

Title: Unhealthy eating practices of city-dwelling Africans in deprived neighbourhoods: evidence for policy action from Ghana and Kenya

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2 Abstract

3 Growing urbanisation in Africa is accompanied by rapid changes in food environments, with
4 potential shifts towards unhealthy food/beverage consumption, including in socio-economically
5 disadvantaged populations. This study investigated how unhealthy food and beverages are
6 embedded in everyday life in deprived areas of two African countries, to identify levers for context
7 relevant policy. Deprived neighbourhoods (Ghana: 2 cities, Kenya: 1 city) were investigated
8 (total=459 female/male, adolescents/adults aged ≥ 13 y). A qualitative 24hr dietary recall was used
9 to assess the healthiness of food/beverages in relation to eating practices: time of day and
10 frequency of eating episodes (*periodicity*), length of eating episodes (*tempo*), and who people eat
11 with and where (*synchronisation*). Five measures of the healthiness of food/beverages in relation
12 to promoting a nutrient-rich diet were developed: i. nutrients (energy-dense and nutrient-poor -
13 EDNP/ energy-dense and nutrient-rich -EDNR); and ii. unhealthy food types (fried foods, sweet
14 foods, sugar sweetened beverages (SSBs)). A structured meal pattern of three main meals a day
15 with limited snacking was evident. There was widespread consumption of unhealthy
16 food/beverages. SSBs were consumed at three-quarters of eating episodes in Kenya (78.5%) and
17 over a third in Ghana (36.2%), with those in Kenya coming primarily from sweet tea/coffee.
18 Consumption of sweet foods peaked at breakfast in both countries. When snacking occurred
19 (more common in Kenya), it was in the afternoon and tended to be accompanied by a SSB. In both
20 countries, fried food was an integral part of all mealtimes, particularly common with the evening
21 meal in Kenya. This includes consumption of nutrient-rich traditional foods/dishes (associated with
22 cultural heritage) that were also energy-dense: (>84% consumed EDNR foods in both countries).
23 The lowest socio-economic groups were more likely to consume unhealthy foods/beverages. Most
24 eating episodes were <30 minutes (87.1% Ghana; 72.4% Kenya). Families and the home
25 environment were important: >77% of eating episodes were consumed at home and >46% with
26 family, which tended to be energy dense. Eating alone was also common as >42% of eating
27 episodes were taken alone. In these deprived settings, policy action to encourage nutrient-rich
28 diets has the potential to prevent multiple forms of malnutrition, but action is required across
29 several sectors: enhancing financial and physical access to healthier foods that are convenient (can
30 be eaten quickly/alone) through, for example, subsidies and incentives/training for local food
31 vendors. Actions to limit access to unhealthy foods through, for example, fiscal and advertising
32 policies to dis-incentivise unhealthy food consumption and SSBs, especially in Ghana. Introducing

33 or adapting food-based dietary guidelines to incorporate advice on reducing sugar and fat at
34 mealtimes could be accompanied by cooking skills interventions focussing on reducing frying/oil
35 used when preparing meals, including 'traditional' dishes and reducing the sugar content of
36 breakfast.

37

38 Key words: eating practices, unhealthy foods, food environment, Africa, Ghana, Kenya, cities

39

40 **Highlights**

41

42 Growing urbanisation in African countries, such as Ghana and Kenya is accompanied by rapid
43 changes in food environments, with potential shifts towards unhealthy food and beverage
44 consumption, including lower socio-economic groups.

45 This study investigated how unhealthy food and beverages are embedded in everyday life in
46 deprived areas of two African countries, to identify levers for context relevant policy.

47 There was widespread consumption of unhealthy foods and beverages including energy dense
48 nutrient rich traditional foods, associated with cultural heritage.

49 A structured meal pattern of three main meals a day with limited snacking and quick meals was
50 evident, with eating with family or alone common.

51 Policy action to promote nutrient-rich diets to prevent multiple forms of malnutrition in deprived
52 urban areas is required across several sectors in Ghana and Kenya.

53

54

55 **1. Introduction**

56 Africa is experiencing a nutrition transition with changing dietary habits and food
57 environments related to urbanisation (Imamura et al., 2015; Agyemang et al., 2016,
58 Holdsworth and Landais, 2019), accompanied by rising obesity and diet-related non-
59 communicable diseases (DR-NCDs) (Naghavi et al., 2017) and persistent micronutrient
60 deficiencies/undernutrition, affecting all socioeconomic groups. Nutrition transition is
61 characterised by increased consumption of added sugar, fat (particularly oils), animal-source foods
62 and decreased consumption of coarse grains, staple cereals and pulses (Popkin and Gordon-
63 Larsen, 2004; Hawkes et al., 2017). Ghana and Kenya typify this dietary and epidemiological
64 transition (Ghana DHS, 2015; Kenya DHS, 2015; Rischke et al., 2015; Agyemang et al., 2016; Cira et
65 al., 2016; Ofori-Asenso et al., 2016; 2017; Rousham et al., 2020), which they have recognised as a
66 pressing public health concern through the development of national policies to prevent NCDs,
67 incorporating interventions and policies to promote healthier diets (Ministry of Health Ghana,
68 2012; Ministry of Health Kenya, 2015). However, the evidence for developing policy action within
69 the African region comes mainly from high income countries and is not tailored for low
70 socioeconomic groups within African cities. Therefore, it is important to investigate the eating
71 practices that people develop in changing urban food environments, so that context and
72 culturally-sensitive policies and interventions can be developed; this is difficult to achieve without
73 locally relevant evidence.

74 The overconsumption of unhealthy diets with a high concentration of calories and low
75 micronutrients (energy-dense and nutrient-poor -EDNP), is implicated in the onset of multiple
76 forms of malnutrition (Pradeilles et al., 2019-a). Eating practices may also evolve in response to
77 changing contexts (Jastran et al., 2009), such as that accompanying the nutrition transition. Eating
78 practices are shaped by many social, material, economic and cultural factors (Warde et al., 2007;

79 Jastran et al., 2009; Southerton et al., 2011; Warde 2015; Osei-Kwasi et al., 2020) in people's food
80 environments and are '*closely tied to the routines and rhythms of everyday life ...*' (Horton et al.,
81 2017). Policies and interventions to promote healthier food consumption may be more effective
82 when they address the dynamics of eating practices, which requires an exploration of how food
83 consumption is structured and organised in social practices (Shove et al., 2012), such as the time
84 of day and frequency of eating episodes (*periodicity*), length of eating episodes (*tempo*), and who
85 participants eat with and where (*synchronisation*). The *periodicity* with which people eat may have
86 negative effects on health, for example eating more frequent and irregular meals can have a
87 detrimental impact on body weight (St-Onge et al., 2017). *Periodicity* also includes consumption of
88 specific foods at certain times of the day that mark the passing of periods of time (breakfast–
89 lunch–dinner) (Southerton et al., 2011). *Tempo* is integral to different types of eating episode,
90 which may, for example, be relatively fast when eating alone compared with when eating with
91 others (Southerton 2011). *Synchronisation* requires the co-ordination of people and practices.
92 Eating practices are usually synchronised with other practices such as work routines and social
93 lives (Southerton 2011). Hence, by investigating eating practices in deprived communities in urban
94 Africa, emerging public policies and recommended interventions can be developed that are
95 sensitive to the context and therefore more likely to lead to healthier food environments and the
96 consumption of healthier diets.

97 There is a lack of evidence about how unhealthy food and beverage consumption is embedded in
98 everyday life in African cities, including for the urban poor (Osei-Kwasi et al., 2020). Therefore,
99 the objective of this study was to ascertain how unhealthy food and beverage consumption is
100 embedded in everyday life in deprived areas of two African countries, to identify levers for context
101 relevant policy.

102 **2. Methods**

103 *2.1 Ethical approval*

104 Ethical approval for the study was acquired by each institution involved in the data collection
105 process. In Ghana, ethical approval was obtained from the Ghana Health Service Ethics Review
106 Committee (references: GHS-ERC 07/09/16 and GHS-ERC 02/05/17). In Kenya, ethical approval
107 was obtained from Amref Health Africa (reference: ESRC P365/2017). The University of Sheffield
108 and Loughborough University recognised both of these ethical review boards as meeting their
109 ethical standards. Additional ethical approval was obtained from the University of Liverpool
110 (references: 1434 and 2288) and Loughborough University (reference: R17 -P142). Written
111 informed consent was obtained from adults and assent from legal guardians of participants <18y.

112 *2.2 Selecting neighbourhoods and participants*

113 Comparable studies were conducted with adolescents/adults aged ≥ 13 y (male and female) in
114 deprived neighbourhoods of three rapidly growing cities in Ghana (Accra and Ho) and Kenya
115 (Nairobi). In Ghana, James Town was selected from a list of poverty endemic areas in Accra (CHF
116 International, 2010) and Dome was selected from a list of poor areas in Ho (UN-HABITAT, 2009). In
117 Nairobi, Makadara was selected amongst high deprivation areas (Kenya National Bureau of
118 Statistics et al., 2015) that were judged to be safe to work in by the research team. To select
119 participants in these low income neighbourhoods, quota sampling was used to gain a broad
120 sample based on age, body mass index (BMI), occupation and socio-economic status (SES). These
121 socio-demographic factors were included to ensure a diverse sample. The target sample was:
122 n=294 Ghana (192 in Accra and 96 in Ho); n=144 Kenya). These quota sampling frames differ
123 because the data from Ghana combine two separate sister projects (DFC and TACLED) with
124 different target populations. The DFC project was only conducted in Ghana (Accra and Ho) whilst
125 the TACLED project was conducted in both Ghana (Accra only) and Kenya (Nairobi).
126 **(Supplementary file 1: Quota sampling).**

127 To classify participant's SES for quota sampling, we applied different methods in Ghana and Kenya.
128 In Ghana, we derived household SES scores from 13 questions used in the Ghana EquityTool.
129 Household scores were then compared to the average scores for urban Ghana and SES quintiles
130 were subsequently derived. Participants were further classified into three groups: 'lowest SES' (1st
131 quintile); 'low to middle SES' (2nd and 3rd quintiles) and 'high SES' (4th and 5th quintiles). For this
132 study, only participants in the 1st and 2nd groups, representing the 'lowest SES' and 'low to
133 middle SES' were selected. In Kenya, participants' SES was derived from their total household
134 expenditure; those spending <23,674Ksh/month were classified as lowest SES while those
135 spending 23,674Ksh to 199,999Ksh/month were classified as low-middle SES based on the Kenya
136 National bureau of Statistics classification (2015).

137 *2.3 Assessing Food Intake*

138 In both countries, an interviewer-led questionnaire was administered using electronic data
139 capture (CsPro version 6.3/Survey CTO version 2 on a Samsung Galaxy tab-4) to obtain information
140 relating to socio-demographic characteristics and 24hr food consumption and eating practices. For
141 the latter, interviewers noted all food and drink consumed by participants in/out-side of the home
142 in the previous 24hr. They also recorded how long an eating episode lasts ('tempo'), time of day of
143 the eating episode ('periodicity'), who participants eat with and where ('synchronisation')
144 (**Supplementary file 2: 24hr recall**). To facilitate data collection, a pre-defined list of food items
145 (Ghana n=229 and Kenya n=270) was inputted into the electronic data collection template. The
146 development of these food lists was informed first from an earlier study in Ghana (Osei-Kwasi et
147 al., 2019-a) and adapted for Kenya, the subsequent food list was discussed with local partners in
148 all cities and communities to incorporate their knowledge of food consumption locally. Data were
149 collected between June-December 2017, so over a 7 month period covering both dry and rainy
150 seasons, therefore seasonality did not impact on food consumption data. From local knowledge,

151 the day to day variation of dietary intake is low in the context of these urban poor communities,
152 meaning that one 24hr recall is probably a good reflection of eating practices; we also asked
153 participants whether this was a usual day before beginning the 24 hour recall and arranged to
154 return on another day if it was not.

155 *2.3.1 Categorising foods and beverages*

156 Foods that were consumed were categorised into 26 food groups to explore how healthy they
157 were and by comparing with those expected for countries undergoing nutrition transition (Hawkes
158 et al., 2017; Rousham et al., 2020) (Table 1).

159 **- Table 1. List of all foods and beverages consumed here-**

160 Five measures of healthiness were used to classify foods (Table 2) in terms of: i. their
161 nutrient/energy density and ii. based on the unhealthy types of foods/ beverages to prevent
162 DR-NCDs (sweet foods, sugar sweetened beverages (SSBs) and fried foods). SSBs were defined
163 to include cold and hot drinks with added sugar as well as non-diet soft drinks, regular soda,
164 iced tea, sports drinks, energy drinks, fruit punches, sweetened waters following standard
165 definitions (von Philipsborn et al., 2019). There is overlap between categories i and ii, but they
166 serve different purposes. Whilst energy and nutrient density of foods provides a technically
167 correct classification, it does not tell us about the unhealthy food groupings, which is particularly
168 useful for communicating public health interventions, such as developing food- based dietary
169 guidelines (FBDGs). Therefore, classification into unhealthy food types (Table 2) was undertaken
170 by categorising individual food items into these types, based on cooking method and high total
171 fat/sugar content.

172 **- Table 2. Classification of foods and beverages into food groups here-**

173 Combining the nutrient and energy density information about each food/beverage allowed us to
174 classify food items as EDNP (represents 'unhealthy' foods/beverages). We were also interested in
175 consumption of energy-dense, nutrient-rich (EDNR) foods/beverages because of their potential
176 contribution to obesity and DR-NCDs, but also their importance in providing micronutrients in the
177 context of multiple burdens of malnutrition in Ghana and Kenya.

178 Food items were classified as energy dense if $>225\text{kcal}/100\text{g}$ (WCRF/AICR, 2007). We classified
179 foods based on their nutrient composition by assigning each food with a nutrient density score to
180 reflect its nutrient quality based on previously validated approaches (e.g. Drewnowski, 2005;
181 2010; Drewnowski and Fulgoni, 2014). The score incorporated 11 nutrients to encourage
182 (protein, fibre, vitamins A, C, E and iron, calcium, potassium and magnesium, folate and zinc) and
183 three nutrients to limit (total fat, total sugars, sodium) based on balancing the public health
184 nutrition context with the availability of food composition data for the selected nutrients in Ghana
185 (Abdul-Haq et al., 2018) and in Kenya. For each food item consumed, nutritional information per
186 100kcal for the 11 nutrients and energy density were extracted from a combination of food
187 composition tables based on their rigour and local relevance. Nutritional content (both macro- and
188 micro-nutrient information) for each of these unique food items was then identified using a
189 combination of food composition tables) (6 for Ghana and 4 for Kenya). The primary tables used
190 were: The West African Food Composition Table (Ghana) and the Kenyan Food Composition Table
191 (**Supplementary file 3: Food composition tables and nutrient profiling method**). Where food
192 composition data were unavailable for nutrients and/or energy density in any of these tables (38
193 foods in Ghana; 2 in Kenya), they were substituted with similar food items agreed by co-authors
194 (AT, SK, MG, MH, MW, NB, RP). Using USDA dietary recommendations, the % daily value of all
195 nutrients was calculated per 100kcal. Nutrient density scores were generated by subtracting the
196 sum of the nutrients to limit from the sum of the positive nutrients to encourage. Each food item

197 was categorised as nutrient dense if the nutrient density score was $\geq 10\%$ and nutrient poor if
198 $< 10\%$ applying widely used cut-offs (U.S. Department of Health and Human Services, 2013).

199

200 *2.4 Assessing eating practices: periodicity, tempo and synchronisation*

201 As an integral part of the 24hr recall (**Supplementary file 2: 24hr recall**), questions were asked to
202 assess routines of eating practices in relation to the time of day and frequency of eating episodes
203 (periodicity), length of eating episodes (tempo), and who people eat with and where
204 (synchronisation). An eating episodes was defined as any eating occasion that involves
205 consumption of any food/beverage (except water alone) by participants. We chose this term
206 because it reflects the lived experiences of individuals as part of their daily schedules (Bisogni et
207 al., 2007).

208 *2.5 Data Management and Analysis*

209 Data from the 24hr recall interviews were transferred to SPSS version 21. A dictionary of variables
210 was prepared with all variables. 24hr recall data were then cleaned by checking for missing values
211 and inconsistency in the data and personal information was also removed. Analysis was
212 undertaken at an individual person level (frequency of eating for individuals; age categories, socio-
213 economic status); and at the eating episode level (EDNP/EDNR score for the eating episode; length
214 of eating episode; time of day of eating episode). Participants from the two cities in Ghana were
215 merged for the analysis because we were interested in eating practices at country rather than city
216 level. Descriptive statistics were calculated and visualised to explore practices in Ghana and Kenya.
217 Negative binomial regression models were used to analyse the influence of SES on count of food
218 types consumed for individuals. Statistical analyses were completed using R.

219 **3. Results**

220 We slightly over-recruited based on our target quota sample, with a total of n=459 participants
221 (female/ and male, adolescents/adults aged ≥ 13 y) across both countries: Ghana (n=198 Accra, n=
222 103 Ho) and Kenya (n=158). See Table 3.

224 3.1 Food group consumption

225 A list of all food items consumed from the 24hr recall yielded a total of n=138 unique foods for
226 Ghana and n=136 for Kenya (Table 1). In terms of overall food consumption, we found evidence
227 that nutrition transition existed in both countries when compared with theories of food
228 consumption in the context of nutrition transition, but in slightly different ways (Fig.1-A). There
229 was widespread consumption of vegetable oils in Kenya (82.3%), refined cereals in both countries
230 (77.1% Ghana; 86.1% Kenya), but lower consumption of unrefined wholegrain cereals (9.6%
231 Ghana; 38.0% Kenya). There was widespread consumption of animal source foods, including fish in
232 Ghana (74.4% Ghana; but only 1.9% Kenya) and red meat and poultry (especially in Ghana, with
233 48.8% of the sample consuming them on the previous day, compared with 27.2% in Kenya). Eggs
234 and dairy product consumption was less widespread (Fig.1-A). Fruit and vegetable consumption
235 was higher in Kenya (43.0% and 93.0% respectively), compared to Ghana (14.3% and 8.0%
236 respectively) (Fig.1-A). Consumption of legumes/pulses was higher in Kenya than in Ghana, but in
237 Ghana this did not account for traditional mixed dishes, stews or soups that contained
238 beans/pulses. There was widespread consumption of SSBs, including sweetened tea/coffee in
239 Kenya (72.8% of Kenyans consuming, compared with 11.0% of Ghanaians) and SSBs (excluding
240 tea/coffee) in Ghana (35.2% of Ghanaians compared with 13.9% of Kenyans). However, highly
241 processed food group consumption (processed meats, crisps and crackers) was low in both
242 countries. Overall, consumption of so called 'ultra-processed' food consumption was low in these
243 deprived neighbourhoods in both countries and was restricted to consumption of noodles, fried
244 sausage, corned beef, jam, ketchup, tomato paste, SSBs, sweetened milk, cocoa milk drinks and
245 confectionary.

246 **-Fig. 1 here Consumption of food groups and unhealthy foods-**

247 3.2 'Unhealthy' food consumption

248 Consumption of food and beverages classified as EDNP (e.g. biscuits, doughnuts, meat pie, fried
249 sausage, sweets and toffee, oils and fats - Table 1) was widespread, especially in Kenya where
250 89.9% of eating episodes contained EDNP items, compared with 55.8% of eating episodes in
251 Ghana (Fig.1-B). EDNR foods and beverages (e.g. peanut butter, plantain, waakye-rice and beans,
252 boiled red meat, mabuyu-baobab fruit candy- Table 1) were even more widespread, with the
253 majority of participants in each county consuming these the previous day (89.4% Ghana, 84.2%
254 Kenya). In terms of unhealthy food types, over a third of participants in Ghana (38.5%) compared
255 with over half in Kenya (57.6%) ate sweet foods in the 24hr period before the interview. SSBs were
256 consumed at three-quarters of eating episodes in Kenya (78.5%) and over a third in Ghana
257 (36.2%), with those in Kenya coming primarily from sweet tea/coffee. Two-thirds of eating
258 episodes (66.8%) in Kenya contained fried foods, compared with 42.4% in Ghana.

259 We explored whether consumption of these categories of foods (EDNP, EDNR, sweet foods, SSBs
260 or fried foods) were more or less common in low or middle SES populations for each country
261 (**Supplementary file 4: SES analysis**). Our analyses suggested that most unhealthy categories
262 (especially sweet foods, SSBs or fried foods), were more commonly consumed in lower SES
263 individuals. Associations were consistent in both countries. Effect sizes were larger in Kenya
264 compared to Ghana, suggesting stronger socio-economic influences and inequalities operating in
265 Kenya.

266 *3.3 Periodicity of eating practices*

267 A structured meal pattern around three main meals a day in both countries was evident, as
268 participants reported eating an average of 3.3 times a day in Ghana and 3.7 times in Kenya. (Fig.2-
269 A). There was limited snacking in-between meals in Ghana and evidence of an afternoon snack in
270 Kenya. The eating day started earlier in Ghana: breakfast (7-8am), lunch (12-1pm) and dinner (5-
271 7pm), compared with Kenya: breakfast (8-9am), lunch (1-2pm) and dinner (8-9pm), with a snack

272 more likely between lunch and dinner in Kenya. We defined breakfast, lunch and dinner time
273 periods based on the peak times across the sample in each country.

274 **-Fig 2 Structure and length of eating episodes –**

275 In Ghana, EDNP foods were more commonly consumed during the morning, whereas in Kenya,
276 EDNP food consumption peaked at meal times. EDNR food consumption peaked at meal times in
277 Ghana. These patterns suggest that EDNP foods are a more integral part of meal times in Kenya,
278 compared with EDNR foods in Ghana (Fig.3-A). Consumption of sweet foods peaked in the
279 morning in both countries (Fig.3-B). In Ghana, SSBs consumption tended to peak with or just after
280 mealtimes, whereas in Kenya they peaked at breakfast time and in the afternoon. In Ghana, fried
281 food was an integral part of all mealtimes, whereas in Kenya, fried food was particularly common
282 with the evening meal (Fig.3-C). SSBs appear to be more common in-between meals in both
283 countries, but there is also a high consumption of SSBs at breakfast in Kenya (Fig.3-B), coming
284 mainly from tea.

285 **-Fig 3 Healthiness of eating episodes throughout the day-**

286 *3.4 Tempo of eating practices*

287 In Ghana, the majority of eating episodes were either <10 mins (40.1%) or 10-29 mins (47.0%) (Fig
288 2-B). People took longer to eat in Kenya, where less eating episodes were <10 mins (21.5%).
289 Longer eating episodes (≥ 30 mins) were twice as likely in Kenya (27.6% vs 12.9% in Ghana). Almost
290 one-third (31.5%) of the shortest eating episodes (<10 mins) included EDNP foods in Ghana,
291 compared with almost half (49.2%) in Kenya. In Ghana, sweetened beverages were more likely to
292 be consumed at shorter eating episodes (17.4% of episodes <10 mins v 6% of episodes ≥ 30 mins).
293 The opposite trend was apparent in Kenya (29.4% v 39.5% respectively), where SSBs (mostly from
294 sweetened tea/coffee) were more likely to be consumed at longer eating episodes, suggesting

295 they are integrated more into family meals. Longer eating episodes were more likely to have a
296 greater intake of fried food in Ghana (19.6% v 43% respectively) and EDNP foods in Kenya (49.2% v
297 56.8% respectively).

298 *3.5 Synchronisation of eating practices*

299 The home environment appeared to be a key setting for shaping food consumption (Fig. 4-A),
300 given that over three-quarters of eating episodes were taken at home in both countries (81.9% in
301 Ghana v77.5% in Kenya), especially the evening meal in both countries (Fig. 4-A). Longer meals
302 were also more likely to occur at home. In both countries, street eating was not a large contributor
303 to food habits as only 6.3% (Ghana) and 12.2% (Kenya) of eating episodes were taken on the
304 street, it was most common in the afternoon (Fig. 4-A). Schools and workplaces were the least
305 common settings for food consumption in both countries (7.4-8.5% of food episodes). The
306 healthiness of food consumed varied across countries, in Ghana: unhealthier foods were eaten in
307 schools/workplaces; whereas in Kenya: unhealthier foods tended to be eaten less often in
308 schools/workplaces (less EDNP or sweetened beverages) (data not shown).

309 **-Fig 4 Synchronisation of eating practices-**

310 Eating with friends was much less common than with family, as only 7-8.8% of eating episodes
311 were eaten with friends (Fig. 4-B). Fried foods were almost three times as likely to be consumed
312 when with friends in Ghana (30.3% in Ghana v 11.5% in Kenya). This was not the case in Kenya,
313 where sweet foods and SSBs were more commonly consumed when with friends (sweet foods
314 23.1% in Kenya v 15.2% in Ghana; SSBs 30.8% in Kenya v 24.2% in Ghana). Breakfast was the most
315 frequent meal eaten with friends in Ghana, whereas the evening meal in Kenya was more likely to
316 be shared with friends than other meals (Fig. 4-B). However, eating alone was also common in
317 both countries, as 41.7% in Kenya and 45.4% in Ghana of eating episodes were taken alone (Fig. 4-

318 B). Eating alone was most common at lunchtime in Kenya and in the evening in Ghana. The role of
319 family was core, as 46.5% in Kenya and 47.3% in Ghana of eating episodes were taken with family.
320 In Ghana, family mealtimes were less likely to include EDNP foods (24.5%) than in Kenya (53.4%).
321 Analysis was also undertaken for sex and age across periodicity, tempo and synchronisation, but
322 no differences emerged (data not shown).

323 **4. Discussion**

324 This study investigated how unhealthy food and beverages are embedded in everyday life in
325 deprived areas of two African countries (Ghana and Kenya), to identify levers for context relevant
326 policy to prevent multiple forms of malnutrition.

327 *4.1 Food consumption*

328 We found evidence of unhealthy diets in deprived communities in both countries, which reflected
329 the types of diets expected in countries undergoing the nutrition transition, with widespread
330 consumption of refined cereals in both countries. Animal source foods were commonly consumed,
331 including red meat, poultry and fish (especially in Ghana). Consumption of unhealthy food types
332 was common, especially SSBs in Kenya and fried foods in Ghana. Consumption of EDNP food and
333 beverages was common, especially in Kenya. Commonly consumed EDNP foods were sugar, coco
334 milk drinks, fried chicken in Ghana and sugar, vegetable oil and margarine in Kenya. Consumption
335 of EDNR (often traditional foods associated with cultural heritage) was widespread, with >84% of
336 the sample consuming these in both countries. Commonly consumed EDNR foods were fried fish,
337 white sugar/butter bread and boiled red meat in Ghana and mandazi (African doughnut), white
338 bread and groundnuts in Kenya. Sweet foods and SSBs were popular in both countries, but an
339 appreciation of sweetness was evident in Kenya across all eating occasions, with SSBs coming
340 primarily from sweet tea/coffee at breakfast and in the afternoon. The Kenya STEPS survey (Kenya
341 Bureau of Statistics, 2015) reported that over a quarter (28%) of Kenyans always add sugar to

342 beverages. Evidence from a recent systematic review and meta-analysis of 47 studies of dietary
343 behaviours among adults and adolescents in Ghana and Kenya also found some evidence of
344 nutrition transition with relatively widespread consumption of animal source foods (especially red
345 meat and poultry), unhealthy foods and beverages, and particularly SSBs, which were consumed by
346 39.9% of the population in Ghana/Kenya (Rousham et al. 2020).

347 Consumption of so called 'ultra-processed' food and beverages (Monteiro et al., 2010) was low in
348 the deprived neighbourhoods studied in both countries. Ultra-processed foods are energy dense
349 and characterized by high levels of free sugar, total/saturated/trans fats, sodium and low levels
350 of protein and fibre (Monteiro et al., 2010; Moubarac et al., 2013). 'Ultra-processed' food and
351 beverages overlap to some extent with the classification of EDNP foods and beverages that we
352 used. But it was regarded as less appropriate for our context as ultra-processed food does not
353 account for the presence of other beneficial nutrients to include in the diet, besides fibre. A
354 strength of our approach to categorising foods was that it is based on previously validated
355 approaches (e.g. Drewnowski and Fulgoni, 2014) and by including several nutrients to
356 encourage, it accounts for the context of multiple burdens of malnutrition. Therefore, taking this
357 approach means that identifying subsequent interventions can emphasize foods to encourage as
358 well as to avoid, hence shifting the notion of a 'healthy' food-based on the absence of fat, sugars
359 and sodium to also encompass its content of beneficial nutrients (Drewnowski, 2005). Low SES
360 groups were more likely to consume unhealthy foods. It has been postulated that in times of
361 economic stress, low SES groups tend to choose cheaper energy-dense foods to maximize energy
362 value for money, resulting in habitual energy-dense, nutrient-poor diets (Drewnowski and Specter
363 2004). Our findings suggest a similar SES gradient to that of high income countries, i.e. low SES are
364 more likely to consume an unhealthy diet (Allen et al. 2017). A limitation with using a qualitative
365 24h recall was that we did not have data on portion size, which also contributes to energy intake

366 and therefore needs acknowledging in future interventions and policy. The use of quota sampling
367 allowed us to include a diverse socio-demographic background in the selected deprived
368 communities, but a larger quantitative study would have allowed us to explore differences in food
369 consumption within population subgroups, but this was not the purpose of this study.

370 There are several limitations with classifying foods as unhealthy. The classification of some foods
371 as EDNP was counter-intuitive and may be a result of the 10% cut off we used, this is widely used
372 but it could lead to some foods being classified as EDNP or EDNR when they are not, and further
373 validation is required. For example, in Ghana, meat pies were classified as EDNP because there is a
374 high ratio of pastry to filling in meat pies, so nutrient density is less than one may expect from
375 other contexts. This is the same logic behind other fried meats/sausages. We acknowledge that
376 these foods have positive nutrients (protein, iron, zinc) but the negative nutrients outweigh them
377 (either because the overall score for negative nutrients is higher or very close). Fried chicken was
378 classified as nutrient poor in Ghana because the nutrient values suggested a higher fat and lower
379 micronutrient content than the food composition tables used in Kenya, where it was classified as
380 nutrient rich. This emphasises the challenge of using different food composition tables, as well as
381 the diversity in nutrient composition of some foods depending on context. Indeed this potential
382 misclassification of foods seems to be a limitation of nutrient only approaches to classifying foods
383 and beverages, as the classification is dependent on the accuracy of the food composition foods in
384 the context where they are used. Not all foods and beverages consumed were listed in one food
385 composition table for Ghana or Kenya and we had to consult other food composition tables to
386 complete these for missing foods or nutrients (**outlined in Supplementary File 3**).

387 *4.2 Eating practices*

388 A structured meal pattern around three main meals a day in both countries was evident with
389 limited snacking in-between meals, except in the afternoon in Kenya. These findings are in line

390 with evidence from a systematic review (Rousham et al., 2020), in which most individuals and
391 households had a typical pattern of three meals per day in Ghana and Kenya. The greater
392 likelihood of a regular afternoon energy dense snack (usually sweetened tea, with chapatti or
393 mandazi-doughnut in Kenya) appears to be a reflection of the later timing of the evening meal. We
394 need to acknowledge this is part of eating practices and encourage healthy foods/less sugar at
395 those times through FBDGs and subsidies on healthier options, like fruit. EDNP foods were a more
396 integral part of meal times in Kenya, whereas EDNR and fried food were well integrated into
397 Ghanaian meals. Indeed, the adult Ghanaian diet is traditionally energy-dense; the main energy-
398 dense component (grain, cereal, legume or tuber) of the diet is served with soup or stew, usually
399 accompanied by fish, beef or poultry (Laar and Aryeetey, 2014), which is characteristic of cultural
400 eating practices of many sub-Saharan African countries. By 'traditional' we draw on a range of
401 definitions of traditional food that usually evoke cultural or gastronomic heritage, sharing of
402 knowledge, usually within a country/region (Sebastia, 2017). In one study of Ghanaians,
403 participants referred to traditional foods as commonly eaten, culturally acceptable foods
404 associated with national cultural identity (Osei-Kwasi et al., 2019-b). Defining 'traditional' food and
405 diets is challenging given that colonisation in both countries by the British has incorporated foods
406 that have been part of diets for more than a generation. For example, in Ghana, people in the
407 urban south, where the British predominantly resided, incorporated milk, tea and breakfast
408 cereals in their regular diet (Tuomainen, 2009), which illustrates the challenge of defining
409 'traditional'.

410 Most eating episodes were relatively short as around three-quarters were <30 mins, with people
411 taking longer to eat in Kenya. We have not identified any similar studies in Africa, but we know
412 from the UK and European context that the length of time spent eating varies across cultures. One
413 UK study estimated that over three-quarters (79-83%) of meals lasted 10-30 mins and almost a

414 quarter (17-21%) were longer, lasting ≥ 30 mins, which is similar to the Ghanaian and Kenyan
415 context (Cheng et al., 2007). A European study reported that the French spend almost 3 hours/day
416 eating whilst the Finnish, Slovenian, Estonian and British spend < 2 hours/day (Warde et al., 2007).
417 They found that time spent eating has reduced over the previous decades, suggesting we might
418 expect the same in countries undergoing transition. As we did not collect data on the exact
419 number of minutes per episode but as a time category, we are unable to make direct comparisons
420 with these other studies. Nevertheless, given the distribution of time spent eating, we can
421 reasonably conclude that in Ghana and Kenya, it is less than in these European countries.

422 Almost one-third of the quickest eating episodes (< 10 mins) included EDNP foods in Ghana,
423 compared with almost half in Kenya. In Ghana, sweetened beverages were more likely to be
424 consumed at shorter eating episodes, but the opposite trend was apparent in Kenya, where SSBs
425 tended to be consumed at longer eating episodes, suggesting they are integrated more into family
426 meals. In both countries, longer eating episodes were more likely to have a greater intake of EDNR
427 foods, fried food in Ghana and EDNP foods in Kenya. Other studies have reported that short
428 durations of eating have been attributed to consuming so called 'fast foods' and more snacking
429 and individualized eating (Southerton 2011). Eating alone was common in both countries,
430 involving over a third of eating episodes. Nevertheless, street eating was not a large contributor to
431 food consumption, even though it was twice as likely in Kenya. One limitation from our study is
432 that we are unable to identify where food eaten at home was prepared, and it is possible that
433 food may have been purchased from street vendors but consumed at home, possibly because
434 their work is more likely to be informal and close to home. Policy and interventions, including
435 FBDGs, need to recognise that quick and convenient options are required that are also healthy and
436 can be eaten alone.

437 The home environment and the family emerged as an important setting where healthier eating
438 can be encouraged, with more than three-quarters of meals consumed at home and almost half of
439 eating episodes taken with family, which tended to be energy dense and fried/high in sugar. Eating
440 with friends was much less common than with family. This was also the case in a US study (Sobal
441 and Nelson, 2003), where authors report that commensal relationships are primarily with family.
442 Eating alone was most common at lunchtime in Kenya and in the evening in Ghana. This did not
443 follow the trend we had expected from studies in high income countries (Sobal and Nelson, 2003),
444 where people tend to eat alone more in the day but share evening meals with family. Whilst
445 eating with families peaked in the evening in Ghana, so did eating alone. One explanation may be
446 that people's working lives are less structured in Ghana and Kenya, so families may not gather
447 together as much in the evening due to irregular work patterns; possibly because family members
448 may arrive home late after work when others have already eaten. Eating routines tend to be
449 embedded in work and family schedules (Jastran et al., 2009; Warde, 2015), but one limitation of
450 our study is that we did not measure working patterns so we are unable to shed light on their
451 inter-relation with food consumption and eating practices in these deprived communities in Ghana
452 and Kenya. A strength of our study was the inclusion of situational information on eating practices
453 integrated within the qualitative 24hr recall that we have additionally linked to the healthiness of
454 eating episodes. Most studies of dietary intake only focus on food/beverage consumption, rather
455 than also investigating the eating practices around them (Sobal et al., 2012).

456 Whilst we are unable to generalise to a wider urban population in both countries our purpose was
457 to undertake an in-depth investigation in low income populations who suffer most from multiple
458 burdens of malnutrition, whilst policy action often ignores SES and is insufficiently sensitive to the
459 daily lives of the urban poor but tends to be targeted at the whole population.

460 5. Recommendations for policy action and conclusions

461 In the deprived urban neighbourhoods studied in Ghana and Kenya, we found widespread
462 consumption of unhealthy foods and beverages, with high consumption of EDNP, EDNR foods and
463 fried/sweet foods. Our findings have provided evidence for action in the following three policy
464 areas:

465 *Enhancing financial and physical access to healthier foods that are convenient (can be eaten*
466 *quickly/alone) through for example, subsidies and incentives/training for local food vendors.*

467 We make this recommendation based on our findings that food episodes are often relatively quick
468 so they need to be healthy and convenient. Local food vendors are omnipresent in the
469 neighbourhood food environment, as demonstrated by our geographical mapping study on the
470 physical food environment in these same neighbourhoods (Green et al., 2020) so they are likely to
471 be able to play a key role in providing healthy food. We think that this wider context needs to be
472 acknowledged in the policy action we are recommending. We mention financial access because
473 these are deprived areas, and we know from many studies in Africa, including our community
474 participatory studies in these same neighbourhoods (Pradeilles et al., 2019-b) that the cost of food
475 is a major driver of food choice. Indeed we found that sweet foods, SSBs or fried foods were more
476 commonly consumed amongst the lowest SES categories in our study.

477

478 *Actions to limit access to unhealthy foods and beverages through, for example, fiscal and*
479 *advertising policies to dis-incentivise unhealthy food consumption, and SSBs, especially in Ghana.*

480 We make this recommendation because we found that processed SSBs consumption was
481 widespread, especially in Ghana- so we have now nuanced this recommendation for the Ghanaian
482 context. We know from evidence in these same deprived neighbourhoods (Green et al., 2020) that
483 advertising of SSBs (except tea/coffee) is widespread, comprising almost half of all advertisements.
484 We also know from wider research that advertising is an important driver of food choice. We also

485 know from policy appraisals with national stakeholders in Ghana and Kenya that food advertising
486 controls are a priority for action (Laar et al., 2020; Asiki et al., 2020). We recommend actions to
487 dis-incentivise unhealthy food consumption because we found widespread consumption of
488 unhealthy foods and beverages, including at mealtimes. Limiting access to these foods by making
489 healthier foods (such as fruit and vegetables) relatively cheaper (through subsidies on healthier
490 foods or taxes on unhealthy food and beverages) could contribute to a healthier food
491 environment.

492

493 *Introducing or adapting FBDGs incorporating advice on reducing sugar and fat at mealtimes*
494 *accompanied by cooking skills interventions focussing on reducing frying/oil used when preparing*
495 *meals, including 'traditional' foods/dishes and reducing the sugar content of breakfast (from foods*
496 *and drinks).*

497 We found that sweetened beverages were consumed at three-quarters of eating episodes in
498 Kenya (78.5%) and over a third in Ghana (36.2%), with those in Kenya coming primarily from sweet
499 tea/coffee. We also found that EDNP foods and fried foods were an integral part of meal times in
500 Kenya, compared with EDNR and fried foods in Ghana. Consumption of sweet foods and SSBs
501 peaked at breakfast in Kenya (just sweet foods increase at breakfast in Ghana). When snacking
502 occurred (more common in Kenya), it was in the afternoon and tended to be accompanied by a
503 sweetened drink. In both countries, fried food was an integral part of all mealtimes, particularly
504 common with the evening meal in Kenya. SSBs appear to be more common in-between meals in
505 both countries, but there is also a high consumption of sweetened drinks at breakfast in Kenya,
506 coming mainly from tea. Therefore, FBDGs need to acknowledge these directly, for example
507 making recommendations for a lower sugar breakfast by reducing sugar in tea in Kenya and sweet
508 food consumption in both countries; and reducing fat in meals, including those consumed at
509 home, including 'traditional' foods and dishes that are associated with cultural identity. In Ghana

510 there are no interpretive, evidence-informed FBDGs despite political support (Laar et al., 2020).
511 However, Dietary and Physical Activity Guidelines have been adopted by the Ghana Dietetic
512 Association (MoH 2009), which provide information on making healthy choices and planning meals
513 based the nutrient content of foods. Kenya has published national Guidelines for Healthy Diets
514 and Physical Activity that provide generic guidance (MoH, 2017). Neither of these guidelines
515 mention meals or how or when food is eaten at meals, but are nutrient focused. They do not
516 mention avoiding sweet foods or drinks at breakfast, fried foods or SSBs. They also need to
517 account for who people eat with- family meals or alone and include examples of healthy
518 convenient foods. All this could be added to extend their reach to more deprived communities.

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Table 1:

Food and beverage items consumed per country

	Food group	Food item: Kenya	Food items: Ghana
1	Fats and oils (oils, spreading fats and fats)	Margarine, butter, peanut butter, vegetable oil, corn oil, kimbo/kasuku/cowboy/chipsy (vegetable fats),	Palm oil, margarine, coconut oil
2	Sugar and sweet spreads	Jam, sugar, sugarcane, honey, sukari nguru (molasses)	Sugar, other sugar and sweet spreads
3	Red meat, poultry, offals & giblets	Beef, pork, minced meat, liver, goat, matumbo (fried cow/goat intestines), fried chicken	Pork, fried chicken, boiled chicken, grilled chicken, turkey, goat, beef, grilled beef, fried beef, wele (cow hide or /feet), liver and giblets, offal, guinea fowl, duck
4	Fish and shellfish	Fish non-fried/fish fried	Fish non-fried (barracuda, tuna, tilapia, salmon, cassava fish, mudfish, sardine, kpanla/adziador (Marine-sourced fish, usually smoked), fish fried (tilapia fried, tuna fried, kyenam (fried fish), seafood/shellfish (snail, clams,/adodi, crab, oysters, octopus), dried fish (anchovies), canned fish, smoked fish, kako (salted fish)
5	Eggs	Scrambled egg, poached egg, fried egg, boiled egg, omelette	Scrambled egg, fried egg, boiled egg
6	Processed meat	Smokies (precooked smoked sausage), mutura (African sausage)	Fried sausage, corned beef
7	Dairy products	Milk, sweetened condensed milk, unsweetened condensed milk, soya milk, coconut milk or cream fermented milk (maziwa mala (fermented milk), mursik (fermented milk flavoured with charcoal)	Sweetened condensed milk, powdered milk, evaporated milk, milk, flavoured yoghurt, burkina drink (ground millet/maize and pasteurized milk)
8	Sweetened tea & coffee	Sweetened tea, sweetened coffee	Sweetened tea, sweetened coffee
9	Sugar Sweetened Beverages (except tea/coffee)	Non-alcoholic beer, sodas, fruit based drinks, squashes, cocoa milk drink (Milo etc)	Light and soft drinks, sodas and sweetened beverages, fruit based drinks, cocoa milk drink (Milo, cholim, richoco), Sobolo (hibiscus tea: dried hibiscus leaves and sweetened with sugar)
10	Alcoholic beverages	Beer, wine, spirit	Beer, wine,

11	Cakes and sweets	Doughnut, mandazi (African doughnut- deep fried), scone, cake, biscuits cookies, chocolate, sweets and toffee, mabuyu (sweetened/flavoured baobab seed), ngumu (hard cake), pancake	Sweet pie or tart, pastries, biscuits(imported/local), chocolate, sweets and toffee, ice cream, groundnut cake, doughnuts, bofrot (dry doughnuts)
12	Crisps and crackers	Crisps, chips (snack made from flour dough fried)	Plantain crisps, chips (snack made from bread flour dough fried)
13	Modern mixed dishes	No consumption	Fried rice, fried noodles
14	Traditional mixed dishes	Githeri (maize & beans), muthokoi (dehusked maize & beans), mukimo (potatoes, vegetable, pumpkin leaves, maize and beans), pilau (rice, vegetables, spices & meat), meat stew, fish stew, vegetable stew	Bean stew, eto (boiled plantain or yam with palm oil), waakye (cooked rice and beans meal), red red (fried plantain with bean stew), jollof rice, egg stew, garden egg stew, cabbage stew, tomato sauce and stew, okro stew, nkontomire stew (local spinach stew), moringa stew (made with moringa oleifera leaves)
15	Condiments	Tomato and chilli sauce (ketchup), dried chilli, tomato paste	Shito (a traditional condiment/very hot sauce), pepper sauce
16	Wholegrain cereals	Whole (brown) bread, local brown rice, whole meal (brown) chapatti, whole meal ugali (whole corn flour meal), whole meal porridge, boiled maize, roasted maize	Local brown rice, boiled corn meal, maize sorghum, whole grain bread (seeded), whole (brown) bread, maize (boiled, roasted), millet porridge, other wholegrain cereals
17	Refined cereals	White bread, white rice, noodles, macaroni, white chapatti, white ugali (dehusked corn flour meal), white naan, refined porridge	White bread (sugar bread, butter bread, tea bread), white crisp bread, oats, white rice, pasta, macaroni, hot cereals/porridge/maize porridge/rice porridge, tapioca, tombrown (porridge of roasted corn/cereal flour), indomie/noodles, hausa koko (spicy millet porridge)
18	Roots/tubers not fried	Bananas (roasted/boiled), arrowroots, potatoes (roasted/boiled), sweet potatoes (roasted/boiled), yam	Plantain (roasted/boiled), cassava (boiled), gaari/gari (cassava powder), yam, fufu (boiled cassava, yam, plantain or cocoyam), Konkonte (fufu made solely from cassava flour/water)
19	Roots/tubers fried	Fried potatoes, fried sweet potatoes, fried arrowroots, fried bananas, fried bhajia	Plantain fried, sweet potatoes fried, yam fried
20	Legumes and pulses	Beans, lentils, ndengu (green grams), mbaazi (pigeon peas), njahi (black beans)	Baked beans, red beans
21	Nuts and seeds	Groundnuts	Agushi (melon seeds), groundnuts
22	Fruit	Orange, watermelon, ripe pawpaw, pineapple, apple, passion fruit, banana, lemon, avocado	Aluguntungui (sour soup), banana, watermelon, avocado, orange, pineapple, pear, mango, coconut, fruit juices (unsweetened), Pawpaw

23	Vegetables	Osuga/sucha/managu (African nightshades), cucumber, peppers, pumpkin, tomatoes, red or yellow pepper, green peas, green beans, carrots, kales, spinach, eggplant, mushrooms, onions, chicory, sukuma wiki (kale), kanzira (Ethiopian kale), saga (spider plant), mrenda (Jute mallow), mitoo (Bush Okra), garlic, kunde (cow pea leaves), terere (amaranth)	Green leaves, spinach, lettuce, chinese and white Cabbage, tomatoes, peppers, carrots, cucumber, eggplant, green beans, onions and garlic, mushrooms, pumpkin, bottle gourd, okro, turkey berries, other locally available leaves and traditional vegetables
24	Savoury pies	Vegetable samosa, meat samosa,	Meat pie, fish pie, koose (bean cake;spicy black-eyed pea fritter)
25	Fermented and non-fermented grain products	No consumption	Akple (unfermented cereal meal), T.Z/Tuo Zaafi (unfermented cereal meal), kenkey-Ga/Fante (fermented cereal meal), banku (fermented cereal meal), abolloo (fermented cereal meal), mashed kenkey (kenkey with sugar, milk and possibly peanut)
26	Soups	Tomato soup, vegetable soup, bone soup	Ademe soup (made from leaves of jute plant), light soup, vegetable soup, agushie soup (melon seeds), amma soup (green leafy vegetable), groundnut soup, lentil pea and bean soup, okro soup, palmnut soup, nkantomire soup (made from local spinach leaves), other soup

Table 2

Classification of foods and beverages into unhealthy categories.

	Kenya	Ghana
Classification based on nutrient and energy density		
EDNP (energy dense, nutrient-poor foods) Energy Dense (>225kcal/100g) Nutrient Poor (<10% for nutrient rich index score)	matumbo, mutura honey, jam, sweets and toffee, sugar, cake, scone, biscuit cookies, white chapatti, doughnut, margarine, butter vegetable fats/oils fried bhajia, sukari nguru	Fried red meat (beef, goat, pork, bush meat, cat meat), fried chicken, duck, bofrot, meat pie, fried sausage, TZ, sugar, sweet spreads, biscuits, sweets and toffee, doughnuts, tapioca, vegetable oil, margarine
EDNR (energy dense, nutrient-rich foods) Energy Dense (>225 kcal/100g) Nutrient Rich (≥10% for nutrient rich index score)	Pancake, crisps, mabuyu, mandazi, ngumu, vegetable /meat samosa, roasted maize, local brown rice, wholemeal chapati, bread, fried chicken, pork, smokies, peanut butter, groundnuts, unsweetened condensed milk	Bread, yam, plantain, maize, burkina drink, powdered milk, gari, konkonte, waakye, koose, boiled red meat (beef, goat, pork, bush meat, cat meat), corned beef, tilapia fried, octopus, groundnuts
Classification based on food types		
Fried foods (fried through cooking process)	Fried chicken, fried egg, fried sausage, koose, fried octopus, fried plantain/banana, fried sweet potato/potato, fried tilapia, fried yam, fried arrowroots, chips (flour dough fried), vegetable/meat samosa, crisps, fried Bhajia	Fried chicken, fried egg, fried sausage, koose, fried octopus, fried plantain, fried sweet potato, fried tilapia, fried yam
Sweet foods (added sugars)	Sweets/toffee, chocolate, sugar, sugarcane, jam, honey, mandazi, doughnut, ngumu, scone, biscuit/cookies, sukari nguru, sugar cane juice, cake	Sweets/toffee, chocolate, bofrot, sugar, sweet pie/tart, tombrown, sugar/sweets
Sugar Sweetened Beverages (SSBs)	Sweetened tea/coffee, sodas sweetened fruit juices, squash, fruit based drink	Sweetened tea/coffee, burkina drink, sobolo, sodas and sweetened beverages

Full definitions of Ghanaian and Kenyan dishes are in Table 1

Table 3: Socio-demographic characteristics of the sample

	Total (n=459)		Accra (n=198)		Ho (n=103)		Nairobi (n=158)	
	n	%	n	%	n	%	n	%
Gender								
<i>Females</i>	310	67.5	122	61.6	103	100.0	85	53.8
<i>Males</i>	149	32.5	76	38.4	–	–	73	46.2
Age								
<i>13-18y</i>	150	32.7	65	32.8	37	35.9	48	30.4
<i>19-49y</i>	205	44.7	83	41.9	66	64.1	56	35.4
<i>≥ 50y</i>	104	22.6	50	25.3	–	–	54	34.2
Socio-economic status								
<i>Lowest</i>	222	48.4	97	49.0	51	49.5	74	46.8
<i>Low to middle</i>	237	51.6	101	51.0	52	50.5	84	53.2
Occupation								
<i>In work</i>	193	42.0	74	37.4	37	35.9	82	51.9
<i>In education</i>	76	16.6	28	14.1	16	15.5	32	20.3
<i>Not in work or education</i>	190	41.4	96	48.5	50	48.6	44	27.8
Body mass index								
<i><25 kg/m²</i>	225	49.1	99	50.2	47	45.6	79	50.0
<i>≥25 kg/m²</i>	233	50.9	98	49.8	56	54.4	79	50.0

Fig. 1. Consumption of food groups (A) and unhealthy foods (B)

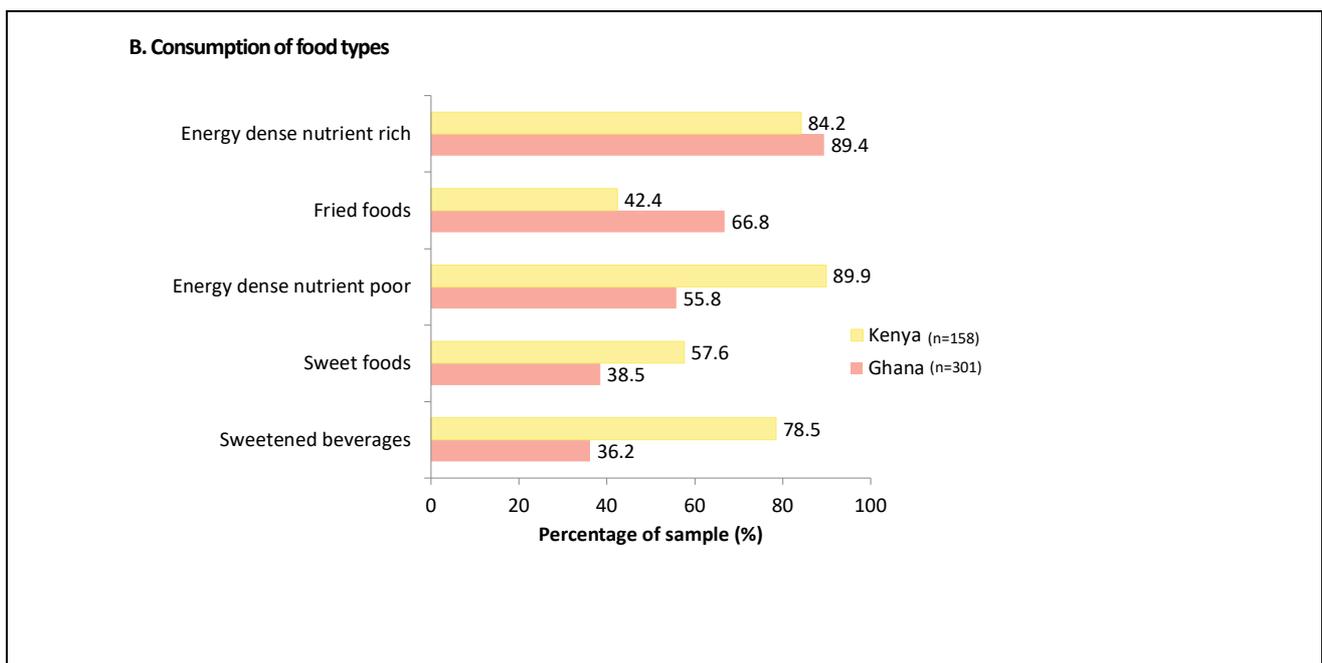
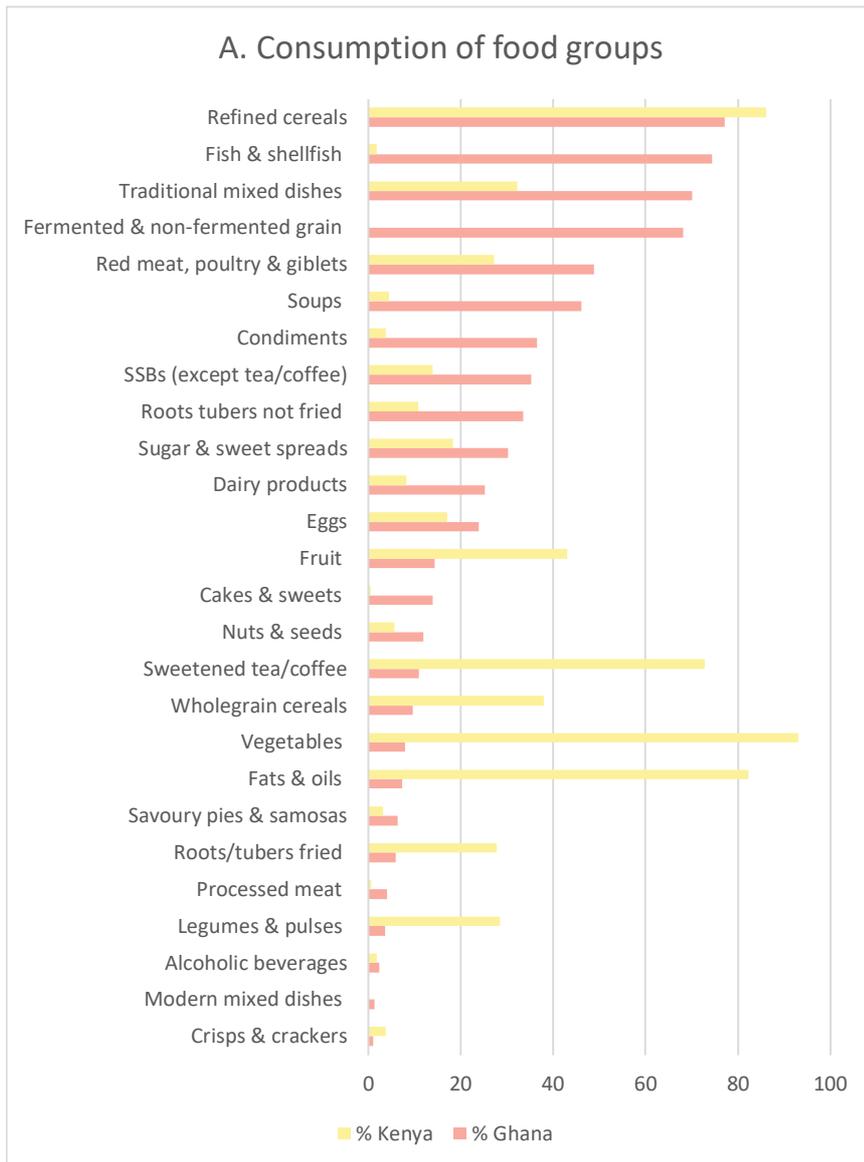
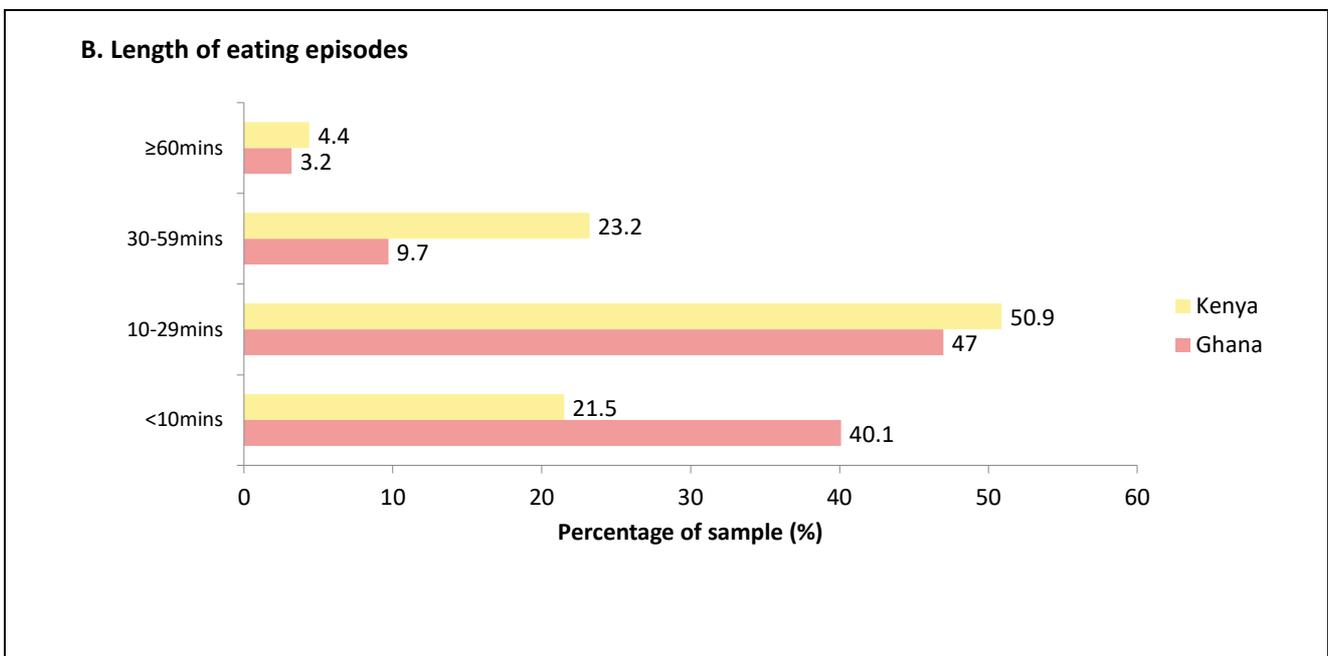
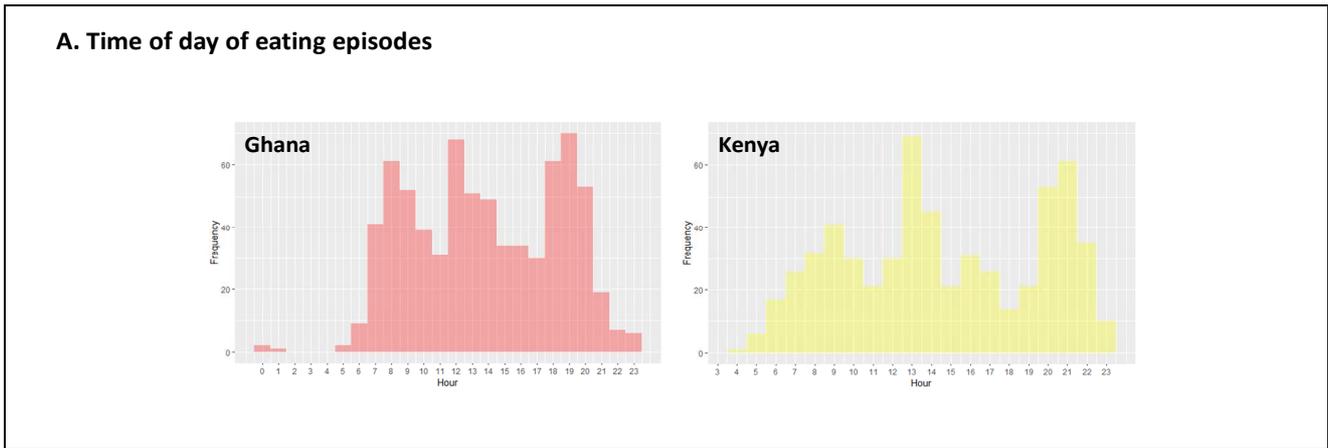


Fig. 2. Timing (A) and length (B) of eating episodes



*

Fig. 3. Healthiness of eating episodes throughout the day based on nutrients (A), sweet foods and beverages (B) and fried food (C)

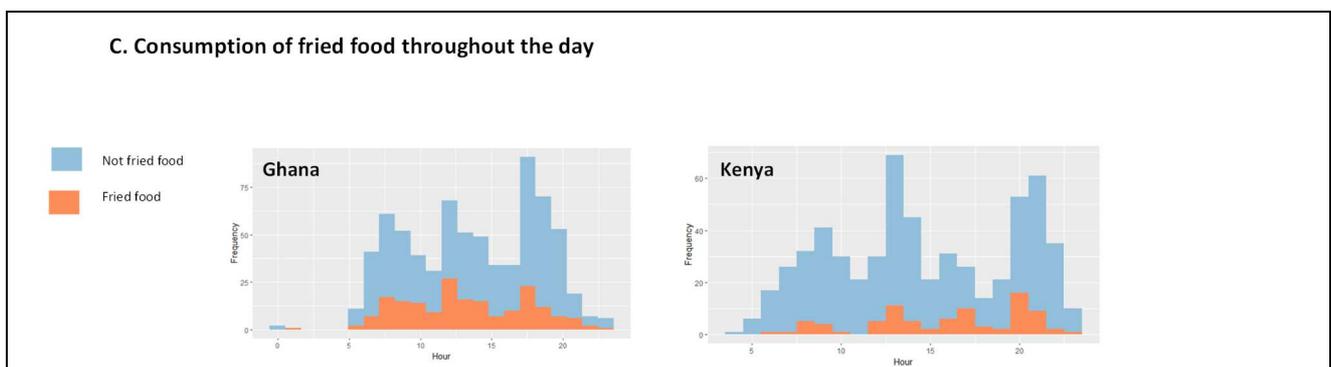
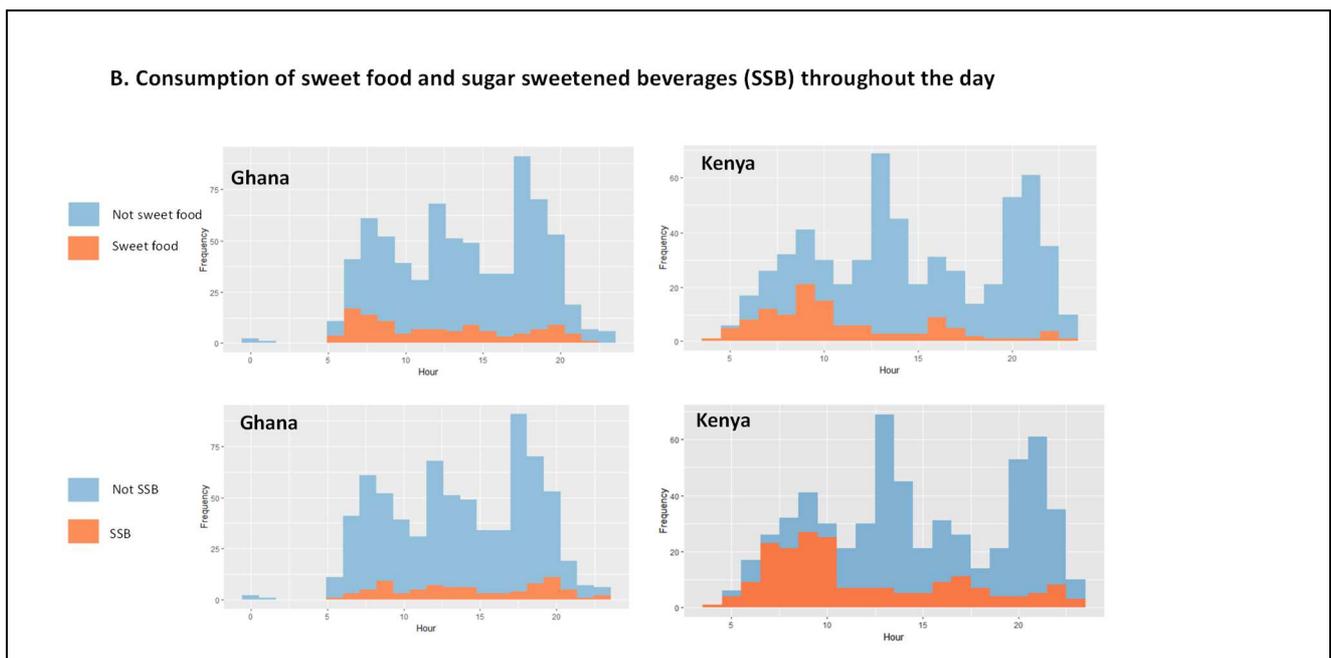
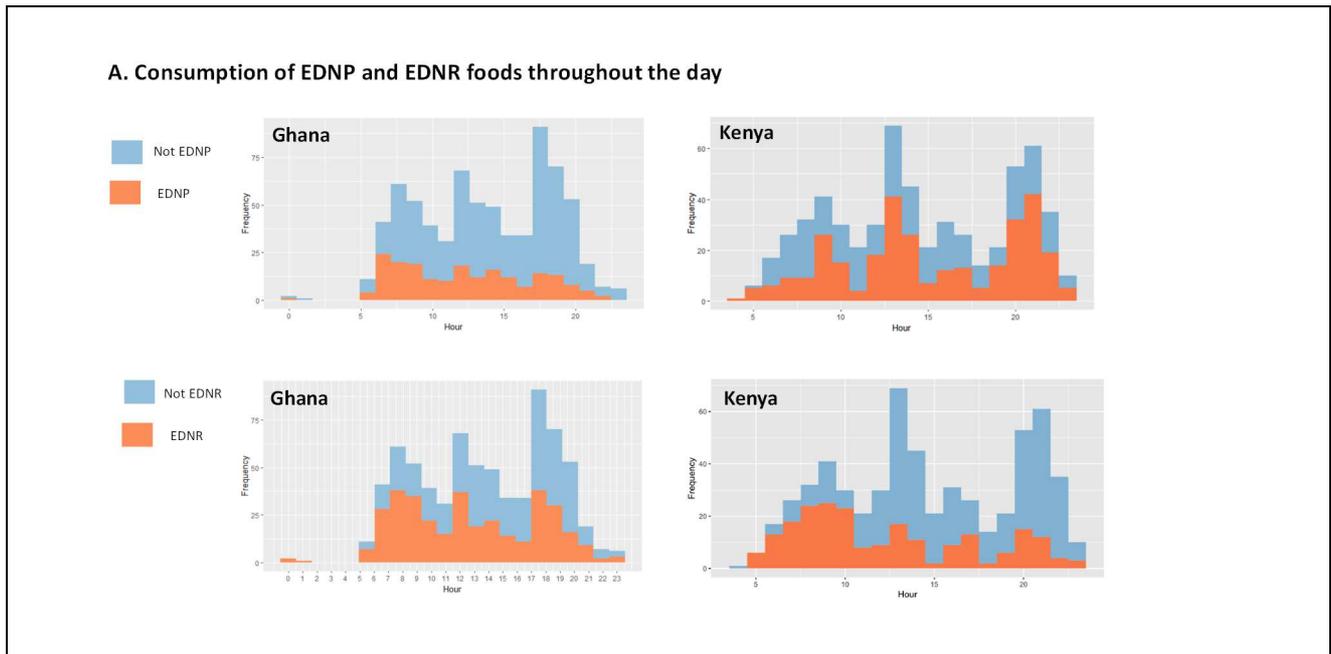


Fig. 4. Synchronisation of eating practices incorporating where people eat (A) and with whom (B)

