Drivers and solutions to unhealthy food consumption by adolescents in urban slums in Kenya: A qualitative participatory study

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Conflict of Interest

None

Authorship

MW: led the study conceptualisation, data collection, data analysis, drafting, review and finalisation of manuscript; EKM, GA, KKG: guided the study conceptualisation, data analysis, reviewed all versions of the manuscript MH, RP, CW: guided the data analysis, reviewed all versions of the manuscript. All authors reviewed and approved the final manuscript for submission.

Ethical Standards Disclosure

The study was conducted according to the guidelines of the Helsinki Declaration and all procedures involving research study participants were approved by AMREF ethics and scientific review committee (protocol number P919/2020) while a research permit was obtained from the National Commission for Science and Technology (NACOSTI/P/21/9739). Written assent and parental consent were obtained from all the adolescents younger than 18 years and their parents or primary caregivers respectively, while informed consent was obtained from all adolescents and adults 18 years or older, prior to data collection.

ABSTRACT

Objective: To explore the perceptions, drivers, and potential solutions to consumption of unhealthy, ultra-processed foods (UPF) and foods high in fat, salt and sugar (HFSS), and their contribution to the double burden of malnutrition in adolescents living in urban slums, Kenya.

Design: Qualitative participatory research, through Photovoice, group discussions and community dialogues. Inductive, thematic analysis was undertaken.

Setting: Three major slums, Nairobi.

Participants: Adolescents 10-19 years (n=102: 51 boys, 51 girls) and adults (n=62).

Results: UPF/HFSS consumption emerged as a predominant theme on the causes of undernutrition and overweight/obesity and foods commonly consumed by adolescents. Adolescents described UPF/HFSS as junk, oily, sugary or foods with chemicals, and associated UPF/HFSS consumption with undernutrition, obesity, non-communicable diseases. They perceived UPF/HFSS as modern, urban, classy, appealing to young people, and minimally processed foods as boring, primitive, for older people, and those in rural areas. Individual-level drivers of UPF/HFSS consumption were organoleptic attributes (taste/aroma), body size/shape, illicit drug use, convenience, adolescents' autonomy. Social environment drivers were peer-pressure and social status/aspirations. Physical environment drivers were UPF/HFSS availability and accessibility in the slums. Education on healthy eating and adverse effects of consuming UPF/HFSS, through existing structures (youth groups, school, community health strategy) was proposed as potential solution to UPF/HFSS consumption.

Conclusion: UPF/HFSS were perceived as associated with poor nutrition and health, yet were preferred over unprocessed/minimally processed foods. Interventions to promote healthy diets beyond raising awareness are important, while address the underlying perceptions and drivers of UPF/HFSS consumption at individual-level, and social and physical food environments.

Keywords: Ultra processed foods (UPF), adolescent, unhealthy food, dietary behaviours, urban, Photovoice, participatory research, Sub-Saharan Africa.

INTRODUCTION

Optimal nutrition is important for adolescents' health, growth and development, with recent calls globally to address malnutrition in all its forms [1]. Adolescence is a stage of transition and emancipation from dependency on adults to autonomous dietary behaviour [2]. As such, it presents an opportunity to establish a foundation of good health and dietary behaviour [1]. Healthy behaviour including dietary choices cultivated during adolescence can help to achieve optimal nutrition and lower the risks of diet related non-communicable diseases (NCDs) in adulthood [3]. Adolescents' dietary behaviours are largely influenced by individual factors and the physical and social environments around them [4]. The food environment within which they live and interact plays an important role in shaping their food purchase and consumption behaviour [5].

Modern and urban food environments are linked to nutrition transition, characterised by abundant availability, accessibility and promotion of ultra-processed foods (UPF) and foods high in fat, salt and sugar (HFSS), especially in sub-Saharan Africa (SSA) [1,2]. UPF and HFSS (UPF/HFSS) are associated with poor diet quality, including a high intake of saturated fat, salt and sugar, and a low intake of fibre, protein, vitamins [6], fruit and vegetables [7]. UPF/HFSS consumption is associated with overweight/obesity, metabolic syndrome and the double burden of malnutrition (DBM) in adolescence [8–10]. Children and adolescents are more likely to consume of UPF/HFSS compared to older populations [11]. Urban lifestyles such as eating out coupled with intensive marketing and advertisement UPF/HFSS through mainstream and digital media are implicated in the increased exposure and consumption of UPF/HFSS by children and adolescents [12]. Additionally, high consumption of UPF/HFSS is documented among socio- economically disadvantaged and food insecure households [13].

Kenya is experiencing growing trends in overweight/obesity in children and adolescents, alongside the persistent burden of undernutrition and unhealthy dietary practices. The prevalence of overweight/obesity among girls has increased from 8% in 2003 to 13% in 2022, while 43% of boys are underweight [14]. Unhealthy dietary patterns among adolescents are also documented in urban areas [15], about 70% of school children and adolescents in Nairobi consume unhealthy foods including sugar sweetened beverages and 'junk' foods [16]. There are ongoing efforts by the government to develop policies to create a healthy food environment to address the burden of malnutrition and diet related NCDs [17], but there is a dearth of context specific evidence on the consumption and drivers of unhealthy foods among

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adolescents to inform such policies and interventions. As adolescents' perceptions of factors influencing their dietary behaviours may differ from those of adults, there is a need for more evidence on adolescents' perspectives, with global calls for representation of adolescent voices in the discourse on drivers of food choices, and active participation in actions to support healthy dietary behaviour [2]. Furthermore, in food environment related research, the need for qualitative studies and opportunities for learning from people's perspectives and experiences has been emphasized [5,18]. Hence, this study used qualitative participatory research methods, including participatory photography (Photovoice) complemented by focus group discussions and community dialogues, to explore the perceptions, drivers, and potential solutions surrounding the consumption of UPF/HFSS and their contribution to the double burden of malnutrition, among adolescents living in Nairobi slums, Kenya. Photovoice is a participatory and visual research methodology introduced by Wang et al (1997) [19]. This methodology uses the support of photographs taken by local people to talk about their environment. The photographs then act as a visual prompt for participants, providing them with an opportunity to describe their realities, communicate perspectives and raise awareness of complex (public health) issues in their environments [20]. In addition, Photovoice allows researchers to see 'through the eyes' of study participants and communities, while the visual products of Photovoice act as effective tools for community dialogues, dissemination, policy engagement and advocacy for social change [21]. Photovoice has been used in low-income countries to understand food choices and environments as perceived by adolescents and youth [22,23].

MATERIALS AND METHODS

Study site

Data were collected in three of the largest urban slums in Nairobi, Kenya, namely: *Mathare, Korogocho* and *Viwandani*. They are all located in the vicinity of the central business district of Nairobi at an average distance of 5km (Mathare), 7km (Viwandani) and 12km (Korogocho). *Mathare* is the largest of these and one of the oldest slums in Kenya, with an estimated population density of 68,941 persons/km^2 [24]. *Viwandani* is the smallest of these, located in Nairobi's major industrial area, with an estimated population density of 68,941 persons/km^2 [25]. Korogocho is located close to the 'light industry' area comprising small/medium factories and artisanal industries, with an estimated population density of

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100,000 persons/km^2 [25]. The three slums are generally characterized by high unemployment rates, high poverty and food insecurity, poor housing and congestion; inadequate infrastructure including health, education, water and sanitation; high levels of violence, crime and insecurity [25,26].

Study design

This was a cross sectional descriptive study, employing qualitative participatory research methods including photovoice, focus group discussions and community dialogues. In Photovoice methodology, participants are provided with a camera that enables them to identify, reflect upon and take photographs representing their experiences and perspectives on issues relevant to the topic of inquiry that affect them [19]. The photovoice activities in this study were guided by the format proposed by Wang & Burris.,1997 [19]. It involves participants working in groups to take and discuss photographs representing the issues under research and thereafter organising a community dialogue to exhibit the photographs and stories from the photovoice exercise for subsequent discussion with the community members. This study is part of a larger study focusing on exploring adolescents' experiences and perspectives on nutrition and malnutrition in urban slums. As such, photovoice and focus group discussions were conducted with older (15 to 19 years) and younger (10 to 14 years) adolescents respectively, exploring their perspectives and experiences with i) undernutrition, ii) overweight/ obesity and iii) common foods consumed by adolescents. Community dialogues were thereafter organised with community representatives (adults) to discuss the photographs and issues identified by the adolescents on the three topics.

Sampling and data collection

Sampling and sample size

Sampling of adolescents for participation in Photovoice and focus group discussions involved purposive quota sampling considering sex (boys and girls), and age (younger (10-14 years) and older (15-19 years) adolescents). As slums are organised in villages (13 in Mathare, 8 in Korogocho and 6 in Viwandani), at least four adolescents were selected from each village including a younger boy, a younger girl, an older boy, and an older girl. This yielded 108 adolescents from the three slums (n=52 Mathare; n=32 Korogocho; n=24 Viwandani). In order to obtain a wide range and variety of perspectives and experiences in the community,

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adolescents with varied characteristics such as ethnicity and religious groups were selected for participation in the study.

For the community dialogues, purposive convenience sampling was applied to identify community members representing relevant community groups namely: parents, teachers, health workers, community health promoters, and community leaders (chief, village elders, community-based organisation, youth group, women group and religious leaders). Two representatives from the above-mentioned community groups were selected in each slum, yielding a total sample of 20 participants per slum. A sampling strategy indicating the number of participants in each slum is further summarised in *supplementary file 1*.

Identification and mobilisation of eligible participants was conducted with support from community health promoters who are part of Kenya's community health services [(27)]. The community health promoters conduct monthly visits to households to provide basic health information, screening, and referrals to health facilities as part of their mandate. They are therefore well informed about households with eligible adolescents and the various community group representatives for the community dialogues.

Data collection

Data were collected between April and October 2023. The Photovoice and focus group discussions were conducted separately for boys and girls in each slum to facilitate free expression of opinions without fear of contradiction from the opposite sex. Prior to the main data collection, a pilot exercise was conducted with the adolescents, upon which the Photovoice prompt and the focus group discussions guiding questions were reviewed and translated into Swahili. The main revisions made involved the translation of technical terms into a language that was easier to understand. This included 'undernutrition' into '*poor nutrition'* and 'overweight/obesity 'into '*excessive weight'* as proposed by the adolescents. In addition, due to the high level of insecurity in the slums, concerns were raised about the safety of the younger adolescents while walking around the neighbourhood with cameras for the Photovoice exercise. Hence, a decision was made to engage the younger adolescents on focus group discussions only (and not Photovoice) as they were deemed safer.

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Photovoice with older adolescents

The Photovoice exercise was undertaken over four days: one day of Photovoice training, two days of the photograph taking, and one day of photograph selection, printing, and discussion. On the Photovoice training day, participants were taken through the: i) consent process, ii) Photovoice methodology, iii) use of a camera to take different types of photographs, and iv) ethics of photography, including the no face or identification details' protocol to ensure anonymity of people or places [(28)]. Subsequently, participants were provided with digital cameras (Canon IXUS 155) and requested to take at least five photographs, that best represented something (thing or person) in their community that: i) causes undernutrition *(poor nutrition)*; ii) causes overweight/obesity *(excessive weight)*; iii) should be done to prevent undernutrition iv) should be done to prevent overweight/obesity, among teenagers in their community; v) food that teenagers commonly eat in their community. The five prompts were generated from the broader study objective on exploring adolescents' experiences and perspectives on nutrition (food commonly consumed by adolescents) and malnutrition (undernutrition and overweight/obesity) in urban slums

During the photo taking exercise, participants worked in small groups to identify and capture photographs that represented the issues that they wanted to highlight. Working in smaller groups enhanced efficiency, engagement and participation of the adolescents in the activities. On the photograph selection, printing, and discussion day, the adolescents reconvened into the larger group to review the photographs taken and select those that best represented the stories that they wanted to share. They were then provided with portable printers (Canon Selphy CP 100) and materials (manila paper, pens, glue) to print the photographs, create posters and provide short captions describing the story represented in each photograph. Thereafter, discussions were conducted with the larger group, during which the participants presented and discussed the 'stories' of the photographs they had selected.

Group discussion with younger adolescents

During the focus group discussions, the adolescents were first organised into smaller groups of at least three participants and asked to reflect and brainstorm on the same five prompts (questions) that the older adolescents were asked to take photographs of namely: i) *what are causes undernutrition (poor nutrition);* ii) *what are causes of overweight/obesity* (excessive weight); iii) *what should be done to prevent undernutrition* iv) *what should be done to*

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prevent overweight/obesity, among teenagers in this community; v) *what foods do teenagers commonly eat in this community*. Thereafter they reconvened for the main focus group discussion where they presented and discussed the issues they had identified.

Community dialogues with community representatives (adults)

One community dialogue was conducted in each slum. This involved a one-day exhibition of the photographs/posters and issues identified by the adolescents during the Photovoice and focus group discussions, followed by discussions with the community representatives. In the exhibition, photographs were displayed for viewing by the community members, with the adolescents present to provide clarification or explanation on the photographs. They later convened for a discussion, to share their perspective and opinions on the issues highlighted by the adolescents. This step also served as a part of the participant checking and evidence validation process for this study.

All discussions (Photovoice, focus group discussions and community dialogues) were moderated by the first author (MW) and an assistant moderator, while probing to obtain more details or clarity where relevant. Both are research officers, have a Master's level education in nutrition and dietetics, and extensive experience in research and qualitative interviewing skills. The discussions were conducted mainly in Swahili, the local language in the study areas. Sometimes participants used local slang, in which case the clarification was sought in Swahili. The Photovoice prompts and focus group discussions guides were also translated into Swahili.

All discussions were digitally recorded using an audio recorder and field notes taken during the data collection process. The discussions lasted between 90-120 minutes. The research activities were carried out in venues within the community, which were considered safe and easily accessible by participants. These included the community resource centre in Mathare, a church in Viwandani and a school in Korogocho.

Data analysis

All discussions were translated and transcribed verbatim in English by a professional Swahili-English transcriber. MW reviewed the transcripts for accuracy, and coded them in NVivo version 11. Inductive (data driven) thematic analysis [29,30] was undertaken in the development of the codebook and subsequent coding and analysis. The process involved

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identification of ideas, concepts and patterns emerging from the discussions and narratives with the adolescents and community members and organising them into broad themes and subthemes. Data coding and analysis were conducted in three steps. First, the first author (MW) read 25% of the transcripts (n=4) and developed the first codebook. This initial codebook was then applied in coding of all the transcripts, while continually expanding and refining it to include new themes and subthemes emerging from the data, with review and contribution by the co-authors. During the coding and analysis processes, consumption of unhealthy foods (UPF/HFSS) emerged as one of the predominant themes, which is the focus of this manuscript. The theme of UPF/HFSS consumption comprised three main subthemes; i) general perceptions of UPF/HFSS, ii) the perceived drivers of UPF/HFSS consumption, and iii) recommendations to address UPF/HFSS consumption by adolescents. The subtheme on perceived drivers of UPF/HFSS was further organised into four categories including individual, social and physical and macro level drivers, based on the existing conceptual model of adolescents eating behaviours [4]. Upon the completion of data coding, a matrix was created with the final nodes (themes and subthemes), photographs and excerpts, organised by study slums (Korogocho, Viwandani, and Mathare) and type of interview (older boys/girls, younger boys/girls), for comparisons and further synthesis, such as the differences or similarities across slums, sex and age groups.

RESULTS

In total, 102 adolescents (10-19 years) participated in the Photovoice and focus group discussions and 62 adults (≥ 20 years) in the community dialogues **(Table 1).**

Narratives on the theme UPF/HFSS consumption were organised into three major sub-themes: i) Perceptions on UPF/HFSS, ii) Drivers of UPF/HFSS consumption, and iii) Recommendations to address UPF/HFSS consumption by adolescents.

1. Perceptions of UPF/HFSS

1.1 UPF/HFSS are sugary, fatty, junk foods, food with chemicals

UPF/HFSS were mainly described as ‘sweet or sugary foods’, ‘chemical foods’, ‘junk foods’, or ‘fatty foods’. They were also described as soft or light foods, which provided less satiety and foods with ‘poor nutrition’ referring to poor nutritional quality. These descriptions were

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often provided in comparison with minimally processed foods, which were considered as 'natural foods', 'home food' and 'strong food' that provided satiety and better nutritional quality **(Table 2).**

1.2 UPF/HFSS are modern, food for the city and food of our generation

Generational (old vs young) and urbanisation (rural vs urban) related perceptions on UPF/HFSS consumption were observed. In most discussions, UPF/HFSS were considered as modern foods, fitting for the current generation, and for those living in urban areas. In contrast, traditional or minimally processed foods were considered as foods for the older generation, i.e. 'our parents' or 'our grandparents' or those living in the rural areas. Furthermore, UPF/HFSS foods were perceived as exciting and aspirational, but minimally processed foods were in some groups considered as normal or usual, 'boring', home food and less appealing to the adolescents **(Table 2).**

1.3 UPF/HFSS consumption causes poor nutrition and health

Consumption of UPF/HFSS was perceived as a cause for both overweight/obesity and undernutrition. Participants discussed the sugary/sweet and fatty nature of UPF/HFSS as a cause for overweight/obesity and their poor nutritional quality as a cause of undernutrition. Furthermore, UPFs were reported to have chemicals (not specified) and sugar that could cause dental caries and NCDs, such as hypertension, cancer and diabetes. In some of the discussions, only excessive (not moderate) consumption of UPFs was seen as the cause of these diseases. Narratives on UPF/HFSS as a cause of obesity and NCDs were more widespread than as a cause of undernutrition. The discussions mostly depicted a general knowledge of the link between UPF/HFSS food consumption and poor health outcomes, but there were also indications of knowledge deficits of the unhealthy nature of UPF/HFSS by some adolescents **(Table 2).**

2. Drivers of UPF/HFSS

Figure 1 presents a summary of the individual, social and physical environmental drivers of UPF/HFSS consumption among adolescents based on the conceptual model of drivers of adolescent eating behaviours. No major themes emerged on drivers of UPF/HFSS in the macro-level food environment.

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Individual level drivers of UPF/HFSS

i) Food preference and sensory perceptions

In most discussions, adolescents acknowledged that they liked and preferred UPF/HFSS compared to minimally processed foods. The main reason for the preference of UPF/HFSS was the perception that they were 'sweeter' and tasted better than homemade or 'natural' foods. They expressed experiencing cravings and strong desires to consume UPF/HFSS, and the satisfaction and pleasure that they experienced with consumption, even with the knowledge that the foods were linked to poor health outcomes. In discussing their preference for UPF/HFSS, comparison was often made with minimally processed 'natural' 'home foods', which were considered as boring and uninteresting, participants also reported that home food was monotonous 'always available' and easy to access at home, while UPFs were not commonly available at home, and hence making them more aspirational (**Table 3).**

ii) Convenience of UPFs/HFSS

UPF/HFSS were perceived as convenient in comparison to minimally processed foods and home-prepared foods. The perception of UPF/HFSS's convenience was based on the reason that they: i) were often ready to eat, ii) required little or no effort for food preparation, iii) necessitated little or no effort for clean-up thereafter, iv) were easy to handle, 'take away' compared to other foods (e.g. some fruits and vegetables). Discussions on the convenience of UPF/HFSS foods were also reflected in the dialogues with community members. Participants highlighted the common practice of parents giving their children money to purchase ready-to-eat foods from the streets, instead of preparing meals at home, as it was convenient. Some participants also observed that adolescents were often too 'lazy' and lacked motivation to prepare meals and would opt for ready-to-eat, often unhealthy UPF/HFSS (**Table 3).**

iii) Inadequate time

Inadequate time was highlighted as among the reasons for preference of UPF/HFSS over 'natural' or 'homemade meals' that were perceived to require more time for preparation. Adolescents expressed the lack of time to prepare meals at home due to other competing interests, such as work, school and spending time on media such as watching TV or playing video games. The discussion on time deficiency as a driver of UPF/HFSS preference also emerged during community dialogues. Parents highlighted their concerns with adolescents

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spending too much time on the 'remote control' (watching TV) or on social media such as 'tiktok' and 'You tube' leaving them with no time to prepare/eat healthy foods. Furthermore, some community health promoters observed that most parents were busy fending for their families and had little or no time to prepare healthy meals at home, and hence gave their children money to purchase ready-made food, mainly UPF/HFSS from the streets, without considering the healthiness of the food bought and consumed by their children **(Table 3).**

iv) Illicit drug use and UPF/HSS consumption

It emerged from the narratives that some UPFs, especially sugar-sweetened beverages and candy, were commonly consumed alongside some illicit recreational drugs, such as 'weed' (cannabis) and khat. The main reason for this was to amplify the effect of the drugs (weed or khat with energy drinks), mask the unpleasant taste and smell of the drugs (khat with sweetened beverages or chewing gum/candy) or enhance the usability of the drugs (mainly khat and chewing gum). The narratives on UPFs and drug use were mainly in Korogocho and Mathare slums and were particularly made in reference to adolescent boys **(Table 3).**

v) Perceived links between body size and shape with UPFs/HFSS

The consumption of UPF/HFSS, and mostly those that are fatty/oily was perceived to cause weight gain. As such, some adolescents aspiring to gain weight reported consuming UPF/HFSS to achieve this. In addition, participants described having a body shape with 'broader hips' as more attractive to men and peers. Eating fatty and sugary foods was perceived as one of the ways of gaining weight and achieving this body shape. In other discussions, an opposing view emerged, as UPF/HFSS were seen as 'lighter' compared to traditional foods and hence preferable for those not wanting to gain weight. Perceptions that UPF/HFSS contribute to weight gain were most prevalent. These discussions on body size and shape preferences mainly referred to adolescent girls **(Table 3).**

vi) Adolescents' autonomy

Discussion on the autonomy of adolescents in their dietary behaviours emerged from the dialogues with community members and not from the discussions with adolescents. Adolescents were said to be a 'difficult' group to deal with, as they did not always listen to their parents' advice on healthy food preparation and consumption. Some parents highlighted their intention and efforts in preparing healthy meals at home, which the adolescents would

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reject, opting for unhealthy options such as UPF/HFSS, or going without food. They further raised concerns of constant frustrations while trying to encourage and supervise their adolescents' eating practices and eventually giving up and allowing them to make their own decisions, and on some occasions, following the lead of their children on the foods that they wanted to eat in order to maintain peace in the family **(Table 3).**

2.1 Social environment's drivers of UPF/HFSS consumption

i) Social status

UPF/HFSS were perceived as prestigious and 'classy' to eat or be seen eating in public. Eating UPF/HFSS was also described by participants as a sign of being progressive and having better economic status in the neighbourhood and at school, compared to 'ordinary' home cooked food or other non-processed foods that would be seen as 'embarrassing', 'primitive' or a sign of poverty **(Table 4).**

i) ***Peer pressure to eat UPFs/HFSS***

Peer pressure from friends also emerged as a reason driving the consumption of UPF/HFSS. Participants expressed that they would consume UPFs because they saw their friends taking them and would not like to appear different from their friends and schoolmates. In some cases, participants expressed embarrassment from carrying 'home food' while their peers had UPF/HFSS. Some community members also expressed their observations on the influence of peer pressure among adolescents in consuming 'junk foods' **(Table 4).**

2.3 Physical environment level drivers of UPFs/HFSS consumption

i) Physical access (availability)

UPF/HFSS were perceived as largely available and accessible in the neighbourhood, sold by both formal (shops) and informal food vendors including roadside (street) food vendors. Photographs taken by participants on UPF /HFSS were mainly of street and informal food vendors, which may be an indication of informal food vendors as a common source of UPF/HFSS in the study area. Although they were readily available in the neighbourhoods, there were perceptions that UPF/HFSS were less common at home, which made them more desirable (**Table 5).**

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ii) Economic access (affordability)

Economic access was discussed in reference to UPF/HFSS food prices in comparison to other non-UPF/HFSS foods, as well as their affordability relative to the adolescents purchasing ability and the value for money based on the quantity of food that could be bought for a certain amount of money.

Most narratives from adolescents indicated that UPFs/HFSS were cheaper in the neighbourhood and available in more affordable quantities compared to minimally processed foods. Additionally, the perception that UPF/HFSS were mostly ready to eat, required less preparation resources such as fuel and no accompaniments, made them more affordable compared to other homemade foods that needed elaborate preparation and accompaniments, hence requiring extra costs. In some occasions, participants indicated that UPF/HFSS were more affordable in slum neighbourhoods, compared to other parts of the city.

Community discussions supported the perception that some UPFs/HFSS were cheaper than non-processed foods and hence were preferred in their community in the context of high food prices and difficult economic situation **(Table 5).**

3. Recommendations to address UPF/HFSS consumption

Nutrition education and awareness creation on the unhealthy nature of UPFs/HFSS and the negative health effects associated with UPF/HFSS consumption were the most common recommendations by adolescents and community dialogue participants. Existing structures such as schools, youth group and community meetings, were recommended as potential avenues for education and awareness creation on healthy diets to adolescents. In addition, inclusion of adolescent nutrition components in the community health strategy through the community health promoters training modules was recommended, to enable them to reach out to adolescents during their regular monthly household visits.

Banning the sale of UPFs in their neighbourhoods was also recommended as a way of curbing their consumption. However, some adolescents had the view that UPF/HFSS were a core part of urban food sources and would therefore be difficult to eliminate. It further emerged from the discussions that UPF/HFSS sale and business were important income generating activities in the neighbourhood. As such, the adolescents were concerned that eliminating UPF/HFSS would render them or their families economically inactive **(Table 6).**

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DISCUSSION

This study sheds light on adolescents' experiences and perspectives on UPF/HFSS consumption, complemented by the observations of other community members. The findings indicate widespread popularity and positive regard for UPF/HFSS foods compared to non-UPF/HFSS 'natural' and 'homemade' meals amongst adolescents in urban slums, Kenya. The study further reveals a contrast between adolescents' knowledge and their preferences or practices regarding UPF/HFSS. There is, in general, awareness of the unhealthy nature of UPF/HFSS and their potential contribution to poor nutrition and health outcomes. There is also awareness of the healthiness of unprocessed or minimally processed foods and their association with good health and nutrition. Despite this awareness, there is a greater preference for UPF/HFSS compared to minimally processed foods.

The disconnect between adolescents' knowledge and preferences (and potential practices) is fuelled by the perceptions that UPF/HFSS foods are modern, urban, classy, a sign of better social status and for the young generation, and the opposite perception for minimally processed foods. Spending time on media, such as watching TV, gaming and social media emerged as a potential competing interest, deterring them from preparing and consuming healthier homemade meals. A review of worldwide UPF consumption showed that they are indeed more commonly consumed by younger (than older) populations [(11)] with indications that children and adolescents are their earliest adopters in low and middle-income countries [(12)]. Other studies indicate that deliberate strategies by UPFs industries to market and promote UPFs to children and adolescents, such as campaigns in broadcast and social media may influence their attitudes and perceptions [(31,32)]. Strategies to limit the marketing and advertisement of unhealthy foods to children and adolescents, while promoting healthier foods, should be implemented to counter the positive attitudes and preference for unhealthy UPF/HFSS and the widespread perception that minimally processed foods are boring and for older or rural populations.

Factors driving the consumption of UPF/HFSS were identified, at individual level, as well as in the social and physical environment that they live and interact with.

At individual level, food preferences, largely driven by the food's organoleptic qualities and convenience influenced the consumption of UPF/HSSF in line with previous findings [(33,34)], in which out of over 100 possible factors identified, food preference was ranked among the top five drivers of dietary behaviours in the African context [(35)]. UPFs by design have high

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sensory appeal, are highly palatable, and often ready to eat, requiring little or no preparation [36]. The various processes in the production and preparation of UPF/HFSS such as deep frying, the addition of artificial flavors and colors, emulsifiers, sweeteners, carbonating, gelling, and glazing agents, enhance their organoleptic qualities [36]. The high preference of UPF/HFSS compared to alternative healthier minimally processed foods is of concern given the increasing literature that links UPF/HFSS consumption with adolescents' poor diet quality, such as high calorie and poor nutrient intake, and poor health outcomes such as overweight/obesity, micronutrient deficiencies [10] metabolic and cardiovascular-diseases [8,37]. Interventions to educate and provide practical support to adolescents to prepare recipes from affordable, convenient, appealing (tasty/socially desirable), healthier, minimally processed foods are therefore needed in urban contexts.

Body size and shape emerged as an important issue driving the consumption of UPF/HFSS. Adolescence is a stage where body awareness and romantic relationships begin [38], which could explain the aspiration towards body shapes that are perceived to be attractive. In a previous review of body size preferences for African women, a large body size (but not obese) was seen as a traditional African ideal and associated with strength, wealth and prosperity while a full figure was perceived as sexually attractive [39]. Literature on the role of personal values in dietary behaviours indicates that the values or issues that consumers perceive as important to them, may ultimately drive their decisions on food consumption [40]. This may explain the preference and choice to consume UPF/HFSS by some adolescents in pursuit of a perceived attractive body shape, despite the knowledge of their unhealthy nature. This therefore calls for interventions to shift social norms about what a healthy weight is and how to achieve it safely through a healthy diet and physical activity, as well as addressing the underlying attitudes that cause stigmatisation of certain bodies among adolescents.

We also observed recreational illicit drug use to be a potential driver for UPF consumption among adolescents in this study in line with previous results showing the potential link between UPF consumption and illicit drug use among adolescents [41]. Further research on this issue, as well as integration of nutritional messages into campaigns against illicit drug abuse by adolescents are warranted, especially in urban slums and similar contexts where drug and substance use among teenagers especially boys, is prevalent [42].

Within the physical environment, availability and accessibility of UPF/HFSS as a driver for consumption as highlighted in this study have been documented in a previous study [43]. Urbanisation and nutrition transition are implicated in the wide availability of a variety of

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unhealthy foods and changes in dietary behaviour from traditional diets to highly processed, cheap, energy dense and nutrient poor diets such as UPF/HFSS [44]. Street and snack foods in urban areas are widely available and documented as a source of readily available, affordable and convenient calories, which drives their consumption by adolescents in such contexts (5,42, 43). Urban areas are characterized by busy lifestyles, often going along with minimal time for preparation of healthy homemade meals. Urban slums are further characterized by high levels of food insecurity and poverty [26], a situation which worsened during and soon after the COVID pandemic leading to increasing food prices, especially staple foods (e.g. cereals and legumes) often used for healthier homemade meals [46]. Previous research indicates that some of the UPF industries are multinationals, well financed to ensure that their products remain affordable in the context of economic adversity, including the provision of a variety of low-cost products targeting different market segment [43]. These may be some of the reasons why UPF/HFSS were reported to be more affordable and convenient and cost-effective options compared to minimally processed foods and homemade meals. In line with this, food prices was ranked as one of the most important drivers of dietary behaviours in the African context [35]. Strategies such as food price interventions are advocated to improve the availability and affordability of healthier non-UPF/HFSS foods and limit consumption of UPF/HFSS and address the widespread access to UPF/HFSS. Fiscal policies to increase taxes on unhealthy foods and subsidize healthier foods are among the recommended interventions to create a healthier food environment [47].

There was a widespread recommendation from participants that nutrition education was needed to shift attitudes and dietary behaviours. Existing literature further indicates that knowledge alone may not be sufficient to trigger healthy dietary behaviors among adolescents [2]. This is partly because health and nutrition outcomes are not a major priority for adolescents' dietary behaviors, but rather the immediate benefits such as convenience, satiety and sensory gratification, provided for example by UPF/HFSS [48]. This, according to Neufeld et al., is because the consequences of poor diets are often not experienced immediately, but in adulthood, which may seem too far away to motivate adolescents to change their behavior [48], indicating the need for multifaceted and multisectoral interventions to promote healthy dietary behavior among adolescents, and address the drivers of UPF/HFSS consumption. Guided by the Behaviour Change Wheel for designing interventions [49], emphasis should be placed on i) **education and training** to increase and

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reinforce the knowledge and understanding on healthy dietary behavior for optimal health and nutrition and the adverse effects of UPF/HFSS, through schools, community and peer groups and the community health strategy, ii) **modelling** behavior through practical demonstrations to enable them prepare recipes from affordable, convenient, appealing (tasty/socially desirable) healthier, minimally processed foods iii) **Food environmental restructuring** to increase the availability, accessibly of healthier non-UPF/HFSS foods in the urban slum neighborhoods and v) **incentivisation** and empowerment of food vendors to provide healthier and safer non-UPF/ HFSS foods in slum neighbourhoods. Policy actions to create a healthy food environment that supports healthy dietary behavior for adolescents may also focus on i) **Regulations and legislation** for marketing and promotion of unhealthy foods such as UPH/HFSS targeting children in and around schools and traditional and social media ii) **Fiscal measures** to increase taxes on unhealthy foods (e.g. UPF/HFSS) and subsidize healthy non-UPF/HFSS foods, iii) **marketing and communication** strategies for promoting healthy foods and dietary behaviour and addressing underlying perceptions (UPF/HFSS are urban, modern, classy, for young people) and misconceptions (e. g. body shape/size, social class) that fuel UPF/HFSS preference and consumption by adolescents.

Strengths and Limitations

A particular strength of this study is the participatory research undertaken, empowering adolescents to document, reflect upon and discuss in detail their own perspectives and experiences with UPF/HFSS consumption in their communities, by use of photography and group discussions. Community members added a complementary perspective, which combined with adolescents' views, allowed for a more holistic understanding of the issues and identification of possible solutions. The photographs generated by participants assisted the researchers to better understand the perspectives and experiences of the adolescents and probe for more in-depth information, hence enriching the insights. A potential limitation is that the photography exercise was only conducted for two days. More days would have allowed the adolescents longer time for reflection and photography, but this could not be realised because the majority of participants were school-going children and were only available during the weekend. However, during the discussions, adolescents were encouraged to talk about any other issues that were not addressed in the photographs that they had already taken. Other limitations include potential desirability in reporting the foods commonly consumed by adolescents in the study community; however, this was mitigated through

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triangulation of data from adolescents of different sex and age groups, and the community representatives. Furthermore, the narratives on the causes and solutions to unhealthy food consumption were mainly at the individual, social and physical levels and not at the macro level (see Figure 1).

CONCLUSIONS

This study highlights a general understanding of the adverse nutrition and health outcomes associated with UPF/HFSS consumption by adolescents living in urban slum settings in Kenya. However, this knowledge does not necessarily translate into positive action towards healthier choices, as evidenced by the general preference for UPF/HFSS compared to healthier non UPF/HFSS, fuelled by perceptions that UPF/HFSS foods are modern, urban, classy foods and for the young generation while minimally processed foods are boring and for older and rural people. Factors at the individual level (e.g. organoleptic food preferences, body shape, illicit drug use, convenience, time deficiency and autonomy), physical environment (UPF/HFSS, physical and economic access) and social environment (social status, peer pressure) influence the consumption of UPF/HFSS. There is need for multifaceted, multisectoral interventions to promote healthy dietary behaviour among adolescents, and address the perceptions and drivers of UPF/HFSS consumption. Adolescents should be involved in the design and co-creation of such interventions, given the role of adolescents' autonomy in decision-making regarding UPF/HFSS consumption as revealed in this study.

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

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Table 1: Characteristics of participants

		Photovoice/focus group discussions (n=102)	**Community dialogues (n=62)**
Site (name of slum area)			
	Korogocho	35	19
	Viwandani	35	19
	Mathare	32	24
Age (years)			
	10-14	48	N/A
	15-19	54	14
	20-29	N/A	12
	30-39	N/A	18
	40-49	N/A	10
	≥50	N/A	8
Sex			
	Female	51	29
	Male	51	33

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Table 2: Narratives and photographs on the theme 'Perceptions of UPF/HFSS'

UPF/HFSS are sugary, fatty, junk foods, food with chemicals

"Junk foods are foods with a lot of fats such as smokie, deep fried chips." (Younger girls, Viwandani)

"My opinion is that the foods that she has mentioned like crisps, junk foods and biscuits, they are sugary so the more one eats them they become sick." (Older girls, Korogocho)

"Chips with a lot of oil and also some mandazis called mandazi-chapo. They are too oily and even if you squeeze them, you see the oil. So teenager like it but it has a lot of oil and causes over nutrition." (Older boys, Mathare)

"It shows fats and oily foods. ...these foods which have a lot of oil, e.g. bhajia, chips, samosa." (Older girls Korogocho)

UPF/HFSS are modern, foods for the city/urban areas and food of our generation

"I don't think it [traditional foods] is consumed a lot because people say that those are foods of old times. ... When you go home in upcountry you will find that most people there are used to eating natural foods while here in Nairobi we are used to eating rice, indomie [instant noodles] and chipo [French fries/chips]... Most parents do prefer natural foods like yams so you find that on Monday they would eat Ugali [cornmeal], Tuesday they would eat beans, Wednesday yams. So you find that the children get bored of eating those foods and they will want other foods. They prefer foods like bread, chips, sodas, juice and things like candy." (Older boys, Viwandani)

"Traditional foods are like yams, cassava, mukimo (a mix of mashed potatoes, vegetables, maize and beans)... They are for old people, our grandmothers. We eat modern foods, chips, sausage, samosa, bhajia, pizza, sweet cake, KFC (chips and chicken)...Time-

"Sweet potatoes, most people do feel that it's those people who are up country who should eat them.... I do see sweet potatoes being eaten by women or older people eating them....So someone like this [adolescent] cannot eat sweet potato. She will prefer chips." (Older girls, Mathare)

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change, people have become modern and consume different foods." (Young girls, Korogocho) *"You can find someone eating junk food and if you ask them why they don't eat vegetables they will ask you, "Are we in the rural area or am I old?" They say that it's for the older people…while the teenagers have to eat the junk foods….What a teenager should eat are sugary things." (Young girls, Viwandani)*	
3.1 UPF/HFSS consumption causes poor nutrition and health	
"Teenagers prefer sugary foods though I don't think that it is right for our body because it causes us diseases…diabetes, toothache and such [but] they like them... Sometimes samosa also makes one to be overweight." (Older girls, Mathare) *"…. We have biscuits, crisps, we have waffles, we have patco (sweets) and others. These are the foods that teenagers like eating…Teenagers love eating crisps, they like eating biscuits, hotdogs, pizza and others. These are good but also bad for health if you are used to it... It can cause diseases like obesity, diabetes, hypertension." (Older girls, Korogocho)* *"This shows, this child likes eating sweets and her weight is reducing, she likes to eat chips, popcorns, she likes to eat sweet things… it is common especially us teenagers." (Older girls, Viwandani)*	 *This [Photo] is talking about the chemicals in the foods. Those chemicals can cause overnutrition because they add chemicals to the body. So in case you eat a lot of chocolate, you know they have chemical additives, you may get cancer and other big diseases." (Older boys, Korogocho)*

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Table 3: Narratives and photographs on the theme 'Individual drivers of UPF/HFSS'

Food preference and sensory perceptions

[Tastes good, gives pleasure, cravings]

"Bhajia and chips, are also not good because they also make you eat excess. You will always want to eat the chips and bhajia all the time…because they are sweeter than the foods cooked at home." (Older girls, Mathare).

"Some know (UPFs are unhealthy) but their bodies force them to buy… They are sweet…. Cravings, you may be satisfied but still buy it just to taste its sweetness…They are mostly consumed (by teenagers) because they are sweet and sugary…also for self-enjoyment…When the soda is sweet you enjoy...you may want to taste it because they sometimes are rare. This one (fruit and vegetable) is easy to access" (Older boys, Korogocho)

"Teenagers should eat these vegetables but they don't think that they are tasty" (village elder, community dialogue, Viwandani).

"Here we see that we have biscuits, crisps, we have waffles, we have patco and others. These are the foods that teenagers like eating…They eat a lot because they are sweet… for enjoyment…" (Older girls, Korogocho)

Convenience of UPFs/HFSS

[Quick to eat/prepare, lack of motivation and skills to cook, easy to take away, competing interests e.g. watching TV, social media]

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"Teenagers don't like things like ugali. Ugali is something that takes time to be ready but junk foods are ready made so you just pick them and eat them."(Older girls, Korogocho)" (Older girls, Korogocho) *"And then also laziness; because for the boys when they come from work they will be too tired to cook so they will just be eating tea and bread daily because of the laziness to cook." (Older boys, Mathare)* *"Let me say that one thing that leads to that food [junk food] is social media and we also have PS...PS is computer game….So you find that a child has been left with 50 bob to buy food. But the teenager wants to go and play PS, watch a movie...They [teenagers] want to sit with the remote and scroll their phones on YouTube and the likes. So you know, they will just go to the shop and buy bread." (Community health promoter|parent, Community dialogue, Viwandani)* *"Parents have also become too lazy because you find that they cook late and sometimes even tell the children to buy chips." (Community health promoter, community dialogue, Korogocho)*	 *"Natural foods like maize from the farms; they are good though people are too lazy because they will feel that the maize would take time to be cooked so they would rather buy bread and eat it… In my opinion, natural food is not consumed a lot because you cannot find a teenage boy going to buy maize or githeri (a mixture of maize and beans). They will feel that it wastes their time." (Older boys Viwandani)*
Illicit drug use and UPF/HSS consumption *[Illicit drugs consumed with UPFs to disguise taste or enhance effect]*	

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"There are these drugs like khat that they consume as well. You use energy drink to chew jaba [khat]…It is bitter so you reduce the bitterness." (Older boys, Korogocho)

"You find that when one gets 100 bob they just go to buy the drugs. If someone was paid 200 or 300 in a day, they will use some on mirra [khat], groundnuts, kashata (coconut sweets/candy) and some spices because you cannot just chew mirra [khat] without some substances." (Older boys, Mathare)

"Jaba [khat] it is too bitter and so they accompany with the sugary foods so that they can feel the taste... You don't chew it to swallow; you keep it on your cheeks. You just chew it and then at some point it chokes you. So you buy soda or water though teenagers mostly use sodas to prevent the choking …. When one smokes bhang they also drink sodas … jaba [khat] they chew with ball gums and even sweets." (Older girls, Mathare)

Perceived links between body size and shape with UPFs/HFSS

[Eating UPF/HFSS linked with weight gain and desirable body shape]

"There are those who always want to be shapeful so that men can love them. Some of them also use their shapes to look for money. Some girls will say 'Let me make my stomach small and my buttocks big so as to attract men…'. They eat chips – some even buy tummy-trimmer whereby their stomachs become smaller while the other parts of the body gain weight … You will have the shape you wanted when you were eating chips… I can say that the shape (they want) is just a small tummy, small chest and big hips." (Older girls, Mathare)

"Girls do add oil into their foods so that they can gain in certain places in their bodies… Like one gained back here [showing the buttocks]. Some want to have hips so that the boys can see them as beautiful." (Younger boys, Viwandani)

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"It [Body shape] affects both sides because even a boy when they want to win over girls they will want to have biceps so that when they wear that shirt or vest, they look good. As a girl, I will want to eat junk food so that I can have hips and get a sponsor [older, wealthier man] somewhere. So it's something that affects both sides." (Youth representative, Community dialogue, Mathare)
Adolescents' autonomy *[Disregarding parent's advice on healthy foods and opting for UPF/HFSS]*
"First, it's a challenge parenting teenagers or adolescents because there are foods that they prefer to eat. You find that girls prefer to eat chips ... So, if you tell them that you'll eat saga, managu, mitoo (traditional vegetables), you will have a conflict. This (dialogue) is a good idea but I would still like you to reach more teenagers since it's like we have a conflict with them and one cannot afford to have a conflict with children in the household…The challenge in our community is that these teenagers do not like homemade foods and that's why you see various diseases affecting them. A parent may have cooked food but the teenager may buy some chips out there and then they tell you that they are satisfied." (Parent |Village elder, Community dialogue, Viwandani)
"As a parent with a teenage girl, I can say that it's not easy to understand these teenagers because you will work hard to get some flour they can use to cook ugali (corn meal), when you get home they start complaining ''This is the flour you've brought?' It's because they've seen a brand in TV like 'Raha Kavagara' or 'Hostess' (refined corn flour)… You then tell them to go and buy kales but they will again complain about the vegetables. Maybe you've bought them mala [fermented milk], but they will still keep complaining. So raising teenagers is not easy… I also have a teenage girl and you can buy food and bring it home and cook it but she won't eat. She tells you 'Mom, just cook and eat the food.' After you cook, you ask her what she will eat and she tells you that she will drink tea and go to bed..." (Parents, Community dialogue, Mathare)

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Table 4: Narratives on the theme 'Social environment level drivers of UPFs/HFSS consumption'
Social status *[Aspirational foods, sign of greater/better social status]*
"She feels embarrassed to eat sweet potatoes but when she eats chips she is proud even if someone sees her. You know girls do love chips." (Older girls, Mathare) *"You know most girls don't like being seen to come from poor backgrounds. So they would rather go buy the chips instead of mangoes. In fact you find that maybe bananas are sold at three for ten bob, but people will view you as stupid." (Older girls, Viwandani)* *"Someone will feel that for example instead of buying bananas to eat by the road they would rather buy chips because people will think that you are primitive or such like thing." (Older girls, Korogocho)*
Peer pressure to eat UPFs/HFSS *[Social norms around UPF/HFSS being modern, urban, young, 'cool']*
"Some buy 'junk foods' because they are influenced by their fellows." (Older boys, Korogocho) *"… For example at school we have groups of mabombe 'rich kids'… they will always just buy sodas and go and drink it. So there are maybe some girls whose parents don't have the money but due to peer pressure she will eat foods that are not beneficial to her every time – soda, crisps and such." (Older girls, Viwandani)* *"Some friends at school just like girls with hips. If you don't have hips they say that you cannot walk with them. So a friend of mine told a girl 'you don't even have hips, go and have some hips before you can come back here' … Since one she had been told in the group that they don't want someone who is underweight, one will go and buy foods like chipo [chips/French fries], so that she can gain some weight and be loved by the group." (Younger girls, Mathare)* *So, on balanced diet and especially in school, we find that peer pressure makes the teenagers not eat the traditional foods and all they want are the junk foods. If you cook for them the traditional foods they say that it's not tasty. So you find that due to peer pressure they want to eat what they want and not what is nutritious." (Teacher, community dialogue, Mathare).*

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Table 5: Narratives and photographs on the theme 'Physical environment level drivers of UPFs/HFSS consumption'

Physical access (availability)

[UPF/HFSS are widely available and accessible in the neighbourhood]

"Like these junk foods are available… They are excess…. They are everywhere." (Older girls, Korogocho)

"Modern foods are more available than traditional foods." (Young girls Viwandani)

"We have mandazi, kdf [donuts], bread, and samosa. So, that's the food that is readily available." (Community based organisation representative, Community dialogue, Viwandani)

"Everywhere you go you will find which our children just eat chobo from early in the morning… Chobo are these expired food products that are sold on the streets and most of them are the sugary foods." (Community health promoter, Community dialogue, Korogocho)

"It shows a shop. So there are shops that sell foods that are balanced diet while there are also those that sell sweets and cakes that interfere with the teeth." (Older girls, Mathare)

Economic access (affordability)

[UPF/HFSS are cheap to buy/prepare; source of income for some families in slum neighbourhoods]

"They (UPF) are cheaper…You get a lot of crisps for five shillings…For example in town (City center) chips sell at 100 while here (slum) it sells starting from 10 shillings . Junk foods are cheaper than vegetables because you cannot buy kales worth five bob, you won't be satisfied. So we can just say that it's [more] expensive than the junk foods." (Older girls Korogocho)

"You see like samosa, a big one is sold at 10 bob but most of them are five bob each. So you will feel that you don't have the money to buy [maize] flour which currently is 200 or 100 shillings, so you cannot afford to buy flour, vegetables,

"So we eat a lot of junk foods in the slums because you don't have the money to buy food since it's expensive. So you will just eat junk

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paraffin, stove and such; so they feel that this is cheap."(Older girls, Mathare) *"You find that we go for junk foods because it is cheap and readily available and if I have 20 bob, I can get satisfied. If I want to order other foods from upcountry [rural areas]…it will cost a lot." (Youth representative, community dialogue, Mathare)*	*food which is cheaper, sweeter and can satisfy you. So you will go for junk food like smokie, and such." (Older boys, Viwandani)*

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Table 6: Recommendations to address UPF/HFSS consumption from participants	
Nutrition education and awareness creation	
"People should be called for seminars and told the disadvantages of consuming sugary foods and some people will learn from there that eating sugary foods has a lot of disadvantages such as toothache and such." (Older girls, Mathare). *"As a community health promoter we should have key messages (on adolescent nutrition) because most of the times we have messages about pregnant mothers, children below five years and elderly persons with NCDs, and teenagers we don't focus much on that cohort. ... We don't have the key messages for the teenagers. So, what I would recommend is that the health officials should give [the key messages] to the health promoters, because we are the health representatives in the community and we can reach the teenagers." (Community health promoter, community dialogue, Mathare)* *"The government should get involved and teachers to teach nutrition education in all the schools. ... And even when one goes to the hospital they should be told about nutrition ... Like now that the schools are closed we would encourage that they be called in groups – even the champions here [Photovoice participants] can educate the youth – you can put them in groups and educate them." (Community dialogue, Parent, Viwandani)*	 *"It [Photo] is showing this man advising the teenagers on what they should eat so as to boost their immune system…They should offer these lessons like twice a month or weekly. More educators should be made available. They should make it attractive such that all teenagers can go and listen to them."(Older girls Viwandani)*
Controlling physical access to UPFs/HFSS	
"I feel that people should be stopped from eating those sugary foods like biscuits and sweets and instead eat foods that provide energy to the body ... You can consume them but not often or daily. So we cannot stop eating these foods though we should eat them with a limit." (Older girls, Mathare). *"You cannot come to me and tell me that 'xxx stop selling these chips because the children are becoming obese' , because I am also providing for my family ...maybe my mother also sells and then they come and stop them then what will we eat? If you say that they shouldn't sell then it will affect some families." (Older girls, Korogocho).*	

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FIGURE

Drivers of UPF/HFSS consumption in adolescents emerging from discussions with adolescents and community members

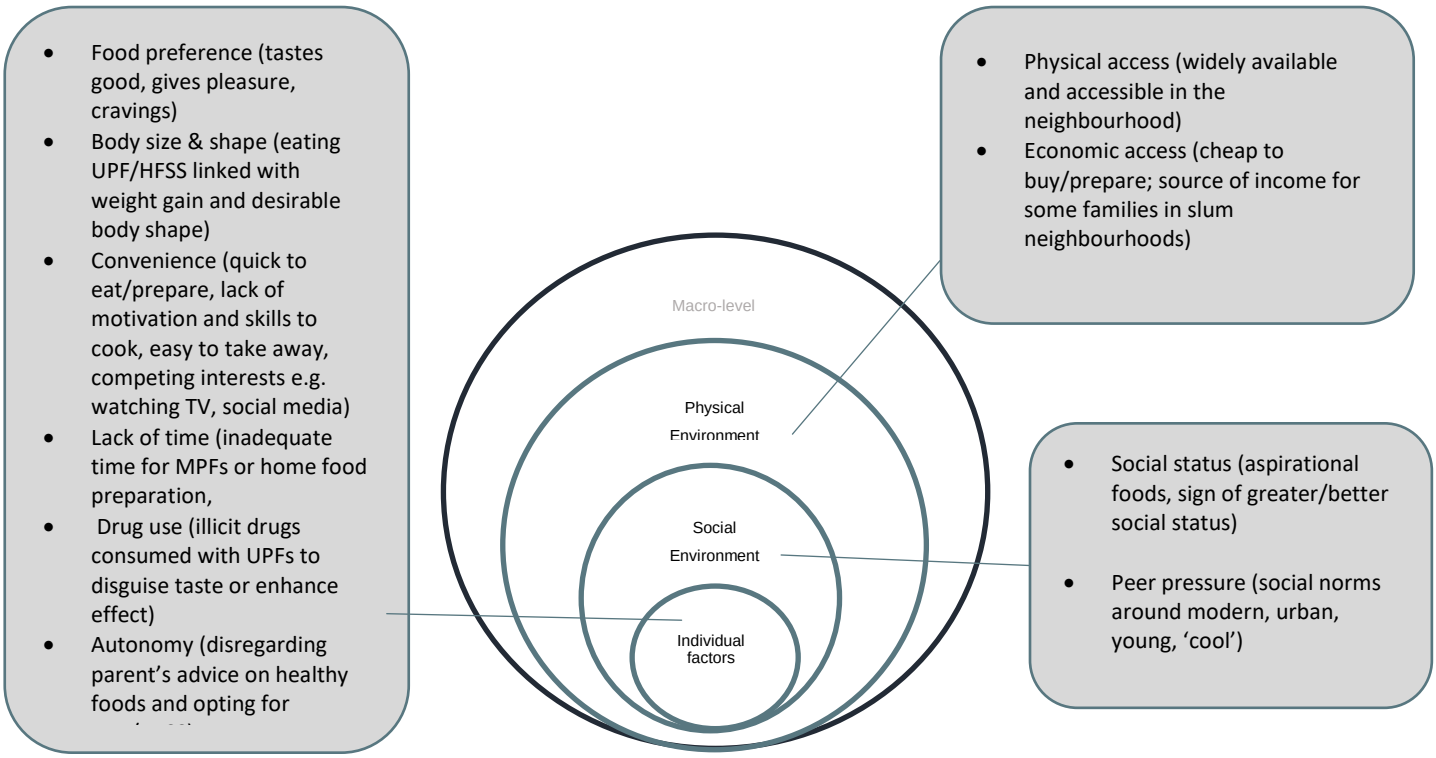

Figure 1: Drivers of UPF/HFSS consumption in adolescents emerging from discussions with adolescents and community members

(UPFs /HFSS: Ultra processed foods and foods high in fat, salt and sugar MPFs: unprocessed/minimally processed foods)

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Supplementary file 1

Supplementary table 3 : Sampling strategy for the study

	Mathare (13 villages)	**Korogocho (8 villages)**	**Viwandani (6 villages)**	**Total**
Photovoice participants				
Older girls	13	8	6	**27**
Older boys	13	8	6	**27**
Focus group discussion participants				
Younger girls	13	8	6	**27**
Younger boys	13	8	6	**27**
Total number of adolescents per slum	52	32	24	**108**
Community dialogue participants	20	20	20	**60**
Total number of participants per slum	72	52	44	**168**

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