Review Article

Factors influencing dietary behaviours in urban food environments in Africa: a systematic mapping review

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Submitted 17 June 2019: Final revision received 8 November 2019: Accepted 19 December 2019

Abstract

Objective: To identify factors influencing dietary behaviours in urban food environments in Africa and identify areas for future research.

Design: We systematically reviewed published/grey literature (protocol CRD4201706893). Findings were compiled into a map using a socio-ecological model on four environmental levels: individual, social, physical and macro.

Setting: Urban food environments in Africa.

Participants: Studies involving adolescents and adults (11–70 years, male/female).

Results: Thirty-nine studies were included (six adolescent, fifteen adolescent/adult combined and eighteen adult). Quantitative methods were most common (twenty-eight quantitative, nine qualitative and two mixed methods). Studies were from fifteen African countries. Seventy-seven factors influencing dietary behaviours were identified, with two-thirds at the individual level (45/77). Factors in the social (11/77), physical (12/77) and macro (9/77) environments were investigated less.

Individual-level factors that specifically emerged for adolescents included self-esteem, body satisfaction, dieting, spoken language, school attendance, gender, body composition, pubertal development, BMI and fat mass. Studies involving adolescents investigated social environment-level factors more, for example, sharing food with friends. The physical food environment was more commonly explored in adults, for example, convenience/availability of food. Macro-level factors associated with dietary behaviours were food/drink advertising, religion and food prices. Factors associated with dietary behaviour were broadly similar for men and women.

Conclusions: The dominance of studies exploring individual-level factors suggests a need for research to explore how social, physical and macro-level environments drive dietary behaviours of adolescents and adults in urban Africa. More studies are needed for adolescents and men, and studies widening the geographical scope to encompass all African countries.

Rapid demographic change in Africa, partly driven by increasing migration of individuals into cities, has changed people’s food environments and dietary habits¹. Economic development has increased access to food markets selling energy-dense processed foods at low prices and decreased the price of certain foods such as vegetable oils².

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Modification of diet structure towards a higher intake of energy-dense foods (especially from fat and added sugars), a higher consumption of processed foods, animal source foods, sugar and saturated fats, and a lower intake of complex carbohydrates, dietary fibre, fruit and vegetables has led to a significant change in diet quality over the past 20 years. The nutrition transition in urban areas of many African countries has resulted in a ‘double burden of disease’ in which there is an increased prevalence of nutrition-related non-communicable diseases (NR-NCD) alongside existing communicable diseases. Although obesity prevalence is higher among African women than men, there has been a rise in both. Children and adolescents are an important group to target in the prevention of overweight and obesity. In 2010, of the 43 million children estimated to be overweight and obesity, 35 million were from low- and middle-income countries. The prevalence of overweight and obesity in children in Africa is expected to increase from 8.5% (2010) to a projected 12.7% by 2020. By understanding this shift in nutrition and disease, new NR-NCD prevention strategies that account for the factors driving dietary behaviours can be developed across the life course.

A mapping review was previously conducted in 2015 to identify drivers of dietary behaviours specifically in adult women within urban settings in African countries and identify priorities for future research. However, the increasing evidence that the overweight and obesity burden is spread more widely across population groups indicates the need for a broader review. Hence, this systematic review mapped the factors influencing dietary behaviours of adolescents and adults of both genders in African urban food environments and identified areas for future research.

**Methods**

A systematic mapping review was conducted to map existing literature regarding factors influencing dietary behaviours in urban Africa. Systematic mapping reviews are often conducted as a prelude to further research and are imperative in the identification of research gaps. Prior to conducting the review, the Cochrane Database of Systematic Reviews and MEDLINE were searched to ensure that no similar reviews were underway or had been conducted beyond the original mapping review. A review protocol was produced to ensure transparency in the review methodology and then registered with the PROSPERO database of existing and on-going systematic reviews (registration number CRD4201706893).

To determine appropriate inclusion and exclusion criteria for the review, the Sample, Phenomenon of Interest, Design, Evaluation, Research type tool was used. Criteria used in the original review were modified to acknowledge the additional population groups (adolescents and adult men); otherwise, the same processes were applied to ensure compatibility.

**Inclusion and exclusion criteria**

The original review conducted in 2015 investigated women aged 18–70 years living in urban Africa from 1971 to April 2015. This current review synthesised recent research in this same group, published since April 2015 to April 2019, and included men (18–70 years) and female/male adolescents (11–17 years), between 1971 and April 2019. All participants were living in urban Africa, those from rural settings were excluded, as were studies with participants <11 years or >70 years. Participants with a clinical diagnosis related to NR-NCD were excluded; excluding studies with specific diseases also ensured that the included studies were of healthy African populations and not specific clinical sub-groups. The phenomenon of interest was defined as factors influencing dietary behaviours. This was purposely broad to enable sensitive mapping of all available literature. Furthermore, studies including African-Americans or African migrants to non-African countries were excluded on the basis of setting. Studies measuring the effect of factors on dietary behaviours were included, but studies that focused on the relationship between diet and diet-related diseases were excluded given the focus on factors influencing dietary behaviour rather than their effect on specific diseases.

To ensure broad coverage of research, all types of study designs were included, that is, randomised controlled trials, cohort studies, case-control studies, ecological/observational studies, reviews and meta-analyses. All publication types were included, provided they were in English or French. Languages were chosen to acknowledge the main publishing languages in Africa.

For adult men and adolescents, any appropriate study from 1971 to 2019 was included. For adult women, studies published since the previous search (April 2015–April 2019) were retrieved. The chosen 1971 start date reflected the earliest appearance of relevant publications concerning health behaviour in the context of the epidemiological transition on the nominated databases and search engines. The primary outcome was dietary behaviour, including macronutrient, food item and food diversity intake, as well as eating habits, preferences, choices and feeding-related mannerisms. Macronutrients were included because of the review’s focus on urban settings where dietary transition is more likely to be associated with dietary change from the nutrition transition, which is associated with increased consumption of fat, vegetable and edible fat and increased added sugar.

**Search strategy**

Electronic searches were conducted across six key databases: EMBASE, MEDLINE, CINAHL, PsycINFO, ASSIA and African Index Medicus. The search strategy replicated that
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used in the previous review with the additional inclusion of search terms representing adult men and adolescents\(^{(8)}\). An example of a search strategy used for these databases can be found in Supplemental Table 1 in the online supplementary material. Grey literature was explored through the WHO International Trials Registry Index and Thesis (UK and Ireland) Database.

Reference lists for the seventeen studies included in the initial review were examined, and citation tracking using Google Scholar (through Publish or Perish\(^{(89)}\)) was also conducted. Forward and backward citation tracking sought to ensure that no important studies were missed and that representation of appropriate literature was maximised. Reference lists of newly identified included studies, reflecting the expansion of date range and populations of interest, were also reviewed. The dual approach of subject searching and follow-up citation tracking was considered to provide sufficient coverage of the relevant literature\(^{(12)}\).

Study selection

Studies that fulfilled the inclusion and exclusion criteria for title and abstract then underwent full-text screening by two reviewers (A.M./F.G.). Duplicates were removed prior to full-text screening. A second reviewer (H.O.-K./M.H.) assessed 10% of excluded studies at two stages: the title and abstract stage and the full-text search stage. Any disagreements were resolved by discussion. If no agreement was reached, a third reviewer also assessed the study.

Quality assessment

Quality assessment is not a mandatory requirement for a mapping review\(^{(89)}\). However, by incorporating it into the review methodology, it enhances the credibility of the review’s findings and is particularly useful in documenting uncertainties that persist in relation to previous research\(^{(9)}\). Quality assessment was conducted with a validated tool\(^{(13)}\) for qualitative and quantitative studies by two reviewers independently (A.M., M.W. or F.G.).

Data extraction

Data were extracted from included studies by one of two principal reviewers (A.M. or F.G.) supported by a second reviewer (H.O.-K. or M.H.) and was checked by a member of the review team (M.W.). As the aim of this mapping review was to map the factors influencing dietary behaviours of adolescents and adults living in African urban food environments and identify areas for future research, it was decided to include all factors reported by authors and not to restrict the review to reporting factors only where a statistical relationship or association had been demonstrated.

Data synthesis

There are different approaches to updating a review. In this review, the new findings were integrated with those of the original review at the synthesis level\(^{(14)}\) in order to present all the evidence for men, women and adolescents for the same timescale. In order to determine which factors influence dietary behaviours in the three population sub-groups, factors influencing dietary behaviours for adults and adolescents of all thirty-eight studies were mapped to the socio-ecological model defined by Story et al.\(^{(15)}\). Factors were placed within four broad levels: individual, social environment, physical environment and macro-environment and assigned to an appropriate sub-level. For novel factors that emerged, it was decided within the team where to place it in the aforementioned socio-ecological model, similar to the original review\(^{(89)}\). Reporting of the review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses) checklist\(^{(16)}\).

Results

Search results

The search yielded 2433 title and abstract records after duplicates were removed (Fig. 1); 274 records remained for full-text retrieval, at which stage 247 records were excluded, leaving twenty-seven studies for inclusion for studies of adolescents, men and women (from 2015). Twelve studies from an earlier review of women only aged 18–70 years (1971–2015) were integrated in the review findings, giving a total of thirty-nine studies.

Description of included studies

Thirty-nine studies were included in the final data synthesis (Table 1), of which nineteen were conducted in lower middle-income countries\(^{(17)}\): Cape Verde, Egypt, Ghana, Kenya, Morocco, Nigeria and Tunisia. Thirteen studies were conducted in upper middle-income countries: Botswana, Mauritius and South Africa, and one study was undertaken in the Seychelles (high-income country). Only six studies were undertaken in low-income countries: Burkina Faso, Benin, Niger and Tanzania (Table 1). Over half of studies were conducted in Ghana and Morocco (six studies each) or South Africa (ten studies).

Of the thirty-nine studies, eight were qualitative (ten records)\(^{(18–27)}\), twenty-nine (thirty-three records) were quantitative\(^{(28–60)}\) and two used mixed methods\(^{(61,62)}\) studies. The qualitative and quantitative data in the latter were extracted separately in order to generate distinct quality assessment scores. Of the thirty-nine studies, thirty-two were cross-sectional studies\(^{(18–20,25,28–37,39–45,47–62)}\), four were observational\(^{(18,21,26,27,46)}\), two used a longitudinal design\(^{(38)}\) and one was a detailed case study\(^{(12,20)}\). The methodology consisted of interviews and focus groups to obtain qualitative data, whereas self-administered or interviewer-led surveys were mostly used for quantitative studies.

Quality assessment

In summary, while most of the quantitative studies scored high on criteria such as appropriate study designs,
question/objective sufficiently described and data analysis clearly described, these studies did not report on controlling for confounders or estimation of variance in the main results.

Similarly, in all qualitative studies, authors failed to report on procedures to establish credibility or show reflexivity. The individual aspects of the quality assessment conducted for all thirty-nine included studies (see online supplementary material, Supplemental Tables 2 and 3).

Factors influencing diet or dietary behaviour in urban Africa
In total, seventy-seven factors influencing dietary behaviours were identified, with two-thirds at the individual level (45/77). Factors in the social (11/77), physical (12/77) and macro (9/77) environments were investigated less. Slightly more studies investigating social-level factors studied adolescent populations (Table 2). The configuration of dietary factors in adult men paralleled that of adult women, probably because relevant included studies examined a mixed adult population. In all population groups, the individual and household factors level of the socio-ecological model was the most studied.

Dietary factors in adult women, adult men and adolescents

Individual level
Almost two-thirds of factors identified were on the individual level (45/77), of which twelve related to cognitions, fifteen to lifestyle/behaviours, nine were biological factors and nine were demographic factors (Fig. 2). Factors specific to adolescents included self-esteem, body satisfaction, dieting, spoken language, school attendance, gender, body composition, pubertal development, BMI and fat mass.
| Study | Design, method | Country | Income level | Sample characteristics | Sample size | Sampling |
|-------|----------------|---------|--------------|-------------------------|-------------|----------|
| Qualitative studies | | | | | | |
| Batnitzky et al. | Field study, semi-structured interviews, observation | Morocco | Lower middle | Mixed | 20+ years (adult) | 1789 | Unclear – individuals then households |
| Boatemaa et al. | Cross-sectional, interviews | Ghana | Lower middle | Mixed | 15–35 years and 35+ years (adolescent and adult) | 30 | Purposive sampling |
| Brown et al. | Cross-sectional, focus groups | Botswana | Upper middle | Mixed | 12–18 years (adolescent) and adult (age range not specified) | 72–132 (adolescents) parents unknown | Sampling of schools with differing tuition status |
| Craveiro et al. | Observational, focus groups | Cape Verde | Lower middle | Mixed | 18–41 years (adult) | 48 | Opportunistic sampling using probabilistic sampling with random selection |
| Draper et al. | Observational, focus groups | South Africa | Upper middle | Female | 24–51 years (adult) | 21 | Convenience sampling |
| Legwegoh et al. and Legwegoh & Hovorka | Case-study, interview | Botswana | Upper middle | Mixed | 20–65 years (adult) | 40 households | Purposive sample, stratified based on household-head gender and socio-economic status |
| Rgui & Behalsen | Cross-sectional, questionnaire via interview | Morocco | Lower middle | Female | 15–70 years (adolescent and adult) | 249 | Convenience. Women visiting primary care centres |
| Sedibe et al. and Voorend et al. | Observational, duo-interviews | South Africa | Upper middle | Female | 15–21 years (adolescent) | 58 | Voluntary participation following researcher involvement in school |
| Quantitative studies | | | | | | |
| Agbozo et al. | Cross-sectional, questionnaire | Ghana | Lower middle | Mixed | 60–70 years (adult) | 120 | Purposive sample from four peri-urban communities |
| Amenyah & Michels | Cross-sectional, questionnaire | Ghana | Lower middle | Mixed | 11–18 years (adolescent) | 370 | Random selection, five secondary schools |
| Aounallah-Skhiri et al. | Cross-sectional, questionnaire | Tunisia | Lower middle | Mixed | 15–19 years (adolescent and adult) | 1019 | Clustered random sampling from three regions of Tunisia |
| Becquey et al. | Cross-sectional, questionnaire | Burkina Faso | Low | Mixed | 15–65 years (adolescent and adult) | 1072 | Purposive random sampling |
| Cisse-Egbuonye et al. | Quantitative, cross-sectional | Niger | Low income | Female | 15–49 years (adolescent and adult) | 3360 | Randomly selected household heads in purposive sample |
| Codjo et al. | Cross-sectional | Ghana | Lower middle income | Mixed | 15–59 years (adolescent and adult males), 15–49 years (adolescent and adult) | 452 households | Purposive sampling according to age from a larger data set |
| El Ansari & Berg-Beckhoff | Cross-sectional, questionnaire | Egypt | Lower middle | Mixed | 16–30 years (adolescent and adults) | 2810 | Voluntary questionnaire distributed to students attending lectures of randomly selected courses |
| Feeley et al. | Cohort, questionnaire | South Africa | Upper middle | Mixed | 13–17 years (adolescent) | 1298 | Cohort selection sampling-recruitment of all singleton births that occurred over a 7-week period in public delivery centres from all population groups |
Table 1  Continued

| Study | Design, method | Country | Income level | Sample characteristics | Sample size | Sampling |
|-------|----------------|---------|--------------|------------------------|-------------|----------|
| Fokeena & Jeewon (36) | Cross-sectional, self-reported questionnaires | Mauritius | Upper middle | Mixed 12–15 years (adolescent) | 200 | Multistage sampling, schools randomly selected from four educational zones of Mauritius and sample taken from three of these schools |
| Glozah & Pevalin (37) | Cross-sectional, self-reported questionnaires | Ghana | Lower middle income | Mixed 14–21 years (adolescent and adult) | 770 | Participants selected at random from four senior high schools that were purposively selected in Accra |
| Gitau et al. (38) | Longitudinal, self-reported questionnaire | South Africa | Upper middle | Males 13–17 years (adolescent and adult) | 391 | Stratified convenience sample |
| Hattingh et al. (39,40,41) | Cross-sectional, questionnaire | South Africa | Upper middle | Female 25–44 years (adolescent) | 488 | Stratified random according to number of plots in each settlement |
| Jafri et al. (42) | Cross-sectional, questionnaire | Morocco | Lower middle | Female 18+ years (adult) | 401 | Multistage cluster. Households randomly selected within clusters |
| Kiboi et al. (43) | Longitudinal, self-reported questionnaires, questionnaire | Kenya | Lower middle | Female 16–49 years (adolescent and adult) | 254 | Purposive sampling at antenatal clinic in a hospital over 1 month |
| Landais and Landais et al. (44,45) | Cross-sectional, questionnaire | Morocco | Lower middle | Female 20–49 years (adult) | 894 | Multistage cluster. Households then addresses randomly selected from enumeration areas |
| López et al. (46) | Observational, 3 × 24 h dietary recalls | Morocco | Lower middle | Mixed 15–20 years (adolescent and adult) | 327 | All students enrolled in high schools year 2007–2008 completed survey |
| Mayén et al. (47) | Cross-sectional, survey | Seychelles | High | Mixed 25–64 years (adult) | 2004 | National surveys, random sample drawn from entire population |
| Mbochi et al. (48) | Cross-sectional, questionnaire | Kenya | Lower middle | Female 25–54 years (adult) | 365 | Stratified random according to number of women in each socio-economic stratum |
| Mogre et al. (49) | Cross-sectional, questionnaire | Ghana | Lower middle | Mixed 20–60 years (adult) | 235 | Stratified random based on number of employees in each department |
| Njelekele et al. (50) | Cross-sectional, questionnaire | Tanzania | Low | Mixed 45–66 years (adult) | 209 | Random stratified selection from list of adult residents, strata: gender |
| Onyiriuka et al. (51) | Cross-sectional, structured questionnaire | Nigeria | Lower middle | Female 12–19 years (adolescent and adult) | 2097 | Random selection by ballot from four all-girls schools, no sampling performed as designed to include all students |
| Peltzer & Phaswana-Mafuya (52) | Cross-sectional, survey | South Africa | Upper middle | Mixed >50 years (adult) | 3840 | National population based sample, from original study (SAGE; two-stage probability sample) |
| Savy et al. (53) | Cross-sectional, questionnaire | Burkina Faso | Low | Female 29–50 years (adult) | 481 | Random, from a database containing an exhaustive list of inhabitants |
| Sodjinou et al. (54,55) | Cross-sectional, questionnaire | Benin | Low | Mixed 25–60 years (adult) | 200 | Multistage cluster. Neighbourhoods, households, then individuals randomly selected |
| Soualem et al. (56) | Cross-sectional, questionsnaires | Morocco | Lower middle | Mixed 12–16 years (adolescent) | 190 | Random selection from five schools in Gharb region |
| Steyn et al. (57) | Cross-sectional, structured interview | South Africa | Upper middle | Mixed ≥16 years (adolescent and adult) | 3287 | Stratified sampling of annual survey data |
| Van Zyl et al. (58) | Cross-sectional, questionnaire | South Africa | Upper middle | Mixed 19–30 years (adult) | 341 | Convenience, residents of Johannesburg visiting a mall |
Cognitions. Taste and hunger were cognition-related factors only found within adult studies (26, 27, 32, 58, 61). For instance, one quantitative study (58) in Johannesburg found that 52.5% of participants believed taste influenced fast-food intake. Higher perceived stress levels were found to significantly decrease the amount of fruit and vegetable consumption in a mixed adult population in Egypt, with a more pronounced effect in men (34). Food knowledge and subjective health status was more commonly reported in the studies of adults (28, 46, 59). Preferences, mood and perception of diet quality and quantity were reported in both qualitative and quantitative studies of both adolescents and adults (19, 26, 27, 31, 59).

A small number of factors emerged on the relationship between body satisfaction and dietary behaviours. An association was identified between decreased self-esteem and body satisfaction with disordered eating in South African adolescents, as measured by the Eating Attitudes Tests 26 (38). No significant association was found between body image perception and food intake in a quantitative study of female adults (59).

Lifestyle/behaviours. A third of individual-level factors identified for adults were categorised under the lifestyle/behaviours sub-level. Time limitation was found to be an important factor in five studies encompassing qualitative and quantitative data conducted in Botswana, Cape Verde, Ghana and South Africa (20, 21, 23, 24, 49, 58). In the qualitative study conducted in Cape Verde (21), reduced time availability was associated with the intake of unhealthy street foods. Other important lifestyle-related factors identified in a quantitative study related to lack of fruit and vegetable intake (52) were tobacco use, alcohol use, physical inactivity and low quality of life. Spoken language was found to be significantly associated with dietary quality in one quantitative study conducted in Morocco, as adolescents who only spoke Arabic had a poorer quality of diet than those who spoke both Arabic and French (56).

Biological. Evidence from quantitative studies was found for the role of biological factors, which were associated with dietary behaviours in adults, that is, morbidity (43), age (31, 39–42, 44, 45, 51, 53, 56) and having multiple children (parity) (44, 45, 54). For instance, increased morbidity was significantly associated with minimum dietary diversity among pregnant women in Kenya (43).

More diverse biological factors were investigated for adolescents than for adults. However, only age (51), BMI and fat mass (55) were significantly associated with dietary behaviours. For instance, increasing age was significantly associated with skipping meals among schoolgirls in Nigeria (51) and fat mass was negatively associated with poor eating behaviour (55).

Demographic. More demographic factors were identified in adult women than in mixed adult studies. In one quantitative study of adults conducted in Burkina Faso, males of higher SES, as measured by income and education were significantly aggregated in the ‘urban’ diet cluster,
| Level Sub-level | Factor (no. of studies) | Dietary behaviour | Evidence | Population |
|-----------------|-------------------------|-------------------|----------|------------|
| Individual and household (45) | Cognitions (12) | Taste (4) | Dietary intake | Pradeilles(52)MM, Sedibe et al.(26)QL and Voorend et al.(27)QL | Mixed adolescent adult; Female adolescent |
| | | Fast-food intake | Dietary intake | Van Zyl et al.(58)QN† | Mixed adult |
| | | Food choice | Dietary intake | Charlton et al.(61)IM | Female adolescent and adult; female adolescent |
| | | Food choice | Dietary intake | Boatema et al.(19)QL | Mixed adult |
| | Preferences (1) | | | | Mixed adult; Mixed adult; Female adult |
| | Hunger/not hungry/lack of appetite (6) | Fruit and vegetable intake | Dietary intake | Agbozo et al.(28)QN†, Mogre et al.(49)QN† and Waswa(59)QN† | Female adolescent and adult |
| | Mood (1) | Skipping meals | Dietary intake | Cisse-Egbuonye et al.(32)QN† | Female adult |
| | | Food intake | Dietary intake | Onyirinka et al.(51)QN† | Female adult |
| | | Fruit and vegetable intake | Dietary intake | Peltzer & Phaswana-Mafuya(52)QN† and Mogre et al.(49)QN† | Mixed adult; Mixed adult |
| | Subjective health status (4) | Food choice | Dietary intake/Disordered eating | Agbozo et al.(28)QN† | Mixed adult |
| | | | | Amenyah & Michels(23)QN† | Mixed adolescent |
| Lifestyle/behaviours (15) | Perceived stress (1) | Dieting (1) | Dietary intake | El Ansari & Berg-Beckhoff(34)QN† | Mixed adolescent and adult |
| | | | | | Males adolescent; Mixed adolescent |
| | | | | | Female adolescent |
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| | Perception of diet quality (1) | Perception of diet quantity (1) | Dieting (1) | | |
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| Level                      | Sub-level          | Factor (no. of studies) | Dietary behaviour            | Evidence                                  | Population                                      |
|---------------------------|--------------------|-------------------------|------------------------------|-------------------------------------------|------------------------------------------------|
| Biological (9)            | Morbidity (1)      |                         | Dietary patterns             | Zeba et al.[50]QN†                         | Mixed adult                                    |
|                           |                    |                         | Dietary quality              | Sodjinou et al.[50]QN†                      | Mixed adult                                    |
|                           |                    |                         | Dietary diversity            | Kiboi et al.[43]QN†                         | Female adolescent and adult                     |
| Age (11)                  |                    |                         | Fruit and vegetable intake   | Landais[44]/Landais et al.[45]QN†          | Female adult                                   |
|                           |                    |                         | Fruit and vegetable intake   | Peltzer & Phaswana-Mafuya[52]QN†           | Mixed adult                                    |
|                           |                    |                         | Dietary quality              | Soualem et al.[52]QN†                       | Mixed adolescent                               |
|                           |                    |                         | Dietary diversity            | Becquey et al.[53]QN†, Savy et al.[53]QN†  | Adult women; Mixed adolescent and adult         |
|                           |                    |                         | Dietary patterns             | Codjoe et al.[33]QN† and Cisse-Egbuonye et al.[32]QN† | Female adolescent and adult; Female adolescent and adult |
|                           |                    |                         | Meal skipping                | Onyiriuka et al.[51]QN†                   | Female adolescent                              |
|                           |                    |                         | Food choice                  | Onyiriuka et al.[51]QN                     | Female adolescent                              |
|                           |                    |                         | Dietary patterns             | Zeba et al.[53]QN†                          | Mixed adult                                    |
|                           |                    |                         | Energy intake                | Hattingh et al.[39]/Hattingh et al.[40]/Hattingh et al.[41]QN | Female adult                                   |
| Parity (2)                |                    |                         | Fattening practices          | Jafri et al.[42]QN†                         | Adult women                                    |
|                           |                    |                         | Dietary patterns             | Zeba et al.[54]QN†                          | Mixed adult                                    |
|                           |                    |                         | Fruit and vegetable intake   | Landais[42]/Landais et al.[45]QN†          | Adult women                                    |
| Gender (5)                |                    |                         | Dietary quality              | Soualem et al.[56]QN†                       | Mixed adolescent                               |
|                           |                    |                         | Dietary diversity            | Codjoe et al.[33]QN†                        | Mixed adolescent and adult                      |
|                           |                    |                         | Dietary intake               | Aounallah-Skhn et al.[30]QN†               | Mixed adolescent and adult                      |
|                           |                    |                         | Fast-food intake             | Van zyl et al.[58]QN†                       | Mixed adult                                    |
|                           |                    |                         | Fruit and vegetable intake   | Peltzer & Phaswana-Mafuya[52]QN†           | Mixed adolescent and adult                      |
| Body composition (2)      |                    |                         | Dietary intake               | Pradeilles[62]MM†                          | Mixed adult                                    |
| Pubertal development (1)  |                    |                         | Fruit and vegetable intake   | Peltzer & Phaswana-Mafuya[52]QN†           | Mixed adult                                    |
| BMI z-score (1)           |                    |                         | Dietary intake               | Pradeilles[62]MM                          | Mixed adolescent and adult                      |
| Fat mass (1)              |                    |                         | Dietary intake/Snacking      | Feeley et al.[35]QN†                        | Mixed adolescent                               |
| Health (2)                |                    |                         | Dietary intake/Snacking      | Feeley et al.[35]QN†                        | Mixed adolescent                               |
| Demographic (9)           | Income (individual/household) (6) |                    | Fruit and vegetable intake   | Peltzer & Phaswana-Mafuya[52]QN†           | Mixed adult                                    |
|                           |                    |                         | Dietary diversity            | Codjoe et al.[33]QN† and Kiboi et al.[43]QN† | Female adolescent and adult                     |
|                           |                    |                         | Dietary intake               | Legwegoh et al.[23]/Legwegoh et al.[24] and Steyn et al.[27][28]† | Mixed adult; Mixed adolescent and adult |
|                           |                    |                         | Dietary patterns             | Zeba et al.[54]QN†                          | Mixed adult                                    |
|                           |                    |                         | Dietary quality              | Soualem et al.[56]QN†                       | Mixed adolescent                               |
|                           |                    |                         | Dietary diversity            | Becquey et al.[31]QN† and Savy et al.[53]QN† | Mixed adolescent and adult                      |
|                           | Socio-economic status (individual/household) (13) |                    | Dietary intake               | Aounallah-Skhn et al.[30]QN†               | Female adult                                   |
|                           |                    |                         | Fruit and vegetable intake   | Peltzer & Phaswana-Mafuya[52]QN†           | Mixed adolescent and adult                      |
|                           |                    |                         | Dietary quality              | Soualem et al.[56]QN†                       | Mixed adolescent and adult                      |
|                           |                    |                         | Meal skipping                | Onyiriuka et al.[51]QN                     | Female adolescent                              |
|                           |                    |                         | Fruit and vegetable intake   | Landais[44]/Landais et al.[45]QN†          | Female adult                                    |
|                           |                    |                         | Diet quality                 | Fokeena & Jeewon[56]QN                      | Mixed adolescent and adult                      |
|                           |                    |                         | Meal skipping                | Onyiriuka et al.[51]QN                     | Female adolescent                              |
|                           |                    |                         | Fast-food intake             | Van zyl et al.[58]QN†                       | Mixed adult                                    |
| Level | Sub-level | Factor (no. of studies) | Dietary behaviour | Evidence | Population |
|-------|-----------|------------------------|------------------|----------|------------|
|       |           |                        | Dietary diversity | Kiboi et al. [43]QN†, Cisse-Egbaunye et al. [32] QN† and Codjoe et al. [33]QN‡ | Female adolescent and adult; Male adolescent and adult; Mixed adult and adolescent; Female adult |
|       |           |                        | Fruit and vegetable intake | Landais [44]/Landais et al. [45]QN‡ | Mixed adolescent and adult; Female adolescent and adult; Male adolescent and adult; Mixed adult and adult; Mixed adolescent |
|       |           |                        | Dietary intake | Aounallah-Skhiri et al. [30]QN‡ and Steyn et al. [57]QN† | Mixed adolescent and adult; Female adolescent and adult; Male adolescent and adult; Mixed adult and adult; Mixed adolescent |
|       |           |                        | Dietary quality | Soualem et al. [56]QN‡ | Male adolescent and adult; Female adolescent and adult; Female adult |
|       |           |                        | Dietary diversity | Kiboi et al. [43]QN† | Mixed adolescent and adult; Female adolescent and adult; Male adolescent and adult; Mixed adult and adult; Mixed adolescent |
|       |           |                        | Dietary intake | Aounallah-Skhiri et al. [30]QN‡, Gloz & Pevalin [37]Q‡ and Lopez et al. [30]QN‡ | Mixed adolescent and adult; Female adolescent and adult; Male adolescent and adult; Mixed adult and adult; Mixed adolescent |
|       |           |                        | Dietary quality | Soualem et al. [56]QN‡ | Male adolescent and adult; Female adolescent and adult; Female adult |
|       |           |                        | Dietary patterns | Zeba et al. [54]QN‡ | Male adolescent and adult; Female adolescent and adult; Female adult |
|       |           |                        | Fruit and vegetable intake | Landais [44]/Landais et al. [45]QN‡ and Peltzer & Phaswana-Mafuya [52]QN† | Male adolescent and adult; Female adolescent and adult; Female adult |
|       |           |                        | Household dietary diversity | Codjoe et al. [33]QN‡ | Mixed adolescent and adult; Male adolescent and adult; Female adolescent and adult; Male adolescent |
|       |           |                        | Fruit and vegetable intake | Peltzer & Phaswana-Mafuya [52]QN† | Male adolescent and adult; Female adolescent and adult; Female adult |
|       |           |                        | Dietary diversity | Codjoe et al. [33]QN‡ | Mixed adult; Male adolescent and adult; Female adolescent and adult; Female adult |
|       |           |                        | Food choice | Agbozo et al. [29]QN‡ | Mixed adult; Male adolescent and adult; Female adolescent and adult; Female adult |
|       |           |                        | Dietary diversity | Kiboi et al. [43]QN† | Male adolescent and adult; Female adolescent and adult; Female adult |
|       |           |                        | Dietary intake | Steyn et al. [57]QN† | Mixed adolescent and adult; Female adolescent and adult; Female adult |
|       |           |                        | Disordered eating | Gitau et al. [38]QN | Male adolescent and adult; Female adolescent and adult; Female adult |
|       |           |                        | Meal skipping/Food choice | Onyiriuka et al. [51]QN‡ | Mixed adolescent and adult; Female adolescent and adult; Female adult |
|       |           |                        | Fruit and vegetable consumption | Peltzer & Phaswana-Mafuya [52]QN† | Mixed adult; Male adolescent and adult; Female adolescent and adult; Female adult |
|       |           |                        | Dietary diversity | Codjoe et al. [33]QN‡ | Mixed adult; Male adolescent and adult; Female adolescent and adult; Female adult |
|       |           |                        | Dietary diversity | Becquey et al. [31]QN‡ and Codjoe et al. [33]QN‡ | Mixed adult; Male adolescent and adult; Female adolescent and adult; Female adult |
|       |           |                        | Unhealthy eating choice | Draper et al. [22]QLN | Male adolescent and adult; Female adolescent and adult; Female adult |
|       | Family (9) | Marital status (6) | Fruit and vegetable intake and diversity | Landais [44]/Landais et al. [45]QN‡ and Peltzer & Phaswana-Mafuya [52]QN+ | Male adolescent and adult; Female adolescent and adult; Female adult |
|       |           |                        | Fattening practices | Rguibi & Behalsen [25]QL and Jafri et al. [42]QN‡ | Male adolescent and adult; Female adolescent and adult; Female adult |
|       |           |                        | Dietary diversity | Becquey et al. [31]QN† and Savy et al. [53]QN+ | Male adolescent and adult; Female adolescent and adult; Female adult |
|       |           |                        | Social environment (11) | Family (9) | Marital status (6) |
|       |           |                        | Snacking | Batnitzky [18]QLN | Mixed adult; Female adolescent and adult; Female adult |
|       |           |                        | Meal skipping | Onyiriuka et al. [51]QN | Mixed adult; Female adolescent and adult; Female adult |
|       |           |                        | Food intake | Batnitzky [18]QLN | Mixed adult; Female adolescent and adult; Female adult |
|       |           |                        | Dietary diversity | Codjoe et al. [33]QN‡ and Cisse-Egbaunye et al. [32]QN+ | Mixed adult and adolescent; Female adolescent and adult; Female adult |
|       |           |                        | Meal skipping | Onyiriuka et al. [51]QN | Mixed adult and adolescent; Female adolescent and adult; Female adult |
|       |           |                        | Food choice | Brown et al. [25]QL | Mixed adult and adolescent; Female adolescent and adult; Female adult |
|       |           |                        | Fruit and vegetable intake and diversity | Landais [43]/Landais et al. [45]QN+ | Female adolescent and adult; Female adult |
| Level                  | Sub-level                                      | Factor (no. of studies) | Dietary behaviour                              | Evidence                                                                 | Population                                      |
|-----------------------|-----------------------------------------------|-------------------------|------------------------------------------------|--------------------------------------------------------------------------|------------------------------------------------|
| Physical environment  | Home (4)                                      | Food availability (3)   | Adequacy of food intake                          | Waswa et al. (59)                                                        | Female adult                                    |
|                       |                                               |                         | Dietary diversity                                | Codjoe et al. (23)                                                       | Mixed adult and adolescent                      |
|                       |                                               |                         | Fruit and vegetable intake/ diversity           | Landais et al. (44)                                                      | Female adult                                    |
|                       |                                               |                         | Food choice                                      | Agbozo et al. (28)                                                       | Mixed adult                                     |
|                       |                                               | Living area (3)         | Adequacy of food intake                          | Waswa et al. (59)                                                        | Mixed adult and adolescent                      |
|                       |                                               |                         | Dietary diversity                                | Codjoe et al. (23)                                                       | Female adult                                    |
|                       |                                               |                         | Fruit and vegetable intake/ diversity           | Landais et al. (44)                                                      | Mixed adult                                     |
|                       |                                               |                         | Food choice                                      | Agbozo et al. (28)                                                       | Female adult                                    |
|                       |                                               | Housing conditions (2)  | Adequacy of food intake                          | Waswa et al. (59)                                                        | Mixed adult and adolescent                      |
|                       |                                               |                         | Dietary diversity                                | Codjoe et al. (23)                                                       | Female adult                                    |
|                       |                                               |                         | Fruit and vegetable intake/ diversity           | Landais et al. (44)                                                      | Mixed adult                                     |
|                       |                                               |                         | Food choice                                      | Agbozo et al. (28)                                                       | Female adult                                    |
|                       |                                               | Neighbourhoods (7)      | Adequacy of food intake                          | Waswa et al. (59)                                                        | Mixed adult and adolescent                      |
|                       |                                               |                         | Dietary diversity                                | Codjoe et al. (23)                                                       | Female adult                                    |
|                       |                                               |                         | Fruit and vegetable intake/ diversity           | Landais et al. (44)                                                      | Mixed adult                                     |
|                       |                                               |                         | Food choice                                      | Agbozo et al. (28)                                                       | Female adult                                    |
|                       |                                               | Neighbourhood SES (2)   | Dietary intake/ Snacking                        | Pradeilles et al. (62)                                                   | Mixed adult and adolescent                      |
|                       |                                               |                         | Food choice                                      | Feeley et al. (35)                                                       | Female adult                                    |
|                       |                                               | Affordability (2)       | Dietary intake/ Snacking                        | Pradeilles et al. (62)                                                   | Mixed adult and adolescent                      |
|                       |                                               |                         | Food choice                                      | Feeley et al. (35)                                                       | Female adult                                    |
|                       |                                               | Eating outside of home (2)| Dietary intake/ Snacking                        | Pradeilles et al. (62)                                                   | Mixed adult and adolescent                      |
|                       |                                               |                         | Food choice                                      | Feeley et al. (35)                                                       | Female adult                                    |
|                       |                                               | Where food is bought (1)| Dietary intake                                    | Pradeilles et al. (62)                                                   | Mixed adult and adolescent                      |
|                       |                                               |                         | Dietary intake                                    | Feeley et al. (35)                                                       | Female adult                                    |
|                       |                                               | Convenience (2)         | Dietary intake                                    | Pradeilles et al. (62)                                                   | Mixed adult and adolescent                      |
|                       |                                               |                         | Dietary intake                                    | Feeley et al. (35)                                                       | Female adult                                    |
|                       |                                               | Availability (3)        | Dietary intake                                    | Pradeilles et al. (62)                                                   | Mixed adult and adolescent                      |
|                       |                                               |                         | Dietary intake                                    | Feeley et al. (35)                                                       | Female adult                                    |
|                       |                                               | School (2)              | Dietary intake                                    | Pradeilles et al. (62)                                                   | Mixed adult and adolescent                      |
|                       |                                               |                         | Dietary intake                                    | Feeley et al. (35)                                                       | Female adult                                    |
|                       |                                               | School attendance (1)   | Dietary intake                                    | Pradeilles et al. (62)                                                   | Mixed adult and adolescent                      |
|                       |                                               |                         | Dietary intake                                    | Feeley et al. (35)                                                       | Female adult                                    |
|                       |                                               | Macro-level environment (9)| School attendance (1)                          | Pradeilles et al. (62)                                                   | Mixed adult and adolescent                      |
|                       |                                               |                         | School attendance (1)                            | Feeley et al. (35)                                                       | Female adult                                    |
|                       |                                               | Food marketing and media (3)| Advertising (1)                                | Pradeilles et al. (62)                                                   | Mixed adult and adolescent                      |
|                       |                                               |                         | Advertising (1)                                  | Feeley et al. (35)                                                       | Female adult                                    |
|                       |                                               | Media (3)               | Advertising (1)                                  | Pradeilles et al. (62)                                                   | Mixed adult and adolescent                      |
|                       |                                               |                         | Advertising (1)                                  | Feeley et al. (35)                                                       | Female adult                                    |

Dietary behaviour in African food environments
| Level | Sub-level | Factor (no. of studies) | Dietary behaviour | Evidence | Population |
|-------|-----------|------------------------|------------------|----------|------------|
|       |           | Food intake            |                  |          |            |
|       |           | Ideal body size (2)    |                  |          |            |
|       | Societal and cultural norms/values (2) | Religion (5) | Food intake | Waswa$^{(59)\text{QN}^*}$ | Female adult |
|       |           |                        |                  |          |            |
|       |           |                        | Dietary intake/Disordered eating |                  | Amenyah & Michels$^{(29)\text{QN}^+}$ |
|       |           |                        | Disordered eating |                  |              |
|       |           |                        | Fruit and vegetable intake |                  | Gitau et al.$^{(38)\text{QN}^+}$ |
|       |           |                        | Skipping meal |                  | Peltzer et al.$^{(52)\text{QN}^+}$ |
|       |           |                        | Dietary diversity |                  | Mogre et al.$^{(49)\text{QN}^+}$ |
|       |           | Cultural beliefs (4)    | Food intake      | Waswa$^{(59)\text{QN}^+}$ | Female adolescent and adult |
|       |           | Fattening practices     | Food intake      | Waswa$^{(59)\text{QN}^+}$ | Mixed adult |
|       |           | Dietetic diversity      | Rguibi & Behalsen$^{(25)\text{QL}}$ | Food intake | Female adolescent and adult |
|       |           |                        | Codjoe et al.$^{(33)\text{QN}^+}$ | Dietary intake | Mixed adult |
|       |           | Food and beverage industry (4) | Food prices (5) | Legwegoh et al.$^{(23)\text{QL}}$ | Mixed adults; Female adolescent |
|       |           | Food choice             | Charlton et al.$^{(61)\text{MM}}$ | Food choice | Legwegoh et al.$^{(23)\text{QL}}$ |
|       |           | Food intake             | Waswa$^{(59)\text{QN}^+}$ | Food choice | Legwegoh et al.$^{(23)\text{QL}}$ |
|       |           | Unhealthy eating choice | Draper et al.$^{(22)\text{QL}}$ | Food choice | Legwegoh et al.$^{(23)\text{QL}}$ |
|       |           | Quality/freshness of food (1) | Food choice | Food choice | Legwegoh et al.$^{(23)\text{QL}}$ |
|       |           | Quick/easy to make foods (1) | Food choice | Food choice | Legwegoh et al.$^{(23)\text{QL}}$ |
|       |           | Presentation and packaging (1) | Food choice | Food choice | Legwegoh et al.$^{(23)\text{QL}}$ |

MM, mixed methods; QN, quantitative study; QL, qualitative study.
*Association not assessed/reported.
†Significant association.
‡Association assessed but NS.
while there were proportionally more lower income, non-educated and female subjects in the ‘traditional’ diet cluster. Other factors that were investigated were household composition and family profession, but their relationship with dietary behaviours was NS. Adolescents with high SES adhered to more aspects of dietary guidelines than those of low SES in one quantitative study in Mauritius. Qualitative and quantitative studies have found that the importance of household SES was apparent across a range of SES indicators including household income or wealth, employment, land ownership and financial insecurity. Educational level of individuals or parents was also found to play a role in dietary behaviours in several quantitative studies. Higher parental education level was associated with better dietary intake in four quantitative studies among adolescents, resulting in a higher modern dietary diversity score for adolescents in Tunisia, higher household dietary diversity score in Ghana and better healthy eating behaviours in Ghana and Morocco than those whose parents had average or low educational attainment.

Dietary behaviours were associated with ethnicity in South African adults and adolescents in South Africa and Nigeria. Social environment

Eleven factors emerged that related to the social environment, eleven studies (both qualitative and quantitative) explored family influences and four studies investigated friendship. Two qualitative studies examined the role of friendship on dietary habits and reported that friendship was associated with dietary habits in South African adolescents, stating that ‘participants often ate the same food as their friends’ and that shared food consumption between friends was common. In another qualitative study in Ghana, some participants mentioned friends as influencing food choice; foods recommended among peers were usually processed foods such as savoury snacks, soda and instant noodles. A quantitative study conducted among South African adults did not find a significant association between social cohesion and fruit and vegetable consumption.

Physical environment

Fourteen studies (qualitative and quantitative) investigated the role of the physical environment on dietary behaviours, of which nine included adolescents. Twelve factors emerged in the physical food environment that influenced dietary behaviours. Seven of these were in the neighbourhood, four in the home environment and one in the school environment (Fig. 2).

Convenience and availability of food were the most investigated factors in the physical environment. For instance, convenience was identified as a factor influencing fast-food intake with one quantitative study in South Africa.
noting that 58·1% of participants believed it influenced their food choices\(^{(58)}\). Significant associations were found between housing conditions and where food is bought with dietary behaviours in South Africa\(^{(57)}\). Two studies found an association between eating outside the home and dietary behaviours\(^{(53-55)}\). Eating outside the home was associated with higher household dietary diversity in a quantitative study in Ghana, while food eaten at home was associated with lower household dietary diversity scores\(^{(33)}\).

The influence of school on dietary habits was investigated by only one qualitative study\(^{(26)}\), which found that availability of food within schools, as well as sharing food within school, influenced dietary habits in South Africa.

**Macro-environment**

Nine factors emerged as influencing dietary behaviours that were on the macro-environment level. Three of these factors related to the food marketing and media environment, two related to societal and cultural values and four related to the role of the food and beverage industry.

Food prices were associated with fast-food intake in one South African quantitative study of young adults\(^{(58)}\). Media and advertising were found to be associated with dietary intake of adults in both qualitative and quantitative studies in Botswana\(^{(23,24)}\) and South Africa\(^{(58)}\). About 49% of participants in one study in South Africa stated that they believed media messages influenced their decision to purchase fast food\(^{(58)}\). In a quantitative study conducted in South Africa, ideal body size was related to dietary behaviours\(^{(38)}\). A quantitative study conducted in Ghana\(^{(29)}\) identified that larger ideal body size was associated with a changed Eating Attitudes Tests 26 score. Lack of religious involvement was associated with dietary behaviour in one quantitative study of adults in South Africa\(^{(58)}\), and one quantitative study of adults and adolescents in Ghana but was not associated with meal skipping or food choices in adults\(^{(49)}\).

**Discussion**

This systematic mapping review mapped the factors influencing dietary behaviours of adolescents and adults in African urban food environments and identified areas for future research. Thirty-nine studies (forty-five records) were included in the final data synthesis. In total, seventy-seven factors influencing dietary behaviours were identified, with two-thirds at the individual level (45/77). Factors in the social (11/77), physical (12/77) and macro (9/77) environments were investigated less. The inclusion of two additional population groups (adult men and adolescents), in comparison to the original review, expands the generalisability of findings to the general population in urban Africa. Studies included in this review were from fifteen African countries, encompassing a range of low-, middle- and high-income African countries, reflecting the heterogeneity of urban African contexts. However, over half (22/39) were conducted in Ghana, Morocco or South Africa. This updates and extends a previous review, which was restricted to women\(^{(60)}\). The current review updated and extended the demographic scope to include men and adolescents, as well as women.

Findings synthesised from included studies indicate that the most investigated factors for adults and adolescents were the individual and household environment of the socio-ecological model as described by Story et al\(^{(15)}\). This finding is consistent with our previous review\(^{(48)}\). Dietary behaviour was significantly associated with a range of individual and household environmental factors: household income, educational level, employment, land ownership, socio-economic status (SES), ethnicity and financial insecurity. Low self-esteem, high levels of stress and lack of time were associated with unhealthy dietary behaviours. The focus on individual-level factors might be attributable to the fact that promoting healthy eating and preventing obesity have predominantly focused on changing behaviour through interventions such as nutrition education, although such interventions alone have met with little success\(^{(65)}\).

Studies involving adolescents investigated factors in their social environments and were less focused on the role of the physical food environment on dietary behaviours, than for adults. This bias is unsurprising given that adolescence is defined as a transient formative period where many life patterns are learnt\(^{(64)}\), particularly through the social environment. Shared food consumption between adolescent friends was common. Evidence from the wider literature outlines the social transmission of eating behaviours, whereby a strong relationship exists between the social environment and amount or types of food eaten\(^{(65)}\). This implies individuals tend to eat according to the usual social group they find themselves, either in terms of quantity or types of food eaten\(^{(66)}\). Thus, understanding the role of the social environment among adults and adolescents as a modifiable factor influencing dietary behaviours offers an opportunity for developing nutrition interventions that harness social relationships.

Convenience and availability of food were the most investigated factors in the physical environment. Significant associations were found between housing conditions and dietary intake, and where food was purchased and dietary intake. In contrast to the socio-ecological model\(^{(15)}\), our map lacks evidence for the role of several factors in the physical environment such as workplaces, schools (one study), supermarkets and convenience stores.

In contrast to studies conducted in high-income countries, factors influencing dietary behaviours in the macro-environment were rarely investigated in our review for adults or adolescents. Only food/drink advertising and religion (adolescents only) and food prices were associated with unhealthy dietary behaviours, but many macro-level factors are known to influence diet, such as the political context, economic systems, health care systems and
behavioural regulations\(^{67}\) that were not studied. One possible explanation may be that because Story’s model was generated following research within high-income countries, some of the sub-levels may be less relevant to the African context. Factors that have been shown to influence dietary behaviours in high-income countries and were investigated in studies included in this review include food prices, social networks (friendship), time constraints and convenience. However, in high-income countries these factors are often reported in low-income groups\(^{68}\). Another important finding from this review is the consistent association between SES and dietary behaviours as expected. SES is a global concern, and several studies have shown that lower SES restricts food choices, thus compelling the consumption of unhealthy foods\(^{69-71}\). Of the thirty-nine studies identified, none specifically investigated adult men, as they were only included in mixed adult population studies. Adult men and women studies identified during this review showed similar types of factors associated with dietary behaviour across the different environments, suggesting that similar interventions could be targeted at both men and women. However, demographic factors were identified more in adult women than in mixed adult studies. This implies that the household is an important setting in which to reach women. The findings for women from this review went beyond that of the previous review. Three more factors (stress, self-esteem and body satisfaction) were identified in the updated review. Furthermore, the expanded review identified evidence of more physical-level dietary factors including housing, living area, convenience and where food is bought.

As the most common study methodology of included studies was cross-sectional, it is not possible to conclude on causality of the factors in different components of the food environment on dietary behaviours. Limitations regarding the use of the socio-ecological model\(^{68}\) became evident during the review, as there is overlap between the different environmental levels for factors such as SES, spoken language and religious group. For instance, SES crosses multiple levels of the model, particularly in adolescents, as SES is often measured via physical or household/family-related factors. Another example is religious groups, which do not fit within the current sub-categories defined by Story’s ecological model\(^{15}\). Although religion may broadly be classified as a factor in the macro-environment, religious groups may best fit in the social environment. While the socio-ecological model depicts reality as artificially separating individual and social experiences\(^{68}\), it is still a useful tool to communicate with policy makers and practitioners, unlike systems-based approaches, which are better at representing reality but rely on data on causality and mechanisms that are often lacking in cross-sectional and quantitative studies\(^{72}\) and are harder to communicate to a non-expert audience.

This review revealed considerable heterogeneity in the design of quantitative studies and the outcome measures used for assessing dietary behaviours. Future quantitative studies should ensure that outcome measures are clearly defined and report the direction of association between the factors examined and whether dietary behaviours are healthy or unhealthy. Quantitative studies should enhance the control of confounding variables to prevent them from introducing bias into the findings, and longitudinal quantitative studies are needed to be able to measure how factors influencing dietary behaviours are changing with the transformation of food environments. Qualitative studies are useful for understanding the complex relationships between determinants of dietary behaviours. Qualitative studies need to have a rigorous design and improve the reporting of reflexivity by considering the impact of the role of researcher characteristics on the data collected to improve their quality.

This review highlights the need for robust mixed methods studies to gain a better understanding of the drivers of dietary behaviours in urban food environments in Africa.

This is the first systematic mapping review that focuses on environmental factors of dietary behaviour for all population groups in an urban African context. The nutrition transition has been associated with changes in dietary patterns globally with concomitant increases in obesity and NR-NCD, now among the leading causes of death\(^{73}\). In African countries, NR-NCD risk is increasing at a faster rate and at a lower economic threshold than seen in high-income countries\(^{74}\), hence the need for this review that identifies context-specific factors that influence dietary behaviours. The recent focus on good health and well-being as part of the Sustainable Development Goals (SDG\(^3\))\(^{75}\) also reflects this review’s aim to identify the underlying determinants of dietary behaviour in the urban African context to identify avenues for interventions.

**Conclusion**

The relatively small number of appropriate studies identified, following an extensive literature search, indicates a significant gap in research into understanding of the factors influencing diets in food environments in urban Africa. Due to the increasing presence of multiple burdens of malnutrition in urban Africa, secondary to the nutrition transition\(^{6}\), more studies should be directed at investigating how food environments are changing and driving this complex nutritional landscape. In particular, future research could emphasise the investigation of adult men and adolescents. The evidence from this review will contribute towards developing a socio-ecological framework of factors influencing dietary behaviours adapted to urban African food environments.

**Acknowledgements**

*Acknowledgements:* Emmanuel Cohen was supported by the South African DST/NRF Centre of Excellence in Human
development. Financial support: This research was funded by a Global Challenges Research Fund Foundation Award led by the MRC, and supported by AHRC, BBSRC, ESRC and NERC, with the aim of improving the health and prosperity of low- and middle-income countries. The TACLED (Transitions in African Cities Leveraging Evidence for Diet-related non-communicable diseases) project code is MR/P025153/1. The funders had no role in the design, analysis or writing of this article. Conflict of interest: There are no conflicts of interest. Authorship: All authors designed the review. A.M. conducted the searches and screening. H.O.-K. checked 10% of excluded records at title/abstract and full-text screening stages. A.M., F.G. and H.O.-K. extracted data and conducted analyses and quality assessment. M.W. checked data extraction and quality assessment. H.O.-K. drafted the manuscript. All authors reviewed draft versions of the manuscript and provided suggestions and critical feedback. All authors have made a significant contribution to this manuscript and approved the final manuscript. Ethics of human subject participation: Not applicable.

Supplementary material

For supplementary material accompanying this paper visit https://doi.org/10.1017/S1368980019005305

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