in Africa and might be highest within East Africa.

The addition of sweeteners to drinks at home should be discouraged, and guidelines on appropriate amounts should be given. Since children from all age groups consumed sweeteners, it highlights that nutritional education on adding sugar in IYC feeding is minimal in this urban population. Previous findings from Burkina Faso found that increasing the sweetness of locally prepared porridge (gruels) was associated with progressively increased consumption of complementary food (Vieu, 2001). These findings reveal the risk children face not only for poor dental health but also, getting accustomed to sweet tastes at a young age. If the sweeteners are added in enormous amounts, then children will consume very high quantities of gruels at the cost of eating other nutrient-rich complementary foods. This would compromise their intake of other nutrients, yet gruel meals are energy-dense but nutrient-poor (Dewey and Brown, 2003). Additionally, honey is not recommended for infant consumption because of the risks of *Clostridium botulinum* toxins which could cause botulism (Van Der Merwe *et al.*, 2007).

The three indicators—MDD, MMF, and MAD—are a good proxy for assessing feeding practices, including measures on ultra-processed food consumption that might be nutrient-poor, as was done in the present study. The inclusion of UPF also provides additional information indicating the vulnerability faced by subpopulations (WHO and UNICEF, 2021). Therefore, future complementary studies in LIC need to include measures on commercial foods or unhealthy ultra-processed food consumption to evaluate IYC feeding practices comprehensively. Unfortunately,

there are countable published SSA studies covering two urban African populations (Feeley *et al.*, 2016; Pries *et al.*, 2017; Vitta *et al.*, 2016) that have included this measure and, thus, comparison in a similar context presented problems.

When socio-demographic factors, access to health facility nutrition information, and high consumption of commercial products were examined for those that could independently influence minimum complementary indicators, some findings concurred with those from other published studies. Studies have shown that maternal education level and a higher socio-economic status were positively associated with MDD and MAD, among which are UDHS findings (Ickes, Hurst and Flax, 2015; Shagaro, Mulugeta and Kale, 2021; Uganda Bureau of Statistics (UBOS) and The DHS Program (ICF), 2018) and generally with healthier dietary patterns (Claudia *et al.*, 2019). Maternal education facilitates the acquisition of knowledge on IYCF practices, while a higher socio-economic status enables caregivers to access diverse, healthy food options (Claudia *et al.*, 2019). A review of several LMIC studies also revealed that these are indicators of women's empowerment that may also contribute to decision-making processes, including how to feed the child (Has *et al.*, 2022).

Breastfeeding was also associated with a higher likelihood of meeting both the MDD and MAD, which concurs with other LIC findings (Shagaro, Mulugeta and Kale, 2021). However, this might not be a true predictor since breastfeeding is incorporated in the most recent MDD indicator (WHO and UNICEF, 2021), unlike before, and thus could be a confounder in this relationship. However, a comparison of breastfed and non-breastfed children shows poor performance among non-breastfed children. Therefore, other than exclusive breastfeeding, continued breastfeeding of young children should also be emphasised to boost the health outcomes of urban children.

In addition, the association between the high frequency of consumption of ultra-processed foods and MDD should be considered with caution. In the present study, sweetened yoghurt was included as a dairy product that contributes to MDD. Therefore, it could mediate the relationship between MDD and the consumption of ultra-processed foods. However, to delineate such confusing definitions, there is a need to redefine dairy products and other foods that could be confusing while considering the NOVA classification such that a truer picture can be derived with the MDD and MAD indicators, especially in urban settings.

One unanticipated finding was that attendance of a nutritional class was not significantly associated with either MDD or MAD. Although nutritional counselling has been cited as an effective intervention for improving the nutritional status of malnourished children(Imdad, Yakoob and Bhutta, 2011), these interventions could be characterised by repeated exposure to education packages with a consistent message on IYCF. However, the one-off or unstructured interaction at health facilities might not be as effective. This assertion is supported by a Kenyan study where mothers that got repeated exposure of 3-4 times to IYCF complementary messages with better knowledge (p=0·01) and attitude scores (p=0·08) compared to those that were exposed only once (Schneider *et al.*, 2021). This calls for better structured nutritional education with opportunities for repeated exposure.

The analysis of breastfeeding and complementary feeding indicators in this population revealed that breastfeeding practices were within acceptable levels (Gebremedhin, 2019), but the complementary practices are still generally deficient. These findings highlight the urgent need for policies to shift from emphasising only exclusive breastfeeding and the time of introducing complementary foods to the quality of both commercial and home-prepared foods. This would address present concerns like the inadequate attention given to processed foods that assume that the population only uses traditional homemade foods.

Incorporating considerations of ultra-processed foods highlighted that several children aged 6-23 months old consumed ultra-processed foods, including commercially available complementary foods, but still failed to meet the MDD. Additionally, some UPF, like yoghurt, have no nutritive value and, therefore, should not qualify to be considered for MDD, but this is not yet provided for in the present guidelines (WHO and UNICEF, 2021). A blanket statement mentions any dairy product to be scored as one of the eight food groups. The findings further highlight the indiscriminate inclusion of snacks and present ambiguous definitions that are considered for MMF. Therefore, examples of nutritionally poor snacks with contextually appropriate descriptions, which ought to be excluded in the MMF and MMD indicators, should be elaborated in the guidelines.

7.1.8 Nutritional education and label use

Among the questions included in the survey for mothers were their access to and sources of nutritional information. While "family" was the most common source of information, almost half of the mothers sought it from the internet and friends. Surprisingly, fewer mothers accessed nutritional information from health facilities during ante-natal care. These findings highlight that rather than considering targeted programmes for mothers attending health facilities, nutritional education should take a population-wide approach to include as many people as possible and permeate as many cultures as feasible. These messages should be updated to include information on UPF and made contextually appropriate, based on local evidence of the situation analyses in the country's different regions.

Since a substantial number have access to the internet, this should be explored with contextual messages on IYCF and maternal nutrition. Unfortunately, this was not recognised as an employable strategy in the latest framework that covers maternal, infant, young child and adolescent nutrition (Uganda MoH, 2021). However, for the literate, educated population with internet access, such strategies should be cost-effective ways of delivering messages; moreover, this could cover different age groups.

The availability of nutritional counselling based at health facilities is still very low. Several challenges, including appropriate human resources, could hamper this. However, innovative, cost-effective ways could still be used to provide relevant content based on the location of the health departments. For example, audio-video messages in waiting areas of health facilities and any other platforms have been reported to be effective in different low-income settings (Schneider *et al.*, 2021).

The results of the present study did not show that nutritional labels help provide nutritional information used by consumers for decision-making on the choice of packaged foods for their children. However, even fewer respondents who reported reading labels indicated that they understood nutrition label information. Although few studies have explored nutrition labels in low-income settings, studies from elsewhere suggest that labels, including front-of-pack labels, are an effective public health intervention in promoting healthy food choices (Gustafson and Prate, 2019; Packer *et al.*, 2021; Temple, 2020).

7.2 STUDY 2: LABELLING PRACTICES AND SUGAR CONTENT

7.2.1 Introduction

The present study set out to ascertain the extent to which commercially available complementary foods (CACF) complied with international labelling guidelines that promote optimal infant and young child (IYC) nutrition regarding sugar content. Other than CACF, infants and young children regularly consume processed foods not specifically marketed for this age group (Study 1 Results pp. 57). Such foods are referred to as commercially produced foods (CPF) throughout the present study. Therefore, other than CACF, the nutritional suitability of CPF was assessed based on several local criteria and an international nutrition profile model (NPM). The NPM extensively covers the nutritional composition of foods, including sugar, protein, sodium, energy, and fat. However, the present study focused on the sugar quantity, taste characteristics, and energy contribution by sugars in the diet of IYC. In the same vein, the present study considered labelling practices that could potentially promote purchasing and consumption of processed foods even when they may not be suitable choices.

The key findings of the present study were that the overall median "total sugar" per 100g for commercial baby foods (CBF) was 13.9g, while that of CACF was 12.1g. Eighty-two per cent of CBF and almost 70% of CACF had at least one "added sugar". Less than a third (28%) of the sampled 60 CACF products fully complied with the national and international guidelines on labelling, including the display of age, serving recommendations, and the essential information covering sugar content. Less than a fifth of the CBF were nutritionally suitable for optimal infant and child nutrition based on their taste, sugar content, and energy properties. Among these, 12 were CACF and four fortified porridges for the general population. None of the assessed products fully complied with both label and nutritional requirements for CACF.

The following discussion compares these findings with those reported in similar studies, and it focuses on the variations observed while providing probable explanations for the findings. At the same time, the implications of these findings concerning IYC nutrition and the related guidelines will be explored within the local Ugandan context.

The commonest CACF in the present study were processed cereals (68.3%), and almost a third were fruit and vegetable purees. While the sampling of products may not represent the prevalence of use of the different types of foods, it does provide a snapshot of available

products in the Ugandan market. Product availability has been found to differ geographically and is usually related to neighbourhoods (WHO, 2019a). In other studies in African settings, it has been reported that the most typical available processed baby foods were cereals, with a Ghanaian study reporting 49% cereals and 29% fruit/vegetable purees (Aryeetey and Tay, 2015). Another study found that almost eighty per cent of IYC in Dar-es-Salaam, Tanzania consumed infant cereals (Sweet *et al.*, 2016).

Compared to the Ghanaian study, the present study comprised much less variety of CACF with no juices. Furthermore, unlike in Senegal and Tanzania, there was a smaller variety of pureed foods available. This could be why several alternatives (like fruit drinks) are categorised as CFP in the present study, but that may mistakenly be considered appropriate for IYC feeding. The only locally processed CACF in the present study were cereals. So whereas the complementary feeding in the Ugandan urban population included a variety of products other than home-prepared food, several processed foods were not CACF. This is also confirmed by findings from Study 1 that reported that the commonest consumed CACF were cereals for porridge (44%), but in addition, sweetened beverages, like yoghurt, were commonly used (27%) (p.57).

There were more imported products on the market than the present study sampled, which demonstrates the ubiquitous presence of transnational companies in the processed food market in Uganda. This finding concurs with a study from cities in four countries on point-of-sale promotions of breastmilk substitutes and CACF. In the study, most of the products in the three countries were imports. Two of these were African countries: Senegal and Tanzania, with 95% and 69%, respectively (Champeny *et al.*, 2016). Some transnational companies have expanded their reach by establishing regional suppliers in LIC to improve access to these upcoming markets, also referred to as the "expansion to the global south" (Baker *et al.*, 2021). As the access to such products increases, more consumers access them as alternatives to locally-processed foods. The array of products, especially among the imported CACF, even those of the same brands (Baker *et al.*, 2021) reveals the huge influence of foreign markets on the nutritional transition of LMICs.

An increasing concern is that as some high-income countries establish "unfavourable policies" for manufacturers, they identify alternative markets among the growing economies of LICs (Popkin, 2014). Thus, there is an urgent need for countries like Uganda to improve standards to include aspects of global health concerns, rework guidelines, and create effective systems to

monitor imports. If not, they may end up as "dumping" grounds on account of the lack of policies and poor monitoring mechanisms.

7.2.3 Compliance of labelling of commercial baby foods with selected aspects of national and international guidelines that promote optimal infant and young child feeding

The first objective of the present study was to assess whether commercial baby foods complied with selected national and international labelling recommendations. The results covered seven label recommendations that were combined to form a composite score for each CACF. The discussion follows several recommendations, with some grouped to form themes, such as age recommendations, nutrition and health claims, the presence of information on nutrition, an ingredient list, energy, "total sugar", and serving size.

7.2.3.1 Age-related recommendations of infants and young children on CACF

Labelling practices are meant to protect and promote optimal IYC (Quinn *et al.*, 2010b). One of the core practices is the age recommendation which should display the age for the introduction of CACF as six months or older (Quinn *et al.*, 2010b; WHA, 1986;1996). Any label specifying an age of under six months contravenes several international resolutions and impedes IYC nutrition (WHA, 1986;1996; WHO, 2003b). Other essential items covered by the recommendations include; the type of images used and IYC messages. Images of children appearing younger than six months should not be used. The IYC messages should emphasise exclusive breastfeeding for the first six months, the addition of complementary foods from six months, and continued breastfeeding till two years and beyond (Quinn *et al.*, 2010b).

Nearly all of the CACF surveyed were compliant with the "6-months and older" age recommendation comparable to a Ghanaian study (96%) (Aryeetey and Tay, 2015). The six-month recommendation follows international guidelines to exclusively breastfeed infants for at least six months (PAHO and WHO, 2003; Quinn *et al.*, 2010b; WHO, 2005;2017a;2019a). However, as they grow older, breast milk is insufficient to meet their nutritional and energy needs, and it is at this age when semi-solids and solids should be introduced while continuing to breastfeed. Therefore, the absence of age recommendations, ambiguity of messages, and poor visibility of age information in the present study are concerns on whether these foods are preventing optimal IYC feeding practices, especially among the locally produced CACF. The guideline on the six-month lower limit display is a key message. When there is no age recommendation, the chances are higher that the label would contravene other

recommendations, either by not including them or presenting them inappropriately, as illustrated in a previous study (Sweet *et al.*, 2016).

Sweet *et al.* (Sweet *et al.*, 2016) found 4% of CACF labels in Dakar, Senegal and 19% in Dar-es-Salaam, Tanzania, without an age recommendation. The present study falls within the same range at 7%. This African study also found a lower age recommendation among 20% and 12% of labels in Dakar and Dar-es-Salaam, respectively. However, the present study only had one item, a ready-to-eat dairy-based porridge, an import from the UK that did not have an age recommendation. Therefore, the small proportion of CACF with a lower age recommendation could be because fewer products from the UK were found on the market.

The European Union's legal pronunciation on a lower age limit is four months for processed foods (European Commission, 2006), with 39/48 European countries embracing this in their national recommendations (Koletzko *et al.*, 2020). As such, foods labelled for less than six months are a common finding, as reported by a European study of products from 13 countries where 68% of purees were marketed for infants between 4-6 months (Bridge *et al.*, 2021). It should be noted that the European Food Safety Authority (EFSA) Nutrition Panel advocates for an age range of four to six months and disputes a single age of introducing solids (EFSA Panel on Dietetic Products and Allergies, 2009; EFSA Panel on Nutrition *et al.*, 2019). The Panel argues that the decision on when to start complementary feeding should adopt an "infant-tailored approach", guided by how the child develops their neuro-motor skills that aid in progressing from liquid to a diversified diet (Dipasquale, Agostoni and Romano, 2021). Some key arguments are geared to support the early introduction of foods rich in iron for infants with iron depletion and other exceptional circumstances requiring nutritional boosts, like preterm infants before six months(EFSA Panel on Nutrition *et al.*, 2019).

Concerns regarding insufficient iron supply for exclusively breastfed children are genuine. However, these concerns do not hold because the foods being marketed for use at four months are not necessarily fortified with minerals like iron, and in fact, this kind of feeding may be classified as "special dietary requirements", which should have separate guidelines. Therefore, the argument for the early introduction of complementary foods to avail iron among children with micronutrient deficiencies before six months does not hold since it assumes similar guidelines for both general feeding and special dietary purposes, which is inappropriate. The present WHO guidelines (PAHO and WHO, 2003; WHO, 2005) should be considered more

appropriate to encourage exclusive breastfeeding for as long as possible, especially in low-income settings like Uganda, with relatively low infant nutrition awareness.

The disagreements in age recommendations by the European legal documents and expert panels create confusion with international recommendations that promote a higher age limit of six months to introduce complementary foods. This challenge is faced in several European countries, as reported by one UK qualitative study where parents felt that the lack of clarity on when to introduce solid foods was a major drawback to appropriate IYC feeding practices (Reynolds, 2022). Such age recommendations can also create confusion in other settings beyond Europe.

Since Uganda has embraced the six-month recommendation (Uganda MoH, 2021), this guideline should be operationalised in the different standards produced to date. Furthermore, now that the urban Ugandan IYC population is consuming processed foods more widely and regularly, there is a need to promote all the relevant guidelines. These include the Codex guidelines on formulated complementary foods for older infants and young children (FAO and WHO, 1981a) and specifically those that cover detailed labelling of CACF (Quinn *et al.*, 2010b).

There is also a need to ensure that mechanisms exist for regulating imports and locally produced CACF concerning the different label recommendations that support optimal IYCF practices. Therefore, imports with age recommendations less than six months should not be allowed onto the Ugandan market if the national and widely-accepted international recommendations are to be upheld. Despite having the Uganda National Bureau of Standards (UNBS) logo, two cereals lacked age recommendations.

The absence of age recommendations implies that the present regulation might not consider these label practices as important as the international bodies recommend. Furthermore, the other two products without a logo were not certified products, thus, indicating that some processed foods on the market, including those intended for IYC, might be questionable in terms of content and quality.

7.2.3.2 Nutrition and Health Claims on CACF

A nutrition claim is any statement that suggests or implies that a food has specific nutritional properties. In contrast, a health claim suggests a relationship between a food or its constituent

and health. Foods for general consumption can carry these claims as long as they are proved to be true. However, nutrition and health claims are not permitted for all infant and young child foods unless provided for by Codex Alimentarius (Codex) or national legislation (FAO and WHO, 1997; UNBS, 2014b; WHA, 2010). Nutrition and health claims on CACF are explicitly defined and prohibited in both the Codex and Ugandan standards (FAO and WHO, 1997; UNBS, 2014b) as well as the European guidelines on the appropriate promotion of CACF, used in the present study (WHO, 2019b). Examples of nutritional claims include: "source of calcium", "rich protein source", "less sugar content", "higher iron content", or "no added sugar". Health claims that could be found on CACF include "Food X contains iron. Iron is important cognitive development", "brain booster", "immune booster", "easily digested by small tummies", and the like.

The majority (60%) of CACF had at least one prohibited health or nutritional claim recorded among the local and imported products. Yet, such claims are against the international (FAO and WHO, 1997) and national guidelines (UNBS, 2014b). This finding of CACF labels carrying nutrition or health claims indicates that there is no enforcement of this specific guideline in Uganda. Nutritional labels that carry either a nutritional or health claim use them as marketing techniques (Harris *et al.*, 2011) and can mislead consumers into thinking that the products are adequate for the young child without the need to complement with other foods, compromising optimal nutrition.

Previous reports on health and nutrition claims have found up to 97% of CACF with compositional claims in the UK (Garcia, Menon and Parrett, 2022), 42% with nutrition and 50% health claims in Taiwan (Koo, Chang and Chen, 2018), and 13-35% nutrition claims on 7955 CACF from four European countries (WHO, 2019a). In the European and Taiwanese studies, compositional claims on additives like preservatives, flavours, and colourants were also assessed. However, compositional claims on additives were not considered for the present study because the definitions in the Ugandan standard were used (UNBS, 2014b). The Ugandan guidelines are similar to the Codex guidelines (FAO and WHO, 1997), but also this was done to remain within the present study objectives. Additionally, any statements other than nutritional or health claims that facilitate the marketing of the products were not assessed in the present study because these have not been explicitly stated in the Ugandan guidelines.

However, it is still of concern that the use of health and nutrient claims remains highly prevalent on CACF labels in both imported and locally produced products. These claims are discouraged

because they are usually false and are commonly used as marketing strategies by companies to promote their products (Theurich *et al.*, 2022). A Taiwanese study reported that the products with *health* claims, for example, "provides good nutrition to children" or "improves appetite", had higher sodium or sugar content than those without such claims. Other labels with nutrient content claims like "high calcium, iron" did not contain more nutrients than those without (Koo, Chang and Chen, 2018). Basetti *et al*. (2022) studied products from three Asian LICs and reported that 66%, 67%, and 84% of CACF from Cambodia, Indonesia, and the Philippines had made unfounded nutrient claims. When products from Cambodia and the Philippines with nutritional content claims were compared with those without a nutritional claim, there was no difference in meeting the WHO Europe NPM thresholds. Furthermore, products from Indonesia without nutrient content claims met all the nutritional composition requirements more than those that carried nutritional claims, which was statistically significant. Such practices reflect misleading marketing to consumers as the manufacturers misrepresent facts and thereby inappropriately promote foods as being heathy and nutritious (Harris *et al.*, 2011). Thus, there is an urgent need to address this issue, especially in local African settings. Additionally, since the prohibition of health and nutrient claims is already endorsed as part of the Ugandan guidelines (UNBS, 2014b), a framework must be established to successfully implement and monitor the regulations. Furthermore, emphasis should be placed on promoting appropriate nutrient compositions and quality of fortified cereals based on the Ugandan IYC population's needs and nutrient reference values for micronutrients.

7.2.3.3 Presence of nutritional information on CACF

The required standard for labelling foods includes a nutritional declaration and a list of ingredients (FAO and WHO, 1981a;1985; UNBS, 2014a). These two items provide information on the composition of the packaged products, allowing the consumer to make an informed choice using nutritional criteria. The majority of the products in the present study had nutritional information and an ingredient list; however, 100% compliance was not achieved. For example, one African study reported an item without nutrient labels (Aryeetey and Tay, 2015), while the European studies indicate that CACF compliance with nutrition labelling is 100% (Bridge *et al.*, 2021). Other studies on label practices might not report this data because having nutritional information could have been one of the inclusion criteria for sampling CACF products.

The amount of all the contents and the total energy value should be present with the appropriate units per 100g/100ml or serving. For example, the "total sugar" and "added sugar" in grams and energy in kilojoules or kilocalories (FAO and WHO, 1981a;1985; UNBS, 2014a). In the present study, Ugandan products were the only products without a nutritional declaration or an ingredient list. This finding implies that there are gaps in the present regulation and monitoring of products, the certification process and the uncertified packaged foods presently available in the Ugandan market. In addition, it may also reflect either a lack of vigilance or unawareness of the regulations among retailing businesses in Uganda.

The lack of information on "total sugar" in the nutrient information table and the exclusion of added sugars in the ingredient list indicates that local manufacturers might be unaware or do not take the guidelines in the standard seriously. This situation will prevail without mechanisms to monitor such practices and promote unhealthy food choices. For example, some locally produced cereals included at least one sugar, powdered milk or sucrose (commonly called sugar), in their ingredient list but omitted "total sugar" in their nutritional declaration. This omission could indicate that the manufacturers do not know the meaning of the different sugar definitions and might lack professionals like nutritionists on their teams.

A South African study collected 269 baby foods and reported that 13% did not include information on "total sugar". The authors also noted that several products did not include "added sugar" in their ingredient list, but these products turned out to have a high sugar content (Erzse *et al.*, 2019). However, no details were provided on the products without information on "total sugar"; therefore, a comparison of findings cannot be made. In the present study, when only CACF are considered, a higher proportion (43%) of sampled products did not have the necessary information compared to the South African survey reflecting the lack of monitoring, especially of locally-produced foods.

7.2.3.4 Serving sizes and daily recommendations

Information on serving size and daily ration recommendations is part of the mandatory nutritional information for CACF labels to carry (FAO and WHO, 1981a; Quinn *et al.*, 2010b). Information on serving sizes and daily recommended amounts provide guidelines on healthy consumption limits and, in the case of CACF, needs to be taken into consideration for a child who should be fed a variety of foods (Dewey and Brown, 2003). Hence, the thresholds provided in the guidelines are essential to ensure that a child is not over-nourished from

overconsumption of total sugars. However, none of the locally produced cereals provided clear information on the serving size; instead, the directions on preparations were used to derive these details. When only information on the serving size was available, it was considered the daily ration since a child should feed on other complementary foods. However, the lack of appropriate instructions becomes a concern for children who consume these products more than once a day. Such products like cereals could replace other nutritive local foods when overconsumed and should be contributing only about 20% of the energy of IYC (WHO, 2003a). A constant monotonous diet is common in LIC settings, yet cereals tend to be nutrient-poor (Dimaria *et al.*, 2018; Theurich *et al.*, 2022).

Sweet *et al*.(2016), in a study, carried out in four cities (two African and two Asian), found that although almost all the 202 sampled CACF provided a recommended serving size, the majority (44-81%) did not provide information on daily rations. In the African surveys, 63% and 56% did not have daily rations; from Dakar (Senegal) and Dar-es-Salaam (Tanzania), respectively. Another African study found that only 29% of 100 CACF displayed daily rations (Aryeetey and Tay, 2015).

However, less than a tenth of CACF in the present study suggested a daily ration. Such poor performance is partly due to unclear information among locally-produced cereals, with only measurements of tablespoons provided by directions in preparations. Again, this points to the poor compliance of local foods to international guidelines, which would help caregivers determine appropriate proportions, thus preventing overconsumption of calories from CACF if a child is presently consuming complementary foods and breastfeeding. Additionally, if overconsumed, these CACF could replace breastfeeding and other local foods that are richer in other micronutrients (Quinn *et al.*, 2010b).

7.2.3.5 Overall compliance with selected label practices

From the key selected label practices discussed for the present study, the performance score was a composite and revealed that only fruit and vegetable purees were fully compliant. However, the presence of the following qualified them as fully compliant: age recommendation of six months or older, nutritional declaration, ingredient list, energy information, "total sugar" composition, and serving size recommendations. Additionally, the labels on these products excluded health and/or nutrition claims. All the rest of the items failed to fulfil at least one or more criteria.

The products that performed well were all imported from South Africa, and another cross-sectional South African study reported similar findings on baby food labels (Erzse *et al.*, 2019). This is evidence of the exceptional regulation in South Africa pertaining to label practices. This is also reflected in some detailed regulations; one that covers labelling of all foodstuffs (South Africa Department of Health, 2010), the other on IYC foods (South Africa Department of Health, 2012) and amendments on labelling and advertising of foods

South Africa, a middle-income country, is at a more advanced stage of the nutrition transition (Ronquest-Ross, Vink and Sigge, 2015), which has been taking place for a longer time than in other sub-Saharan LIC (Popkin, 2014) like Uganda. The South African nutrition transition stage is confirmed by evidence from the present study on the number and variety of imported South African products found in the Ugandan market. On account of the fact that South Africa has a high burden of overweight and obesity in the different age groups (Adair *et al.*, 2013; Adair *et al.*, 2009; Martorell R *et al.*, 2010; Monyeki *et al.*, 2015; Rossouw, Grant and Viljoen, 2012), and higher levels of NCD mortality (Abrahams, McHiza and Steyn, 2011), it could explain why South Africa has been more proactive than other SSA countries in addressing concerns regarding IYCF (Erzse *et al.*, 2019; Meyer, Van Der Spuy and Du Plessis, 2007; Mushaphi *et al.*, 2017). Research and strong advocacy have resulted in several amendments and revisions of several guidelines in keeping with more recent international guidelines.

Some of the latest amendments cover the use of nutrition and health claims, nutrition information as mandatory, a ban on the use of cartoon characters in advertising, and font size (South Africa Department of Health, 2012). However, it is evident that these achievements have taken a lot of consultative processes with different key stakeholders in the country, an approach that Uganda can emulate and adopt. Examples of stakeholders include children's organisations, consumer protection bodies and nutrition experts (Global Agricultural Information Network (GAIN), 2014).

The poorest label practices were found among the locally fortified cereals that were not certified products. Certification of foods and products in Uganda is one way to ensure that the minimum standards set by the Uganda National Bureau of Standards (UNBS) are met. Other than the four least compliant, only two local CACF were certified by the UNBS. The absence of a logo that signifies certification is of great concern for Ugandan consumers and raises questions about the quality of processed products on the market. Unfortunately, minimal work has gone into such research in Uganda, probably because no concerns have been raised.

Consumers may be unaware of these guidelines, resulting in large amounts of poor-quality products being marketed.

In summary, the Ugandan CACF fared poorly, and imports from South Africa were the only products that fully complied with the selected label requirements. Therefore, there is a need for concerted efforts to address these gaps in labelling, which could negatively affect infant and young child feeding practices.

7.2.4 Nutritional suitability of CBF based on taste, sugar and energy content declared on labels

One of the objectives of the present study was to assess whether commercial baby foods are appropriate to be promoted for IYC nutrition based on the selected guidelines on taste, sugar, and energy content. In addition, for taste properties, both the use of sweeteners and food flavouring was examined based on the label information.

7.2.4.1 Taste properties: Added sugar/sweeteners and flavouring of all products

The latest guidelines used for the present study discourage the use of sweeteners and the addition of sugars to CACF. Sweeteners may be sugar-based (nutritive sweeteners) or non-sugar sweeteners (non-nutritive). This prohibition addresses the negative health effects of "added sugar" in the IYC's diet and the minimal early exposure to sweet tastes (WHO, 2019b). Furthermore, this recommendation is in response to the WHO guidelines on sugar intake not to exceed 10% of total calories (WHO, 2015a)

All the instant cereals and more than half of the purees in the CACF category had a sweetener. In addition, three of the fortified cereals had milk powder, also classified as a "free sugar" for predominantly cereal-based foods (Monteiro *et al.*, 2016; Walker and Goran, 2015; WHO, 2015a). Similarly, several studies reported CACF that listed at least one added sugar ranging from 15% to 43% (Amagloh *et al.*, 2013; Dewey and Brown, 2003). The highest percentage was in a European study among ten countries in which Hungary recorded 58% among the 123 products surveyed (Hutchinson *et al.*, 2021). However, the present study recorded higher added sugars in the CACF, almost 70% of the CACF. The higher percentage could be due to fewer CACF samples (60) in the present study and the smaller range of products specifically marketed for IYC. In addition, most studies had more than ten types of CACF, whereas the present study had only three main categories.

Unlike in the present study, where sucrose was the most common added sugar, studies from elsewhere found fruit concentrates/juice/purees/powders as the most common added sugar in CACF (Elliott and Conlon, 2015; Grammatikaki, Wollgast and Caldeira, 2021; Maalouf *et al.*, 2017; Santos *et al.*, 2022; WHO, 2021). Among the Ugandan items, none used fruit as added sugar. Using fruit powders and concentrates seems to be a common practice in high-income countries. Moreover, sometimes products with fruit are marked as having "no added sugar", yet this contributes to the total sugar content (Bridge *et al.*, 2021; García *et al.*, 2019; Grammatikaki, Wollgast and Caldeira, 2021). For example, in one study, half of the products indicated "no sugar added," yet 35% had added sugar, primarily as fruit purees and powders. Even though only a tenth of products listed added sugar in the ingredient list, actually 39% contained at least one "added sugar" (Grammatikaki, Wollgast and Caldeira, 2021).

Manufacturers' preference for fruit to sweeten foods may result in a false perception by consumers that it is a healthier option to other added sugars, an issue that Grammatikaki *et al*. concurred with (Grammatikaki, Wollgast and Caldeira, 2021). Some manufacturers ignored the fact that they used fruit to sweeten foods and excluded listing it as "added sugar" since it is not required to state that fruit juice, pureed fruit, or sweet vegetables are added (Hutchinson *et al.*, 2021). It is no wonder that products that indicate that they have no added sugar are more likely to contain fruit. However, any fruit component that is not found in the intact fruit is altered during processing, including the cellular structure being broken down when pureeing, which releases free sugars that have the same effect as other free sugars in the body (Pepin, Stanhope and Imbeault, 2019). Therefore, when pureed or concentrates and powders are included as additives to any product, they become "added sugars" (WHO, 2015a). Unfortunately, if not stated as added sugar, caregivers will be mistaken to think these are healthy foods, resulting in the reinforcement of the child's preference for a sweet taste (Garcia, McLean and Wright, 2016)

In the present study, local products did not declare information on several items, most commonly about having "added sugars" in their ingredient list. It should be noted that even when an ingredient list does not show sugars, a product may have high sugar content, as reported in several studies (Erzse *et al.*, 2019; Grammatikaki, Wollgast and Caldeira, 2021).

In the present study, the single SSB that did not have an added sweetener in its ingredient list was labelled as a "natural fruit juice". However, any sugars not in intact fruit are still considered free sugars (Pepin, Stanhope and Imbeault, 2019) and thus should not be promoted

for IYC feeding. The population, generally, might not appreciate these subtle differences, and the recommendation to eat whole fresh fruit rather than processed fruit juices should be emphasised in nutritional education. Specifically, processed and ultra-processed foods should be discouraged. At the same time, standards and labelling guidelines should clearly state that labels on such foods should display that they are not recommended for children under three years of age (WHO, 2019b).

The ambiguity of labelling naturally occurring sugar and many other free sugars that might not be "added" sugars presents an enormous global problem. For example, the European region has made great strides in drawing up recommendations that cover the composition, labelling, and promotion of complementary baby foods (European Commission, 2006; WHO, 2019a). However, the labelling of "added", "naturally occurring", or "total" sugar is not yet fully addressed (Bridge *et al.*, 2021; Hutchinson *et al.*, 2021). Similarly, it is challenging to classify fruit mixture purees that indicate no added sugars or vegetable purees sweetened with fruits. Yet, a fruit puree added to a vegetable puree or another fruit to a fruit puree is usually done to enhance its taste properties, and thus, in essence, is an "added sugar" (Hutchinson *et al.*, 2021).

Although not of statistical significance in the present study, the presence of a juice drink with an artificial sweetener or non-nutritive sweeteners (NNS) presents a snapshot of what the cheaper drinks in the Ugandan market might use to substitute sugar. NNS have no energy contribution (non-caloric) (Yang, 2010) and do not cause tooth decay (non-cariogenic) (Gupta, 2018; Samman *et al.*, 2020). However, their use in children's foods as sugar substitutes is still controversial (Velázquez, Vidal, Varela, *et al.*, 2021). There is evidence linking NNS to chronic disease/conditions, including an increase in body mass index among older children (OR 1.15, 95% CI 1.06-1.25) (Karalexi *et al.*, 2018). Additionally, NNS have been associated with metabolic diseases for which the explanation seems to be connected to altered gut microbiota and exocrine effects on the glucose regulation mechanisms(Deliza, Lima and Ares, 2021; Pearlman, Obert and Casey, 2017).

Additionally, even without such complicated biological mechanisms, early exposure to artificial sweeteners still renders IYC prone to sweet preferences. Therefore, the recommendation is to reduce overall sweetener intake, whether with caloric or non-caloric properties (Deliza, Lima and Ares, 2021; Swithers, 2015).

Overall, five CACF had added fruit beyond the recommended guidelines, including three vegetable purees that were included because the recommendation is that they should have no fruit added (WHO, 2019b). The low proportion compared to other studies could be due to the smaller variety of items in the present study, which also represents the limited variety in the Uganda market compared to other countries with published research. In addition, locally produced cereals may not afford to add dried fruits. Thus, the contribution would be from imported products like instant cereals. The instant cereals with fruit also had very low percentages (<10%). Concerns over fruit content often added as sweeteners are that when in significant amounts, it contributes a high percentage of the total energy of the food (Hutchinson *et al.*, 2021).

The flavouring item was assessed for the present study even though it is not part of the WHO Europe nutrient composition assessment. This was considered because of the concern that flavours, natural (like fruity) and artificial flavours, are added to processed foods targeted for IYC and older children to increase their hyper-palatability. For some foods, that is the difference between the natural form of the food (unprocessed) and its ultra-processed counterpart. For example, a plain yoghurt with any sensory-intensifying additives like flavours is categorised as an ultra-processed food.

Most products were flavoured, except the locally produced fortified cereals among the CACF, where only one cereal had "flavoured milk" as one of its ingredients. Otherwise, all the CACF had some flavouring with a preference for fruity and vanilla flavours. Interestingly, apart from the chocolate/cocoa flavouring in some CFP, like the breakfast cereals and sweetened milk, the CACF and CFP used similar flavours. Another important finding is a common compositional claim of "no artificial flavours", especially among the purees. Such a statement might mean that the food contains natural flavourings that were not declared if used. In the present study, when assessing such purees, all fruit purees with more than one fruit and vegetable purees with fruit were considered flavoured. This criterion was derived from the WHO European region recommendations to industries to make single-flavour foods and to avoid masking vegetables with sweet purees or sweet flavours (WHO, 2019b).

During the piloting of the WHO Europe NPM, apart from the five nutrient requirements of CACF, a suggestion was made to include an item on sweet flavourings like chocolate for milk (WHO, 2019b). Flavouring should be an essential aspect to consider given that biological taste development for specific preferences is influenced by the smell sensation (Beauchamp and

Mennella, 2009) at an early age; thus, manufacturers influence the taste perception using flavours that smell pleasantly.

The importance of pleasantly smelling flavours in enhancing taste has been explored in some studies. For example, pleasant flavours like vanilla have been proposed as an alternative to high sugar content in packaged milk (Velázquez, Vidal, Alcaire, *et al.*, 2021), presumably for consumption by older children. However, frequent use of these flavours can also get IYC 'hooked' onto these foods and beverages, as demonstrated in Study 1 (pp.57), where parents reported that young children liked flavoured yoghurts. Therefore, this, to them, was a healthy alternative for children with poor appetites.

While children in the Ugandan setting are exposed to a variety of tastes from local foods, very palatable tastes from flavourings like vanilla and chocolate should be discouraged from frequent use as infants are introduced to solids. Instead, the bitter or bland tastes of vegetables and other home-prepared foods should be encouraged to increase the acceptability of healthier foods later in life (Anzman-Frasca *et al.*, 2018; Beauchamp and Mennella, 2009).

Other than influencing taste, the Ugandan guidelines specifically discourage the use of cocoa derivatives for foods and beverages by infants below nine months because of caffeine. In addition, cocoa should not exceed a maximum level of 5% by dry mass. Thus, the labels should also include this age recommendation. Pleasant flavourings should generally be discouraged in the IYC period. When applied to food or beverages that younger age groups might be exposed to, an appropriate age recommendation for use under three years should be made.

7.2.5 "Total sugar" content, energy content and percentage energy contribution of "total sugar"

7.2.5.1 Total sugar per 100g and total sugar per serving

Total sugar is a quantitative measurement of the natural sugars and nutritive sweeteners (monosaccharides and disaccharides) within processed foods that should appear as part of the nutrition information on labels for consumer awareness of a food's nutritional composition. It combines intrinsic sugars (found in intact fruit and milk),"free sugars", and "added sugars" and is helpful to aggregate foods that might contain a high sugar content even though it might not be "added sugar", for example, the free sugars found in natural fruit juice or a fruit puree. The WHO Europe NPM established a threshold for different food categories based on their "total

sugar" content and required that the total energy from sugar should be displayed on the front of the pack.

Only two-thirds of the CBF provided information assessed for total sugar. Five of the items were SSB (fruit drinks), whose carbohydrate content was equated to the "total sugar" since there were no other carbohydrates based on the ingredient list. A recent nutritional profile study of CACF was conducted on products from three Asian low-income countries: Cambodia (68), Indonesia (211), and the Philippines (Bassetti *et al.*, 2022) using the WHO European NPM (WHO, 2019b).

Bassetti *et al*. (Bassetti *et al.*, 2022) reported total sugar per 100g ranges from 0-40g for dry instant cereals from all three cities and 0.1-16.4g for fruit purees from Indonesia and the Philippines. The ranges from the present study were similar for fruit purees (3.7 -15.6g), and would have been similar for instant/dry cereals if the fortified cereals without added sugar had been included (0-37g). The median total sugar of fruit purees (9.5g) was higher than that of Indonesia (6.4g) but almost as high as that of the Philippines (10.4g).

Another study from Portugal surveyed 121 products sold in the Lisbon Metropolitan area using the WHO European reported the total sugar per 100g median (LQ, UQ) of 15 dry cereals as 27.2g (8.0-31.1) and 62 fruit purees as 11.0g (9.1-12.1) (Santos *et al.*, 2022). When compared with the present study, 24g (21, 28.4) for 15 dry cereals and 9.5g (3.7,15.6) for 17 fruit purees, more Portuguese cereals had a higher sugar content indicated by the upper quartile and median values. The same was found for the fruit purees: those in the present study had a lower sugar content. Although the present study had fewer puree samples (17) than the Portuguese study (62), these were all imported products into Uganda. Therefore, their variety and availability depend on many other factors, including the importer and retailer orders.

In the present study, since snacks and SSB were expected to have high sugar content, their content amounts were not surprising. Snacks ($\chi^2(2) = 22.97$, $p = 0.0001$) and SSB ($\chi^2(2) = 21.36$, $p = 0.0001$) had significantly higher total sugar per 100g and per serving, respectively. However, the median "total sugar" per 100g and per serving of CACF was relatively high and about the same as SSB for 100g and snacks per serving. The median revealed that although "total sugar" per 100g is easily quantifiable, it provides a snapshot of the overall sugar content. At the same time, per-serving quantities give more detail on the amounts that an individual

could consume. Therefore, even though snacks had higher sugar content per 100g if SSB were consumed, they are more energy-dense than the Snacks.

The high consumption of SSB is the number one global concern regarding sugar and nutrition-related NCDs (Elliott-Green *et al.*, 2016; Haque *et al.*, 2020; Zheng *et al.*, 2015)". SSB have been labelled as one of the most energy-dense foods yet with poor satiety effects(de Graaf, 2011), i.e., despite their high sugar content, a child does not stop eating other foods. This eventually leads to increased caloric intake, a risk factor for weight gain (Luger *et al.*, 2017; Malik *et al.*, 2013; WHO, 2015a). A meta-analysis using cohort and randomised control trial studies reported that children who consumed free sugars significantly gained weight using pooled data (OR=1.55, 95% CI 1.32-1.82). SSB also have one of the highest risks for poor oral health (Moynihan, 2016; Moynihan *et al.*, 2019; WHO, 2015a).

Acidic SSB increase the risk of dental caries and erosion, while non-acidic ones cause dental decay. A systematic review and meta-analysis revealed that SSB consumption significantly increased the odds of developing decay among low versus moderate consumers (OR=1.57, 95% 1.28-1.92) and moderate versus high consumers (OR=1.53, 95% 1.17-1.99). The odds of erosion also increased significantly among low versus moderate consumers (OR=1.43, 95% 1.01-2.03) and moderate versus high consumers (OR=1.37, 95% 1.17-6.97). This meta-analysis observed a dose-response gradient for dental decay(Valenzuela *et al.*, 2021). Moreover, primary dentition, which matures during infanthood and early childhood, is more vulnerable to erosion than permanent dentition (Amaechi, Higham and Edgar, 1999; Hunter *et al.*, 2000).

Another systematic review and meta-analysis of infants and young children in high- and middle-income countries revealed that the intake of SSB is also a risk factor for decay (early childhood caries, ECC) (OR=1.67, 95% 0.25-3.92). In addition, the frequent intake of sweet foods was significantly associated with ECC; sugary snacks (OR=1.56, 95% 1.42-1.71) and sweetened foods (OR=3.14, 95% 0.89-11.04). Several other longitudinal studies concur with these findings(Moynihan *et al.*, 2019).

A birth cohort study in Brazil also reported an increased risk for severe ECC among 4-year-olds who were feeding on complementary foods with high free sugar content, which dietary data had been collected when they were infants, six and 12 months. Consumption of complementary foods significantly increased the risk among consumers than non-consumers

(RR=1.43, 95% 1.08-1.89, *p*=0.003) (Feldens *et al.*, 2010). On the other hand, high-quality evidence of dose-response gradients of sugary snack consumption and over-nutrition is still lacking (Pries, Filteau and Ferguson, 2019).

The evidence shows that SSB consumption increases the odds of overweight/obesity and dental decay as the dose and frequency increase. In contrast, a higher frequency of sugary snack consumption increases the risk for early childhood caries. In the present study, the median and interquartile range of total sugar per serving of CACF (instant cereals – 9.6g (6.2,16.4) and purees – 8g (6,12) was comparable to that of snacks 8g (6,12). This remains a great concern and, by inference, shows that the sugar quantities in the CACF also pose a risk for oral health if CACF are consumed frequently, as was revealed in Study 1.

Interestingly, the five dairy products with "total sugar" information had "total sugar" ranging from 15-23.8g per serving. Naturally, this high level of sugar, as an absolute amount, is also of great concern. However, due to problems in high-income countries concerning the reduced intake of Vitamin D and calcium by growing children and adolescents from milk, adding sugar was devised as a means to encourage milk intake among these age groups (Johnson *et al.*, 2009; Murray *et al.*, 2015). These recommendations were based on the evidence then showing that in these older age groups, there was no associated increase in weight gain; instead, sweetened-flavoured milk boosted the intake of essential nutrients (Murray *et al.*, 2015). However, there is contradicting evidence to show that sweetened milk may increase weight gain among older children(Murray *et al.*, 2015; Patel *et al.*, 2018). Therefore, it is unclear what effect sweetened milk has on weight in older children, and no studies have been conducted among younger children.

Whereas plain unflavoured natural dairy products (milk and yoghurt) are protective with low cariogenic properties, buffering capacity, and avail calcium in the diets, sweetened milk has added sucrose, which is highly cariogenic like SSB (Woodward and Rugg-Gunn, 2020). Laboratory studies (Giacaman and Muñoz-Sandoval, 2014; Prabhakar, Kurthukoti and Gupta, 2010)have shown an increased risk for decay with sweetened dairy products. However, epidemiological studies with a specific focus on sweetened milk are lacking, except in an older clinical trial where young institutionalised people were given a 5% sucrose solution of milk, which resulted in a non-significant increase in dental caries compared to those on plain milk (Dunning and Hodge, 1971).

However, the present study findings showed that the total sugar was greater than 5g per 100g or 100 ml, and there is no doubt that free sugars are the most important determinant of caries development and progression (Sheiham and James, 2015). Since deciduous (baby) teeth are biologically less resistant to caries (Carlos and Gittelsohn, 1965) and the amounts of sugars exceed 5g per 100ml or 100g, frequent consumption of sweetened milk in early childhood should be considered as cariogenic as other SSB. Thus, the lack of epidemiological specific to the health risks of sweetened dairy in children should not be used to promote its consumption, instead the laboratory findings should be exploited to inform public health interventions for young children.

Such high total sugar content in yoghurt has been reported in other studies. For example, a UK study found total sugar per 100g ranging from 0.1-21.3g with fruit and flavoured yoghurts having the highest medians (range): 11.9 g (4.6–21.3) and 12.0 g (0.1–18.8), respectively. However, those marketed for children were not different in total sugar content of 10.8 g (4.8–14.5) (Moore, Horti and Fielding, 2018).

Given that most of the detailed sugar information was missing on most dairy products, but the labels reflected added sugar, rather than assuming a low total sugar content, it is probably better to assume that it is probably higher. Therefore, this category of products is unsuitable for promotion for IYC, as reflected in the WHO European NPM(WHO, 2019b).

7.2.5.2 Total sugar contribution to energy

An important question on sugar content is the percentage energy from total sugar. In the present study, as is expected, the median energy contribution of sugar in SSB was the highest (92%), with some with 100% energy contribution, and it was statistically significant ($\chi^2(2) = 24.66$, $p = 0.0001$) The surprising finding was that CACF had a higher median energy contribution from sugar (44%) than sugary snacks (25%). More detailed information revealed that instant cereals had a higher median (52%) than vegetable and fruit purees (33%). However, the median energy contribution for fruit purees was even higher at 64%. The comparisons of food categories show that the amount of sugar in CACF is of greater concern than even that of snacks. Fruit purees even raise a big red flag with their sugar contribution to energy, simulating that of SSB.

The thresholds proposed by the WHO Europe NPM to carry front-of-pack flags were used in order to compare the present study with others. Those below the thresholds of sugar

contribution to energy were considered nutritionally suitable. The thresholds are 15%, 30% and 40% for snacks, dry cereals, and fruit/vegetable purees, respectively (WHO, 2019b). Only 41% of Snacks were below all breakfast cereal, while 71% of dairy products were <40%.

Only 35% of CACF were below these sugar limits, all of which were dry instant cereals comprising 12 (80%) dry instant cereals. However, all 19 fruit and vegetable purees were above their threshold. These results on CACF partly reflect those from two other studies from Portugal (Santos *et al.*, 2022) and Poland (WHO, 2021), where all the fruit purees were higher than 40%. On the other hand, more dry cereals in both Poland (70%) and Portugal (53%) were higher than 30% (WHO, 2021). Unfortunately, in the present study, only imported dry instant cereals were assessed because none of the locally produced instant cereals provided details on total sugar. Thus, a judgment on the sugar content of locally produced CACF cannot be made, yet cereals were the only products surveyed that are locally produced in Uganda. The local context cannot explain the difference in total energy contribution.

The fact that in all three studies, sugar contributed the highest energy source is a cause for concern as to whether these purees should feature in IYC food diets. In fact, in the present study findings, there was not much difference in percent energy contribution from total sugar between SSB and several fruit purees.

On further examination of six fruit purees, those without "added sugar" were also assessed to determine if the contribution of their free sugars to total energy was more favourable than those with added sugars. The range of the six purees (without "added sugar") was 52-84%, which energy contribution is very high and not any different from that of purees with sucrose, with a range of 37-92%.

Previous research indicates that even items without added sugar in their ingredient list could have high sugar content. For example, a quarter of the 235 CACF surveyed in a South African study did not indicate sugar in their ingredient list, but 77% had a high percentage of total calories derived from sugar (Erzse *et al.*, 2019) using > 20% as the cut-off (Elliott and Conlon, 2015). Similarly, all six purees without added sugar derived >50% of total calories from sugar. So were the vegetable-only purees, all >20%. One study noted that vegetable purees rarely use "bitter" vegetables and instead more commonly use "relatively sweet" vegetables or have fruit purees added to increase the palatability of the food (Padarath, Gerritsen and Mackay, 2020). These practices were also noted for all the vegetable purees in the present study. Sweet foods

not only increase the total calories from sugar (Garcia, McLean and Wright, 2016), but also repeated exposure reduces the chances of the IYC accepting "bitter" vegetables (Katiforis *et al.*, 2021; Padarath, Gerritsen and Mackay, 2020).

Overall, the CACF assessed for their sugar contribution to energy were all imported, with the fruit purees being the least favourable. It was also observed that there was no difference in the percentage energy from sugar between fruit purees with "added sugar" and those with no added sugar. The free and added sugars in these products are undesirable because they contribute to the development of taste preference for sweet tastes, excess energy intake and dental decay (WHO, 2019b).

Several studies have been published on the percentage energy contribution of sugar in CACF because, principally, the approach to sugar content has been critically considered as a risk for overweight/obesity and a precursor to other NCDs along with food components like salt and fat. On the other hand, oral health outcomes usually feature less in the majority of literature. However, WHO guidelines on sugar highlight that even lower sugar content should be considered for oral health (WHO, 2015a).

The measure of total sugar has been adopted by some studies due to challenges involved in measuring the amount of "free sugars", which would assess suitability using the WHO guidelines of less than 5% or 10% of total energy from "free sugars"(WHO, 2015a). In all the CODEX and Ugandan labelling guidelines and standards, there is no mention of "free sugars" and very few statements on added sugars. Yet, the WHO guidelines are based on the free sugar recommendations. This results in confusion among users of these guidelines and an apparent loophole that manufacturers might exploit to include high amounts of free sugars without them being detected. Therefore, including information on total sugars and carbohydrates only is insufficient and presents challenges in assessing the appropriateness of foods based on free sugars.

Some regional guidelines have adopted the WHO "free sugars" recommendation. For example, the Pan American Health Organisation (PAHO) (2016) provides for an assessment of the energy value of free sugars using the WHO guideline of <10% in its nutrition profile (NP) model. One recent South American study applied the PAHO NP model to 171 CACF from Portuguese and Brazilian cities. Although some Portuguese products were assessed for their free sugar content, all 48 products surveyed from Brazil could not be evaluated due to the

absence of information on free sugars (Araújo *et al.*, 2022). These discrepancies among the international, regional, and national guidelines in definitions and criteria on whether total, added or free sugars are to be considered were highlighted by Mela and Woolner (2018). This is a source of confusion for consumers and public health messages. Whereas the authors argue that the differences in definitions might imply different physiological processes and hence diverse health outcomes, which to date are not well-defined (Mela and Woolner, 2018), the argument for minimal to little free sugars still stands for the prevention of dental caries. The latest ecological studies unearth evidence showing very low caries prevalence in low-income countries three decades before their exposure to processed foods (Sheiham and James, 2014b).

7.2.5.3 Energy density

The energy density of CACF is a point of concern, especially concerning soft-wet spoonable foods and those found in pouches to be fed using a spout. The WHO Europe NPM sets a threshold for fruit purees (fruit only and those combined with other foods) at >0.6 kcal/g. Additionally, cereal-based foods were assessed using a cut-off of >0.8 kcal/g as set in the Ugandan standard on processed cereals for IYC feeding (UNBS, 2021).

The energy density of 118 foods and beverages that provided energy information was determined with a range of 0.3-5.4kcal/g and a median of 3.55kcal/g. Among the CACF, the energy density of fruit and vegetable purees was significantly lower than that of the cereals ($\chi^2(2) = 33.29$, $p = 0.0001$), and it was even lower than that of SSB. These results reflect those of many studies where purees have the lowest energy density (Hutchinson *et al.*, 2021; Santos *et al.*, 2022; WHO, 2019b;2021).

When the nationally recommended thresholds were applied to the dry cereals (UNBS, 2021) and the international recommendations for purees (WHO, 2019b), 75% of the CACF met the minimum energy density requirement. Except for five fruit purees (29%), all the rest (12) were below the minimum requirement, whereas all the dry instant cereals and the four fortified cereals were optimum.

Foods that provide a lower energy density are a concern because while they may provide satiety for a child, they contain very minimal energy and nutrients. Therefore, they are not recommended for regular consumption among infants (less than 12 months) whose energy demands are high because of their rapid growth and development (WHO, 2019b).

Unfortunately, the age recommendations displayed on purees were in the infant age group of 6-12 months, without warning of the importance of complementing with other foods as is required by international guidelines of IYC messaging on CACF (Quinn *et al.*, 2010b).

Foods used during the IYC are supposed to complement breastmilk or breastmilk substitutes by providing more nutrients and energy to the diet. If purees are introduced at an early age, it will compromise the nutrition of the infant. Therefore, foods whose energy density is lower than breastmilk (0.69 kcal/g) (WHO, 2016a) and homemade foods (Koletzko *et al.*, 2018) could be considered non-beneficial to a growing infant's nutritional needs.

Dry cereals are another category of concern in Sub-Saharan Africa (SSA) and LIC settings because of their low energy density, mainly when processed as only flour without adding other nutrients. However, in the present study, it was not possible to assess the energy density of most locally processed flours because their nutrition information was incomplete.

The addition of water in these low energy-density foods further reduces their energy density, which is why purees in pouches are discouraged (Koletzko *et al.*, 2018; WHO, 2019b). Also, preparing thin porridges for children, as is commonly practised in many parts of SSA, is a poor practice for IYC nutrition (Amagloh *et al.*, 2013; Dewey, 2013). The lower the energy density of food, the greater the amounts required to meet an IYC energy needs (Dewey and Brown, 2003).

Interestingly, the breakfast cereals with a lower age recommendation of 36 months were above the 0.8kcal/g cut-off and hence were shown to have enough energy density for complementary feeding. However, due to their high fibre content (>5% of dry weight), they are not suitable for use in complementary foods, as determined by the Codex (FAO and WHO, 1981a). Besides the bulkiness of fibre that increases satiety, a high intake of dietary fibres increases stool bulk and may cause flatulence and decreases appetite (FAO and WHO, 1981a).

Contrary to the present findings, few optimal density fruit purees (29%), Bassetti *et al*. (Bassetti *et al.*, 2022) reported a higher percentage (65%) of fruit purees that met the minimum energy density requirements among CACF surveyed in Indonesia and the Philippines. Since the purees (≥ 0.6 kcal/g) in the present study were a combination of two or more fruits or yoghurt, purees available in Asian countries probably have a similar composition more often than European ones to boost their energy density. However, as other food items are often added to boost energy

density, this may inadvertently increase the “added sugar” content. Therefore, there is a need for a balance in the preparation of such products and also consideration of using items that will not introduce added sugar (WHO, 2019b), for example, plain yoghurt.

7.2.5.4 Appropriateness of daily energy ration

A daily energy ration represents the recommended daily intake from complementary foods for a breastfed child for three respective age categories. Although not one of the WHO Europe NPM assessments, it is one of the WHO guidelines, which takes into account the serving size and number of portions a day. The recommendations are; - 837kJ/day (200Kcal/day), 1255kJ/day (300Kcal/day), and 2301kJ/day (550Kcal/day) for 6-8.9 months, 9-11.9 months and 12-23.9 months, respectively (Quinn *et al.*, 2010b). These recommendations are also captured in the Codex standards (FAO and WHO, 1981a).

The CACF daily energy ration recommendations on 45 products were assessed to determine if they exceeded the upper limit for requirements of a breastfed child (PAHO and WHO, 2003). All products were appropriate for young children (12-23 months), while 32% and 31% exceeded the limit for the 6-8 months old and 9-11 months old, respectively. Similarly, Sweet *et al.*(2016) reported that of the 201 CACF surveyed from four countries (Cambodia, Nepal, Tanzania and Senegal), 36% exceeded the limit for the 6-8-months old. In addition, as in the present study, where 58% and 56% of the instant cereals exceeded the limit for 6-8 months old and 9-11 months old, respectively, over half of the CACF labels exceeded the daily recommendation.

The concerns over exceeding these limits are to ensure that a child gets adequate nutrition without CACF displacing breastfeeding or other breast milk substitutes and traditional homemade meals as complementary foods. Manufacturers, however, are often not interested in such nutritional detail but rather in promoting the use of their products, in which case they would suggest portion sizes while disregarding the IYC nutrition guidelines. Overconsumption of CACF is prone to causing overweight in high-income countries (Maslin and Venter, 2017) and high socio-economic groups in LIC, but may also result in undernutrition, especially micronutrient deficiencies in cereal-based diets(Dewey, 2013; Pries, Huffman, Adhikary, *et al.*, 2016).

7.2.6 Overall nutritional suitability

In the present study, all eight items were considered, and a total score was developed for the determination of the nutritional suitability of 101 products. The nutritional and taste aspects assessed were the sugar content, presence of sweeteners and flavours, and energy density. The median score of CACF (65%) was slightly higher than all products combined (57%). Based on the present study definition, the only nutritionally suitable were 15 fortified cereals, one of which was imported from the East African region. Only 11 of these were classified as CACF.

All CACF classified as instant porridges and purees were nutritionally unsuitable because of the high amount of total calories from sugar and the addition of sweeteners and flavours. Additionally, the purees had a very low energy density. Only five fortified cereals with 100% scores were assessed for energy density. The rest of the eight items did not provide energy information. However, all of them were high-protein cereals which boosts their energy density.

SSB scored the least (0-33%) with regard to nutritional suitability, and seven dairy products were assessed for the presence of sweeteners, flavourings, percentage of fruit content, and total calories from sugar. The same items were assessed for snacks and, in addition, their energy density. Almost half of the snacks scored 0-40%, and four fortified cereals scored 100%. This re-iterates the recommendations by WHO Europe NPM (WHO, 2019b), which specifically discourages products like sweetened milk/dairy products and snacks from being promoted for IYC.

Two breakfast cereals scored 80% (4/5) and failed to score 100% for having an added sugar/sweetener. However, as previously highlighted, these tend to have a fibre content above that is recommended for intake by children. Hence, they should not be considered for infant nutrition.

Complementary feeding is meant to complement breast milk at about six months when breastfeeding is no longer sufficient for the infant's nutritional needs, including energy demands and micronutrients (WHO, 2003a). Infants should be exposed to various flavours and textures during the complementary feeding period. However, the present study found that several CACF were not suited to meet these needs because they have more than one flavour, are sweetened, or are not fortified with micro-nutrients. Additionally, extremes of energy density are undesirable; energy-dense (high sugar content) foods tend to be nutrient-poor, yet

low energy-density foods will satisfy a child's hunger but contribute minimally to their nutritional needs. Therefore, there is a need for a balance to ensure that CACF meet an infant's nutritional needs, dissuade caregivers from over-dependence on nutrient-poor CACF, and encourage complementing with homemade meals.

7.2.7 Label practices that inappropriately promote nutritionally unsuitable products

7.2.7.1 Cartoon characters

The high number of products with cartoon characters depicted on their labels is a concern, especially in a setting where consumers may not understand nutrition labels or never take the time to read the details. In addition, if there are no objective ways of identifying appropriate processed products, cartoon characters could mislead caregivers into thinking that products are suitable for young children.

The misuse of products was reported in a study from a low-income country, Laos, where caregivers mistakenly used a beverage meant for the adult population as a breast milk substitute because of a similar cartoon logo that was used on the same brand of products. Almost all the respondents believed the product contained milk, 46% that it was meant for infant feeding, and 80% never read the warnings against use among infants (Barennes *et al.*, 2008). Thus, if both CACF and CFP have cartoon characters, this is bound to be confusing for those that do not read labels. Unfortunately, on several occasions, CFP products like breakfast cereals are displayed in the same sections as CACF, which further increases the chances of confusing them to be appropriate for IYC consumption. As a result, consumers who pick a CACF might unknowingly select a CFP to create various food options for their young child.

Some researchers have reported that food manufacturers commonly use cartoon characters as child-targeted promotions (Chacon, Letona and Barnoya, 2013; Hadihardjono *et al.*, 2019; Mehta *et al.*, 2012). The tendency for non-nutritive foods and beverages to have cartoon characters was demonstrated in a UK study. More than half of the foods sampled were considered high in fat, salt, and sugar (Pombo-Rodrigues *et al.*, 2020), and this has often been identified as a primary avenue for companies to market unhealthy products to young children who can easily identify with the cartoon characters (Kraak and Story, 2015). However, in settings like Uganda, this could also significantly influence caregivers if there is low nutrition literacy and thus a form of inappropriate promotion (WHO, 2019a). Therefore, there is a great

need to educate the population and for retailers to ensure that there are separate sections clearly labelled for foods that are promoted for IYC. In the present study, a few of the products were locally produced; hence there is a need to discourage manufacturers from using such labels.

Some countries like South Africa, which is looking to increase advertising for healthy eating, have enacted regulations prohibiting the use of cartoon characters on foods intended for children's consumption (South Africa Department of Health, 2012). Monitoring systems are keen to identify inappropriate practices, as are advocacy groups (Global Agricultural Information Network (GAIN), 2014).

7.2.7.2 Age-related statements and images

From study 1, it was noted that several unhealthy foods and beverages, including dairy-based products and breakfast cereals, were frequently consumed because they were considered to be tastier and healthier alternatives to home-prepared foods. Apart from their high sugar content, these products are usually pleasantly flavoured, sweetened or with very low energy density, which disqualifies them for promotion for IYCF.

Considering international recommendations, dairy products such as milk, if marketed as suitable for IYC, are considered breast milk substitutes and thus need to follow the guidelines of the International Code (WHO, 2017a). Whenever these products are not in line with the International Code, mainly when comprising unsuitable additives for IYC, they should be labelled as "***Not suitable for infants and young children under 36 months"*** (WHO, 2019b)**.** The same follows with any other product that should not be marketed for IYC.

All sweetened or flavoured products like breakfast cereals, dairy products, and other beverages, including fruit and vegetable juices, should display a statement discouraging the use of products for young children under three years. However, Ugandan and regional standards have not yet adopted these guidelines. For example, the standard that covers milk-based baby foods (UNBS, 2006) approves the addition of sugars like sucrose, glucose, dextrin, and maltose and recommends a "fresh, pleasant flavour and odour". While considering international recommendations regarding taste, these products should not have additives that alter the taste or create more pleasant flavours like vanilla, cocoa, and strawberry. Instead, any milk products considered appropriate should be minimally processed for preservation and have no additives.

The Ugandan processed CACF had age-related statements, for example, “For children 6+ months and adults”, “all ages”, and “for the whole family”. Some included images of a mother carrying an infant or several children of older age groups. Others had claims such as “Healthy mother, child and family”, which imply that all age groups can use them. Whereas such products qualified to be included as CACF by the present study definition, it is questionable if the nutritional composition is suitable for all age groups, especially infants or whether the serving sizes are suitable for the range of ages indicated. If the serving size is similar to that of adults, then the IYC might overconsume these foods and replace other home-prepared meals, which provide a range of tastes and micronutrients.

In the LIC setting, CACF can potentially provide several micronutrients which might be lacking in local foods, milk, and breast milk (Phu *et al.*, 2012; Pries, Huffman, Adhikary, *et al.*, 2016). Thus, CACF should be encouraged not only if they are appropriately fortified but also if they meet the minimum standards and provide the necessary information to guide consumers and promote optimal IYC feeding practices as outlined in international recommendations (Quinn *et al.*, 2010b; WHO, 2017a). Therefore, if products are specific to the IYC age group, then this should be clearly indicated on the labels, and confusing images and statements should be discouraged.

Other confusing phrases documented by other studies include: “from the start”, “for the whole family”, and“first stage”. These are examples of terms that should not be used oncomplementary food labels (Sweet, Jerling and Van Graan, 2013a). Other words thought to encourage the use of CBF before six months include:- Stage 1/step, Baby/babes/babies, Best start in life/healthy start for life, First/first foods/first tastes, Starter/starter food/for starter eaters, junior, tots, from an early age, (Sweet, Jerling and Van Graan, 2013a) among others. In a setting that has relatively low literacy levels (72%) and even lower for females (68%) (Uganda Bureau of Statistics (UBOS), 2016), such phrases and images should not be considered for label display unless the foods are meant for IYC and meet the minimum standards.

7.2.7.3 Font size

The present study’s findings revealed that some breakfast cereals, due to their low energy density from fibre, did have an age recommendation indicating a minimum age of 36 months, but in a very tiny font size. It is unclear if the manufacturer intended this information to be

missed out altogether since it was the smallest font among the rest of the other label information.

However, it should be noted that the Codex guidelines on nutritional labelling encourage competent authorities to provide national guidelines on the appropriate font type, style and minimum font to ensure the legibility of nutrition labelling (FAO and WHO, 1985). Unfortunately, the relevant Ugandan standard (UNBS, 2014a) do not provide these guidelines. This highlights a general gap in Ugandan standards where context-specific guidelines are needed, yet they have not been provided.

Print size is considered one of the most practical measurements of legibility, and Sweet *et al*. (Sweet, Jerling and Van Graan, 2013a) noted that some countries like Australia, New Zealand, Canada, and South Africa have standard guidelines on the minimum font size. For example, South Africa recommends a minimum font size of 1mm in height for any other information required to appear whose specific font sizes are not mentioned (South Africa Department of Health, 2010). The Ugandan guidelines need to ensure clarity regarding font size recommendations for nutrition labelling with as much detail as the South African guidelines.

7.2.8 Development of the questionnaire

The majority of the questions on nutritional suitability were adapted from the WHO Europe Nutrition Profile Model (WHO, 2019b), which assesses suitability based on several nutritional components. However, the present study focused on sugar content, energy, and taste properties (sweetness and flavouring). Some questions to cover other aspects were adopted from other guidelines/standards; - energy from daily rations (Quinn *et al.*, 2010b; Sweet *et al.*, 2016), the energy density of dry cereals were adopted from the Ugandan standard that covers processed cereals (UNBS, 2021), and flavouring was extracted from recommendations of the WHO Europe NPM. The section on label practices included items from a previously validated questionnaire (Sweet *et al.*, 2016) in a similar study on label practices. Additional questions on the presence of nutritional information (FAO and WHO, 1981a;1985; UNBS, 2014a), nutritional and health claims were adopted from the Ugandan standards and Codex standards (FAO and WHO, 1997; UNBS, 2014a).

7.2.9 Concluding remarks

From the present study, the locally fortified foods were the only nutritionally suitable CACF among the three categories. However, their label information was lacking on several products, and none was fully compliant with the label practices. Despite not adding sweeteners to these products, the manufacturers recommended the addition of sugar without offering further instructions on the amount to be used.

On the other hand, the purees fully complied with label requirements, included all the nutritional information defined by this study as key label practices and carried no health and nutritional claims. However, they were sweetened, had very low energy density and had a high percentage of total calories derived from sugar, which makes them unsuitable for IYC nutrition. Instead, more nutritious alternatives like fresh fruit and vegetables should be strongly encouraged.

The present study found that the current Ugandan IYC policy, guidelines and standards are inconsistent with international recommendations and do not reflect the "modern context" of processed goods and child-feeding practices. The market has a wide range of ultra-processed food items, some marketed as CACF, while others are for the general (older) population but commonly used for IYC feeding. IYC feeding guidelines need to cover the consumption of ultra-processed foods because these have become part of the diet of infants and young children.

The study further found that the labelling of locally produced CACF is poorly regulated, and yet there is a potential for these minimally processed foods to provide micro-nutrients in IYC diets which might be deficient in the traditional homemade meals.

CHAPTER 8

CONCLUSIONS

This chapter will conclude the study by briefly discussing the derived meaning of study findings, the identified gaps and their importance to infant and young child nutrition, and what could be done to address the identified gaps through the recommendations. Additionally, the study limitations will be presented together with suggested opportunities for further research.

Summary of Key Findings and their implications

The first study aimed to establish the consumption level of commercial baby food consumption during complementary feeding and the associated factors in an urban/peri-urban Ugandan population of caregivers of children aged 6-36 months in Kampala. The primary outcome of Study 1 was consuming at least one commercial baby food (CBF) within 24 hours.

Results of the first objective revealed that the consumption of processed and ultra-processed foods and beverages (UPFB) among 403 6-36 months old children on the previous day was very high (81%). These findings confirm the transitioning of diets in LIC, specifically in sub-Saharan Africa. In the urban/peri-urban infant population, there is a mixed diet consisting of unprocessed homemade meals, processed fortified cereals and other UPFB consumed as snacks, sweetened dairy products or commercially available complementary foods (CACF). This transitioning, processed, low environmental impact pattern with both local and processed foods was already described in Uganda among an urban female adult population (Auma *et al.*, 2019). The variety and increased availability of processed foods gradually influence the population's eating patterns. These eating patterns are noteworthy, especially within the first few years of life, a time when eating habits are shaped (Lessa *et al.*, 2017; Navarro *et al.*, 2019), and could persist for the rest of one's lifetime (Beauchamp and Mennella, 2009; Beauchamp and Mennella, 2011; Mennella, 2014).

Considering consumption of UPFB in the previous week still revealed a very high consumption (84%), an indication that the dietary habits are relatively consistent, with 69% having consumed them frequently (four or more days). However, the weekly patterns revealed that sweetened dairy (63%), confectionary (37%), biscuits (27%) and ready-to-eat breakfast cereals (24%) were the most frequently consumed UPFB, a big concern over the dietary habits that have already been established very early in life. All the UPFB are sweetened and thus are re-

enforcing sweet taste preferences at a very early age, setting them up for unhealthy diets later in life (Beauchamp and Mennella, 2009; Mennella, 2014). Furthermore, some caregivers unknowingly consider them very healthy, like the sweetened flavoured yoghurt. Whereas the current Ugandan guidelines recommend IYC feeding to include dairy products (Uganda MoH, 2021), the challenge of consuming sweetened yoghurts and UPFB, generally, that contain several non-essential additives for IYC nutrition, needs to be reviewed and clarified.

In Study 1, the factors significantly associated with frequent consumption of UPFB were assessed and included; - the child's age and maternal education. Children whose mothers had attained college education had greater odds of consuming UPFB than those who had only completed the primary level. These findings on maternal education are inconsistent with most findings where maternal education is negatively associated with the consumption of UPFB (Batalha *et al.*, 2017; Giesta *et al.*, 2019; Pereira *et al.*, 2022; Vilela *et al.*, 2015). However, literature covering other nutrition-related topics, nutrition-related NCDs, and risk factors reveals that such inconsistencies related to socio-economic status in LMICs are common (Allen *et al.*, 2017; Hosseinpoor *et al.*, 2012; Mayen *et al.*, 2014; Stringhini and Bovet, 2017). On the contrary, there is a clear social gradient with low socio-economic status associated with unhealthy diets and other health-detrimental habits in high-income countries (Allen *et al.*, 2017; Hosseinpoor *et al.*, 2012).

The drivers of the nutritional transition might more readily explain the reasons for this negative association, especially urbanisation—more educated parents tend to live in urban areas than rural areas. Urbanisation is associated with increased availability and accessibility to UPFB, while affordability might be influenced by increased income, which is associated with education. Thus, the maternal level of education is accompanied by several material "advantages" associated with affluence. Otherwise, even in high-income countries, affluence was previously associated with dietary patterns that included high consumption of UPFB until a social gradient was established (Stringhini and Bovet, 2017). Another probable reason could be that overall social patterning might differ between countries, even those in LMIC, due to various cultural norms and patterns which influence dietary habits (Batalha *et al.* ; Stringhini and Bovet, 2017).

The findings of the final objective of study 1 on the minimum infant and young child feeding practices showed that almost all (98%) of the 6-36 months olds had ever breastfed, and only 68% of 6-23 months old were presently breastfeeding. Consumption of at least one homemade meal, flesh/meat and fruit/vegetables in the previous 24 hours was 86%, 57% and 60%, respectively. It is encouraging to note that children are breastfeeding and feeding on traditional foods during the complementary period. However, it is also of concern that just as many young children consume UPFB.

These findings reveal a population-wide nutrition education gap, especially concerning complementary feeding. This gap is further confirmed by the low proportion (34%) of 6-23 months old children who met the minimum acceptable diet (MAD). Yet 50% consumed UPFB but did not meet the MAD. These findings highlight the increased risk of developing malnutrition, either overweight/obesity from consuming a lot of energy-dense and nutrient-poor UPFB and/or micronutrient deficiencies displacing more nutritious foods, as demonstrated in a study from another LMIC setting(Pries *et al.*, 2019).

In summary, based on the research aim 1, the findings revealed high and frequent consumption of commercial baby foods among Kampala's 6-36 months old population. Therefore, the results of Study 1 confirmed the first research hypothesis. The findings indicate that UPFB contribute a significant proportion of the dietary energy intake among infants and young children. It highlights the potential for micronutrient deficiency malnutrition among children (about half the population) who do not regularly consume traditional homemade foods and yet use UPFB as the main source of nutrition. The findings further reveal that a subgroup of these children consuming energy-dense nutrient-poor UPFB is at risk of being overweight /obese. Lastly, Study 1 demonstrates the ubiquitous use of sugar and added sugar in UPFB, which presents risks for developing early childhood caries, a chronic condition, and also sets up these children on a life course for poor food choices because of the adaptation to sweet and palatable foods.

One unique finding in the present study was the popular use of sweetened dairy products for IYC feeding as a substitute for milk. This highlights the problem associated with "hidden sugars", whereby consumers and caregivers are not aware of the amount of sugar content and possibly the potential health effects of consuming an unhealthy product. Even the other UPFB that were frequently consumed—confectionary (bread/buns) and ready-to-eat breakfast cereals—typically have hidden sugars because these are not the usual snacks for children. This

finding, along with the consumption of other UPFB, also shows the low awareness concerning optimal complementary feeding and criteria for determining nutritious foods and their specific contribution to a child's nutritional needs.

Study 1 findings are vital as baseline evidence in the country for health researchers, health workers, policymakers and other stakeholders concerned with the state of IYC nutrition of the population. Most Ugandan studies have consistently focussed on malnutrition from the undernutrition perspective among vulnerable groups. However, these findings are key in demonstrating the type of malnutrition experienced in an urban subpopulation that would not be considered "vulnerable" by any measure. Moreover, this is the first study focussing on aspects relating to the nutrition transition among infants and young children within the country and the second within the East African region.

Study 1 implications

These findings reiterate the need for LIC to embrace the paradigm shift associated with the nutrition transition, especially in urban populations. After that, set up relevant guidelines and policies addressing the population's current health promotion needs while being mindful of young children's mixed diets. Additionally, the high breastfeeding rates in this study imply that more efforts are focused on breastfeeding in the country, and little attention has been given to complementary feeding and the challenges of the quality of nutrition associated thereof. However, this is an injustice to the IYC. Yet, as already established, breastfeeding is inadequate after six months to meet all an infant's nutritional requirements, hence the great need to consider interventions to improve nutrition during the complementary feeding period.

Study 1 strengths, limitations and future research

This is the first study in a Ugandan urban population that has captured aspects relating to the nutrition transition and complementary feeding. Participants were selected to represent different socio-economic groups, especially the higher socio-economic class, which has not yet been represented in local research on IYC nutrition. The focus is usually among groups of disadvantaged and rural populations where undernutrition is expected to be rampant.

The use of frequency of consumption the previous week as a measure should be more accurate than the 24-hour data because a weekly measure would reflect habitual use rather than a rare coincidental finding of use or non-use of an item on the day before data collection. Thus,

although the 24-hour diet recall is a quick rapid assessment tool, the weekly consumption counters the over- or under-estimation of the 24-hour diet recall(Batalha *et al.*, 2017). To further reduce on reporting bias of the 24-diet recall, a pictorial recall aid was adopted from previous studies (Pries *et al.*, 2019) and piloted to include contextually-relevant foods.

However, in the present study, we did not consider the quantitative consumption measures, either in counts or actual amounts consumed. Thus the findings could not accurately reflect the total energy contribution of UPFB to the child's overall diet. Such studies have been done elsewhere to give more informative nutrition data (Pries *et al.*, 2019; Soares *et al.*, 2022; Theurich *et al.*, 2020).

Furthermore, this was a facility-based study rather than a community-based study due to the difficulties of accessing study participants in communities during the COVID-19 lockdown and the period after that. A facility-based study's selection may be biased towards those who seek health services regularly. However, this was countered by efforts to have a representation of the different urban populations included during recruitment. Different contexts of service utilisation - private, public and private-not-for-profit and geographical location were explored to get a representative sample. Therefore, these findings are externally valid to generalise to Uganda's urbanised infant and young child population.

Maternal education has been extensively studied in relation to undernutrition in Uganda and other sub-Saharan countries. However, there is still a paucity of data on how this influences the consumption of commercial baby foods. For example, in the present study, only secondary education was significantly negatively associated with consumption on the day before. Instead of decreasing trends for the other levels thereafter – secondary, "advanced level"/tertiary non-degree education and college education, consumption increases. In fact, the prevalence ratios of having primary education or none are similar to those of college education. Future studies are required to explore the relationship between ultra-processed consumption and increasing education with the goal of establishing matching interventions to counter the potential negative health outcomes.

Since the present study has established baseline evidence of high consumption of UPFB, subsequent research could focus on conducting community-based household surveys that include anthropometric measurements of participants. Future community studies should also consider studies on the consumption of UPFB and dental health in early childhood. Such

studies should preferably consider a common-risk factor approach, such that several biological markers and conditions are captured for the sake of efficient and coordinated use of resources. Studies should be designed to reflect both the urban poor and elite populations so that any confounders are taken into account and the differences in consumption patterns are established. In addition, the recommendation is that future complementary studies in urban populations consider an upper age limit of 24 months, as was established in the present study. Above 24 months, almost all young children are neither breastfeeding nor using breast milk substitutes; therefore, ages beyond that are no longer practising complementary feeding as the definition stands.

The second study aimed to investigate whether commercial baby foods in the Ugandan market are nutritionally suitable and comply with label guidelines. The results indicate that most commercially available complementary foods in the Ugandan market did not fully comply with internationally recommended guidelines on labelling complementary foods, especially locally produced foods. Further findings showed that except for locally produced fortified foods, all the commercial baby foods were nutritionally unsuitable for promoting optimal infant and young child feeding with respect to their taste, sugar and energy.

Only 28% of the 60 CACF fully complied with the selected label practices, and these were purees, imports from South Africa. Generally, the CACF complied with nutrition information (93%) and the six-month age recommendations (92%). On the other hand, locally-produced cereals were the least compliant, displaying nutritional or health claims (60%), non-declaration of the total sugar (26%) and exclusion of serving recommendations (33%). Others were not certified by the Uganda National Bureau of Standards (UNBS). These findings highlight the inadequate monitoring and regulation of CACF and other products in the Ugandan market.

Food labels provide basic product-specific information to "consumers" that cover health, nutrition, and safety (Campos, Doxey and Hammond, 2011), while for CACF, even indications and directions for use (Quinn *et al.*, 2010b). Additionally, nutritional information should assist consumers in making food choices using nutrition criteria. The poor label compliance in Uganda must be addressed so that IYC are protected from suboptimal feeding practices. For example, age recommendations promote an appropriate age to initiate complementary feeding and promote exclusive and continued breastfeeding(Quinn *et al.*, 2010b; Sweet *et al.*, 2016; UNBS, 2014a; WHO, 2019b). On the other hand, age recommendations should be provided

for other commercial products frequently consumed by IYC so that caregivers are aware that they are inappropriate for the younger age groups (WHO, 2019b).

The WHO defines nutrient profiling (NP) as 'the science of classifying or ranking food according to their nutrient composition for reasons related to preventing disease and promoting health(WHO, 2015b). Its objective is to serve as an instrument to classify food and beverages that contain excessive amounts of free sugars, salt, total fat, saturated fat and *trans* fatty acids. NP became the basis for the regulation of food labels, health claims and marketing and publicity for children(WHO, 2015b)

The assessment of nutritional information in the second objective revealed that among the 82 CBF and 34 CACF reviewed, the "total sugar" content was high. The median "total sugar" per 100g was 13.9g and 12.1g for CBF and CACF, respectively. The "total sugar" per serving was significantly higher in SSB, and so were the total calories from sugar. These findings only emphasise that SSB are unsuitable for IYC consumption because of their sweetness and high energy density (WHO, 2019b).

Among the CACF, the total calories from sugar were significantly higher in purees than in instant cereals. Even purees with no "added sugar" had an excessive range of calories from sugar (52-84%). Furthermore, the energy density of fruit purees was significantly lower than that of other CACF. These findings on purees are similar to those done in other countries (Hutchinson *et al.*, 2021; Santos *et al.*, 2022; WHO, 2019b;2021). In the Ugandan context, it is questionable if purees are of any nutritional benefit when fresh fruit is a readily available, more nutritious alternative. Although classified as CACF, purees nutritional properties did not differ much from those of SSB.

Ironically, purees were the only CACF that were fully compliant with label recommendations, and yet nutritionally, they were unsuitable for IYC feeding. The present findings highlight that not only should labels be appraised on complying with label recommendations but also on their nutritional composition. In that case, this also pauses a question of whether certain imported products known as CACF are of any nutritional benefit in the Ugandan setting. The findings further highlight the enormous work that needs to be dedicated to screening, analysing and certifying CACF, whether local or imported, before they can be promoted as suitable for IYC nutrition by the food standards body (UNBS).

The total calories range for sweetened dairy products (24-48%) was also high and further confirms the WHO Europe recommendations to avoid sweetened diary because they are unsuitable both in taste properties (sweet and artificial flavour) and energy dense (WHO, 2019b). It is important to create public health awareness because these were the most commonly consumed SSB, which, unfortunately, were considered a healthy alternative to milk consumption.

For the third objective, among the 101 CBF assessed, only 15% were nutritionally suitable concerning the taste, sugar and energy content. All these items were locally produced fortified cereals, with some categorised as CACF (n=11) and four commercial food products (CFP). The poorest attributes were recorded for the total calories from sugar thresholds (41%), the addition of flavours (25%) and sweeteners (18%). Again, the SSB scored the least, re-emphasising that key guidelines, recommendations, and possible policies should be formulated to protect the IYC population from these unhealthy beverages.

Although the locally produced fortified cereals did not comply with label guidelines, it is encouraging to note that they were the only products considered nutritionally suitable for promoting IYC consumption. This is evidence that there is a need to support local companies to produce foods based on specified standards, nutrition quality and safe for IYC nutrition.

To summarise Study 2, the labelling practices on commercial baby foods in the Ugandan market are suboptimal. Several products had health and nutrient claims that manufacturers use to promote their products, yet these can be misleading. Others were missing key nutritional information, and age recommendations, while others were confusing based on ambiguous images and graphics on age appropriateness. Therefore, the labels do not adequately protect and promote optimal IYCF practices.

Implications of study 2

Based on the study findings, the only products suited for promotion as CACF were fortified cereals, which were processed but not classified as ultra-processed. All the rest of the products were ultra-processed foods and beverages, including the CACF. These study findings pause a question of whether the other CACF, which could be fortified with some micronutrients and other unhealthy additives, including free sugars, are not “fake foods” as has been described in other contexts (Popkin *et al.*, 2021). When healthier commercial alternatives exist, or local

family foods, fresh fruit, and vegetables are available, the ultra-processed CACF are of minimal benefit. Instead, they pause a health risk, especially for dental health. Therefore, the ultra-processed CACF (like instant cereals, and purees) surveyed in the present study are not nutritionally suitable to be promoted as commercial complementary foods on the Ugandan market. Therefore, the regulatory bodies need to take action to prevent their consumption while at the same time promoting and supporting the development of healthier alternatives locally.

Study 2 strengths, limitations and future research

This is the first comprehensive study on label practices and sugar content within the East African region that covered both imported and local products commonly used in the urban Ugandan context. The choice of products was informed by Study 1, an urban population survey and visits to small retail shops and big supermarkets.

The sampling of products was non-random, with some brands represented by several products. Therefore, the findings should be considered with caution because they may not be representative of ALL commercially available complementary products nor exhaustive of ALL the commercially produced foods that the urban young child population consumes.

The nutrition profile model applied in Study 2 was developed in another setting, a region with high-income countries. The underlying assumption is that the Ugandan urban population has similar dietary patterns, feeding habits and comparable traditional, complementary foods in terms of nutritional profiles. If other practices like high consumption of table sugar and energy-dense local foods exist in the Ugandan urban population, then more appropriate thresholds, for example, of the "total sugar" and "free sugar" content, would need to be considered. However, there being no contextually appropriate model, this was the next best option while including aspects from the national standards.

Future studies on CACF and other commercial baby foods should embark on a comprehensive nutritional profiling that includes other nutrients; - proteins, dietary fibre, sodium, fats and micronutrients (iron, zinc, vitamins), especially for the locally produced fortified foods. Additionally, since many products do not declare some nutritional information, a laboratory analysis to compare nutritional content against national and international recommendations would be significantly important. Even when nutritional information is declared, comparing

declared information with laboratory-determined content would provide information on how accurate label information is.

There is also a need for research into the use of food labels in the Ugandan population while considering aspects related to the importance attached to nutrition information provided, understanding, and usability of the current food labels. Other countries have simplified nutritional information using graphics like “traffic lights”, where different colours denote the “healthiness” of a food based on the specified nutrients. Such measures to simplify nutritional information could be explored using implementation research while considering the population’s literacy rates and effective communication strategies.

CHAPTER 9

RECOMMENDATIONS

The following recommendations are proposed related to the findings of the present study. The recommendations focus on actions and strategies that are population-wide and those that may influence infant and young child nutrition at a macro level, considering that the consumption of commercial baby foods is a common practice in urban Ugandan populations.

Nutrition Education

Very few caregivers, especially mothers, reported that they accessed nutritional information on complementary feeding from the healthcare institutions they visited and public health programmes (Study 1 p.55). Most had received educational information from family and friends. This is a cause of concern and calls for a multi-sectoral approach to comprehensive nutrition education and engaging in mass public health campaigns using a variety of media to focus on optimum infant and young child feeding practices. The government could employ similar strategies that have been used previously to encourage exclusive breastfeeding and the introduction of solids/semi-solids.

Targeted messages for caregivers should also be provided in health facilities, and contact with any healthcare worker or community health worker (CHW) should be seen as an opportunity to impart health messages, including those of best practices for IYF nutrition. A cost-effective way to do this in urban areas includes the use of audio-visual methods with standardised, contextually appropriate messages which highlight the poor health outcomes of using ultra-processed foods and beverages (UPFB) and high sugar intake. These could be both centralised at health facilities or used by CHWs as they make field visits in homes, the latter having been previously used in one Ugandan study where it was shown to be useful (Schneider, Ollila and Mutanen, 2022). Additionally, in another LMIC setting, mHealth through the use of mobile phone messages over a period of time has been proven to be effective in improving knowledge and attitudes of pregnant and nursing mothers (Peiris *et al.*, 2023), which could also be explored in Uganda. Such messages should emphasise healthier, more nutritious alternatives so that caregivers are empowered to make better choices for their IYC.

The Health Ministry and other ministries, like Agriculture, Education, Gender, and Information Technology, should work together to provide uniform health-related information and

specifically on IYC nutrition education, using innovative, inexpensive ways such as dedicated internet webpages, blogs, and social media to deliver information. Such strategies will provide readily-available information for internet-savvy urban caregivers, and this can be regularly updated with current information.

Nutrition programmes should include content on processed foods and health outcomes in school curricula that are regularly updated whenever new information or guidance from international experts becomes available. This, too, should ideally use a multi-sectoral approach to reach the entire school-going population. This is especially important for the lower level educational systems due to the increasing drop-out rates, especially for the girl child. At the primary level, messages would reach a bigger audience and could potentially influence nutrition in the younger age groups and thereafter as they grow older. Such strategies may also enable the "nannies", who may not be highly educated to access such information and yet are directly responsible for the day-to-day feeding of young children.

The important information that needs to be imparted to parents and caregivers should include aspects of the appropriate composition and preparation of home-prepared foods, as well as when and how CACF should be used. Since fortified CACF can provide micronutrients that are not readily available in traditional local foods, they still need to be available in a child's diet in moderation in combination with traditional family complementary foods. Additionally, messages should emphasise the concept of "hidden" sugars in regularly consumed UPFB, like sweetened yoghurts, identifying UPFB with high sugar content. At the same time, the healthier alternatives should be stressed, for instance, the preparation of minimally processed yoghurt and the appropriate amount of table sugar to be included for IYC.

Lastly, all health professionals should be educated on the various aspects of nutrition because they are the gatekeepers to health and health information. This could be through special sensitisation programmes, including continuing professional education for those already in service and specialised courses on IYC nutrition and nutrition in general. Health workers would then be empowered to provide nutritional counselling to their clients.

Local producers

The current trade policy (Buy Uganda, Build Uganda (BUBU)) in Uganda promotes the purchase of locally produced items. In line with this policy, the Ministry of Health's nutrition

department should collect resources and garner enough support to promote and encourage locally fortified foods because of their potential to meet nutritional requirements without compromising health. However, it is paramount that local producers are supported to ensure the production of high-quality and nutritious foods. Regulating bodies need to ensure that they regularly monitor these products and ensure that they are safe for human nutrition to gain the local population's trust. For example, in the past, dry cereals, the most commonly used product, were found to contain high amounts of aflatoxins. Such health concerns can be mitigated with the proper support from the relevant experts.

All producers and small-scale enterprises should be supported through the services of nutritionists and food scientists during product development. There should be ongoing supervision even after entering the market to maintain standards while ensuring that the standards and guidelines set are met and products are fully compliant with all requirements that cover baby foods.

Policies on sugar reduction

Ugandan guidelines and standards

Given the wide-scale use of processed foods, there is an urgent need for the government of Uganda to update guidelines on complementary feeding practices, especially now that commercial foods are abundant and often marketed to all age groups. During the review of the national standards, it was noted that only nutrient reference values (NRVs) and NRVs-NCD for the general (adult) population had been developed and provided in the Ugandan standard on nutrition and labelling (Ahaibwe *et al.*, 2021; UNBS, 2014a). Much more needs to be considered, especially for the younger age groups and specifically for processed complementary foods. Consequently, even contextually-appropriate nutrition profile models (NPM) can be developed thereafter. Such NPM could be more context-specific and can be used to objectively and scientifically rank foods based on their nutrient composition for reasons related to preventing disease and promoting health (WHO, 2015b).

Furthermore, based on the NRV-NCD, minimum standards should be established for foods incorporating all nutritional requirements. The current standards and guidelines make no mention of the minimum amount of added or free sugars except for processed cereals. Thus, there is a need for periodic reviews of national recommendations to determine if food products are in line with regional and international recommendations (Theurich *et al.*, 2022).

Ugandan guidelines should review all infant and child-related guidelines to ensure uniformity and that all standards promote the same practices. For example, processed cereals discourage the use of cocoa under nine months, and yet this is not mentioned in other standards like baby milk, where instead, the use of additives is encouraged.

National standards should be made available to the public at no cost or at a minimum, a summary of the important facts that would promote healthy choices. This information can be made available in a simplified form to the public, processing industries and retailing businesses. Currently, all the information in the standards can only be accessed after an online purchase from the Uganda National Bureau of Standards. If, however, they were readily available, the public could become vigilant in the identification of products that are of a poor standard or are uncertified. Furthermore, both locally produced and imported products should be subjected to the same minimum standards without discrimination.

From the present study's findings, it could be implied that retailers', manufacturers' and consumers' awareness of quality and composition guidelines was low, hence the need to raise awareness and protect the IYC population from potentially unsafe and inappropriate foods. Furthermore, a more robust regulatory framework is required to ensure that the commercial baby products found in the Ugandan market are of the required minimum standards with regard to nutrient composition and labelling. An effort should be made to ensure that only certified packaged products are available from both manufacturers and retailers/vendors. The government should consider serious consequences for those that fail to comply. This will help protect the public from poor-quality products.

For subsequent demographic and health surveys, it is important to consider the inclusion of indicators on unhealthy consumption of snacks and beverages (WHO and UNICEF, 2021). Additionally, more urban populations should be sampled to establish the prevalence of NCDs, including overweight and obesity. This may also reveal the extent to which sugar contributes to unhealthy diets, a fact currently poorly recognised (Ahaibwe *et al.*, 2021).

Policies on sugar and ultra-processed foods and beverages

The government should consider food strategies towards the reduction in the *sweetness* of foods that covers flavourings and non-nutritive sweeteners, and not just the *sugar content* (Deliza, Lima and Ares, 2021), and aim towards keeping the sugar intake low (Sheiham and James,

2014a). Currently, the latest infant and young child nutrition guideline **(**Guidelines on Maternal, Infant, Young Child and Adolescent Nutrition, Ministry of Health, Uganda, 2021, p27) has a few statements on sugar consumption (Uganda MoH, 2021), for example:

> *Appropriate complementary foods (locally available) should be nutrient-rich with adequate energy, vitamins, and minerals and without excess fats, salt, and sugar*

Furthermore, it provides a specific guideline:

> *Counsel caregivers to avoid giving drinks and foods high in sugar, salt and fat (e.g. fast foods, sugar-sweetened beverages).*

This single statement in the guideline is sorely lacking in guidance, for example, foods and beverages on the market and more detail on the recommended thresholds. In addition, in the three national standards that cover CACF (FAO and WHO, 1981b; UNBS, 2006;2021), only one mentioned added sugar limits. The standard that covers processed cereals approves the addition of nutritive sweeteners with limits of 15% for fructose and 30% for other sugars as a total contribution to energy for those where milk is to be added. It further recommends 20% for fructose and 10% for other sugars for those with high protein content (UNBS, 2021). No reference to the total "added sugar" is made, which leaves these recommendations ambiguous, but more importantly, way above the WHO recommendation that limits of 10% of total energy contribution from free sugars (WHO, 2015a). Therefore, the document should expound these guidelines to include more detail on processed foods and how to avoid sugar consumption in this age group in order for them to be more meaningful.

The current definition of non-alcoholic beverages is also exclusive to soft drinks (fizzy and carbonated drinks) (Ahaibwe *et al.*, 2021). This was derived for defining those that qualify to have an increased excise duty levied. However, it should be more inclusive and well-defined to include all sugar-sweetened beverages, including fruit and vegetable juices, locally manufactured or imported, and from the present study findings, sweetened yoghurt. If the definition remains unchanged, it leaves room for several unhealthy beverages, many of which will be cheaper, to be promoted and marketed to the unsuspecting public. Therefore, rather than a reference to "non-alcoholic sugar beverages", a comprehensive list should be provided to include even those that might be considered "healthy" from their nutrient content.

The fiscal policy on soft drinks should be extended to cover all sugar-sweetened beverages. Researchers, health professionals, nutritionists and health technocrats need to engage other political offices and the Finance Ministry to increase the taxes on sugar-sweetened beverages further. The current tax of 12% is way below the international recommendations of 20% excise duty (Ahaibwe *et al.*, 2021; WHO, 2016b) due to soft drink corporation conflicts (Ahaibwe *et al.*, 2021). The government needs to embrace this action as a fiscal tax rather than one of income generation through multi-sectoral engagements where public health advocates highlight the common risks of poor diets and the benefits of the taxes of at least 20% in terms of decreasing the demand side of the market. These interventions have been reported to be successful in curbing NR-NCDs in terms of reducing consumption, sales and purchases. Several middle-income countries reported a reduction in overweight and obesity rates (Itria *et al.*, 2021).

Labelling practices

Many countries, even the LIC, have embraced the international recommendations on exclusive breastfeeding for six months. Countries that export products globally should take this into consideration, and if their regulations are not universally acceptable, then these products should not be exported to jurisdictions that do not subscribe to European regulations. Otherwise, it would be more prudent and legally binding to adopt the latest international guidelines, such as the WHO European regional guidelines (WHO, 2019b) and replace any guidelines that create regional and global confusion.

Uganda's regulation bodies need to be strict when inspecting imports to ensure that they do not contravene local guidelines. The relevant stakeholders should also ensure that memoranda are established with exporting countries to ensure their exporting corporations abide by international and national recommendations.

In the present study, while reviewing standards, it was noted that only one standard on processed cereals for IYC (UNBS, 2021) included the six-month age recommendation. Therefore, efforts should be made to update the IYCF-related standards. Furthermore, to operationalise these standards, Ugandan guidelines should explicitly include all messages considered supportive for optimal nutrition, including those on exclusive breastfeeding and complementing using other home-prepared foods as enunciated in international recommendations (Quinn *et al.*, 2010b).

A very important message regarding CACF products should be the emphasis that such foods are not adequate for the infant child and need to be complemented with energy-dense foods like local foods. This will protect the IYC population from overconsumption of CACF, some of which are nutrient-poor.

The Standards and nutrition expert bodies should advise on other suitable messages to be included. For example, for fortified cereals without added sugar, experts need to consider the amount of sugar that can be added to prepared porridge without excessive stimulation of the sweet taste and compromising dental health. For example, the taste could be simulated to get as close as that of breastmilk or even lower, and this can be widely promoted in public health circles. This would be important in early childhood since sensitivity to taste keeps adjusting to lower concentrations, which neuroscientists have referred to as "hedonic sensitivity" to sugar reduction (Deliza, Lima and Ares, 2021).

Additionally, there is a need to harmonise the nutrition labelling of fortified foods, many of which are CACF. Thus, clear guidelines on whether they are to be considered as fortified foods only or as fortified CACF and, therefore, should adhere to the CACF guidelines. The present study found that locally produced fortified cereals had poor label practices, with several failing to comply with key requirements (p.81). As current guidelines are reviewed, they should avoid ambiguous statements and highlight potentially confusing practices that should be discouraged from being included on labels. In addition, any products that are considered of no nutritional value for IYC, especially ultra-processed foods and beverages, should clearly display this message, just like the minimum age recommendations. Besides that, there needs to be extra vigilance when inspecting these labels before products are certified for IYC.

Front-of-pack labelling is a food label policy that has proven helpful in controlling the amount of added sugar in packaged foods. This should be explored, and any cultural and contextually appropriate modifications made to check manufacturers and the information should be provided to consumers for them to make healthier choices (Billich *et al.*, 2018; Croker *et al.*, 2020). The same principles and strategies adopted for tobacco control in the country, of providing graphic warnings on the front and wider advocacy from different interest groups and civil society, can also be explored for sugar reduction (Billich *et al.*, 2018).

Marketing practices

Marketing of ultra-processed products that children commonly consume should be regulated. For example, label claims, including health and nutrition claims, should be strictly regulated as indicated in the nutrition guidelines (UNBS, 2014b). Other forms of marketing like accessing spaces that young children frequent, should be prohibited, for example, near daycare centres and children's health facilities. Additionally, graphics, including images of "healthy" babies and cartoons, should be regulated and discouraged for all foods that are unsuitable for IYC consumption. Other common practices that should be prohibited are using child actors in television advertising sugar-sweetened beverages and banning these adverts during show times of children's programmes.

In conclusion, due to the widespread use of processed foods during the complementary feeding period, there is an urgent need to address the gaps identified in the present study research so that the slow but sure emergence of NR-NCDs in early childhood is combated. Uganda should adopt evidence-informed policies to control inappropriate promotion and consumption of nutrient-poor and ultra-processed foods. Many such policies have been developed in countries with similar challenges. If Uganda is not able to invest extensively in research, then identifying what is not addressed for the country's context should be the first step. Thus, international guidelines would need to be assessed to determine how they can be adopted or modified for the local context. Other guidelines that have already been adopted require ongoing vigilance in regulation and monitoring to check whether manufacturers are being compliant.

Furthermore, there is a need for population-wide strategies to sensitise the general population to the health effects of poor dietary choices, especially in early childhood. Nutrition education on complementary feeding in general, and specifically on processed foods, and the choice of appropriate commercial foods for consumption in early childhood is imperative. Uganda needs to acknowledge the nutrition transition and the insidious NR-NCDs in the population. There is a need for ongoing discussions with all role players on healthy environments and the influence of commercial determinants on diets, especially since national borders are open and a variety of foods are now easily available.

Appropriate efforts and strategies should be engaged using multi-sectoral and multi-pronged approaches to fight the increasing demand for "bittersweet" ultra-processed foods and high sugar intake, both common risk factors for NR-NCDs. Strategies that promote healthy

environments like labelling, fiscal taxes, marketing and regulation of commercial baby foods quality need to be promoted. The government needs to guard against the undue influence of transnational corporations and make them accountable for unhealthy behavioural practices. Ultimately, all feasible measures will contribute to protecting and improving both the oral health and general health of IYC, not only in early childhood but ultimately in other health outcomes later in life.

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APPENDICES

APPENDIX 1A: QUESTIONNAIRE USED FOR PILOT STUDY FOR SURVEY ON COMPLEMENTARY FEEDING – ENGLISH VERSION

APPENDIX 6

STUDY QUESTIONNAIRE FOR PILOTING

COMPLEMENTARY FEEEDING PRACTICES AMONG CAREGIVERS OF CHILDREN AGED 6-36 MONTHS ATTENDING SELECTED HEALTH FACILITIES IN KAMPALA

SECTION 1- Identifiers
UNIQUE ID
Location; Health Facility…….. **Department** ……..
Division…… **Place of residence** ……

SECTION 2 -SOCIODEMOGRAPHICS OF CHILD AND CAREGIVER
We want to ask questions that concern your child

1. What is the name of this child? *(Do not record the name, simply ask, and use name throughout the interview)*
2. What is the age of (NAME) in months? *(look up documentation eg immunization card, hospital documents, etc)*
   2b)Was the child's date of birth verified with the health card?) Yes No…….
3. What is (NAME's) sex? *(Take note if observable)*
4. How many children are born with (NAME)? *(emphasize maternal side)*
5. What is (name) birth order? *(emphasize maternal side) (Put number eg 1 for first)*
6. How old are the other children in years? *(Put number of children in the age category that is appropriate?)*
   a. Less than 1 year …….. d. 6-10 years ……...
   b. 1-3 years …….. e. 11 years and older ……...
   c. 4-5 years11 years and older…….... f. Only child ……...

We want to ask you questions about yourself

7. How old were you at your last birthday?
8. What is your relationship with (NAME)? I am….

a) Mother b) Father c)Aunt d)Older sibling d)hired nanny e) other ……(Specify)

(The next questions are relevant if the caregiver is a parent) Questions 9-17 are relevant if caregiver is the mother)

Questions about mother (if deceased go to 18)

9. Marital status 1. Single () 2. Married () 3. Separated/Divorced () 4. Widowed () 5. Cohabiting
10. Age at last birthday …… *(If caregiver not mother)*
11. Religion. 1. Christian ()2. Muslim () 3.Others 'please specify'_____
12. Highest level of education. 1. None 2. Primary not completed 3. Primary completed
    3. Secondary completed 4. Post-secondary but not degree 5. Degree education
13. Occupation 1. Professional/technical/managerial 2. Clerical 3. Sales and services
    4. Skilled manual 5. Unskilled manual 6. Agriculture 7. Stay-home 8. Self-employed/business
    9. Other (specify)…… *(If option 7 go to question 14. The rest go to 15)*
14. Does the father or head of the household provide you with an income?
    1. Yes… 2. No…..*(If No go to 18)*
15. Do you earn/get a regular income? 1. Yes… 2. No, I earn but not regularly (If No go to 18)
16. How regular is it? 1. Daily 2. Weekly 3. Monthly….
17. Please estimate this (daily/weekly/monthly) income. *(Write in numbers UGX. If not comfortable discussing put 999)*

Questions about the father ***(if deceased go to 21)***

18. Is (NAME's) father the head of the household? 1. Yes… 2. No….. *(If No go to18b)*

18b) Who is the head of the household? ……..

19. What is the father's highest level of education?

1. None 2. Primary not completed 3. Primary completed 3. Secondary completed 4. Post-secondary but not degree 5. Degree education 6. Don't know

20. What is the father's occupation 1. Professional/technical/managerial 2. Clerical 3. Sales and services 4. Skilled manual 5. Unskilled manual 6. Agriculture 7. Unemployed 8. Self-employed/business 9. Other (specify)…… 10. Don't know

General questions about family socioeconomic status

21. How many people stay in the same house including (NAME) ? ……..

21b). How many rooms are used for sleeping (bedrooms)?

22. Does any member of the household own land?

1. Yes 2. No 3. I don't know

Indicate the most appropriate responses for each question		
23.What best describes the family home?	24.What is the floor type of the home?	25.What is your main source of lighting?
1. Rented 2. Owned 3. Mortgaged 4. Free (eg work house, for another relative) 5.Other (specify)……	1) Mud 2) Gravel 3) Cement 4) Tiled 5) Other (Specify) ……	1) Kerosene 2) Candle 3) Electricity 4) Solar 5) Others (Specify ……
26.What is your main source of cooking fuel?	27.What is the main source of drinking water used by your household?	28.What kind of toilet facility do members of your household use?
1) Firewood 2) Charcoal 3) Kerosene 4) Gas 5) Electricity 6) other (specify)……	1.Piped into dwelling/compound 2.Piped to neighbour 3.Public tap/standpipe 4.Tube well or borehole 5.Protected well/spring 6.Unprotected wellspring 7.Rainwater 8.Tanker truck/bicycle with jerrycans 9.Bottled water 10.Other (specify)……	1. Flush toilet to piped sewer system 2.Flush toilet to septic tank/latrine 3. Latrine with slab 4. Latrine without slab 5.Bucket/hanging toilet 6.No facility 7.Other (specify)……

SECTION 3

General questions on infant and young child feeding practices

(Questions if respondent is mother or has been with child since birth)

29. Has (NAME) ever been breastfed? 1. Yes 2. No 3. Don't know *(If no, go to 32)*
30. Did (NAME) receive breastmilk yesterday during the day or night?
    1. Yes 2. No 3. Don't know *(If yes, go to 31)*
31. At what age did (NAME) stop breastfeeding? ……*(Specify in months, may use time frame of events. Put 999 if not known)*
32. Have you ever used infant formula to feed (NAME)? 1. Yes 2. No 3. Don't know
33. At what age did you introduce any semi-solid/solid foods to (NAME)? *(Age in months)*
34. Who usually spends the most time with (NAME)? Specify relationship
    a)Mother b)Father c)Aunt d)Older sibling d)hired nanny e) other (specify).....
35. Who most frequently feeds (NAME)?
    a) Mother b)Father c)Aunt d)Older sibling d)hired nanny e) Self f)other (specify).....
36. In your household, who mainly makes decisions on the purchase of food consumed in the household?
    a)Mother b)Father c) Decision as a couple d)Mother and another adult e) Grandmother f)other (specify).....

Questions pertaining to nutrition education source for mothers only

37. Did you attend antenatal clinics when you were pregnant? 1. Yes 2. Sometimes 3. No *If No, go to 38*
37b) How many times did you attend the antenatal clinics when pregnant with (NAME)?
    a)1-2 times b)3-4 times c)More than 4 times
38. Have you ever received nutritional counselling/advice from a health facility? 1. Yes 2. No *(If No, skip to 40)*
39. What areas did this nutrition advice include;
    1. Exclusive breastfeeding till 6 months 1. Yes 2. No 3. I don't know/can't remember
    2. How to prepare foods at home after weaning 1. Yes 2. No 3. I don't know/can't remember
    3. How to use packaged/processed/non-home prepared baby foods 1. Yes 2. No 3. I don't know
    4. Frequency of feeding after weaning the child 1. Yes 2. No 3. I don't know/can't remember
    5. The food groups to give the child 1. Yes 2. No 3. I don't know/can't remember
    6. Food consistency (solid/semi-solid) of baby food 1. Yes 2. No 3. I don't know/can't remember
    7. The amount of sugar to be used in baby food 1. Yes 2. No 3. I don't know/can't remember
    8. The amount of salt to be used in baby food 1. Yes 2. No 3. I don't know/can't remember
40. Where do you obtain information about weaning your child?
    (a) Family members 1. Yes 2. No
    (b) Friends/neighbours 1. Yes 2. No
    (c) Social Media 1. Yes 2. No
    (d) Magazines/ newspapers 1. Yes 2. No
    e) Mass media eg TV/radio 1. Yes 2. No
    f) Others_____Specify
    g) I have never got any information on weaning

SECTION 4:
COMMERCIAL FOOD CONSUMPTION PRACTICES

	QUESTIONS	CHOICES
4.1	DID ***(NAME)*** EAT ANY BISCUITS/COOKIES IN THE LAST WEEK?	1 YES 2 NO 3 CAN'T REMEMBER, If 3 skip question on frequesncy and go to next food item
4.1B	HOW OFTEN? (Read options out loud and check one that applies)	1 Every day 2 Most days (at least 4 days per week) 3 Approximately once a week (less than 4 days but at least once per week) 4 Seldom (less often than once a week) 5 Never
4.2	DID ***(NAME)*** EAT ANY SAVOURY SNACKS (CHIPS, CRISPS, GORILLOS) IN THE LAST WEEK?	1 YES 2 NO 3 CAN'T REMEMBER, If 3 skip question on frequency and go to next food item
4.2B	HOW OFTEN? (Read options out loud and check one that applies)	1 Every day 2 Most days (at least 4 days per week) 3 Approximately once a week (less than 4 days but at least once per week) 4 Seldom (less often than once a week) 5 Never
4.3	DID ***(NAME)*** EAT ANY CAKES/DOUGHNUTS/MANDAZI IN THE LAST WEEK?	1 YES 2 NO 3 CAN'T REMEMBER, If 3 skip question on frequency and go to next food item
4.3B	HOW OFTEN? (Read options out loud and check one that applies)	1 Every day 2 Most days (at least 4 days per week) 3 Approximately once a week (less than 4 days but at least once per week) 4 Seldom (less often than once a week) 5 Never
4.4	DID ***(NAME)*** EAT ANY SWEETS/CANDY/CHOCOLATE IN THE LAST WEEK?	1 YES 2 NO 3 CAN'T REMEMBER, If 3 skip question on frequency and go to next food item
4.4B	HOW OFTEN? (Read options out loud and check one that applies)	1 Every day 2 Most days (at least 4 days per week) 3 Approximately once a week (less than 4 days but at least once per week) 4 Seldom (less often than once a week) 5 Never
4.5	DID ***(NAME)*** EAT ANY BREAKFAST CEREAL IN THE LAST WEEK?	1 YES 2 NO 3 CAN'T REMEMBER, If 3 skip question on frequency and go to next food item
4.5B	HOW OFTEN? (Read options out loud and check one that applies)	1 Every day 2 Most days (at least 4 days per week) 3 Approximately once a week (less than 4 days but at least once per week) 4 Seldom (less often than once a week) 5 Never
4.6	DID ***(NAME)*** DRINK ANY PACKAGED SWEETENED/ FLAVOURED MILK/YOGHURT IN THE LAST WEEK?	1 YES 2 NO 3 CAN'T REMEMBER, If 3 skip question on frequency and go to next food item
4.6B	HOW OFTEN? (Read options out loud and check one that applies)	1 Every day 2 Most days (at least 4 days per week) 3 Approximately once a week (less than 4 days but at least once per week) 4 Seldom (less often than once a week) 5 Never

4.7	DID ***(NAME)*** EAT ANY PACKAGED CHILDREN'S PUREES/DESSERT IN THE LAST WEEK?	1 YES 2 NO 3 CAN'T REMEMBER, If 3 skip question on frequency and go to next food item
4.7B	HOW OFTEN? (Read options out loud and check one that applies)	1 Every day 2 Most days (at least 4 days per week) 3 Approximately once a week (less than 4 days but at least once per week) 4 Seldom (less often than once a week) 5 Never
4.8	DID ***(NAME)*** DRINK ANY PACKAGED CHILDREN'S FRUIT DRINKS IN THE LAST WEEK?	1 YES 2 NO 3 CAN'T REMEMBER, If 3 skip question on frequency and go to next food item
4.8B	HOW OFTEN? (Read options out loud and check one that applies)	1 Every day 2 Most days (at least 4 days per week) 3 Approximately once a week (less than 4 days but at least once per week) 4 Seldom (less often than once a week) 5 Never
4.9	DID ***(NAME)*** DRINK ANY BOTTLED SOFT DRINKS (SODA/RIHAM COLA) IN THE LAST WEEK?	1 YES 2 NO 3 CAN'T REMEMBER, If 3 skip question on frequency and go to next food item
4.9B	HOW OFTEN? (Read options out loud and check one that applies)	1 Every day 2 Most days (at least 4 days per week) 3 Approximately once a week (less than 4 days but at least once per week) 4 Seldom (less often than once a week) 5 Never
4.10	DID ***(NAME)*** EAT/DRINK ANY PACKAGED BABY PORRIDGE (CERELAC,) IN THE LAST WEEK?	1 YES 2 NO 3 CAN'T REMEMBER, If 3 skip question on frequency and go to next food item
4.10B	HOW OFTEN? (Read options out loud and check one that applies)	1 Every day 2 Most days (at least 4 days per week) 3 Approximately once a week (less than 4 days but at least once per week) 4 Seldom (less often than once a week) 5 Never
4.11	DID ***(NAME)*** EAT/DRINK ANY PACKAGED FORTIFIED BABY PORRIDGE (SOYA, NKEJE, RICE, MILLET) IN THE LAST WEEK?	1 YES 2 NO 3 CAN'T REMEMBER, If 3 skip question on frequency and go to next food item
4.11B	HOW OFTEN? (Read options out loud and check one that applies)	1 Every day 2 Most days (at least 4 days per week) 3 Approximately once a week (less than 4 days but at least once per week) 4 Seldom (less often than once a week) 5 Never

If any item was frequently taken, then they will do the last Section 6

SECTION 6
NUTRITION LABEL USE PRACTICES
(For only those that report to use at least one commercial food frequently)

	QUESTION	CHOICES
6.1	Do you look at the label of the baby food you buy?	1. Yes 2. I have never noticed the labels/was not ware 3. No ***If 2 or 3, end the interview***
6.2	Do you read the nutrition information on the labels when you buy baby food?	1. Always 2.Sometimes 3. Never ***If 3, end the interview***
6.3	How often do you choose products with labels that have nutritional information over products without it?	1. Always 2.Sometimes 3. Never
6.4	When shopping for baby food, how important is the nutrition information about the food ingredients to you?	1.Very important 2.A little important 3.not important at all
6.5	Nutrition information is the major factor that determines your choice of baby food.	1. Yes 2.Sometimes 3. No
6.6	I can easily understand the nutrition information and facts (e.g. amount of energy, sugar, protein, etc.) on baby food	1. Always 2.Sometimes 3. Never

THIS MARKS THE END OF THE INTERVIEWD. THANK YOU VERY MUCH FOR YOUR PARTICIPATION!

SECTION 5

Interviewer ID ……..

Caregiver ID ……

24-Hour Recall First Pass

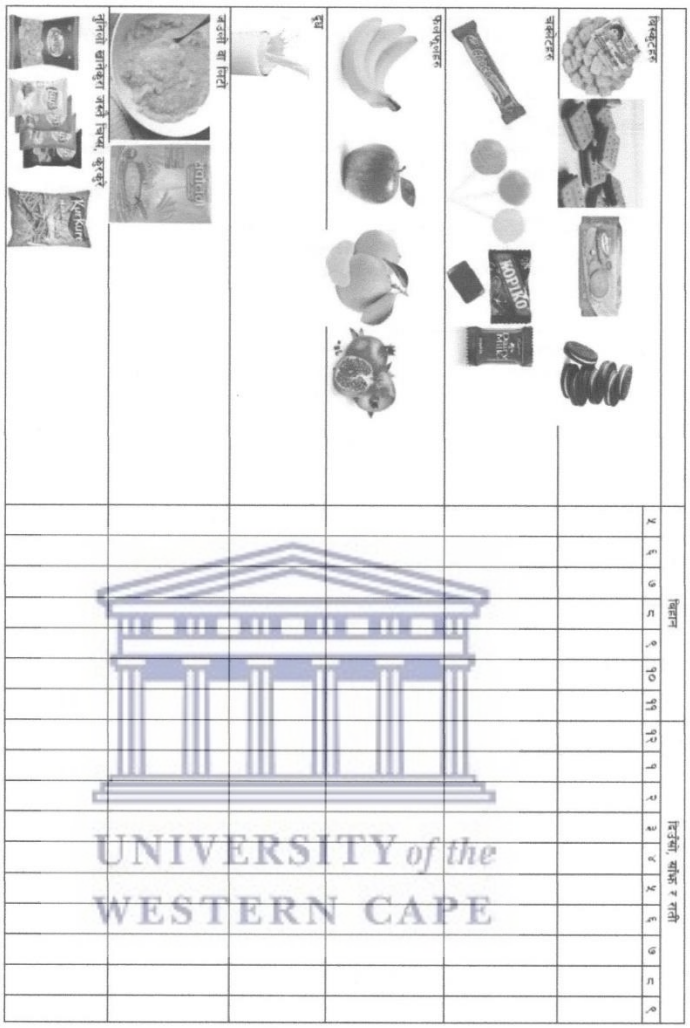
Now I'd like to ask you some questions about the foods and beverages (NAME) consumed yesterday. I would like you to think about everything the child ate or drank, beginning when they first woke up in the morning, then all through the day until they went to sleep in the evening.

	T, ime	Food & Drink
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		

Did the caregiver use the recall aid? YES: [_____] NO: [_____]

If YES, write an 'X' next to the foods that were added because of the recall aid

RECALL AID - PICTORIAL FOOD CHART FOR PILOTING



APPENDIX 1B: QUESTIONNAIRE USED FOR PILOT STUDY FOR SURVEY ON COMPLEMENTARY FEEDING – LUGANDA VERSION

APPENDIX 6B

STUDY QUESTIONNAIRE FOR PILOTING

COMPLEMENTARY FEEEDING PRACTICES AMONG CAREGIVERS OF CHILDREN AGED 6-36 MONTHS IN SELECTED HEALTH FACILITIES IN KAMPALA

SECTION 1- Identifiers
UNIQUE ID
Location; Health Facility…….. **Department** ……..
Division…….. **Place of residence** ……

SECTION 2 -SOCIODEMOGRAPHICS OF CHILD AND CAREGIVER
Tugenda kubuuza ebikwata kumwanawo

1. Omwan onno bamuyita ani? *(Do not record the name, simply ask and use name throughout the interview)*
2. (ERINNYA) alina emy'ezzi emeka? *(look up documentation eg immunization card, hospital documents, etc)*
   2b Was the child's date of birth verified with the health card?) Yes No…….
3. (ERINNYA) mulenzi oba muwala? 1. Mulenzi 2. Muwala *(Take note if observable)*
4. (ERINNYA) azalibwa n'abaana abalala bamekka kuludda lwa maama? *(emphasize maternal side)*
5. (ERINNYA) akwata kiffo ki munzalwa?*(emphasize maternal side) (Put number eg 1 for first)*
6. Baganda be oba banyinna balina emyaka emeka? *(Put number of children in the age category that is appropriate?)*
   a. Wansi w'omwaka gumu
   b. Emyaka 1-3
   c. Emyaka 4-5
   d. Emyaka 6-10
   e. Emyaka 11 oba okusingako
   f. Azalibwa bw'omu

Tugenda kubuuza ebikufaako

7. Walina emyaka emeka bukyanga amazalirana agasembayo?
8. Olina luganda ki ku (ERINNYA)? Nze…
a) Maama b)Taata c)Senga/ maama we omuto d)Mukulu we/Baaba
b) d)Mukozi wewaka e) Ekirala (kimenye) .....

(The next questions are relevant if the caregiver is a parent) Questions 11-16 are relevant if caregiver is the mother)
Ebibuuzo bikwata ku maama wa (ERINNYA) ***(if deceased go to 18)***

9. Marital status 1. Ssi mufumbo () 2. Mufumbo () 3. Yanoba/yayawukana () 4. Namwandu () 5. Abeera n'omwami naye ssi bafumbo
10. Emyaka gy'amaama kumazaliba agasembayo …… *(If caregiver not mother)*
11. Ddiini ki. 1. Mukulisitatayo/mukulisitu ()2. Musiraamu () 3. Ekirala (kituregeeze) ……
12. Okusoma kwatuka wa? 1. Teyasomako 2. Teyamaliriza pulayimale 3. Yamaliliza pulayimale 3. Sekendele 4. Emisomo egisuka sekendele nga si ddiguli 5. Ddiguli
13. Omulimu gwa maama
    1. Mukugu 2. Egya ofiisi 3. Egya kiyunzi 4. Emirimu gy'emikono emitendeke 5. Emirimu ejjitarina butendeke 6. Obulimi 7. Asigala waka 8. Yekozesa/musubuzi 9. Ekirala (kimenye) .....*(If option 7 go to question 14. The rest go to 15)*
14. Taata w'omwana oba omukulu mumaka ganno alina obuyambi bwakuwa?
    1. Yes… 2. No….. *(If No go to 18)*
15. Osasulwa/ofunna sente buli luvanyuma lyebbanga egereke? 1. Ye… 2. Nedda,nfuna naye sibbanga gereke *(If No, go to option 2 go to 18)*
16. Buli ddi? 1. Lunalu 2. Buli wiiki 3. Buli mwezi

17. Ziri sente meka buli luvanyuma lwa(lunaku/weekly/monthly)? *(Write in numbers UGX. If not comfortable discussing put 999)*

Ebibuuzo bikwata ku taata wa (ERINNYA) ***(if deceased or not known go to 21)***

18. Taata wa (ERINNYA) yemukulu wa mmaka? 1. Ye… 2. Nedda….. *(If No go to18b)*

18b) Ani akulira ammaka? ……

19. Taata wa (ERINNYA) yakomya wa emisomo?

1. Teyasomako 2. Teyamaliriza pulayimale 3. Yamaliliza pulayimale
3. Sekendele 4. Emisomo egisuka sekendele nga si ddiguli 5. Ddiguli 6. Simanyi

20. Taata wa (ERINNYA) akola mulimu ki?

1. Mukugu 2. Egya ofiisi 3. Egya kiyunzi 4. Emirimu gy'emikono emitendeke 5. Emirimu ejjitarina butendeke 6. Obulimi 7. Takola 8. Yekozesa/musubuzi 9. Ekirala (kimenye) .....10. Simanyi

General questions about family socioeconomic status

21. Abantu bameka abasula mu nnyumba mwemubeera nga ne (ERINNYA) omugaseeko? ……..

21b). Ennyumba erina ebisenge bimeka ebisulwamu? ……

22. Waliwo mumaka ganno alina ettaka oba poloti?

1. Ye 2. Nedda 3. Simanyi

Londako ekidibwamu kyolaba nga ky'ekisiinga buli kibuuzo w'amanga		
23 Kiki ekisinga okunyonyola enyumba y'amaka?	24. Wansi enyumba erina ki?	25.Awaka mukozesa ttaala ki?
1. Mpangise 2. Yananyini 3. Tusasula banka gyediza 4. Yabwerere (eg yamulimu, yawaluganda) 5.Ekirala (kimenye)……	1) Ttaka 2) Nkokotto 3) Sementi 4) Tayilo 5) Ekirala (kimenye) ……	1) Mafuta 2) Tadooba/musubbawa 3) Masanyalaza 4) Sola 5) Ekirala (kimenye).....
26.Musinga kozesa ki okufumba emmere y'awaka?	27.Musinga kunnywa mazzi gavaawa awaka?	28.Ab'awaka mweyambisa ki?
1) Nku 2) Manda 3) Mafuta 4) Gassi 5) Masanyalaze 6) Ekirala (kimenye)	1.Mazzi ga payipu awaka 2.Mazzi ga payipu kumuliraano 3.Taapu mukitundu yakayoola 4.Nayikonto 5.Oluzzi oluzimbe 6.Oluzzi olutali luzimbe 7.Enkuba 8.Kitanka oba ebidomola kukagaali 9.Amazzi g'ekyupa gebatunda 10. Ekirala (kimenye))……	1. Toyi y'amazzi ngeyiwa kumiddumu 2. Toyi y'amazzi ngeyiwa mukinya 3. Kabuyonyo erina akajjo wansi 4. Kabuyonjo ng'awansi miti 5.Kabuyonjo yekidomola 6.Tewali 7. Ekirala (kimenye).....

SECTION 3

Binno ebibuuzo bikwata kundiisa y'mwana

(Questions if respondent is mother or has been with child since birth)

29. (ERINNYA) yali ayonseeko bukyanga azalibwa? 1. Ye 2. Nedda 3. Simanyi *(If no, go to 32)*
30. (ERINNYA) yayoonseko jjo emisana oba ekiro?
    1. Ye 2. Nedda 3. Simanyi *(If yes, go to 31)*
31. (ERINNYA) yakoma kumyezi emeka okuyonka?... *(Specify in months, may use time frame of events. Put 999 if not known)*
32. Mwali muwadeko (ERINNYA) amata g'abaana agomukebe? 1. Ye 2. Nedda 3. Simanyi
33. (ERINNYA) yatandikira kumyezi emeka okulya emmere ? *(Age in months)*
34. Ani akyasinze okubeera ne (ERINNYA)? Tegeeza oluganda
    a) Maama b)Taata c)Senga/ maama we omuto d)Mukulu we/Baaba d)Mukozi wewaka e) Ekirala (kimenye) .....
35. Ani asinga okuvunaanyizibwa okuliisa (ERINNYA)?
    a) Maama b)Taata c)Senga/ maama we omuto d)Mukulu we/Baaba
    b) d)Mukozi wewaka e) Yeliisa f)Ekirala (kimenye) .....
36. Ani avunanyizibwa okusalawo emmere egulibwa mumakagamwe?
    a) Maama b)Taata c) Maama ne Taata awamu d)Maama n'omukulu omulala mumaka
    e) Jjaja f) Ekirala (kimenye) .....

Binno ebibuuzo bikwata kukusoma kw'okuliisa abaana abato. Ba maama bokka bebaddamu

37. Wagenda mu ddwaliro okunyywa eddagala ng'oli lubuto? 1. Ye 2. Lumunalumu 3. Nedda *If No, go to 38*

37b) Wagenda ng'emirundi emeka ng'oli lubuto lwa (ERINNYA)?
    a)1-2 b)3-4 c)Emirundi ejjisusa ena

38. Wali ofunyeeko okunnyonyola kundiisa y'omwanawo muddwaliro?
    1. Ye 2. Nedda *(If No, skip to 40)*

39. Kunnyonyola kutya kwe wali ofunyeeko muddwaliro okwekuusa ku ndiiisa y'omwana;
    1. Okuyonsa kwoka ng'omwana tanaweza myezi 6 1. Ye 2. Nedda 3. Simanyi/sikyajukira
    2. Engeri y'okuketegekamu/kufumba emmere y'omwana 1. Ye 2. Nedda 3. Simanyi/sikyajukira
    3. Enkozesa y'emmere y'abaana gy'ebatunda 1. Ye 2. Nedda 3. Simanyi/sikyajukira
    4. Emirundi emeka ejjokuliisa omwana omuto 1. Ye 2. Nedda 3. Simanyi/sikyajukira
    5. Ebika byemere eby'okuliisa omwana omuto 1. Ye 2. Nedda 3. Simanyi/sikyajukira
    6. Obunywevu bw'emmere (okukaluba oba obugoonvu obusanidde) ay'omwana omuto
        1. Ye 2. Nedda 3. Simanyi/sikyajukira
    7. Ekipimo ky'asukaali ekisanidde mu by'okunywa by'omwana1. Ye 2. Nedda 3. Simanyi/sikyajukira
    8. Ekipimo ky'omunnyo ekisanidde mu mmere y'omwana 1. Ye 2. Nedda 3. Simanyi/sikyajukira

40. Ottera kujjawa embuulira kundiisa y'omwanawo ngatusiiza ebbanga mwalira emmere?
    (a) Ab'eng'angda 1. Ye 2. Nedda
    (b) Ab'emikwano n'baliriwana 1. Yes 2. No
    (c) Emikutu gya soso mediya 1. Yes 2. No
    (d) Akatabo oba amawulire 1. Yes 2. No
    e) Emikutu emitimbagano nga ladiyo, TV 1. Yes 2. No
    f) Ekirala (kimenye) .....
    g) Siwebwangako/sifunangako mbulirirwa kukuliisa omwana

SECTION 4:
EBIBUUZO EBIKWATA KUNDYA Y'EMMERE ETTUNDIBWA

	EKIBUUZO	LONDAKO
1	(ERINNYA) Y'ALYAKO .BUBISKWITI MU WIIKI EYISSE EMABEGA?	1) YE 2) Nedda 3) Sikyajukira Alonze 3 tobuuza kibuuzo kiddako naye kibuuke obulirize eky'okulya/okunywa ekiddako
1B	EMIRUNDI EMEKA MU WIIKI? (Ssoma awulire alondeko ekimu ekisanidde)	1) Buli lunaku 2) Ennaku ezisinga (eziwera 4 mu wiiki) 3) Nga lumu mu wiiki (teziwera nnaku 4 naye wakiri lumu mu wiiki) 4) Lumu nalumu (wiiki esobola okuwera) 5)Tekibangawo
2	(ERINNYA) Y'ALYAKO OBUMPWAKIMPWAKI (KIPUSI, GOLILO) MU WIIKI EYISSE EMABEGA?	1) YE 2) Nedda 3) Sikyajukira Alonze 3 tobuuza kibuuzo kiddako naye kibuuke obulirize eky'okulya/okunywa ekiddako
2B	EMIRUNDI EMEKA MU WIIKI? (Ssoma awulire alondeko ekimu ekisanidde)	1) Buli lunaku 2) Ennaku ezisinga (eziwera 4 mu wiiki) 3) Nga lumu mu wiiki (teziwera nnaku 4 naye wakiri lumu mu wiiki) 4) Lumu nalumu (wiiki esobola okuwera) 5)Tekibangawo
3	(ERINNYA) Y'ALYAKO KEEKI, BUDADDI, MANDAAZI MU WIIKI EYISSE EMABEGA?	1) YE 2) Nedda 3) Sikyajukira Alonze 3 tobuuza kibuuzo kiddako naye kibuuke obulirize eky'okulya/okunywa ekiddako
3B	EMIRUNDI EMEKA MU WIIKI? (Ssoma awulire alondeko ekimu ekisanidde)	1) Buli lunaku 2) Ennaku ezisinga (eziwera 4 mu wiiki) 3) Nga lumu mu wiiki (teziwera nnaku 4 naye wakiri lumu mu wiiki) 4) Lumu nalumu (wiiki esobola okuwera) 5)Tekibangawo
4	(ERINNYA) Y'ALYAKO SWITI, KYOKOLETI MU WIIKI EYISSE EMABEGA?	1) YE 2) Nedda 3) Sikyajukira Alonze 3 tobuuza kibuuzo kiddako naye kibuuke obulirize eky'okulya/okunywa ekiddako
4B	EMIRUNDI EMEKA MU WIIKI? (Ssoma awulire alondeko ekimu ekisanidde)	1) Buli lunaku 2) Ennaku ezisinga (eziwera 4 mu wiiki) 3) Nga lumu mu wiiki (teziwera nnaku 4 naye wakiri lumu mu wiiki) 4) Lumu nalumu (wiiki esobola okuwera) 5)Tekibangawo
5	(ERINNYA) Y'ALYAKO EMPEKE ZEBATEEKA MUMATA NGA KONIFULEKISI MU WIIKI EYISSE EMABEGA?	1) YE 2) Nedda 3) Sikyajukira Alonze 3 tobuuza kibuuzo kiddako naye kibuuke obulirize eky'okulya/okunywa ekiddako
5B	EMIRUNDI EMEKA MU WIIKI? (Ssoma awulire alondeko ekimu ekisanidde)	1) Buli lunaku 2) Ennaku ezisinga (eziwera 4 mu wiiki) 3) Nga lumu mu wiiki (teziwera nnaku 4 naye wakiri lumu mu wiiki) 4) Lumu nalumu (wiiki esobola okuwera) 5)Tekibangawo
6	(ERINNYA) Y'ANYWAKO YOGATI/AMATA EBYAPAKITI NGA BIWOMERERA MU WIIKI EYISSE EMABEGA?	1) YE 2) Nedda 3) Sikyajukira Alonze 3 tobuuza kibuuzo kiddako naye kibuuke obulirize eky'okulya/okunywa ekiddako
6B	EMIRUNDI EMEKA MU WIIKI? (Ssoma awulire alondeko ekimu ekisanidde)	1) Buli lunaku 2) Ennaku ezisinga (eziwera 4 mu wiiki)

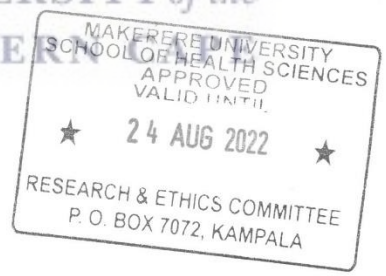
		3) Nga lumu mu wiiki (teziwera nnaku 4 naye wakiri lumu mu wiiki) 4) Lumu nalumu (wiiki esobola okuwera) 5)Tekibangawo
7	(ERINNYA) Y'ALYAKO BUPUDINI BWA PAKITI OBW'ABAZUNGU MU WIIKI EYISSE EMABEGA?	1) YE 2) Nedda 3) Sikyajukira Alonze 3 tobuuza kibuuzo kiddako naye kibuuke obulirize eky'okulya/okunywa ekiddako
7B	EMIRUNDI EMEKA MU WIIKI? (Ssoma awulire alondeko ekimu ekisanidde)	1) Buli lunaku 2) Ennaku ezisinga (eziwera 4 mu wiiki) 3) Nga lumu mu wiiki (teziwera nnaku 4 naye wakiri lumu mu wiiki) 4) Lumu nalumu (wiiki esobola okuwera) 5)Tekibangawo
8	(ERINNYA) Y'ANYWAKO JUUSI W'ABAANA OWA PAKITI OBA ECCUPA MU WIIKI EYISSE EMABEGA?	1) YE 2) Nedda 3) Sikyajukira Alonze 3 tobuuza kibuuzo kiddako naye kibuuke obulirize eky'okulya/okunywa ekiddako
8B	EMIRUNDI EMEKA MU WIIKI? (Ssoma awulire alondeko ekimu ekisanidde)	1) Buli lunaku 2) Ennaku ezisinga (eziwera 4 mu wiiki) 3) Nga lumu mu wiiki (teziwera nnaku 4 naye wakiri lumu mu wiiki) 4) Lumu nalumu (wiiki esobola okuwera) 5)Tekibangawo
9	(ERINNYA) Y'ANYWAKO SOODA OBA OBW'OKUNYWA OBUSAALA MU WIIKI EYISSE EMABEGA?	1) YE 2) Nedda 3) Sikyajukira Alonze 3 tobuuza kibuuzo kiddako naye kibuuke obulirize eky'okulya/okunywa ekiddako
9B	EMIRUNDI EMEKA MU WIIKI? (Ssoma awulire alondeko ekimu ekisanidde)	1) Buli lunaku 2) Ennaku ezisinga (eziwera 4 mu wiiki) 3) Nga lumu mu wiiki (teziwera nnaku 4 naye wakiri lumu mu wiiki) 4) Lumu nalumu (wiiki esobola okuwera) 5)Tekibangawo
10	(ERINNYA) Y'ALYAKO OBUUGI BW'ABAZUNGU (SELELAAKA) MU WIIKI EYISSE EMABEGA?	1) YE 2) Nedda 3) Sikyajukira Alonze 3 tobuuza kibuuzo kiddako naye kibuuke obulirize eky'okulya/okunywa ekiddako
10B	EMIRUNDI EMEKA MU WIIKI? (Ssoma awulire alondeko ekimu ekisanidde)	1) Buli lunaku 2) Ennaku ezisinga (eziwera 4 mu wiiki) 3) Nga lumu mu wiiki (teziwera nnaku 4 naye wakiri lumu mu wiiki) 4) Lumu nalumu (wiiki esobola okuwera) 5)Tekibangawo
11	(ERINNYA) Y'ANYWAKO/Y'ALYAKO OBUUGI OBUTUNDIBWA NGA BATABIKAMU SOYA, ENKEJJE MU WIIKI EYISSE EMABEGA?	1) YE 2) Nedda 3) Sikyajukira Alonze 3 tobuuza kibuuzo kiddako naye kibuuke obulirize eky'okulya/okunywa ekiddako
11B	EMIRUNDI EMEKA MU WIIKI? (Ssoma awulire alondeko ekimu ekisanidde)	1) Buli lunaku 2) Ennaku ezisinga (eziwera 4 mu wiiki) 3) Nga lumu mu wiiki (teziwera nnaku 4 naye wakiri lumu mu wiiki) 4) Lumu nalumu (wiiki esobola okuwera) 5)Tekibangawo

If any item was frequently taken, then should respond to the last Section 6

SECTION 6
EBIBUUZO EBIKWATA KUNSOMA Y'EBIWANDIIKO BY'EMMERE ETTUNDIBWA
(For only those that report to use at least one commercial food frequently)

	EKIBUUZO	EKY'OKULONDAKO
6.1	Otunulaku kiwandiiko ekibeera kummere y'abaana abato gy'ogula?	1. Ye 2. Sikirabangako/mbadde simanyi kibaako 3. Nedda ***If 2 or 3, end the interview***
6.2	Osoma kukiwandiiko ekibeera kummere y'abaana abato nga tonagigula?	1. Buli kaseera 2. Lumu na lumu 3. Sikikolangako ***If 3, end the interview***
6.3	Mirundi emeka gy'osalawo ogula emmere y'omwana ng'erina ekiwandiiko noleka etalina kiwandiiko?	1. Buli kaseera 2. Lumu na lumu 3. Sikikolangako
6.4	Bw'obanga onoonya emmere y'omwana ey'okugula makulu ki ggosa kukusoma n'okutegeera ebirungo ebiri mu mmere?	1. Kikulu nnyo 2. Bwekityo 3. Sikitwala nga kikulu
6.5	Ekiwandiiko ekinyonyola ebirungo ky'esingira ddala okusa esira ng'asinasalawo emmere y'omwana ey'okugula	1. Ye 2. Olumu 3. Nedda
6.6	Ekiwandiiko ekibeera kummere y'abaana nkitegeera bulungi by'ekinyonyola (nga.obungi bw'empapiro,sukaali, emmere ezimba omubiri, nebirala.)	1. Buli kaseera 2. Lumu na lumu 3. Nedda, sibitegeera

EBIBUUZO BIKOMWEWANO. WEBALE NNYO KWETABA MUKUNOONYEREZA KUNNO!



SECTION 5

Interviewer ID ……..

Caregiver ID ……

24-Hour Recall First Pass

Kakati twagala otutegeeza eby'okulya n'okunnywa byonna (ERINNYA) byeyalidde n'annywa jjo lwonna okuva kumakya ng'azuukuse okutuusa ng'agenda okwebaka ekiro.

	Essaawa	Emmere n'eky'okunnywa
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		

Did the caregiver use the recall aid? YES: [_____] NO: [_____]

If YES, write an 'X' next to the foods that were added because of the recall aid.

APPENDIX 2: UWC BMREC ETHICS APPROVAL

UNIVERSITY of the WESTERN CAPE

60 YEARS of hope, action & knowledge

10 June 2021

Dr C Mwesigwa
Community Oral Health
Faculty of Dentistry

Ethics Reference Number: BM21/3/16

Project Title: Commercial Baby Food: Sugar Content, Consumption and Marketing Practices in Uganda and South Africa.

Approval Period: 08 June 2021 – 08 June 2024

I hereby certify that the Biomedical Science Research Ethics Committee of the University of the Western Cape approved the scientific methodology and ethics of the above mentioned research project.

Any amendments, extension or other modifications to the protocol must be submitted to the Ethics Committee for approval.

Please remember to submit a progress report annually by 30 November for the duration of the project.

Permission to conduct the study must be submitted to BMREC for record-keeping.

The Committee must be informed of any serious adverse event and/or termination of the study.

Ms Patricia Josias
Research Ethics Committee Officer
University of the Western Cape

Director: Research Development
University of the Western Cape
Private Bag X 17
Bellville 7535
Republic of South Africa
Tel: +27 21 959 4111
Email: research-ethics@uwc.ac.za

NHREC Registration Number: BMREC-130416-050

FROM HOPE TO ACTION THROUGH KNOWLEDGE.

APPENDIX 3: MAKERERE REC ETHICS APPROVAL

MAKERERE UNIVERSITY
P.O. Box 7072 Kampala, Uganda
E-mail: healthsciences.irb@gmail.com
deanshs@chs.mak.ac.ug
Tel: 256 0200903785
Tel: 256 414 531533
Fax: 256 414 531533

COLLEGE OF HEALTH SCIENCES
SCHOOL OF HEALTH SCIENCES
OFFICE OF THE DEAN

24/08/2021

To: Catherine Mwesigwa

0772611035

Type: Initial Review

Re: MAKSHSREC-2021-138: Commercial Baby Food Consumption and Complementary Feeding Practices in Kampala, 2, 2021-08-12

I am pleased to inform you that at the 88th convened meeting on 13/07/2021, the Makerere University School of Health Sciences REC, committee meeting, etc voted to approve the above referenced application.
Approval of the research is for the period of 24/08/2021 to 24/08/2022.

As Principal Investigator of the research, you are responsible for fulfilling the following requirements of approval:

1. All co-investigators must be kept informed of the status of the research.
2. Changes, amendments, and addenda to the protocol or the consent form must be submitted to the REC for re-review and approval prior to the initiation of the changes.
3. Reports of unanticipated problems involving risks to participants or any new information which could change the risk benefit ratio must be submitted to the REC.
4. Only approved consent forms are to be used in the enrollment of participants. All consent forms signed by participants and/or witnesses should be retained on file. The REC may conduct audits of all study records, and consent documentation may be part of such audits.
5. Continuing review application must be submitted to the REC eight weeks prior to the expiration date of **24/08/2022** in order to continue the study beyond the approved period. Failure to submit a continuing review application in a timely fashion may result in suspension or termination of the study.
6. The REC application number assigned to the research should be cited in any correspondence with the REC of record.
7. You are required to register the research protocol with the Uganda National Council for Science and Technology (UNCST) for final clearance to undertake the study in Uganda.

The following is the list of all documents approved in this application by Makerere University School of Health Sciences REC:

No.	Document Title	Language	Version Number	Version Date
1	Data collection tools	Luganda	1	2021-08-12
2	Data collection tools	English	1	2021-08-12
3	Informed Consent forms	Luganda	2	2021-08-12
4	Informed Consent forms	English	1	2021-08-12
5	Protocol	English	2	2021-08-12
6	COVID RISK MANAGEMENT PLAN	English	1	2021-06-24

Yours Sincerely

Kalidi Rajab
For: Makerere University School of Health Sciences, REC

MAKERERE UNIVERSITY
SCHOOL OF HEALTH SCIENCES
APPROVED
VALID UNTIL
24 AUG 2022
RESEARCH & ETHICS COMMITTEE
P. O. BOX 7072, KAMPALA

APPENDIX 4: NATIONAL ETHICS APPROVAL

Uganda National Council for Science and Technology

(Established by Act of Parliament of the Republic of Uganda)

Our Ref: HS1784ES **2 December 2021**

Catherine Mwesigwa
Department of Dentistry, Makerere University
Kampala

Re: Research Approval: Commercial Baby Food Consumption and Complementary Feeding Practices in Kampala

I am pleased to inform you that on **02/12/2021**, the Uganda National Council for Science and Technology (UNCST) approved the above referenced research project. The Approval of the research project is for the period of **02/12/2021** to **02/12/2022**.

Your research registration number with the UNCST is **HS1784ES**. Please, cite this number in all your future correspondences with UNCST in respect of the above research project. As the Principal Investigator of the research project, you are responsible for fulfilling the following requirements of approval:

1. Keeping all co-investigators informed of the status of the research.
2. Submitting all changes, amendments, and addenda to the research protocol or the consent form (where applicable) to the designated Research Ethics Committee (REC) or Lead Agency for re-review and approval **prior** to the activation of the changes. UNCST must be notified of the approved changes within five working days.
3. For clinical trials, all serious adverse events must be reported promptly to the designated local REC for review with copies to the National Drug Authority and a notification to the UNCST.
4. Unanticipated problems involving risks to research participants or other must be reported promptly to the UNCST. New information that becomes available which could change the risk/benefit ratio must be submitted promptly for UNCST notification after review by the REC.
5. Only approved study procedures are to be implemented. The UNCST may conduct impromptu audits of all study records.
6. An annual progress report and approval letter of continuation from the REC must be submitted electronically to UNCST. Failure to do so may result in termination of the research project.

Please note that this approval includes all study related tools submitted as part of the application as shown below:

No.	Document Title	Language	Version Number	Version Date
1	Informed Consent forms	Luganda	2	12 August 2021
2	Data collection tools	Luganda	1	12 August 2021
3	Informed consent form	English	2	12 August 2021
4	Informed consent form	English	1	12 August 2021
5	Informed consent form	Luganda	1	12 August 2021
6	Informed consent form	Luganda	2	12 August 2021
7	Project Proposal	English	2	
8	Approval Letter	English		
9	Administrative Clearance	English		

Yours sincerely,

Hellen Opolot
For: Executive Secretary
UGANDA NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY

LOCATION/CORRESPONDENCE

Plot 6 Kimera Road, Ntinda
P.O. Box 6884
KAMPALA, UGANDA

COMMUNICATION

TEL: (256) 414 705500
FAX: (256) 414 234579
EMAIL: info@uncst.go.ug
WEBSITE: http://www.uncst.go.ug

APPENDIX 5A: INFORMED CONSENT FORM FOR SURVEY – ENGLISH VERSION

Appendix 3A: Informed Consent Form for Research Participants (Caregivers of Children aged 6-36 Months)

Title: Commercial baby food consumption and complementary feeding practices in Kampala

Investigator:
Dr. Catherine Lutalo Mwesigwa
Department of Dentistry
College of Health Sciences, Makerere University
P.O. Box 7072, Kampala-Uganda
Kampala, Uganda
0788478562,
E-mail address: drcathymwesigwa@gmail.com

Study sponsor
This study is sponsored by bursary provided by Prof Naidoo Sudeshni, an Emeritus professor at the University of the Western Cape, as part of a bigger project titled **"Commercial Baby Food: Sugar Content, Consumption and Marketing Practices in Uganda and South Africa".**

Background and rationale for the study:
This is a research project being conducted by Dr Catherine Mwesigwa, a Ugandan PhD student at University of the Western Cape in South Africa. We are inviting you to participate in this research project because you meet the set criterion for the population of interest and your participation will help other people in your community and the country as a whole.

Purpose:

The purpose of this research project is to determine the level of consumption of commercial baby food among infants or young children aged 6-36 months and family-related factors in an urban/peri-urban Ugandan setting. We intend to find out your practices of feeding your baby or child (those under your care) during the period after weaning and thereafter. We hope that you will explain the reasons for your choice of feeding the baby foods in case you buy any of these if you look at the labels and consider the information given.

We intend to establish if commercial baby foods should be a concern in the Ugandan urban population so that the necessary steps are taken to inform the concerned people like parents, but also encourage the entities like government and health workers to address such challenges.

Procedures:
You will be asked to sign a consent form agreeing to take part in the study. A member of our research team will ask you questions and he/she will note your responses.This interview should not take more than 30-40 minutes for us to complete. Before we start, we will seek permission from any concerned person as well, for example a parent whenever it is deemed necessary.

Who will participate in the study and where the study is going to be conducted from?

Caregivers of babies and young children aged 6-36 months attending selected health facilities within Kampala will be invited to participate in the present study to provide information about the consumption of commercial baby foods. The interviews will be carried out at the health facility where we will find you.

Risks/Discomforts:
Your participation in this study means that you take time off your planned schedule which would be an inconvenience to you and the child. Additionally, there could be questions in this interview that you are uncomfortable responding to. Please feel free to let the interviewer know if such question is asked and you are not obliged to answer all questions.

Benefits of the research study:
There might be no direct benefit to you as a participant. We hope that your participation will provide insight from which other people who will get information or any interventions as a result of the study findings concerning healthy infant feeding practices will directly benefit.

Cost:
You will not spend any money by taking part in this study.

Compensation for participation in the study:
You will be compensated UGX 10000 for your time.

Reimbursement:
Any costs that you might incur like phone calls made to the study team will be re-imbursed.

MAKERERE UNIVERSITY SCHOOL OF HEALTH SCIENCES APPROVED VALID... 24 AUG 2022 RESEARCH & ETHICS COMMITTEE P. O. BOX 7072, KAMPALA

Questions about the study:
In case of any questions, please direct them to the lead researcher, Dr Catherine Mwesigwa on 0703007029 or 0788478562, or email: drcathymwesigwa@gmail.com.

Questions about participants rights:
If you have questions about your rights as a participant in this study, please direct them to the acting Chairperson, School of Health Sciences Institutional Review Board (MakSHS-IRB)

Dr. Kalidi Rajab on telephone number +256 776798978 or +256 0200903786).

Dissemination of study feedback or study findings and progress of the study
The findings of this study will be circulated to the study participants via reports which will be done using the mode of your preference. For example, email or WhatsApp. If necessary, we shall also use other mass media like newspapers, social media, and television.

Statement of voluntariness:
Your participation in this research is completely voluntary. You may choose not to take part at all. If you decide to participate, you have the right to withdraw at any time or only answer selected questions. If you decide not to participate in this study or if you stop participating at any time, you will not be penalised in any way.

Approval of the research study

NOTE: Do not sign this consent form if it does not have an IRB approval stamp, or if the date has lapsed

This study has been approved by Makerere University School of Health Sciences Research and Ethics Committee /IRB) which is an accredited Ugandan based Research and Ethics Committee/IRB.

Confidentiality:

The information that will be collected will be kept anonymous and confidential in accordance with the international and local ethical standards governing research involving humans as research participants. Your identity will be concealed and your name will not appear anywhere on the coded forms with the information. The study team will be the only one with the authority to access the collected data. However, the School of Health Sciences Research and Ethics Committee and the Uganda National Council for Science and Technology (UNSCT) may have access to private information that identifies the research participants by name where applicable. The filled questionnaire or any other filled data collection form will be kept under strict lock and key, and information on computers will be kept confidential with password protection respectively. For any further questions, you may contact the Chairperson of the School of Health Sciences Research and Ethics Committee (MakSHSREC) on (+256) 772-404970 / (+256) 0200903786 or Uganda National Council of Sciences and Technology on Tel: (+256)-041-4705500).

STATEMENT OF CONSENT

..... has described to me what is going to be done, the risks, the benefits involved and my rights regarding this study. I have been informed about the study in which I am voluntarily agreeing to take part. In the use of this information, my identity will be concealed. I am aware that I may withdraw at any time. I understand that by signing this form, I do not waive any of my legal rights but merely indicate that I have been informed about the research study in which I am voluntarily agreeing to participate. A copy of this form will be provided to me.

Name of research participant……

Age……

Signature/thumbprint ……

Date (DD/MM/YY) ……

Name of Witness ……
(Witness for illiterate and mentally incapacitated or physically handicapped participants who signs with thumbprint)
Signature ……

Date (DD/MM/YY) ……

(If necessary, verbal consent should be obtained when the caregiver is not a legal guardian and documented below)
AND

VERBAL CONSENT OBTAINED (By telephone from the legal guardian) ……

Name of legal guardian……

Phone contact……

Name of the person consenting the research participant: ……

Signature ……

Date (DD/MM/YY) ……

NOTE: Do not sign this consent form if it does not have an IRB approval stamp, or if the date has lapsed

MAKERERE UNIVERSITY
SCHOOL OF HEALTH SCIENCES
APPROVED
VALID
24 AUG 2022
RESEARCH & ETHICS COMMITTEE
P. O. BOX 7072, KAMPALA

APPENDIX 5B: INFORMED CONSENT FORM FOR SURVEY – LUGANDA VERSION

Appendix 3B: Informed Consent Form for Research Participants (Caregivers of Children aged 6-36 Months) -LUGANDA VERSION
Omutwe: Enkozesa y'emmere ettundwa y'abaana abato ne ndiisa yabwe okutwalira awamu mubibuga ebirondedwa mu Kampala

Omunoonyereza:

Dr. Catherine Lutalo Mwesigwa
Department of Dentistry
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Kampala, Uganda
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Atadde sente mu kunoonyereza

Awadeyo sente ez'okunoonyereza kuno ye Pulofessa Naidoo Sudeshni, akolera mu Yunivasite mu Western Cape,e South Africa era okunoonyereza kuno kuli wansi w'okunoonyereza okunene okuyitibwa "Emmere y'abato ettundwa: Obungi bwa sukaali mu yo, enkola mu ngeri gy'eriibwa ne gy'etundibwamu mu Uganda ne mu South Africa.".
Ebitandikirwako ebikwata kukunoonnyereza kuno

Eno pulojekiti ya kubuuliriza okukolebwa Dr.Catherine Mwesigwa omusawo omutendeke assoma ddiguli ey'okusattu (PhD) mu Yunivasite ye Western Cape mu South Africa. Tukutukiridde okukusaba nawe weetabe mukunonyereza kuno kubanga otukaana bulungi ne bisanyizo by'abo abatono mukulaba kwaffe, abasaana okutuwa ebirowoozo, era nga okwetaba kwo mu kunonyereza kuno, kwa kuganyula na balala mu kitundu gy'obeera awamu ne ggwanga lyona okutwalizza awamu.

Ekigendererwa:

Ekigendererwa ky'okunonyerezza kuno, kwekugeerageranya ebigero by'emmere y'abato eribwa abaana abato wakati we myezi mukaaga (6) okutuuka ku myaka essatu (3) mu bibuga n'obubugabuga bwa Uganda, n'ensonga ezekuusa ku amaka ez'enjawulo mwebazaalibwa. Tugenderedde okuzuula by'emuyiseemu ne bwemulowooza kundiisa y'omwana wo (oba abo bolabirira gwe mwenyini) mu kiseera ky'atandika okugyibwa ku bbeere n'ekiseera ekiddirira. Tusubira nti onatutegeeza ensoga ezekuusa ku ky'ogoberera bwobanga otera okugula emmere y'omwana era oba otunulira kubiwandikibwaako, n'ebigyogerako.

Tugenderedde okutunuulira oba nga okutunda emmere y'abaana kyandyetaaze okutunulamu naddala mu banayuganda banakibuga tulyooke tulabe nga ebyetaagisa bikolebwa okumanyisa abakwatibwako ng'abazadde, naye era n'okukubiriza abakwatibwako nga gavumenti n'abakozi bye by'obulamu okunogera ensonga ezo eddagala.

Ebinagobererwa mu kunoonyereza

Ojja kusabibwa okuteeka omukono oba ekinkumu ku bbaluwa nga okaanya ntino okirizza okwetaba mu kunoonyereza. Ojja kubuuzibwa ebibuuzo ebinasomebwa era nga bwetuwandiika by'oddamu. Tusubira nti kinatwala eddakiika ezitasuka makumi assatu kwana (30-40). Bwekiba ky'etagiisa tujja kusooka tufunne olukusa lw'omuntu gw'ekikwatako ng'omuzadde w'omwana.

Baani abanetaba mukunoonyereza nebiffo okunoonyereza gy'ekunaabeera?

Abantu abavunanyizibwa abaana abato abali wakati w'emyezi mukaaga ne mmakumi assatu mumukaaga (6-36) betunasaanga nga bajjanjabirwa mumalwaliro amalondemu mu Kampala. Banno bajjakutuukirirwa basabibwe okwetaba mu kunonyereza kuno era ngabusubirwa okututegeeza ky'ebamanyi ku mmere y'abaana entundibwa oba eri ku katale. Okunoonyereza kuno kujjakolebwa mukiffo abantu gy'ebasangibwa.

Obuzibu oba okunyigirizibwa okwekuusa ku kunoonyereza:

Bw'onetaba mukunoonyereza kuno kijja kulya mubudde bwo era kino kiyinza okukalubiriza oba olyawo n'okalubiriza omwana wo. Oyinza okubuuzibwa ekibuuzo ekitasanyusa. Embeera bwetyo bweba ebaddewo, beera wa ddembe otegeeza akubuuza ebibuuzo era tewewaliriza kuddamu kibuuzo ekiakusanyusa.

Biki ebinaganyurwanga mu kunoonyereza kuno?

Oyinza obutaganyulwa ngagwe ngawetabye mukunoonyereza naye tusubira nti on'otutangaaza mubyetagisa okolebwa oluvanyuma ly'okunoonyereza, okuyamba abantu abalala okutegeera engeri yokuliisamu abaana abato oblungi. Abantu gabo bebanaganyulwamu okutwaliza awamu.

Okusasula:

Tewali sente gy'ojja kusasula okwetaba

mukunoonyereza kuno.

Okuliyirirwa:

Oluvannyuma lw'okumaliriza okuddamu ebibuuzo, ojja kuweebwa akasiimo olw'obudde bwo omuwendo gwe sente ogwa silingi za Uganda mutwalo gumu.

Okuddizibwa sente eziba zikozesebbwa:

Singa wabaawo embeera ekuletera okukozesa sentezo okusobola okwetaba mukunoonyereza kuno, ng'okuba essimu, zijjakudizibwawo.

Ebibuuzo kukunoonyereza kuno:

Ssinga olina ebibuuzo byonna ebyekuusa kununonyereza kuno, osabibwa otuukirire akulira okunoonyereza: Dr Catherine Mwesigwa kussimu 0703007029 oba 0788478562, oba yimeyiro: drcathymwesigwa@gmail.com.

Watya ng'olina ebibuuzo ku ddembe lyabetabye mukunoonyereza?

Bwoba ng'olina kyonna kyewandiyagadde okumyonyola ku ddembelyo nga ggwe eyetabyemu kunoonyereza, tuukirira Ssentebe w'ekitongole ekivunaanyizibwa- School of Health Sciences Institutional Review Board (MakSHS-IRB) Dr. Kalidi Rajab kussimu +256 776798978 oba +256 0200903786.

Ensasaanya kubivudde mu konoonyereza:

Abetaabi mu kunonyereza bajja kugambibwa ebivudde mu kunoonyereza ng'obubaka bwonna obunaba buzuliddwa bujja kubategezebwa mu alipoota n'ebiwandiiko ebyefaninyirizanga ebyo ng'atukozesa omukutu gw'olonze nga yimeyiro, watisappu, ne byempulizinganya nga amawulire, soso mediya ne telefaniya.

Okwetaba okw'ekyeyagalire:

Okwetaba mu kunoonyerezza sikyabuwaze era osobola okuvaamu wakati mu kwetabamu obudde bwona, era okusalawo okuddamu oba obutaddamu kibuuzo kyona awatali kutya buzibu bwona oba ekibonerezo. Teri buzibu ffe bwetulabye obuyinza okukuviramu nga wetabye mu kunoonyerezza kwaffe kuno.

Okukakasibwa kw'okunoonyereza mu Uganda:

Okunoonyereza kuno kwakakasibwa akakiiko akamu buvunanizibwa okukwasa empisa mu kunoonyereza mu Uganda aka Yunivasite ye Makerere, akayitibwa Makerere University School of Health Sciences Research and Ethics Committee /IRB.

Okuuma ekyama

Byonna by'onatugaamba, nga otaddeko nebikukwatako nga ggwe, bijja kukumibwa butiribiri nga byankiso. Erinya lyo etuuffu nabo bonna abanakwatibwako, tebijja kwatulwa mukunoonyereza kwaffe, era n'ebyo byonatugamba binakumibwa nga bikusike mu kompyuta zaffe n'obukugu obwenjawulo. Twongerako ntinno, mu komputa, ttiimu y'abanoonyereza abavunanyizibwa okukung'anya n'okwekeneenya ebivuddemu bebanasobola bokka okulaba kw'ebyo by'onatuwa. Mpozzi bwekiba kyetaagisa, akakiiko akavunanyizibwa okwasa empisa aka Makerere University School of Health Sciences Research and Ethics Committee /IRB kayinze okwetaga okutunulira entambula y'omussomo era n'ekasaba okulaba ebikwata kubeetabi. Singa waliyagadde okwongera okwebuuzako tuukirira: Akulira akakiiko ka School of Health Sciences Research and Ethics Committee (MakSHSREC) ku namma y'essimu (+256) 772-404970 / (+256) 0200903786 oba ekitongole ekivunaanyizibwa okunoonyereza mu gwanga lyonna ekya Uganda National Council of Sciences and Technology ku ssimu (+256)-041-4705500).

OKUKKAANYA KW'OYO EYETABYE MU KUNOONYEREZA

.....antegeezeza byonna ebikwatagana n'okunoonyereza kunno, ebigenda okolebwa, obuvune, okuganyulwa ne ddembe lyange. Ntegezebbwa nti okwetaba mukunoonyereza kunno kwa kyeyagalire era nti n'ebinkwatako byakukumibwa nga bya kyama. Nkimanyi nti wonna wenjagalira nsobola okusalawo obutetaba oba okweyongera mumaaso ngantandiseeko. Nkitegedde nti nga ntadde omukono kukiwandiiko kino mba sejeeko ddembe lyange lyonna ery'obwebange naye ndaga nti ntegeezebbwa ebikwata kukunoonyereza kuno era nganzikirizza nga neeyagalidde okukwetabamu. Kkopi ye kiwandiiko kino enempebwako.

Totekkako mukono kukiwandiiko kino bwe kiba nga terina stampu ya IRB ekirizibwa, oba olunaku bweluba lwayitako

MAKERERE UNIVERSITY
SCHOOL OF HEALTH SCIENCES
APPROVED
VALID
24 AUG 2022
RESEARCH & ETHICS COMMITTEE
P. O. BOX 7072, KAMPALA

Eyetabye mu kunoonyereza: ……

Emyaka……

Omukonogwe /ekinkumu……

Ennaku z'omwezi leero (Elonaku/omwezi/omwaka)……

Erinnya ly'omujulizi ……

(Witness for illiterate and mentally incapacitated or physically handicapped participants who signs with thumbprint)

Signature ……

Ennaku z'omwezi leero (Elonaku/omwezi/omwaka)……

(Bwekiba kyetaagisa okufuna olukusa olulala okuva ew'omuzadde oba omukuza w'omwana ekiwandiiko kikirage wamanga)

NE

VERBAL CONSENT OBTAINED (Akassimu eri omuzadde oba omukuza) ……

Erinnya ly'omuzadde oba omukuza ……

Essimu……

Erinnya lya akakasa eyetabye mukunoonyereza……

Omukono…… ……

Ennaku z'omwezi leero (Elonaku/omwezi/omwaka)……

Totekkako mukono kukiwandiiko kino bwe kiba nga terina stampu ya IRB ekirizibwa, oba olunaku bweluba lwayitako

APPENDIX 6. LIST OF BABY FOODS FOR STUDY 2

UID	PRODUCT/BRAND NAME	MANUFACTURER	EXTRA NAME/FLAV	COUNTRY OF MANU	DESCRIPTIVE NAME	WEIGHT (GRAMS)	TYPE OF PACKAGI	STORE WHERE IT V
1	COCOA PUFFS	GENERAL MILLS		USA	BREAKFAST CEREAL	249G	BOX	GARDEN CITY SMK
2	RICE KRISPIES	KELLOGGS		UNITED EMIRATES	BREAKFAST CEREAL	375G	BOX	CAPITAL SHOPPER
3	STRAWBERRY FILLS	KWALITY		INDIA	BREAKFAST CEREAL	250G	BOX	CARREFOUR
4	CHOCO POPS	TEMMYS		EGYPT	BREAKFAST CEREAL	250G	BOX	CAPITAL SHOPPER
5	CORNFLAKES	GOLDEN COUNTRY		ITALY	BREAKFAST CEREAL	500G	BOX	GARDEN CITY SMK
6	MARSHMALLOW FRUIT PEBBLES	POST		USA	BREAKFAST CEREAL	311G	BOX	GARDEN CITY SMK
7	FRUIT RINGS	TEMMYS		EGYPT	BREAKFAST CEREAL	250G	BOX	CAPITAL SHOPPER
8	LUCKY CHARMS	GENERAL MILLS		USA	BREAKFAST CEREAL	652G	BOX	CARREFOUR
9	BERRY COLOSSAL CRUNCH	MALT-O-MEAL		USA	BREAKFAST CEREAL	283G	PLASTIC BAG	CARREFOUR
10	CERELAC	NESTLE	MIXED FRUITS & WH	UNITED EMIRATES	INSTANT PORRIDGE	400G	TIN	CAPITAL SHOPPER
11	CERELAC	NESTLE	WHEAT & FRUITS	UNITED EMIRATES	INSTANT PORRIDGE	400G	TIN	CAPITAL SHOPPER
12	MAGANJO TOTO	MAGANJO GRAIN MILLERS	SOYA & WHEAT MII	UGANDA	INSTANT PORRIDGE	500G	TIN	CAPITAL SHOPPER
13	MAGANJO TOTO	MAGANJO GRAIN MILLERS	BRAIN BOOSTER	UGANDA	INSTANT PORRIDGE	500G	TIN	CAPITAL SHOPPER
14	CERELAC	NESTLE	RICE	UNITED EMIRATES	INSTANT PORRIDGE	400G	TIN	CAPITAL SHOPPER
15	LAIT-RIZ-FRUITS	FRANCE LAIT		FRANCE	INSTANT PORRIDGE	250G	BOX	CAPITAL SHOPPER
16	NUTRI GROW	COW&GATES		SOUTH AFRICA	INSTANT PORRIDGE	200G	BOX	CAPITAL SHOPPER
17	TOTS	FUTURELIFE		SOUTH AFRICA	INSTANT PORRIDGE	250G	BOX	CAPITAL SHOPPER
18	LAITE-BLE-BISCUITE	FRANCE LAIT		FRANCE	INSTANT PORRIDGE	250G	BOX	CAPITAL SHOPPER
19	LAIT-RIZ-MIEL	FRANCE LAIT		FRANCE	INSTANT PORRIDGE	250G	BOX	CAPITAL SHOPPER
20	NUTRI GROW	COW&GATES		SOUTH AFRICA	INSTANT PORRIDGE	200G	BOX	CAPITAL SHOPPER
21	BABY SOYA	MAGANJO		UGANDA	INSTANT PORRIDGE	500G	BOX	STANDARD SUPER
22	NUTRI GROW	COW&GATES		SOUTH AFRICA	INSTANT PORRIDGE	200G	BOX	STANDARD SUPER
23	NOOTRI QWIK	AFRICA IMPROVED FOOD		RWANDA	LOCAL PORRIDGE	1KG	PLASTIC BAG	STANDARD SUPER
24	IRISH BABY PORRIDGE	ANKOLE BASIC FOOD		UGANDA	LOCAL PORRIDGE	1KG	BOX	STANDARD SUPER
25	BABY SOYA RICE	KIRUNGA		UGANDA	LOCAL PORRIDGE	1KG	BOX	STANDARD SUPER
26	BABY SOYA WITH ENKEJJE	MAGANJO		UGANDA	INSTANT PORRIDGE	500G	BOX	STANDARD SUPER
27	BABY SOYA	YELLOW STAR		UGANDA	LOCAL PORRIDGE	500G	BOX	KENJOY
28	SOYA RICE COMPOSITE FLOUE	YELLOW STAR		UGANDA	LOCAL PORRIDGE	1KG	BOX	KENJOY
29	SMILE INSTANT COMP FLOUR	PEAK VALUE		UGANDA	LOCAL PORRIDGE	500G	BOX	KENJOY
30	NEW BABY SOYA	BASIC FOODS		UGANDA	LOCAL PORRIDGE	500G	BOX	KENJOY
31	PORRIDGE	DEMICH FOODS		UGANDA	LOCAL PORRIDGE	1KG	PLASTIC BAG	KENJOY
32	RICE SOYA	NICE		UGANDA	LOCAL PORRIDGE	1KG	PLASTIC BAG	KENJOY
33	NOOTRI FAMILY	AFRICA IMPROVED FOOD		RWANDA	LOCAL PORRIDGE	1KG	PLASTIC BAG	GARDEN CITY SMK
34	PEAR AND BANANA DELIGHT	TIGER CONSUMER BRANDS LTD		SOUTH AFRICA	PUREE	125G	BOTTLE	CARREFOUR
35	APPLE AND BANANA	TIGER CONSUMER BRANDS LTD		SOUTH AFRICA	PUREE	200G	BOTTLE	CARREFOUR
36	PEARS	TIGER CONSUMER BRANDS LTD		SOUTH AFRICA	PUREE	80G	BOTTLE	CARREFOUR
37	SUMMER FRUIT DESSERT	TIGER CONSUMER BRANDS LTD		SOUTH AFRICA	PUREE	250G	BOTTLE	CARREFOUR
38	FOUR FRUITS	TIGER CONSUMER BRANDS LTD		SOUTH AFRICA	PUREE	200G	BOTTLE	CARREFOUR
39	SWEET POTATO,APPLE AND SWEE	TIGER CONSUMER BRANDS LTD		SOUTH AFRICA	PUREE	110G	POUCHE	CARREFOUR
40	VANILLA CUSTARD AND PRUNE	TIGER CONSUMER BRANDS LTD		SOUTH AFRICA	PUREE	110G	POUCHE	CARREFOUR
41	SQUISH(PEAR,PEACH,ROOIBOS	RHODES QUALITY		SOUTH AFRICA	PUREE	110G	POUCHE	GARDEN CITY SMK
42	SQUISH(BANANA N PRUNE	RHODES QUALITY		SOUTH AFRICA	PUREE	110G	POUCHE	CARREFOUR
43	GROW & GAIN	PEDIASURE		USA	SHAKE	32G	BOTTLE	CARREFOUR
44	AUNT PORRIDGE	FORNA HEALTH FOODS		UGANDA	INSTANT LOCAL PORRI	500G	PLASTIC BAG	WANDEGEYA SUP
45	JESA	JESA FARM DAIRY LTD	strawberry	UGANDA	SWEETENED MILK	250ML	BOX	CAPITAL SHOPPER
46	FRESH DAIRY	BROOKSIDE LTD	vanilla	UGANDA	SWEETENED MILK	250ML	BOX	CAPITAL SHOPPER
47	LATO MILK	PEARL DAIRY FARM LTD	STRAWBERRY	UGANDA	SWEETENED MILK	250ML	BOX	PRICKLY SMKT
48	LATO MILK	PEARL DAIRY FARM LTD	VANILLA	UGANDA	SWEETENED MILK	250ML	BOX	PRICKLY SMKT
49	FRESH DAIRY	BROOKSIDE LTD	CHOCOLATE	UGANDA	SWEETENED MILK	250ML	BOX	PRICKLY SMKT
50	JESA	JESA FARM DAIRY LTD	CHOCOLATE	UGANDA	SWEETENED MILK	200ML	BOX	PRICKLY SMKT
51	FRUIT YOGHURT	BROOKSIDE LTD	STRAWBERRY -FRUI	UGANDA	FLAVOURED YOGHURT	250ML	disposable contai	WANDEGEYA SUPI
52	FRUIT YOGHURT	BROOKSIDE LTD	VANILLA	UGANDA	FLAVOURED YOGHURT	100ML	disposable contai	WANDEGEYA SUPI
53	FRUIT YOGHURT	BROOKSIDE LTD	PEAR CARAMEL	UGANDA	FLAVOURED YOGHURT	100ML	disposable contai	NANSANA SUPERM
54	FRESH DAIRY THICK N' CREAMY	BROOKSIDE LTD	STRAWBERRY	UGANDA	FLAVOURED YOGHURT	100ML	disposable contai	NANSANA SUPERM
55	MEGA	PREMIER DAIRIES LTD	VANILLA	UGANDA	FLAVOURED YOGHURT	250ML	disposable contai	STANDARD SMKT
56	JESA	JESA FARM DAIRY LTD	STRAWBERRY	UGANDA	FLAVOURED YOGHURT	400ML	PLASTIC BAG	STANDARD SMKT
57	JESA	JESA FARM DAIRY LTD	VANILLA	UGANDA	FLAVOURED YOGHURT	400ML	PLASTIC BAG	STANDARD SMKT
58	TREE TOP	SKY FOODS LTD	TROPICAL JUICE	KENYA	JUICE	500ML	PLASTIC BOTTLE	STANDARD SMKT
59	ONER	HARISS INTERNATIONAL LTD	APPLE FRUIT	UGANDA	JUICE	500ML	PLASTIC BOTTLE	GARDEN CITY SMK
60	MINUTE MAID	CENTURY BOTTLING CO. LTD	MANGO	UGANDA	JUICE	400ML	PLASTIC BOTTLE	CAPITAL SHOPPER
61	AFIA	KEVIAN (K) LTD	MULTIVITAMIN	KENYA	JUICE	500ML	PLASTIC BOTTLE	STANDARD SUPER
62	RIBENA	DEVYANI FOOD INDUSTRIES	BLACK CURRANT	KENYA	JUICE	250ML	PLASTIC BOTTLE	CAPITAL SHOPPER
63	PICK & PEEL	KEVIAN (K) LTD	MANGO	KENYA	JUICE	250ML	BOX	CAPITAL SHOPPER
64	SPLASH	BRITANIA ALLIED INDUSTRIES	PASSION	UGANDA	JUICE	250ML	BOX	STANDARD SMKT
65	SPLASH	BRITANIA ALLIED INDUSTRIES	MANGO	UGANDA	JUICE	150ML	BOX	CAPITAL SHOPPER
66	YOJUS	BRITANIA ALLIED INDUSTRIES	APPLE	UGANDA	JUICE	150ML	BOX	CAPITAL SHOPPER

UID	PRODUCT/BRAND NAME	MANUFACTURER	EXTRA NAME/FLAV	COUNTRY OF MANU	DESCRIPTIVE NAME	WEIGHT (GRAMS)	TYPE OF PACKAGI	STORE WHERE IT V
67	CERES NECTAR	GLAXOSMITHKLINE LTD	TROPICAL	KENYA	JUICE	250ML	BOX	STANDARD SMKT
68	SUN TOP	BIDCORO AFRICA LTD	ORANGE	KENYA	JUICE	125ML	BOX	GARDEN CITY SMK
69	SQUISHY FRUIT DRINK	KEVIAN (K) LTD	MANGO	KENYA	JUICE	200ML	BOX	GARDEN CITY SMK
70	KRUNCH	HARISS INTERNATIONAL LTD		UGANDA	BISCUITS - LETTERS	10G	PLASTIC BAG	PRICKLY SMKT
71	SKITTLES	MARS WRINGLEY CONFECTIC	CRAZY SOUR	UK	SNACKS - MULTICOLOR	45G	PLASTIC BAG	CAPITAL SHOPPER
72	CADBURY BOURNVITA	MONDELEZ INDIA FOODS LTD		INDIA	BISCUITS	46.5G	*PLASTIC BAG	STANDARD SMKT
73	HANIMELLER	ULKER BISKUVI SANAYI A.S.	COCOA CHIPS	TURKEY	BISCUITS	82G	*PLASTIC BAG	STANDARD SMKT
74	MILK BISCUITS	BRITANIA ALLIED INDUSTRIES LTD		UGANDA	BISCUITS	30G	*PLASTIC BAG	PRICKLY SMKT
75	NICE	BRITANIA ALLIED INDUSTRIE	COCONUT	UGANDA	BISCUITS	50G	*PLASTIC BAG	PRICKLY SMKT
76	RIHAM	HARISS INTERNATIONAL LTD	CREAMY STRAWBER	UGANDA	BISCUITS	85G	*PLASTIC BAG	PRICKLY SMKT
77	RIHAM GLUCOSE BISCUITS	HARISS INTERNATIONAL LTD	GLUCOSE	UGANDA	BISCUITS	23G	*PLASTIC BAG	PRICKLY SMKT
78	NUTREAL COOKIES	NUTREAL LTD	NUTREAL	UGANDA	COOKIES	50G	*PLASTIC BAG	STANDARD SMKT
79	MILKMAN YOGHURT	VITAL TAMOSIS DAIRY	VANILLA	UGANDA	YOGHURT	170ML	PLASTIC CONT	STANDARD SUPER
80	LUBOWA YOGHURT	LOBOWA DAIRIES	STRAWBERRY	UGANDA	YOGHURT	300ML	PLASTIC BOTTLE	STANDARD SUPER
81	V-SOY MILK	DIPRODLIFE OLEN.GREEN SP	MULT GRAIN	THAILAND	SWEETENED MILK	250ML	BOX	STANDARD SUPER
82	ONO LIGHT	OYO JUICE AND FOOD ENTEF	MANGO	UGANDA	JUICE	280ML	PLASTIC BOTTLE	LOCAL SHOP
83	RIHAM BISCUITS	HARISS INTERNATIONAL LTD	CHOCOLATE	UGANDA	BISCUITS	10G	PLASTIC BAG	LOCAL SHOP
84	BUTTER COOKIES	UNITED BISCUITS PVR	MC-VITIES	INDIA	COOKIES	60G	PLASTIC BAG	LOCAL SHOP
85	BISKREM BISCUITS	ULKER BISKUVI SANAYI A.S.	COCOA	TURKEY	BISCUITS	60G	PLASTIC BAG	LOCAL SHOP
86	COKOPRENS BISCUITS	ULKER BISKUVI SANAYI A.S.		TURKEY	BISCUITS	81G	PLASTIC BAG	LOCAL SHOP
87	PURITY	TIGER CONSUMER BRANDS L	BANANA & YOGHUI	SOUTH AFRICA	PUREE	130G		MEGA STANDARD
88	PURITY	TIGER CONSUMER BRANDS L	APPLES	SOUTH AFRICA	PUREE	84G		MEGA STANDARD
89	LATO MILK	PEARL DAIRY FARM LTD	CHOCOLATE	UGANDA	SWEETENED MILK	250ML	BOX	MEGA STANDARD
90	LATO YOGHURT	PEARL DAIRY FARM LTD	MIXED BERRIES	UGANDA	YOGHURT	250G	PLASTIC CONT	MEGA STANDARD
91	BROOKSIDE YOGHURT	BROOKSIDE LTD	FRUIT YOGHURT	UGANDA	YOGHURT	100ML	PLASTIC CONT	CAPITAL SHOPPER
92	SPLASH	BRITANIA ALLIED INDUSTRIE	APPLE	UGANDA	JUICE	150ML	BOX	CAPITAL SHOPPER
93	SKITTLES	MARS WRINGLEY CONFECTIC	TROPICAL	UK	BISCUITS - LETTERS	45G	PLASTIC BAG	MEGA STANDARD
94	PURITY	TIGER CONSUMER BRANDS L	BUTTERNUT AND PE	SOUTH AFRICA	PUREE	110G	POUCHE	MEGA STANDARD
95	SQUISH	RHODES QUALITY LTD	FRUIT MEDLEY	SOUTH AFRICA	PUREE	110ML	POUCHE	MEGA STANDARD
96	PURITY	TIGER CONSUMER BRANDS L	APPLE AND GUAVA	SOUTH AFRICA	PUREE	110ML	POUCHE	MEGA STANDARD
97	PURITY	TIGER CONSUMER BRANDS L	BUTTERNUT	SOUTH AFRICA	PUREE	125ML	BOTTLE	CAPITAL SHOPPER
98	PURITY	TIGER CONSUMER BRANDS L	PRUNES	SOUTH AFRICA	PUREE	125ML	BOTTLE	CARREFOUR
99	HEINZ	H.J.HEINZ FOODS UK LTD	APPLE AND YOGHUI	UK	PUREE	120G	BOTTLE	CARREFOUR
100	PURITY	TIGER CONSUMER BRANDS L	FRUIT AND YOGHUI	SOUTH AFRICA	PUREE	110ML	BOTTLE	CARREFOUR
101	HEINZ	H.J.HEINZ FOODS UK LTD	APPLE,APRICOT,BA	UK	PUREE	120G	BOTTLE	CARREFOUR
102	HEINZ	H.J.HEINZ FOODS UK LTD	CREAMED PORRIDG	UK	PUREE	120G	BOTTLE	CAPITAL SHOPPER
103	OATS SOYA	KIRUNGA GROUP	KIRUNGA	UGANDA	LOCAL PORRIDGE	1KG	BOX	CAPITAL SHOPPER
104	OATS SOYA RICE	KIRUNGA GROUP	KIRUNGA	UGANDA	LOCAL PORRIDGE	1KG	BOX	CAPITAL SHOPPER
105	RICE CORN PORRIDGE	KEYNES INVESTMENT	ENERGY BOASTER	UGANDA	LOCAL PORRIDGE	2KG	PLASTIC BAG	CAPITAL SHOPPER
106	BABY BOOSTER	ANKOLE BASIC FOOD	IMMUNE DIET	UGANDA	LOCAL PORRIDGE	1KG	PLASTIC BAG	CAPITAL SHOPPER
107	HIGH PROTEINS BABY PORRIDGE	ANKOLE BASIC FOOD	BENOVA CEREALS	UGANDA	LOCAL PORRIDGE	1KG	PLASTIC BAG	MEGA STANDARD
108	SOYA,RICE WITH MUKENE	ANKOLE BASIC FOOD		UGANDA	LOCAL PORRIDGE	1KG	PLASTIC BAG	CAPITAL SHOPPER
109	BABY SOYA RICE WITH NKEJJE	YELLOW STAR	DOMESTIC SUPER C	UGANDA	LOCAL PORRIDGE	1KG	BOX	CAPITAL SHOPPER
110	BABY SOYA	YELLOW STAR	CEREAL BASED FOO	UGANDA	LOCAL PORRIDGE	1KG	BOX	CAPITAL SHOPPER
111	HONEY POPS	MASS FOOD INT	TEMMYS	EGYPT	CEREALS	250G	BOX	CAPITAL SHOPPER
112	WEETABIX	WEETABIX EAST AFRICA	STRAWBERRY FLAV	KENYA	CEREALS	500G	BOX	MEGA STANDARD
113	WEETABIX	WEETABIX EAST AFRICA	VANILLA ONJA KAN	KENYA	CEREALS	500G	BOX	MEGA STANDARD
114	WEETABIX	WEETABIX EAST AFRICA	ORIGINAL ONJA KA	KENYA	CEREALS	450G	BOX	MEGA STANDARD
115	WEETABIX	WEETABIX EAST AFRICA	BANANA ONJA KAN	KENYA	CEREALS	500G	BOX	MEGA STANDARD
116	WEETABIX	WEETABIX EAST AFRICA	CRISPY MINIS CHOC	KENYA	CEREALS	450G	BOX	CAPITAL SHOPPER
117	WEETOS	WEETABIX LTD/METRO ALLIA	CHOCO	ENGLAND	CEREALS	375G	BOX	CAPITAL SHOPPER
118	CHOCO BALLS	PAGARIYA FOOD PRODUCT	KWALITY	INDIA	CEREALS	375G	BOX	CAPITAL SHOPPER
119	FRUIT RINGS	PAGARIYA FOOD PRODUCT	KWALITY	INDIA	CEREALS	375G	BOX	CAPITAL SHOPPER
120	CHOCO FLAKES	PAGARIYA FOOD PRODUCT	KWALITY	INDIA	CEREALS	375G	BOX	CAPITAL SHOPPER
121	FROSTIES	KELLOGG CO.OF GREAT BRIT	KELLOGGS	UNITED KINGDOM	CEREALS	500G	BOX	CAPITAL SHOPPER
122	CHOCO RICE	MASS FOOD INT	TEMMYS	EGYPT	CEREALS	250G	BOX	MEGA STANDARD
123	CERELAC(RICE)	NESTLE SOUTH AFRICA(PTY)L	NESTLE	SOUTH AFRICA	INSTANT PORRIDGE	250G	BOX	MEGA STANDARD
124	CERELAC(REGULAR WHEAT	NESTLE SOUTH AFRICA(PTY)L	NESTLE	SOUTH AFRICA	INSTANT PORRIDGE	250G	BOX	MEGA STANDARD
125	CERELAC(HONEY)	NESTLE SOUTH AFRICA(PTY)L	NESTLE	SOUTH AFRICA	INSTANT PORRIDGE	250G	BOX	MEGA STANDARD
126	CERELAC(STRAWBERRY)	NESTLE SOUTH AFRICA(PTY)L	NESTLE	SOUTH AFRICA	INSTANT PORRIDGE	250G	BOX	MEGA STANDARD
127	CERELAC(MAIZE)	NESTLE SOUTH AFRICA(PTY)L	NESTLE	SOUTH AFRICA	INSTANT PORRIDGE	250G	BOX	MEGA STANDARD
128	CERELAC(MIXED FRUIT)	NESTLE SOUTH AFRICA(PTY)L	NESTLE	SOUTH AFRICA	INSTANT PORRIDGE	250G	BOX	MEGA STANDARD
129	LAIT.BLE.FRUIT	BELGIUM	FRANCE LAITE	FRANCE	INSTANT PORRIDGE	250G	BOX	MEGA STANDARD
130	LAIT.RIZ.FRUIT	BELGIUM	FRANCE LAITE	FRANCE	INSTANT PORRIDGE	250G	BOX	MEGA STANDARD
131	LAIT.BLE.MIEL	BELGIUM	FRANCE LAITE	FRANCE	INSTANT PORRIDGE	250G	BOX	MEGA STANDARD
132	NESTUM(REGULAR WHEAT)	NESTLE SOUTH AFRICA(PTY)L	NESTLE	SOUTH AFRICA	INSTANT PORRIDGE	250G	BOX	MEGA STANDARD
133	SUPER KAWOMERA	NUTREAL LTD		UGANDA	INSTANT PORRIDGE	50G x 60	PLASTIC BAG	JUMIA
134	MAGANJO TOTO	MAGANJO GRAIN MILLERS	BANANA	UGANDA	INSTANT PORRIDGE	500G	TIN	JUMIA
135	NOOTRI TOTO	AFRICA IMPROVED FOOD			INSTANT PORRIDGE	1KG	PLASTIC BAG	JUMIA

APPENDIX 7. COMMERCIAL BABY FOOD LABELLING PRACTICES QUESTIONNAIRE

	QUESTION	ANSWERS	CRITERIA CHOOSING ANSWERS	TYPE OF FOOD	REFERENCE
1	**ID number**				
2	Assessor number		1=Grace, 2=Cathy		
3	Type of food	**1 Commercially processed complementary food (CACF)** **2 Sweetened beverage/dairy-based product (SSB)** **3 Sweet snack for general consumption (Snack)** **4 Other**	CACF should have a word "toto", "baby", "infant", "small tummies" or "toddler" or photos of babies or age recommendation 36mo. or less. All the rest that do not qualify to be CACF fall under type 3 if solid and 2 if liquid. "Others" are for general consumption but neither snacks nor sweetened beverages		
4	Category of CACF	**1 Instant cereal/porridge including breakfast cereals specifically marketed for children under 36mo.** **2 Fortified cereal/other porridge** **3 Vegetable/fruit puree** **4 Shakes/ready porridges/yoghurts/desserts**		CACF	
5	Category of SSB	**1 Dairy-based: Sweetened/flavoured yoghurt** **2 Cow's milk and milk alternatives with added Sugar or sweetening agent** **3 Ready-to-drink juice**		SSB	
6	Category of Snack	**1 Biscuits** **2 Other finger snacks** **3 Breakfast cereals**		Snack	
7	Does the product have a nutrition declaration?	**0 No** **1 Yes**		All	

8	Does the product have an ingredients list?	**0 No** **1 Yes**		All	
9	Does the product have a front-of-pack label?	**0 No** **1 Yes**		All	
	AGE-RELATED RECOMMENDATIONS AND IMAGES				
10	Does the product label specify a recommended age of introduction that is less than 6 months of age?	**1 Yes** **2 No** **3 N/A**	Yes - Recommended age of introduction is less than 6 months of age (180 days/the 7th- month of life). No- Recommended age of introduction is 6 months of age (180 days/the 7th-month of life) or later. N/A - The label does not specify an appropriate/recommended age of introduction	CACF	WHA resolution 39.28(1986) WHA resolution 39.28(1996) Global strategy for IYCF (WHO 2003) Quinn *et al.*, 2010 (Section 3.1,p13-14,Section 4p23)
11	Does the product label include an appropriate/recommended age for use of the product that is 6 months (180 days) or more?	**1 Yes** **2 No** **3 N/A** **Skip Qs 12 & 13 if N/A**	Yes - Recommended age of introduction is from 6 months of age (180 days/the 7th- month of life) or later. No- Recommended age of introduction is before 6 months of age (180 days/the 7th- month of life). N/A -no age of introduction is specified.	CACF	WHA resolution 39.28(1986) WHA resolution 39.28(1996) Global strategy for IYCF (WHO 2003) Quinn *et al.*, 2010 (Section 3.1,p13-14,Section 4p23)
12	Is the message on age relegated to small print that cannot easily be seen?	**1 Yes** **2 No** **3 N/A**	N/A - no age of introduction is specified.	CACF	Quinn *et al.*, 2010 (Section 3.1,p14,Section 4p23) Sweet *et al.*, 2012
13	Does the age appear in close proximity to the name of the food?	**1 Yes** **2 No** **3 N/A**	Close proximity defined by same face as name	CACF	Guidelines-on-formulated-complementary-foods-for-older-infants-and-young-children (CAC/GL 8–1991, REV 2013) (Codex Alimentarius 1991)(Section 10.1.2.,p9)

14	Does the product label include images of babies appearing to be older than 6 months of age?	**1** **Yes** **2** **Unclear** **3** **No** **4** **N/A**	**Yes** - Pictures of babies showing achievement of physical or developmental milestones clearly reached after 6 months of age: standing with assistance; hands-and- knees crawling; walking with assistance; standing alone; walking alone; one or more teeth; peddling a tricycle; running; holding objects such as a spoon/cup and self-feeding; kicking a ball; standing on tip toes. If the label carries multiple images of children, all of the images have to qualify for a 'Yes' answer before the answer 'Yes' can be selected. **Unclear** - If the label carries multiple images of children, select unclear if none of the images qualify for a 'No' answer and at least one qualifies for an 'unclear' answer **No** - Pictures of infants/young children showing physical or developmental milestones commonly associated with infants 0 to 6 months of age such as holding a toy and shaking it; lying down; lying on stomach and pushing up to elbows; no teeth; reclining; sitting with support; sitting without support. Or head shot of infant (including baby in mothers arms) with no physical or developmental milestones reached after 6 months displayed. Or heavily stylized image of a baby with no physical or developmental milestones reached after 6	CACF	WHO MGRS 2006; Quinn *et al.*, 2010 (Section 3.1, p. 14–15; Section 4, p. 25).

			months displayed N/A- No images displayed		
15*	Does the product label include images of cartoon/ cartoon characters/colours associated with young children?	**0 No** **1 Yes**		All	South African Department of Health 2012 (Section 4.1.g p19)
16+	Does the product label include phrases such as 'from the start', 'for the whole family' or 'first stage' or 'and adults'	**0 No** **1 Yes**		CACF	Quinn *et al.*, 2010 (Section 3.1, p. 14–15; Section 4, p. 25).
17*	Does the product clearly state a minimum age of 36 months/3 years on packs?	**0 No** **1 Yes** **If no, skip Q 20**		All others except CACF	WHO 2019 p10
18	Is the message on age relegated to small print that cannot easily be seen?	**0 No** **1 Yes**		All others except CACF	Quinn *et al.*, 2010 (Section 3.1,p14,Section 4p23)
	Serving size and daily ration				
19	Does the product label include a proposed daily ration/serving (or recommended number of servings per day and serving)?	**1 Yes** **2 Partial** **3 No** **If no or partial skip Q 24**	Yes – Clear column "per serving" recommendations with grams/mls Partial - when there is a column but it's not clear exactly how much is recommended per serving or if the amounts are given in abstract terms like "tablespoon" No- No information	CACF	Codex 1991; Quinn *et al.*, 2010 (Section 3.1, p. 15; Section 4, p. 24)
	Does the daily ration (or a recommended serving size combined with a		For products where an age of introduction is not provided,	CACF	PAHO/WHO 2003; Quinn *et al.*, 2010 (Section 3.1; p. 13–15; Section 4, p. 24).

	recommended frequency of feeds per day) included on the product label exceed the recommended energy intake from complementary foods for a breastfed child provided below?		answer the question for all age categories.		
20A	6–8.9 months: 837 kJ/day (200 Kcal/day)	**1 Less than the recommended** **2 Greater than the recommended** **3 Insufficient information** **4 N/A if for higher or lower age-group**		CACF	
20B	9–11.9 months: 1255 kJ/day (300 Kcal/day)	**1 Less than the recommended** **2 Greater than the recommended** **3 Insufficient information** **4 N/A if for higher or lower age-group**		CACF	
20C	12–23.9 months: 2301 kJ/day (550 Kcal)	**1 Less than the recommended** **2 Greater than the recommended** **3 Insufficient information** **4 N/A if for higher or lower age-group**		CACF	
20D	Specify comment from observation above				
	SPECIFIC TO SUGARS and PLEASANT TASTES				
		list and declaration			
21	Does the product label list sugars in their list of ingredients?	**0 No** **1 Yes**		All	(Codex Alimentarius 1991) (Section 10.2.2-10.2.3,p8-9)
22	Does the product use an appropriate name in their list of ingredients?	**0 No** **1 Yes**	sugar, sucrose, dextrose, glucose, fruits, skimmed milk, lactose	All	Guidelines on nutrition and labelling (*CAC/GL 2-1985*, REV 2021)
23	Does the product declare and use an appropriate unit for energy in their declaration of nutrient value?	**0 No** **1 Yes**	KJ/kcal (Calories or joules) Yes – if declared and with the appropriate unit	All	(Codex Alimentarius 1985) (Section 3p3-5)

No
Yes

			No – if not declared or declared but with the inappropriate unit		Nutrition labelling — Requirements Ugandan Standards US EAS 803
24*	Is the energy per serving or per 100g/ml?	**1 per 100g/ml** **2 per serving**	**If both given tick 100gm/ml**	All	
25	Does the product declare and use an appropriate unit for total sugars in their declaration of nutrient value?	**0 No** **1 Yes** **If no skip Q 31&32**	Grams Yes – if declared and with the appropriate unit No – if not declared or declared but with the inappropriate unit	All	
26*	Are total sugar and added sugar represented as sugar in general?	**1 Yes** **2 No** **If no skip Q 32**	Yes- Only the word sugar or total sugar declared No- both total and added sugar declared N/A- no sugar declared	All	
27	Does the product declare and use an appropriate unit for added sugars in their declaration of nutrient value?	**1 Yes** **2 No** **3 N/A**	grams or percent N/A-If no sugars in the ingredients list	All	
28	Specify comment from observation above				
	AMOUNTS OF SUGARS AND ENERGY				
29	Specify the total energy per 100g/ml			All products relevant if energy is per 100gm/ml	(Codex Alimentarius 1985) (Section 3.3.1, 3.4.2p4)

30	Specify the total energy per serving KJ/Cal		If energy per 100g/ml not given	All products relevant if energy is per 100gm/ml	
31	Specify the grams of food per serving		If energy per 100g/ml not given		
32A&	Calculate the energy in 100g		If energy per 100g/ml not given		
32B	What is the unit?	**1 Calories** **2 Joules** **If Calories skip to Q 40**			
32C&	Convert Joules to Calories		**1 cal =4.184joules**		
33A&	Specify/calculate the amount of added sugar per 100g		if no 100g quote multiply by 100 and divide by serving in grams		
33B&	Specify/calculate the amount of energy from added sugar per 100g (Calories or Joules)		if not indicated write 99		
33C	What is the unit?	**1 Calories** **2 Joules** **If Calories skip to Q 40**			
33D&	Convert Joules to Calories		**1 cal =4.184joules**		
	SUGAR LIMITS AND ENERGY CALCULATIONS				
	FOR PROCESSED CEREALS				
	If sucrose, fructose, glucose, glucose syrup or honey are added to products mentioned in points 2.1.1 (Products consisting of cereals which are or have to be prepared for consumption with milk or other appropriate nutritious liquids) and 2.1.4 (Rusks and biscuits which are to be used either directly or, after pulverization, with the addition of water, milk or other suitable liquids)				WHO 2019

34a[&]	does the amount of added carbohydrates from these sources exceed 1.8 g/100 kJ (7.5 g/100 kcal);	**1 Yes** **2 No mention of the contribution** **3 No** **4 N/A, not that product**	If can/t see the sugars in the ingredients list then N/A or If product not as defined or If no energy in declaration If can't see the sugars in the ingredients list then N/A or If product not as defined or If no energy in declaration To calculate grams per 100Kcal/KJ get (added sugar in g per serving * 100) divide by the serving energy	Cereal products	Standard for processed cereal-based foods for infants and young children (CXS 74-1981) (Section 3.4,p2-3)
34b[&]	Does the amount of added fructose exceed 0.9 g/100 kJ (3.75 g/100 kcal)	**1 Yes** **2 No mention of the contribution** **3 No** **4 N/A, not that product**	If can/t see the sugars in the ingredients list then N/A or If product not as defined or If no energy in declaration	Cereal products	
	If sucrose, fructose, glucose, glucose syrup or honey are added to products mentioned in point 2.1.2 (Cereals with an added high protein food which are or have to be prepared for consumption with water or other appropriate protein-free liquid)				
35a[&]	Does the amount of added carbohydrates from these sources exceed 1.2 g/100 kJ (5 g/100 kcal)?	**1 Yes** **2 No mention of the contribution** **3 No** **4 N/A, not that product**	If can/t see the sugars in the ingredients list then N/A or If product not as defined or If no energy in declaration	Cereal products	
35b[&]	Does the amount of added fructose exceed 0.6 g/100 kJ (2.5 g/100 kcal)?	**1 Yes** **2 No mention of the contribution** **3 No** **4 N/A, not that product**		Cereal products	
36	Does the product contain fruit (fresh or dry) and state the percentage of this product in the ingredient list?	**1 Yes** **2 No** **3 N/A**	If can/t see the sugars in the ingredients list then N/A Yes – in the ingredient list and with percentage No – if in ingredients list but no percentage	Exclude fruit drinks	WHO 2019
	ALL FOODS				

	If the total-sugar content exceeds specified limits, the front of pack must show the percentage of energy from total sugar. Limits for different foods are set at 30% energy for dry cereals and fruit/vegetable purées, 40% for dairy-based foods, 20% for vegetable purées with cereals or milk, and 15% for savoury and meal-type foods.				WHO 2019
37a[&]	Calculate energy percentage of total sugars to total energy (in Kcal or KJ)			Exclude fruit drinks	
37b	Does the energy percentage from total sugars in the figure above exceed the limits with reference to the type of food?	**1 Yes** **2 No** **3 N/A**	N/A if calculations not possible ie no energy or no total sugars declared	Exclude fruit drinks	
	TASTE CHARACTERISTICS				
38	Does the product label include one of the "pleasant" flavours?	**1 Yes** **2 No**	look in ingredient list	All	WHO 2019 p10
38b	Specify the flavouring agent			All	
39	Does the product have a nutritive sweetening agent listed?	**1 Yes** **2 No**	powder (dry) or liquid forms of sugar, invert sugar, dextrose, fructose, lactose, honey, glucose syrup, cane juice, cane sugar, caramel, carob, corn syrup, date paste, dextran, dextrose, diastase, fructose, fruit juice concentrate, galactose, glucose, glucose–fructose, high-fructose corn syrup, honey, lactose, maltodextrin, maltose, molasses, nectar, sucrose, sugar, syrup	All	WHO 2019 p14-19
39b	Specify the sweetening agent			All	
40	Does the product have a non-nutritive (artificial) sweetening agent listed?	**1 Yes** **2 No**	sucralose, xylitol, sorbitol, inositol, erythritol, aspartate, saccharin,	All	

40b	Specify the sweetening agent			All	
	INSTRUCTIONS FOR USE				
41	Does the label indicate suggested number of feedings per day?	**1 Yes** **2 No**		CACF	(Codex Alimentarius 1991) (Section 10.2.4.3,p9)
41b	Is it a single serving product?	**1 Yes** **2 No**		CACF	
42a	Specify any comments about the preparation			CACF	(Codex Alimentarius 1991) (Section 10.2.4.5,p9) WHO 2019
	if sugars should be added during preparation, do the instructions for use	**1 Yes** **2 No**		CACF	
42b	i) identify appropriate sources	**1 Yes** **2 No** **3 N/A**	The word "sugar" is used it is assumed to be table sugar N/A if no mention of necessity to add sugar	CACF	
42c	ii) indicate the amounts of the ingredients to be added	**1 Yes** **2 No** **3 N/A**	N/A if no mention of necessity to add sugar	CACF	
	HEALTH AND NUTRITION CLAIMS				
44	Does the product include any health or nutrition/compositional claim?	**1 Yes** **2 No**		All CACF	Guidelines for use of Nutrition and Health Claims CAC/GL 23-1997 (SectionN 1.4 p1)
44 b	Specify type of claim	**1 Nutrition** **2 Health**		All CACF	WHO 2019 p10
44c	Specify type of nutrition claim	**1 Nutrient content** **2 Nutrient comparative** **3 Non-addition claim**	**Nutrient content claim is a nutrition claim that describes the level of a nutrient containe of calcium"; "high in fibre and low in fat".)** **Nutrient comparative claim is a claim that compares the nutrient levels and/or energy v foods.(Examples: "reduced"; "less than"; "fewer"; "increased"; "more than".)** **Non-addition claim (any claim that an ingredient has not been added to a food)**	All CACF	

44d	Specify type of health claim	**1** **Nutrient function claims** **2** **Reduction of disease risk claims** **3** **Other claims**	**Nutrient function claims** – a nutrition claim that describes the physiological role of the nutrient in growth and normal functions of the body. **Eg:** "Nutrient A (naming a physiological role of nutrient A in the body in the maintenance of health and promotion of normal growth and development). Food X is a source of/ high in nutrient A **Reduction of disease risk claims** Eg: "A healthful diet low in nutrient or substance A may reduce the risk of disease D. Food X is low in nutrient or substance A." "Other claims" concern specific beneficial effects of the consumption of foods or their constituents, in the context of the total diet on normal functions or biological activities of the body. Such claims relate to a positive contribution to health or to the improvement of a function or to modifying or preserving health. **Eg:**"Substance A (naming the effect of substance A on improving or modifying a physiological function or biological activity associated with health). Food Y contains x grams of substance A	All CACP	Use of nutrition and health claims — Requirements Ugandan Standard US EAS 805 (Section 5.3 p2)
	UGANDAN STANDARDS				
	DAIRY-BASED BEVERAGES				
45	Does the product use an appropriate name?	**1** **Yes** **2** **No**	a) milk beverage/drink; b) milk X beverage/drink (eg. MANGO drink) c) milk X flavoured drink (eg. MANGO FLAVOURED drink,	DAIRY	Dairy based beverages — Specification Ugandan Standard US 1653
46a	Does the product contain one or more of fruit?	**1** **Yes** **2** **No** **If no go to 58**			Fruit-based dairy beverage — Specification Ugandan Standard US 2237
46b	Is the amount of fruit declared on the label?	**1** **Yes** **2** **No**			
47	Is the rate of dilution declared if it is concentrated?	**1** **Yes** **2** **No** **3** **N/A**			

48	Does the product have cocoa or cocoa product like chocolate?	**1 Yes** **2 No**			
	Cereal based foods			CEREAL BASED	
49	Does the product have cocoa or cocoa product like chocolate?	**1 Yes** **2 No**			Processed cereal-based foods for older infants and young children —Specification Ugandan standard US EAS 72
49bb	Does the product indicate that minimum age of consumption is 9 months?	**c Yes** **2 No** **3 N/A**			
	Calculate energy density kcal/g				
50	Does the label indicate more than 0.8kcal/g (or 3.3KJ) or 0.6 kcal for snacks?	**1 Yes** **2 No**	yes its more than 0.8, No its less than 0.8	CEREAL AND SNACKS	Processed cereal-based foods for older infants and young children —Specification Ugandan standard US EAS 72 WHO 2019
	NUTRITION AND HEALTH CLAIMS SPECIFIC TO SUGARS				
	Does the product claim to be free of sugars?	**1 Yes** **2 No**		All	Use of nutrition and health claims — Requirements Ugandan Standard US EAS 805 (Table 1 p4)
	Is the amount of sugar 0.5g or less per 100g or 100ml?	**1 Yes** **2 No**		All	
	Does the product claim to have "non-addition" of sugars?	**1 Yes** **2 No**	a) no sugars of any type have been added to the food (examples: sucrose, glucose, honey, molasses, corn syrup, etc.); b) the food contains no ingredients that contain sugars as an ingredient (examples: jams, jellies, sweetened chocolate, sweetened fruit	All	

			pieces, etc.); c) the food contains no ingredients containing sugars that substitute for added sugars (examples: non-reconstituted concentrated fruit juice, dried fruit paste, etc.); and d) the sugars content of the food itself has not been increased above the amount contributed by the ingredients by some other means (example: the use of enzymes to hydrolyse starches to release sugars).		
	FRUIT DRINKS				
	Are sweeteners used?	**1 Yes** **2 No**		FRUIT AND JUICE DRINKS	Fruit drinks — Specification Ugandan Standards US EAS 807
	Is there a statement next to the name if a non-nutritive sweetener is used?	**1 Yes** **2 No** **3 N/A**	"with sweetener(s)," shall be included in conjunction with or in close proximity to the product name OR		
	Is the amount of non-nutritive sweetener declared?	**c Yes** **2 No** **3 N/A**	N/A if sweetener is nutritive		