What factors are associated with obesity-related health behaviours among child refugees following resettlement in developed countries? A systematic review and synthesis of qualitative and quantitative evidence

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Summary
Refugee children are likely to become less active and eat more unhealthily after their resettlement in developed countries. This review aims to identify and synthesize research about factors that influence unhealthy behaviours related to obesity in this population. Six electronic databases were searched systematically to identify studies that sampled refugee children or parents of refugee children aged 2 to 16 years who have resettled in a developed country. Methodological and cultural study quality was assessed and factors associated with obesity-related health behaviours investigated. Twenty studies fulfilled the inclusion criteria. Five major themes, representing factors influencing health behaviours, were identified from the data synthesis process: Acculturation, Environmental, Socioeconomic, Cognitive, and Family. The analysis revealed that refugee's health behaviours are influenced by several complex factors that are common to immigrant groups but have a greater influence among refugees. The review also revealed parental practices influence the health behaviours of children, especially those aged 2 to 10 years. Research is needed to understand further the role that parents have in influencing health behaviours and weight trajectories of children following resettlement.

KEYWORDS
diet, health behaviours, physical activity, refugee parents

1 | INTRODUCTION

Obesity is an extremely important public health problem facing individuals, communities, and governments.1 The last decade has seen a marked rise in the prevalence of obesity rates worldwide, with incidence of overweight reaching epidemic proportions2 and threatening to outnumber global rates of undernutrition.3,4 The increasing prevalence of global obesity has serious health implications for populations worldwide as it constitutes a major risk for chronic diseases, including type 2 diabetes, cardiovascular disease, hypertension, and stroke, as well as certain forms of cancer.5 Importantly, although it is more common among adults, a marked rise has also been observed in the incidence of obesity in children.6
Rising levels of childhood obesity constitutes one of the most serious public health challenges in the modern era. Although this trend has been observed globally, the increase in overweight children and adolescents is especially evident in economically developed countries. There are many negative physical, social-emotional, psychological, and academic effects associated with childhood obesity. Short-term repercussions include hypertension, dyslipidaemia, orthopaedic problems, and poor quality of life, while longer-term health impacts include cardiovascular disease and diabetes. Childhood obesity and its associated increased health risks often persists into adulthood. Increased childhood obesity has been observed across populations; however, data show a particularly rapid rise in the prevalence of obesity among children in low-educated, low-income families, and among immigrant groups and refugees who have settled in developed countries. This suggests that different or additional factors may be required to reduce the risks of obesity.

Forced migration is a life-changing process for refugees. A refugee is defined as any person who is forced to leave their home country due to ‘fear of being persecuted for reasons of race, religion ... and is unable or, owing to such fear, is unwilling to avail himself of the protection of that country’ (P2). As such, refugees can be differentiated from immigrants who leave their home country following planned migration. At least 13 million children live as refugees or asylum seekers outside their home country, most of whom originate from Asia, the Middle East, or Africa. Many refugees, especially children, are exposed to considerable health risks on these dangerous and often prolonged journeys, reaching host countries suffering from the effects of undernutrition, infectious disease, and poverty. Although their health and weight typically improves postresettlement, their health tends to decline in the longer term, possibly as a result of adopting the unhealthy health behaviours that may relate to the culture of the country in which they resettle. The profound alteration of lifestyle, associated with resettlement in developed countries, has numerous attendant challenges for refugees, including adaptation to the local food environment. The processes involved in acclimatizing to a new environment can negatively affect the general health of refugees, manifesting in a range of negative outcomes. For example, it is argued that the challenges in navigating the obesogenic lifestyle associated with some economically developed societies during resettlement can increase the risk of childhood obesity.

Ethnicity and acculturation have been identified as factors that contribute to health inequality and so function as determinants of diet and lifestyle among migrants. A number of studies have focused on the role of acculturation (i.e., the process of adopting the cultural norms and practices of a host society) in studying obesity and the associated health decline of immigrant and refugee populations. Previous studies have demonstrated a connection between acculturation and increased risk of obesity and cardiovascular disease, with suboptimal dietary behaviours mediating this connection. Other studies highlight important ethnic differences in cardiovascular disease risk factors among immigrant populations, which demonstrate the connection between ethnicity/acculturation, diet, and the risk of cardiovascular disease. These findings also suggest that each ethnic group may have a distinct trajectory related to the lifestyle in their country of origin and their level of acculturation in their host country. This difference between lifestyles in the country of origin and reception may explain why obesity trajectories can be expected to be diverse in refugee children. This is especially important given that obesity rates differ greatly between high-income countries, which may be attributable to differences in diet and levels of physical activity. However, other research reveals the limited extent of acculturation theory to clarify the differences and changes between refugee and immigrants as well as the factors underpinning health inequality among refugee populations.

There is evidence that refugee children have poorer health outcomes than other migrant children. Refugees relocating to the United States of America report more adverse physical health outcomes (e.g., heart disease, hypertension, and type 2 diabetes) and become more overweight and have obesity than nonrefugee immigrants. One explanation for this is that refugees experience greater stress prior to (e.g., stress related to armed conflict), during migration (i.e., the actual journey), and after settlement (e.g., insecure and transient accommodation) than migrants. The trauma and stress associated with the refugee experience increases the risk of chronic disease. The reasons for this are unclear, but it is likely that the stressors involved in being refugee influence obesity related health behaviours during resettlement. For example, refugee children who have undergone long-term dietary limitation in refugee camps may adopt health behaviours that are associated with obesity development, such as increased consumption of processed and energy-dense foods and corresponding decreased consumption of fish, fruit, and vegetables. It is important to systematically synthesize the existing literature to obtain a deeper understanding of the complex factors that contribute to unhealthy weight change, specifically among refugee children.

To date, there are limited data focusing on the factors associated with behaviour changes and obesity among refugee families after their resettlement. The interaction between ethnicity/acculturation and refugee stress is poorly understood; this may be due to the associated methodological difficulties involved in studying this hard-to-reach population. The reluctance of refugees to become involved in research, as well as the likelihood that individuals will move after resettlement, make it difficult to obtain necessary sample sizes and to obtain follow up data. Other methodological challenges include the difficulties in ascertaining the legal status of refugees, because most organizations that support minorities tend to group immigrants and refugees into a single category. Moreover, some refugees are worried about revealing their legal status.

Consequently, this review sought to contribute to existing knowledge by obtaining a deeper understanding of the complex factors that influence obesity-related health behaviours in refugee children after their resettlement in developed countries. Specifically, it aimed to identify the factors associated with health behaviours in this population, as well as identifying those areas that would benefit from further research. Insights in this area could provide important information for
local services, and national and international policy, enabling the provision of the best support for this vulnerable population, as well as informing the design and development of interventions to tackle this problematic trend.

2 | METHODS

This systematic review is reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) and was preregistered (PROSPERO CRD42018096940).

2.1 | Inclusion and exclusion criteria

The studies that met the following inclusion criteria were included (see Table 1).

2.2 | Search strategy

Six electronic databases were searched for eligible studies (CINAHL, MEDLINE, EMBASE, PsycINFO, Web of Science, and Scopus). Unpublished studies were searched using OpenGrey. Ascendancy and descendancy searches were conducted on the reference lists of relevant reviews and studies. In addition, researchers in relevant fields were contacted for assistance in identifying studies in order to ensure that the main studies in this area were included.

2.3 | Search terms

The Sample, Phenomenon of Interest, Design, Evaluation, and Research type (SPIDER) framework was adopted and used to direct the development of the search terms. See Table 2 for the main terms used in this review. The search terms were modified according to the database and combined with Boolean operators (AND/OR/NOT). Searches were limited to the years from January 2003 to August 2018 and human studies.

2.4 | Study selection

The study selection process occurred over several stages: duplicates were removed, then each title and abstract was screened for inclusion by two reviewers (MH and SK) with reference to the inclusion criteria. Full texts of promising studies were subsequently reviewed against the inclusion and exclusion criteria by same two reviewers. Any disagreements were resolved through consultation with a third reviewer. See Figure 1 for a PRISMA diagram depicting the process of selecting studies.

2.5 | Assessment of methodological quality

The quality of the quantitative studies was assessed using a quality-appraisal tool that used six methodological questions (rating the sampling methods, response rate, primary/secondary data source, validity/reliability of the measures used, data quality, and the definition of the problem), see Table 3. The methodological quality of qualitative studies was assessed using 10 evaluation criteria of the Joanna Briggs Institute approach.

Given the focus on refugee children, who represent several ethnic groups, assessment was also conducted into the ‘cultural quality’ of each ethnic group in the studies. The cultural quality assessment considers the cultural, social, and linguistic needs of a highly diverse population during the development of the research ideas, designing, conducting research, and exploring the applicability of research findings. This tool has been used in previous systematic reviews on ethnic minorities. It covers 12 areas (Were any of the authors from...
the same ethnicity background of the participants? Was the ethnicity of the target population defined? Were special considerations used in selecting the measuring tool? What languages were offered? What was the process of translation? Was there ethnic matching of interviewers and interviewees? Was there cultural consideration in interviewer/interpreter training? Was the interviewee’s family consulted? Were community agencies consulted? Were interpreters used? Was the validity and reliability of translated questionnaires tested?49,50

All studies meeting inclusion criteria were included in this review regardless of their quality because some of the lower-rated papers contributed different insights; however, their findings were treated with caution.

2.6 | Data extraction

The results of the literature search were managed using the EndNote reference management software. Data were extracted from the studies using a data extraction tool by one author (MA). For the qualitative studies, all quotes from participants, results, and discussion sections were extracted and uploaded to NVivo11 software.

2.7 | Data synthesis

A separate synthesis for qualitative and quantitative studies was conducted, in which thematic synthesis and narrative synthesis were conducted, respectively. The initial synthesis revealed that five themes extracted from all studies were similar; therefore, a narrative synthesis approach using text and tables was employed to compare and combine the results of the thematic and narrative synthesis.52

3 | RESULTS

A total of 1,892 papers were identified (see Figure 1). After duplication and title/abstract screening, 63 potentially eligible studies were retrieved for full text screening. Twenty fulfilled the inclusion criteria and were included in the review (see Tables 4-6).
3.1 | Study characteristics

The final set of studies comprised eight qualitative, 10 quantitative, and two mixed methods studies. Half focused exclusively on the perception of parents regarding the diet and physical activity of their children; the remainder obtained insights from refugee children themselves. Half of the studies focused their research questions on acculturation as the main factor influencing diet change.18,28,29,54,56,69,70 –72,74,76 Three studies focused on food insecurity, particularly in terms of eating patterns among refugee children.22,23,71 Three55,73,77 studies investigated the link between family functioning/parenting style and childhood obesity, and a single study explored the association between negative mood and health behaviours among refugee parents and their children. The remaining studies explored a range of migration-related elements associated with health behaviours. The included studies involved a diverse range of ethnicities; the majority focused on refugees originating from countries in three distinct regions: Southeast Asia (Laos, Vietnam, Cambodia, and Hmong refugees), sub-Saharan Africa (Sudan, Somalia, Democratic Republic of the Congo, Burundi, Djibouti Kenya, Tanzania, Eritrea, and Ethiopia), and Middle Eastern countries (Afghanistan, Iran, and Iraq). Most of the studies were conducted in Australia18,54–58,72–74 or the United States of America.22,23,25,28,29,59,60,69,70,71 No study was conducted in the United Kingdom.

3.2 | Methodological quality

Almost all the studies were of moderate to high quality, with only one study rated as low.25 Two of the quantitative studies received a high score (83.33%) and eight received a satisfactory score (34–66%) (see Table 7). The main quality issue was around the approaches to sampling. This has been considered a common methodological issue among research into refugee populations.40 Probability sampling was only used to recruit participants in one study,28 with the remainder utilizing nonprobability sampling. This might be an issue as the sample may not be representative of the whole population, therefore views maybe missed or not explored (e.g., from participants who do not volunteer as they are not confident or not able to articulate their experience clearly). It was notable that the majority of studies explored the associations between the different factors and health behaviours.

Qualitative studies were ranked as higher quality compared with the quantitative studies; studies which employed participatory methods (a recommended approach in researching vulnerable populations) were the highest quality. Almost all of the qualitative studies provided information on the underpinning theoretical framework, the appropriateness of the research design, data analysis, and findings (see Table 8). However, few studies provided information on the impact of the investigator, believability, and evaluation/outcome.

During the cultural quality appraisal, it became clear that the studies were low on some aspects. Although most of the qualitative studies used professional bilingual interpreters, interviewers, and mediators to conduct the interviews and focus groups, only seven of the studies reported comprehensive training (e.g., on cultural and ethical issues, safety considerations, and interview techniques) for the interviewers and interpreters.25,28,60,69,72–74 Half of the studies did not mention or report in detail the translation process of the questionnaires, measurement tools, or interviews. Only one study used ethnic
| Authors                          | Country     | Objective                                                                 | Study design | Participants and ethnicity | Instrument(s) used                                                                 | Factors in research question                                                                 | Main results (whether outcomes presented by ethnicity?)                              |
|---------------------------------|-------------|---------------------------------------------------------------------------|--------------|----------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
| Renzaho and Burns (2006)        | Australia   | (i) To describe sub-Saharan African (SSA) post-migration food habits and eating patterns; and (ii) to examine how the food habits of SSA households in Victoria reflect postmigration Acculturation. | Cross-sectional | \(n = 139\) SSA migrants and refugees of the sample 54% Refugees. | Data on food habits and Eating patterns were obtained using semistructured, face-to-face interviews | Postmigration experience and Acculturation. | Data is not reported separately by ethnicity. Factors most influencing food choice: Nutritional value, Budget, Health, Preference/favourite, Easy to prepare, Cultural/traditional, Availability of ingredient, Religion. |
| Renzaho, Swinburn, and Burns (2008) | Australia   | To examine the association between acculturation and obesity and its risk factors among African migrant children in Australia. | Cross-sectional | \(n = 337\) SSA migrant children aged 3-12 years. | Body mass index (BMI), leisure-time physical activity (PA) and sedentary behaviours (SBs) and energy density of food. | Cultural factors | Data is not reported separately by ethnicity. Maintenance of traditional orientation was associated with lower rates of obesity and sedentary behaviours. |
| Mellor, Renzaho, Swinburn, Green and Richardson (2012) | Australia   | Investigates the relationship between parenting style and family function and the BMI of adolescent African refugees | Cross-sectional | \(n = 104\) SSA refugee families with the exception of three immigrants' families. | The Alabama Parenting Questionnaire (APQ) was used to measure parenting style. The Family Adaptability and Cohesion Evaluation Scales IV (FACES IV) was used to measure family functioning | Parenting style and Family functioning | Data is not reported separately by ethnicity. Scores on positive parenting style were significantly higher among parents than adolescents. Parents perceived their family functioning as more flexable and cohesive than the adolescents believed it to be. |
| Authors                        | Country | Objective                                                                                                                                                                                                 | Study design               | Participants and ethnicity                                                                 | Instrument(s) used                                      | Factors in research question                                                                                                                                                                                                 | Main results (whether outcomes presented by ethnicity?) |
|-------------------------------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|--------------------------------------------------------------------------------------------|--------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|
| Dharod, Croom, Sady (2013)    | USA     | To examine the association between food insecurity, dietary intake, and BMI among Somali refugee women living in the United States.                                                                      | Cross-sectional           | (n = 195) SSA refugee mothers from Somali of at least 1 child 12 years of age or younger   | Survey questionnaire                                   | • No significant relationship was found between parenting style, family functioning and BMI of adolescents.                                                                                                                                                   | • Data is reported separately by ethnicity |
| Griffith, Mellor, Green and Renzaho (2014) | Australia | To examine migration- and socioeconomic-related influences on obesity among African migrant adolescents in Melbourne, Australia.                                                                            | Cross-sectional           | (n = 199) 100 adolescents and 99 parents from SSA countries and from both migrant and refugee backgrounds were refugee represents 48% of the total number of adolescents and 89% of the total number of parents. | Anthropometric data was collected. Demographic and socioeconomic information collected. Migration-related factors recorded. Pattern of acculturation using the Acculturation, Habits, and Interests Multicultural Scale for Adolescents. | • Food insecurity was positively related to overweight and obesity                                                                                                                                                                           | • Data is not reported separately by ethnicity | • Factors like gender, pre-migration life, environment and parental acculturation patterns have influence on developing overweight and obesity among African migrant and refugee adolescents. |
| Anderson, Hadzibegovic, Moseley, Sellen (2014) | USA     | To examine the relationship between household food insecurity and refugee mothers’ and other caregivers’ self-reported food intakes.                                                                     | Cross-sectional           | (n = 60) refugee mothers of young children from SSA (Sudan).                               | Household food insecurity (using the Radimer/Cornell hunger scale). Food frequency questionnaire developed by the research team. Tool to measure instrumental                                      | • Data is reported separately by ethnicity. Increasing severity of household food insecurity was associated with decreased consumption of high-cost, high-nutrient-density food items. | • Food insecurity |
| Authors                          | Country       | Objective                                                                 | Study design   | Participants and ethnicity | Instrument(s) used                                                                 | Factors in research question                                                                 | Main results (whether outcomes presented by ethnicity?) |
|---------------------------------|---------------|---------------------------------------------------------------------------|----------------|----------------------------|----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|--------------------------------------------------------|
| Gichunge, Somerset and Harris (2016) [57] | Australia     | To examine the association between home availability and consumption of traditional vegetables among resettled African refugees living in Queensland, Australia. | Cross-sectional | (n = 71) SSA refugees.     | Social support [59], Tool to measure attitudes towards traditional foods [60], Questionnaire was used, comprising questions on demographics and socioeconomic characteristics, food environment and household food inventory (HFI). Using a food frequency questionnaire (FFQ). | Neighbourhood factors and socio-economic status.                                                                 | Increased consumption of some low-cost traditional Sudanese foods by adult caregivers of young children. |
| Cyril, Halliday, Green and Renzaho (2016) [61] | Australia     | To examine the difference between children and parental perception of family functioning, family communication, family type and parenting styles and their relationship with BMI. | Cross-sectional | (n = 568) African parents and their children from both migrant and refugee backgrounds with an equal number of children and parents (284 parents and 284 children). | Family communication was measured using the Revised Family Communication Pattern (RFCP) questionnaire. Parenting style was measured using a single item scale developed by (Radziszewska et al., 1996) [62], Family functioning was measured using the general family functioning subscale of the McMaster Family Assessment Device (FAD) (Miller, Epstein, Bishop and Keitner, 1985) [63]. | Family functioning, family communication, family type and parenting style. | Data is not reported separately by ethnicity, Environmental factors like, language, lack of availability of traditional vegetables and lack of transport, have an influence on the type of food items consumed by resettled refugees. Difficulty in access to and availability of food and vegetable has an influence consumption of the recommended serving of fruit and vegetable. |
matching (i.e., the interviewers were from the same background as the study population).70

Higher cultural quality was more evident for other aspects: for example, the majority offered interviews and questionnaires in both English and the native language of the target population. Providing participants with an option to speak in their own language empowers them to express themselves more accurately and easily, giving a clearer picture of their challenges. This suggests a high level of cultural sensitivity, especially in the qualitative studies. All the studies cooperated with community agencies working with refugees. Together, the findings suggest an improvement in the consideration of cultural quality to that seen in other relatively conducted recently meta-analyses (e.g. Nazir, 2015). A more detailed discussion of cultural quality of the included studies is provided in Appendix A.

3.3 Synthesis of findings

The data synthesis process attempted to interpret the retrieved material within two parallel frameworks, namely the refugees' ethnicity and specific history of stress. Five major themes were identified to represent the factors influencing changes in health behaviours related to obesity among refugee children. Since the literature on refugee families is primarily focused on three distinct ethnic groups, the identified factors will be presented by ethnicity (see Figure 2): (1) Acculturation, (2) Socioeconomic, (3) Environmental, (4) Cognitive, and (5) Family. Quotations corresponding to the themes are shown in Table 9.

3.3.1 Acculturation

Acculturation (i.e., the cultural and psychological changes that occur as a result of two different cultures coming into contact with each other64) was the focus of nine studies.65,69,70–73 Under this theme, two subthemes were identified: Religion and Trying to fit in.

Parents across all ethnicities emphasized the powerful impact of acculturation on the diet and physical activity of their children. Dietary acculturation and lifestyle changes were particularly influential due to the promotion of an unhealthy diet and sedentary lifestyle by the hosting culture. Acculturation was shown to affect refugees and different ethnicities in ways that are dissimilar to the impact on other immigrant groups. For example, one author explained how Hmong refugee mothers have a particularly strong desire to maintain family commensality of traditional meals, which reflects also their need to demonstrate, maintain, and affirm their own identity.72

Acculturation is a crucially important factor that was highly related to the level of acculturation in general. Parents from all the ethnicities studied (i.e., Southeast Asian, sub-Saharan African, and Middle Eastern) described the influence of acculturation on their children's diet as having both negative and positive impacts. However, the negative effects on diet and food choices were far more pronounced, with parents reporting that their children's food preference
### Table 5: Overview of the qualitative studies

| Authors                         | Country | Objective                                                                 | Study design                              | Participants and ethnicity                                                                 | Factors in research question                                      | Main results (whether outcomes presented by ethnicity?) |
|---------------------------------|---------|---------------------------------------------------------------------------|-------------------------------------------|------------------------------------------------------------------------------------------|-------------------------------------------------------------------|--------------------------------------------------------|
| Rondinelli et al (2011)         | USA     | To explore nutrition-related health concerns associated with resettlement | Qualitative (using in-depth interviews)   | Total ($n = 40$) participants ($n = 16$) refugees from Middle East countries (Afghanistan, Iran, Iraq) and sub-Saharan African (Sudan, Somalia) ($n = 14$) refugee service organization and ($n = 10$) health care provider participants. | • Neighbourhood factors  
• Acculturation  
• Socio-economic status | - Data is not reported separately by ethnicity  
*The analysis identifies four possible factors that have an influence on their health:*  
*Past eating habit.  
Level of acculturation  
Socio-economic status  
Neighbourhood environment  
Lack of food choice familiarity and nutritional knowledge |
| Vue, Wolff, Goto (2011)         | USA     | To examine perspectives on food habits, acculturation, and health among Hmong women with young children in northern California. | Qualitative (using semi-structured interviews) | ($n = 15$) Hmong refugee, mothers with young children                                    | Acculturation                                                      | - Data is reported separately by ethnicity  
*The importance of Hmong food culture as it represents their identity, healthful lifestyle and social support.*  
*Differences between American and Hmong food culture and its impact on nutritional health.*  
*Different level of acculturation has an influence on the type of food children and their mother consume.*  
*Children adopted American diet as results of the effect of American lifestyle.* |
| Renzaho, McCabe and Swinburn (2012) | Australia | To explore differences in adolescent and parent perspectives towards health behaviours related to body-size perceptions among African refugee and migrant parents and adolescents. | Qualitative (using semi-structured interviews and focus groups) | ($n = 48$) Refugee parents and adolescents from sub-Saharan African (Sudanese (South Sudan), Somali, and Ethiopian) | Sociocultural factors                                             | - Data is not reported separately by ethnicity  
*Parents perceive large body size as sign of wealth and beauty and small body size as sign of poor health and poverty.*  
*Young people perceive slimness and small body size as the ideal body size which was endorsed by their peers.* |
| Authors | Country | Objective | Study design | Participants and ethnicity | Factors in research question | Main results (whether outcomes presented by ethnicity?) |
|---------|---------|-----------|-------------|---------------------------|------------------------------|-----------------------------------------------------|
| Tiedje et al. (2014)<sup>25</sup> | USA | To explore the reasons behind the lower dietary quality among refugee families after their resettlement in the USA. | Qualitative (using focus groups) | (n = 127) 75% refugee parents and adolescent from (Somali, Mexican, Cambodian, Sudanese) | Personal, environmental, structural factors | • Parents used strategies to promote weight gain in children like tailoring their food practices and restricting children’s involvement in physical activity. • Children adopted strategies to resist parental pressure to gain weight. |
| Wieland et al. (2015)<sup>71</sup> | USA | To explore reasons for low levels of physical activity among refugees and immigrants. | Qualitative (using focus groups) | (n = 127) participant from immigrant and refugee background where refugee represent 75% of the total sample. They are from (Somali, Mexican, Cambodian, Sudanese) | Environmental factors | • Data is reported separately by ethnicity • One of the most significant barriers to be physically active person was lack of comfort and familiarity to take the first step. • Other factors like, limited finances and language barriers have a significant influence on levels physical activity. |
| Wilson and Renzaho (2015)<sup>59</sup> | Australia | To investigate the differences in acculturation experiences between Parent and adolescent refugees from the Horn of Africa in Melbourne, Australia | Qualitative (using semistructured interviews and focus groups) | (n = 40) horn of Africa refugees | Acculturation | • Data is not reported separately by ethnicity • There was a clear difference between parents and their children in lifestyle, eating habits and physical activity levels. |
| Authors | Country | Objective | Study design | Participants and ethnicity | Factors in research question | Main results (whether outcomes presented by ethnicity?) |
|---------|---------|-----------|--------------|---------------------------|-----------------------------|-----------------------------------------------------|
| Wilson, Renzaho, McCabe and Swinbur (2010)\(^72\) | Australia | To explore African immigrant and refugees understanding of Australian food system and how this impact their attitudes and beliefs about food in Australia. | Qualitative (using semistructured interviews and focus groups). | \((n = 15)\) adolescents and 25 parents refugees from the horn of Africa | Acculturation | • Parent’s feeding practice involved focusing and controlling children’s dietary behaviours in an attempt to keep their traditional dietary behaviours.  
• A clear effect of acculturation on diet and physical activity levels. |
| Renzaho, Green, Mellor and Swinburn (2011)\(^73\) | Australia | To explore parenting styles among African migrants after their resettlement in Australia, and investigate the intergenerational issues related to parenting in a new culture and the possible impact on family functioning and the modification of lifestyles. | Qualitative (using focus groups) | \((n = 85)\) refugee and immigrants young adults and parents from sub-Saharan African (include Sudanese, Somali and Ethiopians) | Parenting and family functioning | • Data is not reported separately by ethnicity  
• Significant intergenerational differences:  
  - The complexity of nutrition messages due to poor literacy levels.  
  - Contradiction in body size between Africa culture and Australia culture, which considered one of the main themes.  
  - An abundance of cheap and readily available processed and packaged foods.  
  - Australian food perceived as being full of harmful chemicals. |
changed markedly with integration into the host culture. In three qualitative studies, parents acknowledged a different level of acculturation between themselves and their children, with the children being better integrated into the new culture, explaining their preference for western food and fast food.58,69,72 Regarding traditional food, sub-Saharan African refugee parents placed particular emphasis on the impact of the intergenerational acculturation gap between them and their children. This contributed to changes in their children's dietary intake such as their refusal to eat 'spicy' and 'hot', instead expressing preferences for mild food. In this way, behaviour demonstrated by the children of refugee parents, like skipping meals or refusing traditional foods, may be attributed to their upbringing and high level of integration into the host culture.72 The perspective of some adolescents echoed their parents, declaring that they had 'developed a taste for unhealthy food as a result of growing up in western culture.25 However, the relationship between acculturation and health behaviour was not always negative: for example, one quantitative study found that while the levels of acculturation were generally low among Cambodian refugee mothers, more acculturated mothers reported consuming more healthy food choices.28 The impact of ethnicity was also influenced by the stressful life experiences of refugees, such as the stressful journey to the host country, the challenges inherent to navigating a new culture/society, stresses relating to financial and legal circumstances, and encountering racism and discrimination.

The combination of having a history of stress (from war/armed conflict, and living in refugee camps), the challenges of living in a new culture or society, financial and legal stresses, and racism and discrimination had clear effects on how refugee children interacted with the food environment. One study of refugee adolescents explored the association between health behaviours and negative mood from stress attributed to the refugee experience.60 A significant association was found between negative mood and health behaviours, with those reporting more positive moods also showing healthier behaviours (i.e., reduced consumption of sugary carbonated drinks and higher levels of physical activity).

The above findings suggest that these factors are important for consideration in the development of interventions. This highlights the multidimensional and complex effect of acculturation and ethnicity on the health behaviour of refugees.

The dominant language used in the household and the length of stay in the host country were commonly used as proxy indicators to measure acculturation.23,66–68 Many sub-Saharan African refugee parents reported that language acted as a barrier to the purchase of healthy food (i.e., the inability to read labels in English) and it also shaped their food shopping patterns, by limiting the foods they recognised or how to cook without reading instructions.71 An additional study found that children of sub-Saharan African refugee parents with low English competency reported a greater intake of 'soda' and 'snacks' as these were preprepared and obviated the need to read instructions.65 This indicated that the children were driving their own diet.65

| Authors | Country | Objective | Study design | Participants and ethnicity | Factors in research question (whether outcomes presented by ethnicity?) |
|---------|---------|-----------|-------------|---------------------------|---------------------------------------------------------------|
| ALSUBHI ET AL. |         |           |             |                           | • Parents reported fundamental difference in lifestyle between Africa and Australia relating to allowing their children to play outdoors. They restricting children's engagement in physical activities as result to insecurity neighbourhood. |

TABLE 5 (Continued)
| Authors                  | Country | Objective                                                                 | Study design                                      | Participants and ethnicity            | Instrument(s) used                              | Factors in research question | Main results (whether outcomes presented by ethnicity?) |
|--------------------------|---------|---------------------------------------------------------------------------|--------------------------------------------------|---------------------------------------|------------------------------------------------|-----------------------------|---------------------------------------------------------|
| Patil, Hadley and Nahayo (2009) | USA     | To explore the possible mechanisms that help to explain how the diets of newly arrived refugees and immigrants change after their resettlement in the USA. | Mixed-methods (using face-to-face interviews and survey) | Refugees parents of at least one child under the age of 10 from Somalia | The East Coast survey | Acculturation and food insecurity | Data is reported separately by ethnicity. Participants reported several factors that influence their food choices: 1- Change in the food environment. 2- Economics and time availability constrain the dietary choices. 3- The role that children play in structuring and creating family diet. |
| Keita et al. (2016)      | USA     | To explore the perceptions that southeast Asian refugee parents’ and grandparents’ hold of the risk and protective factors for childhood obesity | Mixed methods (using concept mapping) | (n = 59) southeast Asian refugee parents and grandparents. | The southeast Asian acculturation scale | Acculturation | Data is reported separately by ethnicity. Refugee parents’ and grandparents’ identify several risk factors and they rated them from most important to the least important: 1- ‘Healthy food changes made within the school’ 2- ‘Parent-related physical activity factors’ Were from the most important. 1- ‘Neighbourhood built features’ Was from the least important. |
Religion was found to be a major part of the lives, identity, and culture of refugees and highly related to health behaviours. Those with a high degree of religious loyalty were more likely to be refugees who had been forced to leave their home country due to a well-founded fear of religious persecution. Forcible migration to a culture with a different religious belief was a factor influencing the adoption of unhealthy eating patterns and lower levels of physical activity. For example, the food choices of sub-Saharan African refugees who followed Islam were more likely to be affected because of their religion, such as the prohibition of nonhalal meat and the rules of eating as prescribed by the Qur'an (e.g., appropriate food during Ramadan, fasting). The significance of religion and its close relationship with eating could have a substantial impact on refugee children. For instance, a qualitative study cited an example of young sub-Saharan African girls who skipped lunch at school because ‘halal’ options were not available on all days.

Religion not only restricts food choices, but it also affected the physical activity of refugee children. Some religions hold strict rules for men and women that can directly impact on the ease of participating in physical activities. For example, in the case of refugee families who follow Islam, there are specific and sensitive rules for acceptable behaviour, especially for young girls. The rules for modesty in wearing clothes were often enforced by family members and were considered a risk by the girls.

Adolescents’ attempts to gain acceptance from their peers often changed in their attempts to gain acceptance from their peers. This was found to be a clear factor affecting sub-Saharan African refugees in Australia, with one study finding that many adolescent refugees perceived eating traditional or ethnic food as ‘not cool’ or ‘embarrassing’. Adolescent refugees reported feeling pressure from their nonrefugee peers to try fast food for the first time. This pressure made them uncomfortable bringing traditional food to school, especially for young refugee girls, who were often criticized for eating these foods.

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significant influencing factor in the adoption of health behaviours, with adolescents more likely to be influenced by the new culture than younger children. Many parents reported losing control over their children’s dietary intake when they reached adolescence. For example, one mother explained how her older children gained freedom to eat what they want.72 This strongly relates to the level of acculturation and the attempts by adolescents’ to fit in with the new society.

### 3.3.2 Socioeconomic factors

This factor was specifically pertinent to the experience of being a refugee compared with other immigrants, since newly arrived refugee families typically suffer from limited to poor financial situations—this was irrespective of ethnicity. Having been forced to leave their home country, usually from low-income, developing countries to high-income, developed countries, many families are unable to prepare financially for this dramatic change.71 Factors related to socioeconomic status included (1) housing conditions and (2) past food insecurity and were reported across all ethnicities.

Low income was a key factor in restricting refugee food choices and levels of physical activity. A qualitative study found that limited finances were a barrier for both parents and adolescents to eating healthily25 and concluded that socioeconomic challenges faced by refugees after resettlement were significant factors in the negative change to their dietary patterns.25 A second qualitative study supported this view, revealing how limited finances was an obstacle to accessing sport facilities and subsequently affected physical activity levels among adolescent refugees.59

The high cost of healthy food was also an element that shaped diet.59 For example, adolescents revealed that their parents cannot afford to buy healthy food; this was especially profound at the end of the month, when food assistance (e.g. ‘food stamps’) was not available. Many parents reported this limitation as the main reason for their unhealthy food choices.71 This issue was also discussed by Rondinelli et al, who found that low socioeconomic status led to increased consumption of ready prepared meals and fast food.69 Limited economic resources not only led to poor food choices, but also encouraged the development of unhealthy eating patterns. For example, one mother described how she had to cook one type of food and

### TABLE 7 Quality appraisal for quantitative research

| Authors                        | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Quality of studies |
|--------------------------------|----|----|----|----|----|----|-------------------|
| Renzaho and Burns (2006)53     | 0  | 1  | 0  | 1  | 1  | 1  | Good 67%          |
| Renzaho, Swinburn, and Burns (2008) 54 | 0  | 0  | 1  | 0  | 1  | 1  | Satisfactory 50%  |
| Peterman, Silka, Bermudez, Wilde, Rogers (2011)28 | 1  | 1  | 1  | 0  | 1  | 1  | Good 83.33%       |
| Mellor, Renzaho, Swinburn, Green and Richardson (2012)55 | 0  | 1  | 1  | 1  | 1  | 1  | Good 83.33%       |
| Dharod, Croom, Sady (2013)73    | 0  | 0  | 1  | 1  | 1  | 1  | Good 67%          |
| Griffith, Mellor, Green and Renzaho (2014)56 | 0  | 0  | 1  | 0  | 1  | 1  | Satisfactory 50%  |
| Anderson, Hadzibegovic, Moseley, Sellen (2014)32 | 0  | 0  | 1  | 1  | 1  | 1  | Good 67%          |
| Gichunge, Somerset and Harris (2016)57 | 0  | 0  | 1  | 1  | 1  | 1  | Good 67%          |
| Cyril, Halliday, Green and Renzaho (2016)61 | 0  | 0  | 1  | 1  | 1  | 1  | Good 67%          |
| Morrison et al (2017)60        | 0  | 0  | 1  | 1  | 1  | 1  | Good 67%          |
| Total meeting criteria         | 1  | 3  | 9  | 7  | 10 | 10 |                   |

### TABLE 8 Quality appraisal for qualitative research

| Authors                                      | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 | Quality of studies |
|----------------------------------------------|----|----|----|----|----|----|----|----|----|----|-------------------|
| Rondinelli et al (2011)69                    | Unclear | Yes | Yes | Yes | Yes | No | Unclear | Unclear | Yes | Yes | High quality      |
| Vue, Wolff, Goto (2011)70                    | Yes | Yes | Yes | Yes | Yes | Yes | Unclear | Yes | Yes | No | High quality      |
| Renzaho, McCabe and Swinburn (2012)65       | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Unclear | Yes | Yes | High quality      |
| Tiedje et al. (2014)25                      | Yes | Yes | Yes | Yes | Yes | Yes | No | Unclear | No | No | No | Poor quality      |
| Wieland et al. (2015)59                     | Yes | Yes | Yes | Yes | Unclear | No | Unclear | Unclear | Yes | Yes | High quality      |
| Wilson and Renzaho (2015)72                 | Unclear | Yes | Yes | Yes | Yes | No | Unclear | Unclear | Yes | Yes | High quality      |
| Wilson, Renzaho, McCabe and Swinbur (2010)78 | Yes | Yes | Yes | Yes | No | Unclear | Unclear | Yes | Unclear | High quality |
| Renzaho, Green, Mellor and Swinburn (2011)73 | Yes | Yes | Yes | Yes | Yes | No | Unclear | Unclear | Yes | Yes | High quality      |
| Total meeting criteria                       | 6  | 8  | 8  | 8  | 7  | 1  | 0  | 1  | 7  | 5  |                   |
feed it to her children over many days and encouraged her children to drink additional water as a strategy to overcome hunger.71

Given the above discussion, and in conjunction with the availability and affordability of energy-dense, nutrient-poor foods in western countries, many refugee children experience negative changes to their diet and eating habits. This indicates that economic constraints affect refugee’s dietary intake, preventing parents from buying preferred or traditional food when these are expensive.71 The combination of availability and affordability was shown to have a profound impact on food choices among refugee families. Parents complained about the availability of unhealthy food, but when this food was more affordable than healthy items, the parents chose this food. Many parents reported that fast food was cheap to buy and quick to prepare, encouraging busy parents with limited economic status to take these options for their children.72,74 In their focus groups, Tiedje et al found that many refugee families reported that eating cheap fast food helped them to stay within a tight budget.25 Furthermore, some studies linked fast food to social status, in which some parents held the perception that takeaway food is only for rich people, perhaps because they could not afford it in their home countries.

**Housing conditions**

Rondinelli et al found that many newly arrived refugee families with limited finances are drawn to poor neighbourhoods, where the rent is low and they can be near other people from the same background to help with resettlement.69 Interviews with parents and health providers working with refugees revealed how the limited housing conditions were related to increased sedentary behaviour in children and inhibited refugee parents’ ability to prepare and safely store healthy food.69

Parents expressed concerns about the safety of their neighbourhoods. This inhibited young people from being active as parents tended to keep their children the relative safety of the home. The unintended consequence was increased sedentariness.69 This was a common complaint raised by parents in two studies highlighting the importance of neighbourhoods in influencing children’s physical activity levels.58,69

**Past food insecurity**

Increased food consumption after resettlement was strongly associated with refugees’ experiences of food shortages in the pre-resettlement period.22,23 Prior food insecurity was commonly reported by parents as the reason for their children overindulging once food became available after resettlement. In one study Dharod et al found that previous food insecurity among refugee families strongly negatively shaped subsequent dietary intake in the host country.23 Children had an increased consumption of the plentiful high-density food (e.g., meat and eggs) and a lower consumption of the less accessible fruit and vegetables.23 They also found a significant and positive association between previous food insecurity in refugee families and increased body mass index (BMI) (odds ratio: 2.66; confidence interval: 1.25-5.69).23 This was also supported by Anderson et al, who found that refugee parents who suffered from severe prior food insecurity reported low consumption of vegetables, milk, and starchy cereals, such as rice and pasta.22
TABLE 9 Thematic framework with illustrative quotations from the studies

| Analytical theme/subtheme | Quotations |
|---------------------------|------------|
| **1. Acculturation**      |            |
| • Acculturation           | ‘Younger people do not eat Hmong food as much as American food.’ (Vue, Wolff & Goto, 2011, p. 201). |
|                           | ‘People are very active [in Africa]. Not many people have cars. People move a lot. Walk a lot too. But here [in Australia] we use car for little distance.’ (Wilson & Renzaho, 2015, p.179). |
| • Religion                | ‘On Thursday I bring something else, I cannot eat it [school canteen food]. It’s not halal.’ (Wilson & Renzaho, 2015, p.182). |
|                           | ‘I used to go there with my abaya (loose fitting clothes). Then the staff told me that I could not wear the abaya because it was a risk for injury.’ (Wieland et al., 2015, p.272). |
| **2. Socioeconomic factors** |            |
| • Socioeconomic factors   | ‘They get to the US and they are eating fast food. They may not have access to a kitchen, they may not have money to buy groceries ahead of time and they have to sort of eat from their pocket ... so fresh, healthy food can be really hard to come by when you are very poor.’ (Rondinelli et al., 2011, p.156). |
| • Past food insecurity    | ‘You do not have to worry about what you are going to eat like the next day. People eat more than what they usually did back in the day, with food available on a daily basis, individuals can eat as much as they desire.’ (Vue, Wolff & Goto, 2011, p.201) |
| **3. Environmental factors** |            |
| • Availability and accessibility of unhealthy food | ‘There is a [a] McDonalds on every corner. When people do not have food at home, they just take the family to McDonalds: It’s easier to get junk food than healthy food because you just open a bag or put it in the microwave. [With] healthy food, you have to cut the lettuce, cut the tomatoes’ (Tiedje et al., 2014, p.8). |
| • Housing conditions      | ‘Usually the housing ... conditions that they live in, you know they just cannot go outside and play by themselves ... kids are more sedentary now ...’ (Rondinelli et al., 2011, p. 165). |
|                           | ‘The kids, no backyard to run. You see there is no yard. House is small, nowhere to move.’ (Wilson & Renzaho, 2015, p.179). |
| • Weather                 | ‘The snow. The snow creates a little difficulty and the winter season because naturally his body feels more tired and wants to sleep ...’ (Wieland et al., 2015, p.269). |
| **2.8. Availability and accessibility of modern technology** | ‘And technology nowadays like Facebook, phones and stuff ... you’ll just be sitting down and doing that the whole entire day’ (Wieland et al., 2015, p.269). |
|                           | ‘It's hard going on [...] a diet and eating healthy when your brothers and sisters are watching TV and eating junk food, and if you are a family, [you] motivate each other’ (Tiedje et al., 2014, p.10). |
| • “You cannot really tell your parents: ‘Your food, I do not like it.’ They’ll just say: ‘Eat!’” (Tiedje et al., 2014, p.12). |
| •  “It is very hard to say “no” to a child... so it is good to cook lighter.” (Vue et al., 2011, p.202). |
| • “They do not want their children to feel hungry and that is why they get the children the foods that they prefer.” (Patil et al., 2009, p. 352). |
| • “Our culture... view[s] being big and bulky as a good thing.” (Vue, Wolff & Goto, 2011, p. 202). |
| • “Big body size means you have plenty to eat. We have a proverb that says, ‘Whatever goes through your throat is seen through your body.’ If you are thin, it means not much food goes through your throat, you are poor.” (Renzaho, McCabe & Swinburn, 2012, p.746). |
| • “Our culture... view[s] being big and bulky as a good thing.” (Vue, Wolff & Goto, 2011, p. 202). |
| • “People are very active [in Africa]. Not many people have cars. People move a lot. Walk a lot too. But here [in Australia] we use car for little distance.” (Wilson & Renzaho, 2015, p.179). |
| **4. Cognitive factors** | ‘In Sudan, our food [has] a lot of fat in it. If there is no fat, then it is not right. That’s my culture.’ (Vue, Wolff & Goto, 2011, p.8). |
| **5. Family factors:**   |            |
| • Parenting style         | ‘You cannot really tell your parents: ‘Your food, I do not like it.’ They’ll just say: ‘Eat!’” (Tiedje et al., 2014, p.12). |
|                           | ‘It is very hard to say “no” to a child... so it is good to cook lighter.” (Vue et al., 2011, p.202). |
|                           | ‘They do not want their children to feel hungry and that is why they get the children the foods that they prefer.” (Patil et al., 2009, p. 352). |
| • Changes in family structure | ‘My mom does not cook anymore because she is always at her job.’ (Tiedje et al., 2014, p.9). |
According to an early study by Renzaho and Burns, 80% of refugee parents had experienced prior severe food insecurity in refugee camps, as measured by having run out of food for an average of 5 days, in their home country, refugee camp, or during flooding or drought. This resulted in increased consumption of takeaway food after their arrival in the host country.69–71 Parents explained that when food becomes available, they do not need to worry about what their children will eat the next day, leading them to allowing their children to eat as much as they want, far exceeding previous levels. This reflects the powerful impact of past experience in shaping refugee children’s eating habits and food choices postresettlement.

### 3.3.3 Environmental factors

Parents and children differed in the degree to which they felt environmental factors influenced and impacted upon the diet and physical activity of their children. This complex interaction may be related to the diversity of lifestyles experienced by refugees in their countries of reception. The majority of the studies involved refugee parents in the United States of America, who generally agreed that the environmental factors had a negative influence on their children’s diet and levels of physical activity.25,69–71 Similarly, refugee parents living in Australia agreed that the environmental factors had a negative influence on their children’s diet and levels of physical activity. These factors acted as barriers to being active in the new environment, as well as to the consumption of healthy food. These factors were (1) availability and accessibility of unhealthy food, (2) housing conditions, (3) weather, and (4) availability and accessibility of modern technology.

#### Accessibility of unhealthy food

Across almost all studies, the availability of fast food, canned food, processed, and preprepared food was perceived as a factor that influenced an increase in unhealthy dietary intake after resettlement. Parents in several studies reported significant differences in food availability between their home country and the United States of America, with availability in their originating country being highly dependent on location and season.69,71 However, in the developed countries, like Australia and the United States of America, there is often year-round availability of food items imported from different places. This change in the availability of food items had a significant impact on refugees’ shopping practices and, eventually, on their diet in general. In addition, children in some studies stated that living in developed countries gave them access to new food choices. One example reported by Wilson et al was a sub-Saharan African mother who described her children in the supermarkets, who would say, ‘ooh I never had this in Africa ... give me some.’74

In conjunction with the history of food shortage that refugees experienced, moving to an environment that provides diverse and affordable food choices resulted in young refugees eating more and developing the unhealthy behaviour of overindulgence.

#### Weather

Differences in the weather were commonly reported as hindering refugee children’s physical activity in the host country, particularly among refugees living in colder areas of the United States of America. Relatively cold weather throughout the year was a significant change for refugee families moving from warmer parts of the world, such as countries in Africa and the Middle East, to cooler parts of the world, such as some states in the United States of America.59,71 Parents compared their children’s level of physical activity in their home country with that of their host country, and they perceived weather as one of the environmental factors that adversely affected their physical activity.59 They stated that since their children were not used to the cold weather, they spent most of their time inside the house engaged in sedentary activities.72

Weather patterns were also an important environmental factor in explaining changes to the refugee diet after resettlement in the United States of America. These individuals showed reported higher levels of stress due to high heating bills during the winter months, which resulted in more limited, poorer nutritional choices for their families.71

#### Availability and accessibility of modern technology

In light of the previous factors, such as housing, local safety, and weather, it was unsurprising that children became more sedentary and spent most of their time in the house. With the availability of electronics devices, such as mobile phones, video games, computers, and TV, many of which were less or not available in their home country, children substituted these for outdoor activities. This was particularly pronounced with refugee children as they (a) did not have access to these devices in their home country and (b) were more likely to isolate themselves due to the pressures of being in a different country, therefore spending most of their time on modern technology.59 Many adolescents reported that they spent more time watching TV, on social media, and playing video games than playing outdoors.29,59 Many refugee children also ate while watching the TV, and some adolescents reported that this was encouraged by their parents.29

Another example was the effect of household technology that was not available in refugees’ home countries such as washing machines, vacuum cleaners, and dishwashers. Young African refugee girls moving to Australia perceived that these technologies constituted a dramatic lifestyle change, as access to such appliances significantly reduced the extensive physical effort previously required to clean their homes.72

Alongside the availability of electronic entertainment devices and household goods, modern transportation had the potential to exert a negative impact on shaping food choices and levels of physical activity. One qualitative study revealed life in Australia was physically easier with readily available modern public transport than in the refugee’s home country, where they needed to walk everywhere.72 The availability of cars was perceived by adolescent refugees to be one of the factors that negatively impacted on their level of physical activity postresettlement as parents now escorted them by car rather
than them walking.\textsuperscript{72} Parents also reported a greater reliance on cars and a corresponding reduction in exercise over their previous levels in their home country.\textsuperscript{72} This contrasted with the high levels of daily physical activity undertaken by refugees and immigrants from the Horn of Africa who were active for economic reasons like ‘farming and harvesting’ or because walking was the only source of transport.\textsuperscript{65}

### 3.3.4 Cognitive factors

Cognitive factors have been commonly reported as major factors influencing eating patterns and physical activity among refugees from Sub-Saharan Africa.\textsuperscript{58,72} Perceptions of what is considered healthy or unhealthy food profoundly influenced the dietary intake of refugee children. These types of beliefs were (1) cultural perceptions of body size and (2) knowledge gap regarding food between parents and children.

#### Cultural perceptions of body size

Almost all of the qualitative studies concentrated on refugee families from Africa. Many of the refugee parents from this region held a cultural preference for large body sizes, which represents wealth and beauty in their culture.\textsuperscript{65} Unsurprisingly therefore, parents tended to maintain these cultural beliefs and to promote weight gain among their children.\textsuperscript{65}

Cultural preferences for larger body size was not only seen among parents from Sub-Saharan African cultures, but also among refugee parents from Southeast Asian cultures (e.g., Hmong). As a consequence, parents with this perception encouraged their children to gain weight by using unhealthy feeding practices, such as encouraging them to eat more\textsuperscript{58,72} or feeding lots of milk and cheese to young children.\textsuperscript{65} It might be that parents, in seeking to reinforce their traditional beliefs, are inadvertently also encouraging the development of negative eating habits among their children; for example, parents reportedly offered their children fast food and even restricted their physical activity, potentially incentivizing weight gain.\textsuperscript{58} Some adolescent refugees held similar views to their parents, reporting that their culture viewed a large body size as ‘highly valued’ and signified ‘wealth’ and ‘success,’ with slimness perceived as a sign of sickness and poverty.\textsuperscript{74}

Parental perceptions of large body size not only influenced dietary intake, but also physical activity levels. In one study, parents, particularly fathers, were reported to restrict involvement in sport activities to promote large body size. Fathers perceived the involvement of their children in school sport activities as a ‘waste of time and pointless,’ which necessarily influenced physical activity levels. Renzaho et al found that these cultural perceptions were held by the majority of parents, with only a small number of mothers linking large body size to negative health consequences.\textsuperscript{58} Typically, these women were single and more highly educated, reflecting the importance of knowledge and education about food.

#### Knowledge gap between parents and children about food

Parents and their children demonstrated a clear gap in knowledge of food, and this was particularly clear among Sub-Saharan African refugee families. In the included studies, refugee parents and children often had different views regarding what should be considered healthy food. This might be strongly associated with the cultural influences of what food is regarded as healthy. For example, one study found that parents failed to link fat to negative health consequences,\textsuperscript{65} refugee parents were uncertain about what should be considered healthy and explained that they had never previously worried about food labels or levels of fat.\textsuperscript{71} This uncertainty may be linked to language difficulties, with many refugee parents expressing difficulties with reading and understanding food labels. For some, this resulted in children taking charge of food choices. Furthermore, there was a conflict between parents and children as many parents believed that traditional food or ethnic food was healthy; however, adolescents reported that their traditional food is unhealthy and full of fat.\textsuperscript{25}

Regarding acculturation, refugee children were generally more integrated into the host culture than their parents, with correspondingly greater exposure to knowledge about food. Therefore, refugee children in particular Sub-Saharan African and Southeast Asian were found to possess superior knowledge of food and nutrition than their parents in four out of eight qualitative studies.\textsuperscript{25,65,72} While children in some studies developed a taste for fast food, these children also worried about their parents’ feeding practices and restriction of physical activity.\textsuperscript{25} They reported greater awareness of healthy food and tended to disagree with their parents about body size preferences.\textsuperscript{25} These children were usually considered to be highly integrated into the new culture, as a result of high levels of exposure and education. When asked about their source of knowledge about food, the most common knowledge sources that adolescents reported were school and the media.\textsuperscript{70} While the media can play an important role in educating children about food, it can also negatively affect their eating patterns, with TV advertisements regularly encouraging unhealthy food choices.

### 3.3.5 Family factors

The family was identified as the main element that had an impact on the health behaviours of children. Family functioning, structure, and parenting style influenced the diet and physical activity of refugee children. A stark difference was found between the perceptions of refugee parents and adolescents regarding their family functioning and communication.\textsuperscript{55,77} For example, Cyril et al found that the majority of children perceived their family as functioning more poorly than their parents, and this was strongly positively associated to their BMI.\textsuperscript{77} The eating behaviours of children were shown to be strongly influenced by family functioning, through parental dietary practices, food choices, and family meal environment.\textsuperscript{77} Parents were found to have greater control over the lifestyles of younger children; however, adolescents in also thought their parents played an influential role in
determining their diet and influencing their levels of physical activity.25,58,72,74

**Parenting style**

Parents were identified as one of the primary sources of information for children about eating habits and food knowledge. The majority of the studies showed that parenting played a significant role in the feeding practices and dietary intake of young children.70,72 For example, parents from sub-Saharan African countries tended to be restrictive and to exert a high level of control over their child’s eating habits. This was particularly prevalent among newly arrived refugee parents, who were fearful of losing their cultural identity and feared that their children would lose their cultural values, thereby weakening their family attachments.72 Studies that investigated parenting style found that children perceived their parents to be more authoritative than their parents believed themselves to be and that parents exerted profound influence over the lifestyle behaviours, and dietary intake, of their children.77

In contrast, some parents reported difficulties controlling their children’s diet in the host country, particularly young mothers who reported the challenge of ‘saying no’ to their children.70 Moreover, some parents showed concern about their own diet and explained how they had given up traditional or healthy food to ensure that their children ate well. This strong desire of having control over their young children’s diet and physical activity was also linked to parental cultural perceptions of body size, or cultural and religious beliefs.

**Changes in family structure**

After migration, family dynamics experienced dramatic changes, which created familial conflict. These marked changes in the family structure could be particularly challenging for parents from collectivist societies, such as many African nations, where mothers are responsible for house work and raising and feeding the children, while fathers work outside the house.72 Many refugee mothers described having to work in the host country as being ‘stressful’ and expressed feelings of ‘loss identity’.65,72 Given the previous factors, changes in family structure may also be highly related to acculturation and low socioeconomic status. Mothers who have to work long hours do not have enough time to prepare healthy meals: Many adolescents expressed how their mothers were too busy to cook for them. A lack of time to prepare meals was found across all the studies. Given competing priorities, the preparation of healthy food was accorded a lower significance than going to work, especially for refugee parents who had a low socioeconomic status.

**DISCUSSION**

This review is the first to synthesize the literature exploring changes in diet and physical activity levels among refugee families and identify the factors influencing health behaviours and childhood obesity among refugee children. It is particularly important to note that a refugee might experience specific difficulties with host culture and food as a result of their more stressful migration history, which is likely to set refugees apart from other migrant children. Utilizing both qualitative and quantitative synthesis, this systematic review suggests that a complex interplay of factors influence the development of health behaviours that are detrimental to health among refugee children. The diet and physical activity levels of refugee children have been shown to be powerfully influenced by acculturation, environmental, socioeconomic, family, and cognitive factors. We have interpreted the results within two parallel frameworks: history of stress and ethnicity. There were only two studies that linked the history of stress and living in refugee camps to the changes to refugee’s health behaviours after their resettlement in the host country.53,71 This might be because eight of studies combined forced and planned immigrants together as one cohort. This limits meaningful and specific analysis of outcomes in relation to refugee populations. The findings show that the literature focusing on refugee children has a number of limitations. Outcomes such as ethnicity and BMI have not been consistently reported limiting the opportunities to compare outcomes between different ethnic groups. For example, only two of the included studies reported the BMI of participants, both of which studied African refugees relocated to Australia.73,77 This represents an important limitation of this review since refugees from different ethnic groups and countries of origin are likely to have different between-group experiences. Thus, obesity trajectories can be expected to be diverse in refugee children, being related both to the lifestyle they had in the country of origin, and the lifestyle they encounter in the country of reception. The latter should not be forgotten, since obesity rates differ greatly between high income countries, due to complex and multideterminants included genetic, behavioural, social, and environmental determinants.

Refugee parents of different ethnicities and their children reported in both qualitative and quantitative studies that different levels of acculturation influenced their diet and physical activity. An expanding body of literature has investigated the relationship between acculturation and obesity, such as a systematic review into the association between acculturation and obesity among immigrants to a high-income country.75 This supports assertions in the literature, which describe a negative association between acculturation and health behaviours among African and Hispanic immigrants to the United States.79,80 Furthermore, dietary acculturation represents a greater effect on refugee’s health than physical activity. This influencing factor is supported by the literature, which highlights the impact of acculturation on dietary change. For example, a recent systematic review of the relationship between acculturation, dietary intakes, and the body weight status of children of immigrants concluded that a wide variation exists in the relationship between acculturation and dietary intake.81 Although this position is supported in our findings, it does not suggest that the positive impact of acculturation was equal to the negative impact.

In our findings, acculturation also included the adoption of a more sedentary lifestyle, which affected levels of physical activity. These results corroborate the findings of a recent study, which concluded that young refugees from Nepal, Somalia, and Sudan to the United States of America had fewer opportunities to be physically active than
in their home country. This was largely attributed to their cultural perception of physical activity, with individuals needing to make a conscious effort to exercise in developed countries, rather than physical activity being integrated into their daily lives, as was the case in their home countries.

The subtheme of religion was shown to exert an impact on health behaviours. Religious beliefs can influence the dietary intake of refugee children and restrict their physical activity, suggesting that holding these beliefs in a completely different environment that does not offer the dietary requirements that meet these religious beliefs can have an impact on health. For example, some studies described how participants felt restricted by halal food and this affected their eating patterns especially at schools as some of them explained how they skip lunch in school since they do not offer halal options. This view was supported by Terragni et al, who found that Muslim refugees restricted their food consumption to those food items perceived to be acceptable by their religion, which meant that their eating habits and diet were affected. These contrast with previous research that showed how religious beliefs are considered to be a highly important component of cultural identity, with some recent research indicating that religious beliefs can act as a protective factor for young refugees and immigrants, facilitating their ability to overcome challenges and avoid the adoption of unhealthy behaviours, such as alcohol use, during the acculturation process.

The findings showed that age was a moderating factor. Adolescent refugees tended to voluntarily integrate into the host culture, attempting to fit in through behaviours such as the adoption of culturally more acceptable fast food. In contrast, younger children were highly influenced by their parents. The wider literature supports this finding, showing that acculturation at a young age to high income country like the United States of America is significantly associated with increased consumption of fast food among adolescent immigrants. This may explain the extent to which age-associated differences can affect the impact of acculturation.

One of the main factors affecting refugee children is their environment, which includes changes in weather, living in poor housing conditions, access to modern technology, and living in a new food environment with higher availability of unhealthy, convenient food. These environmental changes have a noticeable effect on the eating habits and levels of physical activity among refugee children. These findings are consistent with existing research, which has overwhelming negatively associated environmental factors with dietary habits and levels of physical activity among immigrants to high-income countries.

The present study identified that socioeconomic factors had a powerful effect on dietary intake. An interesting finding was the negative association between past food insecurity and the current eating habits of refugee children, as manifested in overeating and consumption of nutritionally dense foods. This change in eating habits was explained as a response to exposure to a food-rich host environment after having lived through food shortages. This matches the outcomes of previous studies, which identified that refugees with experience of food deprivation may adopt unhealthy eating practices, including increased consumption of high-density food. Food insecurity is prevalent among refugee families after their resettlement in the host country. The experience of economic hardship and lack of social support distinguishes many refugees from other immigrants, making them more vulnerable and at higher risk of developing unhealthy behaviours as a result of enduring these situations.

Refugee parents from sub-Saharan African backgrounds have a cultural perception of preferred body size; specifically, a preference for a larger body shape, which may encourage behaviours that can lead to obesity. Our findings showed that the strong desire of these individuals to maintain their traditional orientation is a determinant that influences the diet and levels of physical activity of their children. This is especially true for younger children, who often have little freedom regarding their dietary intake in comparison with adolescent refugees. Parental fear of losing their cultural identity was shown to be more extreme among refugees than economic immigrants, perhaps because they have been forced to leave their home country. This is different from the experiences of typical immigrants who may have choice and time to prepare. Refugee parents from sub-Saharan African countries may have preference for larger body sizes, as this characteristic represents health and wealth in some African cultures. This cognitive perception can then influence the development of unhealthy feeding practices that may impact their children. This finding has important implications on parental feeding practices and the corresponding weight status of their younger children.

There may be inconsistencies in the health literacy of refugee families, particularly around nutrition. This knowledge gap may reflect the parental educational level. These results support the findings of studies outside the immigration literature, which show that maternal education level is associated with children's consumption of fruit and vegetables. These factors demonstrate significant influence of parental knowledge on the eating habits.

Family plays a significant role in influencing the diet and physical activity levels of their children. A number of determinants were identified in this review, including parenting style, family functioning, family communication, and family type. Refugee parents reported poor family functioning and lack of discipline, which were associated with childhood obesity. These findings support the literature, in which higher family functioning is associated with a more healthy BMI and active lifestyle among adolescents. Discrepancies were also found in terms of perceptions of parenting style, with refugee parents perceiving themselves as more authoritative. Further, adolescents reported high levels of parental control over their eating and physical activity levels. This supports the literature, which broadly asserts that the majority of newly arrived refugees utilize an authoritarian parenting style and that this is associated with the BMI of adolescents.

This review reveals the important role of parental practices in influencing the health behaviours of children, especially younger children, who are under tighter parental control than adolescents and suggests an avenue for intervention and support. Moreover, most of the studies reviewed were conducted in the United States of America and Australia, with comparatively few in Canada or European countries. In particular, no study has focused on the health outcomes of
refugees after settlement in the United Kingdom, which represents a gap in the literature, especially given the large numbers of refugee families resettling in the United Kingdom every year and differences in lifestyle and healthcare access compared with other countries. Another limitation of the body of literature that this review has revealed is that most of the studies included immigrants in the sample, so results could reflect the experience of immigrants who choose to move to another country, as well as refugees. Refugees and immigrants share many similar challenges and characteristics; however, those undertaking forced migration have a unique history of stress and distinct needs and obstacles, not least since their host country may not be their chosen destination and the journey is likely to have been traumatizing.

The outcomes of this review suggest a number of recommendations for health care professionals, researchers, and policy makers to improve care for children in terms of obesity prevention and treatment. More research on this population is needed to better understand how refugees from different countries with different ethnicities interact with local food options and the culture of the host country. Future research could also undertake a comparative prospective investigation to examine the effect of different ethnic backgrounds, in order to explore the interactions between ethnicity/acculturation and refugee stress. Specifically, a future study could examine BMI trajectories in children of different ethnicities to assess whether differences exist between children from different backgrounds. This is important in light of the marked increase in the number of refugee children arriving in Europe. Given the limitations of the literature, a better understanding of the experience and perspectives of refugee families regarding the health behaviour change and weight management of their young is necessary to develop interventions to tackle childhood obesity.

CONFLICTS OF INTEREST
None declared.

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APPENDIX A

Quality assessment of the cultural sensitivity of the included studies:
All the studies were subjected to a cultural check, which was an especially important assessment given the focus of this systematic review on refugee parents and children, who represent an ethnic minority in developed countries. As noted above, the ‘cultural quality check’ was conducted utilizing the test from a previous systematic review (Waqas, 2010; Nazir, 2015). The check comprises 12 areas and was developed for a specific population. However, the included questions were adapted to make them as general as possible, to cater to the variety of cultures included in this review (see Tables 1 and 2).

During appraisal of cultural quality, it became clear that studies conducted on refugees have a wide range of methodological issues. A more detailed discussion of cultural quality of the included studies is provided as follows:

1 Any of the authors from the same ethnicity background of the participants?

Only one out of 19 studies involved a large number of authors (five) from the same ethnic background as the sample population, reflected in greater consideration of cultural issues in the design and practice of the study (Keita et al., 2016). Eleven studies only had a single author from the same ethnic background as the participants (Renzaho & Burns, 2006; Renzaho, Swinburn, & Burns, 2008; Peterman, Silka, Bermudez, Wilde & Rogers, 2011; Mellor, Renzaho, Swinburn, Green & Richardson, 2012; Griffith, Mellor, Green & Renzaho, 2014; Gichunge, Somerset & Harris, 2016; Cyril, Halliday, Green & Renzaho, 2016; Renzaho, McCabe & Swinburn, 2012; Wilson & Renzaho, 2015; Wilson, Renzaho, McCabe & Swinburn, 2010; Renzaho, Green, Mellor & Swinburn, 2010). Three out of 19 studies did not include any authors from the same ethnic background of the population, and the remaining (four) studies showed medium to low involvement of authors from the same background.

2 Was the ethnicity of the target population defined?

Not all of the studies provided clear definitions of the targeted population. Three studies defined the ethnicity of the targeted population by stating their originating country (Tiedje et al., 2014; Patil, Hadley & Nahayo, 2009; Rondinelli et al., 2011). Three other studies provided more detailed definitions, which created a more complete picture and helped to link the findings (Vue, Wolff & Goto, 2011; Renzaho, McCabe & Swinburn, 2012; Wilson & Renzaho, 2015).

3 Special consideration in selecting measuring tool:

Two studies developed the measurements used in their data collection. Renzaho, Swinburn, & Burns (2008) developed a questionnaire focusing on dietary intake, in addition to a specific physical activity and sedentary behaviour questionnaire, taking into account the specific characteristics of the target population. Two studies translated and adopted tools for the purpose of the study (Peterman, Silka, Bermudez, Wilde & Rogers, 2011; Griffith, Mellor, Green & Renzaho, 2014). Three other studies used pre-existing measurements tools and translated, refined and tested them for suitability and cultural sensitivity with respect to the study population (Dharod, Croom & Sady, 2013; Gichunge, Somerset & Harris, 2016; Morrison et al., 2017). However, five out of 19 studies did not make any special provision for the tools used.

4 Language offered:

The majority of the studies offered both English and the native language of the target population. Only three studies did not record the offered language (Renzaho, McCabe & Swinburn, 2012; Griffith, Mellor, Green & Renzaho, 2014; Renzaho, Swinburn, & Burns, 2008). One study offered only English (Vue, Wolff & Goto, 2011), which was justified with reference to the high level of English fluency among the participants, meaning that they did not face any difficulties expressing themselves in English. The language offered to participants was often culturally sensitive, especially in the qualitative studies, where the option to speak in their own language meant that participants were empowered to express themselves more accurately and easily, giving a clearer picture of their challenges. However, conducting the interviews and focus groups in the native language also created the risk that data might be lost in the translation process, therefore it was important to review the translation process of these studies to determine whether it was sufficiently rigorous.

5 Language opted—ethnic/English:

None of the included studies mentioned the language preferred by participants. However, some studies mentioned this issue during the translation process.

6 Process of translation:

Six out of nine quantitative studies did not mention the translation process of the questionnaires or the measurement tools used in the studies (Renzaho & Burns, 2006; Renzaho, Swinburn, & Burns,
Cultural consideration in interviewer/interpreter training:

Seven out of 19 studies reported comprehensive training for the interviewers and interpreters, including a range of cultural and ethical issues, safety considerations, and interview techniques. Peterman, Silka, Bermudez, Wilde, and Rogers (2011) reported that administrators had 40 h training, while Morrison et al (2017), Tiedje et al (2014), and Wieland et al (2015) reported that interviewers received training by the community organization that was involved in the research. The remaining studies stated that interpreters and interviewers had training (Dharod, Croom, & Sady, 2013; Anderson, Hadzibegovic, Moseley, & Sellen, 2014; Cyril, Halliday, Green, & Renzaho, 2016). However, the remaining three studies mentioned the translation process in detail, reflecting higher cultural quality (Peterman, Silka, Bermudez, Wilde & Rogers, 2011; Mellor, Green & Renzaho, 2014; Gichunge, Somerset & Harris, 2016; Morrison et al., 2017).

Four out of eight qualitative studies recorded the translation process of the interviews and focus groups in greater detail, which is an important consideration in qualitative studies as this directly influences the quality of obtained data and therefore the study findings (Tiedje et al., 2014; Rondinelli et al., 2011; Wieland et al., 2015; Wilson & Renzaho, 2015). As mentioned above, the translation process in the qualitative study should be undertaken with caution, because it influences the quality of the findings. This reflects higher level of cultural and methodological quality. However, the remaining four studies did not recode the translation process.

Ethnic matching of interviewers:

The interviews in one study (Vue, Wolff & Goto, 2011) were conducted by two researchers from the same background as the study population. Nazir (2015) states that this is an important element in qualitative studies with ethnic minorities, because it improves the quality of the data, by making participants feel comfortable asking questions, creates opportunities for understanding and empathy, both of which are considered critical, and enriches the data. However, six out of eight of the qualitative studies used professional bilingual interpreters, interviewers, and mediators to conduct the interviews and focus groups (Tiedje et al., 2014; Rondinelli et al., 2011; Wieland et al., 2015; Wilson & Renzaho, 2015; Renzaho, Green, Mellor & Swinburn, 2010; Wilson, Renzaho, McCabe & Swinburn, 2010). Using professional bilingual interpreters can be considered culturally sensitive to a certain point. However, it is essential to train these interpreters to run the interviews correctly and to ensure they have sufficient access to research information.

Was the family consulted?

None of the included studies reported family consultation. This is largely attributable to the design of the review, which included parents and their children therefore consultations to work with young children from the family were not needed.

Were community agencies consulted?

All the studies included in this review cooperated with community agencies working with refugees. The majority of this cooperation was in the area of recruitment. However, five studies reported in-depth cooperation with the community agencies, including not only assistance with recruitment, but also with the provision of cultural advice (Wilson & Renzaho, 2015; Wilson, Renzaho, McCabe, & Swinburn, 2010; Renzaho, Green, Mellor, & Swinburn, 2010), while others had help with drafting focus group questions, recruiting participants, and conducting the focus groups (Tiedje et al, 2014; Wieland et al, 2015).

Were interpreters used?

It is generally perceived to be important to have interpreters in studies of ethnic minorities, because the language barrier is one of the most commonly reported difficulties in this population. Therefore, interpreters can improve the cultural quality of the study. Seven out of 19 studies did not use interpreters (Renzaho, McCabe, & Swinburn, 2012; Vue, Wolff, & Goto, 2011; Griffith, Mellor, Green, & Renzaho, 2014; Renzaho, Swinburn, & Burns, 2008) However, three out of these clearly utilized bilingual interviews, despite not explicitly stating that interpreters were used (Cyril, Halliday, Green, & Renzaho, 2016; Gichunge, Somerset, & Harris, 2016; Anderson, Hadzibegovic, Moseley, & Sellen, 2014). The remaining studies used interpreters.

Was validity and reliability of translated questionnaires tested?

Four out of 19 studies tested the validity of the questionnaires used (Mellor, Renzaho, Swinburn, Green, & Richardson, 2012; Dharod, Croom, & Sady, 2013; Anderson, Hadzibegovic, Moseley, & Sellen, 2014; Griffith, Mellor, Green, & Renzaho, 2014). However, the majority of the studies did not record the reliability of the translated questionnaires, because they did not translate pre-existing questionnaires.
### Cultural sensitivity of studies included in the review

#### TABLE A1 Cultural sensitivity of quantitative studies included in the review

| Author | Any authors from the same ethnicity background of the participants | Were the target population ethnicity defined? | Special consideration in selecting measuring tool | Language offered | Language opted ethnic/English | Process of translation | Ethnic matching of interviewers |
|--------|---------------------------------------------------------------|---------------------------------------------|-----------------------------------------------|-----------------|-------------------------------|------------------------|--------------------------------|
| Renzaho and Burns (2006) | 1/2 | Yes | No special consideration regarding measuring tool | Using four bilingual African interviewers using the language used in the major sub-Saharan regions | Not recorded | Not recorded | Bilingual African interviewers administered the interviews |
| Renzaho, Swinbur, and Burns (2008) | 1/3 | No definition of the participant ethnicity | The dietary intake and the physical activity and sedentary behaviour Questionnaire and measure were developed and adopted for the purpose of this study | Not recorded | Not recorded | Not recorded | Not recorded |
| Peterman, Silka, Bermudez, Wilde, Rogers (2011) | 1/5 | Yes | The Psychological Acculturation Scale was translated and adapted for the purpose of this study | English and Cambodian | Not recorded | Not recorded | Six bilingual, biliterate Cambodian Americans administered the survey |
| Mellor, Renzaho, Swinburn, Green and Richardson (2012) | 1/5 | Yes | No special consideration regarding measuring tool | Amharic or Arabic or English | Not recorded | All materials were translated into Amharic or Arabic by a professional translation agency, and checked by another translation agency and two bilingual workers for accuracy of translation | All participants were administered translated questionnaires by a trained bilingual interviewer who recorded their responses in either of these two languages as appropriate |
| Dharod, Croom, Sady (2013) | 0/3 | Yes | Pre-existing surveys used with immigrant populations was developed and refined and tested for its suitability and cultural sensitivity | English/Somali | Not recorded | Not recorded | 3 trained, bilingual interviewer administered the interviews |
| Author | Any authors from the same ethnicity background of the participants | Were the target population ethnicity defined? | Special consideration in selecting measuring tool | Language offered | Language opted ethnic/English | Process of translation | Ethnic matching of interviewers |
|--------|---------------------------------------------------------------|---------------------------------|---------------------------------|----------------|----------------------------|----------------------|-------------------------|
| Griffith, Mellor, Green and Renzaho (2014) | 1/4 | No definition of the participant ethnicity just mention sub-Saharan African | They developed subscale to record migration-related factors and validated the acculturation scale | Not recorded | Not recorded | Not recorded | Not recorded |
| Anderson, Hadzibegovic, Moseley, Sellen (2014) | 0/4 | Yes | They did not use any measure that was specific to the population under the study | Arabic, Nuer or Dinka | Not recorded | Not recorded | Three interviewers were from Sudanese origins they can speak Arabic, Nuer or Dinka in addition to being fluent in English. |
| Gichunge, Somerset and Harris (2016) | 1/3 | Yes | They used household food inventory (HFI) which contain traditional African and traditional vegetables | Swahili English | Not recorded | The research instruments were translated to Swahili from English by a professional translator then reviewed by the first author. Also both of the instrument were pre-tested to ensure that the translation was interpreted accurately | The questionnaire was administered by a researcher in any language between Swahili English |
| Cyril, Halliday, Green and Renzaho (2016)1 | 1/4 | Yes | No special consideration regarding measuring tool | African languages and English | Not recorded | Not recorded | Data were collected by bilingual workers |
| Morrison et al. (2017) | 3/12 | Yes | The survey was translated to Somali and Spanish by experts in linguistics also the research team revised the survey for cultural adaptation. In addition, they pre-test the survery before the final version. | Spanish, Somali, Arabic or English. | English was preferred by refugee adolescents more than their parents. | The process of translation included few steps: editing of each item by forward-translation, panel discussion, backward translation, a pre-test, and a consensus on the final version by a core group of community leaders from each participating community | Multilingual interpreters administerate the survey |
| Author                                      | Cultural consideration in interviewer/interpreter training | Consultation with family | Consultation with community agencies | Were interpreters used | Were validity and reliability of translated questionnaires tested |
|--------------------------------------------|----------------------------------------------------------|--------------------------|--------------------------------------|-----------------------|---------------------------------------------------------------|
| Renzaho and Burns (2006)                   | Not recorded                                             | The family were involved in the study | Community health workers, community health centres and migrant resource centres helped in the recruitment process. | Yes                   | Not recorded                                                  |
| Renzaho, Swinbur, and Burns (2008)         | Not recorded                                             | Parents were involved in the study in which they report their children food intake and physical activity | Not recorded           | Not recorded          | Not recorded                                                  |
| Peterman, Silka, Bermudez, Wilde, Rogers (2011) | Administrators received 40 hours of pre-survey training and weekly training for the duration of the survey administration. | The family were involved in the study | The Cambodian Community Health help with the recruitment | Yes                   | Not recorded                                                  |
| Mellor, Renzaho, Swinburn, Green and Richardson (2012). | Trained bilingual interviewer translated the English version of the questionnaires into their languages, and recorded participants' responses in English. | The family were involved in the study | With the assistance of bicultural community health, welfare and youth workers through community settings such as community centres, migrant resource centres, or churches/mosques in metropolitan Melbourne, Australia | Yes                   | Yes                                                          |
| Dharod, Croom, Sady (2013)                 | Interviewer undertook training in interviewing refugee    | The family were involved in the study | Not recorded                       | Yes                   | The survey was test for face validity                          |
| Griffith, Mellor, Green and Renzaho (2014) | Not recorded                                             | The family were involved in the study | Migrant resource centres helped with the recruitment | Not recorded          | Yes The acculturation scale for adolescent was validated     |
| Anderson, Hadzibegovic, Moseley, Sellen (2014) | They trained in using the questionnaire. Also been assisted by the research team when needed. | The family (parent) were part of the study | The voluntary resettlement agencies working with Sudanese refugee families helped with the recruitment | Not recorded          | The measurements (food frequency) was test for face validity  |
| Gichunge, Somerset and Harris (2016)       | Not recorded                                             | The family (parent) were part of the study | The community meetings and settlement agencies helped with the recruitment | Not recorded          | Not recorded                                                  |
| Cyril, Halliday, Green and Renzaho (2016)  | Interviewers had training by the research team which include ethical and safety consideration. As well as interview techniques. | The family (parent) were part of the study | The African community health centre help with the recruitment | Not recorded          | Not recorded                                                  |
| Morrison et al. (2017)                     | Community partners had RHCP-facilitated human subjects protection training | The family (parent) were part of the study | Immigrant community were part of the study (recruitment and interviewing | Yes                   | Not recorded                                                  |
| Author                          | Any authors from the same ethnicity background of the participants | Were the target population ethnicity defined? | Special consideration in developing interviews/focus groups guides | Language offered | Language opted ethnic/English | Process of translation | Ethnic matching of interviewers |
|--------------------------------|--------------------------------------------------------------------|---------------------------------------------|---------------------------------------------------------------|------------------|-------------------------------|-----------------------|--------------------------|
| Rondinelli et al (2011)        | 0/7                                                                | No definition of the participant ethnicity  | Interviews questions were cultural appropriate               | Native languages were offered and English               | Not recorded                       | The interviews were transcribed into text in the same language then translated into English | Bilingual interviewers administered the interviews |
| Vue, Wolff, Goto (2011)        | 2/3                                                                | Yes                                         | A semi structured interview guide was developed based on literature review. It was revised by two graduated student from the same background to verifying the cultural appropriateness of the questions. | Only English                                                                                           | Not recorded                       | Not recorded                       | Two researchers from the same background conducted the interviews |
| Renzaho, McCabe and Swinburn (2012) | 1/3                                                                | Yes                                         | The African Review Panel helped by reviewing and giving advice on the cultural sensitivity of the interview Guide. | Not recorded                                                                                         | Not recorded                       | Not recorded                       | Not recorded                       |
| Tiedje et al. (2014)           | 3/12                                                               | Yes                                         | They developed the focus group guides based on the social cognitive learning theory and was pilot-tested with sample before used it. | Native languages (Arabic, Spanish and Somali) were offered and English | Not recorded                       | Focus groups were audio recorded and translated to English by native speakers and then transcribed. Transcriptions were reviewed and verified for accuracy and reliability by focus groups moderators and native speakers | Focus groups were led by trained moderators who speak the native language from the same community. |
| Author                        | Language opted | Special consideration in developing interviews/focus group guides | Did the target population ethnicity defined? | Ethnic matching of interviewers | Process of translation |
|------------------------------|----------------|------------------------------------------------------------------|---------------------------------------------|--------------------------------|------------------------|
| Wieland et al. (2015)        | English        | Focus groups sessions were audio recorded and then translated to English before transcribing. The transcriptions were reviewed and refined by native speakers from the same background. | Yes                                         | Focus group moderators who speak the same language and participated from the same community led the sessions. | Not recorded            |
| Wilson and Renzaho (2015)    | English        | The focus group guides were developed by community workers and academics in the research team. | Yes                                         | Focus group guides were developed from interviews. | Not recorded            |
| Renzaho, Green†, Mellor‡ and Swinburn (2010) | Arabic        | The focus groups and interviews were audio recorded and transcribed. Then interpreters translated to English, and the accuracy and validity were checked by reviewing the transcriptions by the bilingual African review Panel members. | Yes                                         | Bilingual professional interpreters were used to help with the focus groups. | Not recorded            |
| Wilson, Renzaho, McCabe and Swinburn (2010) | Arabic        | The focus groups and interviews were audio recorded and transcribed. Then interpreters translated to English, and the accuracy and validity were checked by reviewing the transcriptions by the bilingual African review Panel members. | Yes                                         | Bilingual professional interpreters were used to conduct the interviews and the focus groups. | Not recorded            |
| Table A2 | Cultural consideration in interviewer/interpreter training | Consultation with family | Consultation with community agencies | Were interpreters used | Were validity and reliability of translated transcription and interview guides tested |
|---------|----------------------------------------------------------|--------------------------|-----------------------------------|----------------------|---------------------------------------------------|
| Rondinelli et. al (2011) | Interviewers were instructed to probe in regards to general clinical terms and any further information | The family were involved in the study | The San Diego refugee community helped in the recruitment process. | Yes | Not recorded |
| Vue, Wolff, Goto (2011) | Not recorded | The family (parents) were involved in the study | Not recorded | No | A semi structured interview guide was pilot-tested with a Hmong woman before the interviews began. |
| Renzaho, McCabe and Swinburn (2012) | Not recorded | The family (parents) were involved in the study | The African Review Panel helped in the recruitment | Not recorded | Not recorded |
| Tiedje et al. (2014) | Focus groups moderators had training by the Rochester Healthy Community Partnership (RHCP) in how to run the focus group. | The family (parents) were involved in the study | The Rochester Healthy Community Partnership (RHCP) who works with immigrants and refugees helped in recruitment and drafting the focus group questions, recruiting participants, Conducting the focus groups | Yes | Yes |
| Wieland et al. (2015) | Focus groups moderators had training by the Rochester Healthy Community Partnership (RHCP) in how to run the focus group. | The family (parents) were involved in the study | The Rochester Healthy Community Partnership (RHCP) who works with immigrants and refugees helped in recruitment and drafting the focus group questions, recruiting participants, Conducting the focus groups | Yes | The focus group guides were pilot tested and refined before the use. The focus group transcriptions were tested for accuracy by native speakers. |
| Wilson and Renzaho (2015) | Not recorded | The family (parents) were involved in the study | The African Review Panel, the African Family Relationship Centre, the North Yarra Community Health Centre, the Centre for Multicultural Youth issues and the Ethiopian Community Association helped with recruitment | Yes | The accuracy and validity were checked by reviewing the translated transcriptions by the bilingual African Review Panel members. |
| Wilson, Renzaho, McCabe and Swinburn (2010) | Not recorded | The family (parents) were involved in the study | The African Review Panel, the African Family Relationship Centre, the North Yarra Community Health Centre, the Centre for Multicultural Youth issues and the Ethiopian Community Association helped with recruitment and cultural advice. | Yes | Not recorded |
### TABLE A2  (Continued)

| Author | Cultural consideration in interviewer/interpreter training | Consultation with family | Consultation with community agencies | Were interpreters used | Were validity and reliability of translated transcription and interview guides tested |
|--------|------------------------------------------------------------|---------------------------|--------------------------------------|-----------------------|-------------------------------------------------------------------------------------|
| Renzaho, Green †, Mellor ‡ and Swinburn (2010) | Not recorded | The family (parents) were involved in the study | The African Review Panel, the African Family Relationship Centre, the North Yarra Community Health Centre, the Centre for Multicultural Youth issues and the Ethiopian Community Association helped with recruitment and cultural advice. | Yes | Not recorded |

### TABLE A3  Cultural sensitivity of mixed method studies included in the review

| Author | Any authors from the same ethnicity background of the participants | Were the target population ethnicity defined? | Special consideration in developing interviews/focus group guides | Special consideration in selecting measuring tool | Language offered | Language opted ethnic/English | Process of translation |
|--------|------------------------------------------------------------------|--------------------------------------------|-----------------------------------------------------------------|-----------------------------------------------|-----------------|-----------------------------|-----------------------|
| Patil, Hadley, and Nahayo (2009) | 1/3 | No definition of the participant ethnicity | Not recorded | No special consideration regarding measuring tool | Native languages were offered and English | Not recorded | The interviews were transcribed into text in the same language then translated into English |
| Keita et al. (2016) | 5/7 | Yes | Not recorded | They use the Southeast Asian acculturation scale which was designed for the population | English, Khmer, Lao, or Hmong-Mien | Not recorded | Professional translators helped in the translation process |

### TABLE A3  (Continued)

| Author | Ethnic matching of interviewers | Cultural consideration in interviewer/interpreter training | Consultation with family | Consultation with community agencies | Were interpreters used | Were validity and reliability of translated transcription and interview guides tested |
|--------|-----------------------------|-------------------------------------------------|----------------|--------------------------------|-----------------------|-------------------------------------------------------------------------------------|
| Patil, Hadley, and Nahayo (2009) | Bilingual interviewers administered the interviews, with trained female interviewers who were usually from the same sending country as the female interviewee. | Interviewers were instructed to probe in regards to general clinical terms and any further information | The family were involved in the study | The San Diego refugee community helped in the recruitment process. | Yes | Not recorded |
| Keita et al. (2016) | Professional interpreters were hired to administer the survey. | Not recorded | The family were involved in the study | Not recorded | The community organizations helped in the recruitment | Yes | The internal validity of the cluster rating map. |