




The home food environment for children in Northern China

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ABSTRACT

The importance of the home food environment to children's dietary health is increasingly being recognised. There is limited research, however, on its key components for children in China. This study aimed to explore the perspectives and perceptions of parents and their children, on the home food environment in Northern China. Children (6–11 years) and their parents were recruited in Beijing and Dongying (Shandong Province). Interviews were conducted with 30 parents and 28 children, focusing on foods in the home, feeding practices, family food rules and routines. Interviews were video-recorded, transcribed and translated, before data were analysed using an inductive thematic approach. The analysis provided four themes: parents' knowledge and understanding; children influencing food in the family home; home food practices and food rules; and grandparents' role in the family home. Parents played a pivotal role in family food provision, and children's preferences were central to food purchases. Parents discussed adopting various strategies for improving their children's dietary intake, including verbal encouragement, restricting and/or strictly controlling certain foods. Children's homework commitments could limit their helping with food preparation at home, and notably, grandparents made substantial contributions to the home food environment in many households. This study revealed important features of the home food environment for families in Northern China, included factors influencing home food purchasing and children's intake, as well as the roles that children, parents and grandparents can play in family food provision. Findings are valuable in informing the development of targeted interventions related to children's dietary health.

1. Introduction

China, alongside its rapid economic development, is experiencing the double burden of malnutrition: undernutrition in combination with overweight or obesity (Davis et al., 2020). Although the levels of malnutrition among children and adolescents have dropped (from 12.7 % in 2010 to 8.5 % in 2019) (Yan et al., 2023), undernutrition remains a major issue for children and adolescents, particularly in rural areas (Song et al., 2019), where the rate has been reported to be higher than in urban areas (9.2 % vs 7.9 %) (Yan et al., 2023). Further, the prevalence of overweight and obesity among children and adolescents in China has progressively and substantially increased over the last forty years (Dang et al., 2024). Levels observed according to the quinquennial Chinese National Survey on Students' Constitution and Health (CNSSCH) vary, with sex and rural-urban differences (urban areas, boys 27.5 % and girls 16.8 %; rural areas, boys 22.4 % and girls 15.0 %) (Dang et al., 2024), and it is estimated that by 2030, the overall prevalence rate will reach 32.7 % (Dang et al., 2024). Childhood obesity is strongly related to

obesity in adulthood (Simmonds et al., 2016), and given its associated non-communicable comorbidities, such as type 2 diabetes and cardiovascular diseases, it is a considerable global public health issue (Obita & Alkhatib, 2022). At the same time, prolonged undernutrition in childhood may lead to impaired growth and cognitive function, and increased morbidity and mortality (Soliman et al., 2021).

As well as the dual challenges of under- and overnutrition, China is experiencing an ongoing nutrition transition (Huang et al., 2021), where the population's diet is shifting from a traditional pattern, dominated by grains and vegetables to become more westernised, with more animal products, diversification, and increased consumption of foods away from home, as well as a rising demand for processed food and fast food (Yuan et al., 2019). Further, analysis from the China Health and Nutrition Survey (2006–2011), indicated that for children (6–14 years), a modern western-style pattern (dominated by wheat, processed meat and fast food) was associated with later childhood obesity, whereas a traditional Chinese pattern (with high intake of rice, vegetables, poultry, pork and fish) was inversely associated with later obesity (Zhen et al.,

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2018).

The influence of the home food environment on children's dietary behaviours has been reported (Couch et al., 2014; Rex et al., 2021). It is a vital setting where children observe and learn. Parents' food habits and feeding strategies have been reported to be the most dominant determinant of children's food behaviour (Scaglioni et al., 2018), with parental behaviours strong correlates for children's dietary intake (Yee et al., 2017). Most importantly, the home food environment (incorporating food availability (Rex et al., 2021), food accessibility (Rosenkranz & Dziewaltowski, 2008), parents' child-feeding practices (Mahmood et al., 2021), family food rules (Rex et al., 2021), parental food habits (Scaglioni et al., 2018) and family meal routines (Rex et al., 2021)) has been found to play an important role in children's dietary intake and food choices. Research has, for example, indicated that children's consumption of fruit is positively associated with its availability in the home (Bassul et al., 2020). Likewise, positive role modelling has been found to be associated with greater consumption of fruits and vegetables by children (Draxten et al., 2014). Parents setting limits, rules or restrictions on food consumption may also be effective in reducing unhealthy eating, such as the consumption of sugar-sweetened beverages (Yee et al., 2017).

Another important consideration is the richness and diversity of food culture in China, with regional and culinary variations. For example, rice is a typical staple food in southern China, whereas wheat-based foods, such as steamed buns and bread, are more common in the north. Likewise, there are regional differences in recipes and flavours; for example, Shanxi is renowned for sour dishes, and Sichuan, for spicy dishes. The dominance of regional ingredients plays a key role in maintaining a region's flavour (Zhou et al., 2024). Certain foods are also associated with specific occasions and hold symbolic significance. For example, dumplings are traditionally consumed during the Chinese New Year, and noodles are eaten as a symbol of health and longevity (G. Ma, 2015). Further, Chinese culture has long emphasised the importance of family meals and social gatherings, where food plays a vital role in maintaining familial bonds and interpersonal relationships (G. Ma, 2015). This positions the family as a dominant influence on children's dietary behaviours.

Most research on the home food environment for children has originated from the United States and Australia, and there is limited evidence from China. This may be particularly important, given that children in China (aged 6–11 years) were reported to consume 95 % of their total energy intake at home, albeit in 2000 (Adair & Popkin, 2005). More recent data with this respect are needed, especially as dining out is increasingly common among children living in large cities in China, with considerable differences also observed across groups (Zheng et al., 2021).

Given the limited evidence base on the home food environment for children in China and its acknowledged relevance, the aim of the present study was to explore the perspectives and perceptions of parents and their children regarding the home food environment.

2. Materials and methods

2.1. Study design

A qualitative methodology was selected based on the study's aim. Data collection with both parents and children was chosen to understand their experiences, perspectives and perceptions of the home food environment in China. Focus group interviews were selected as the main means of data collection, as these can encourage participant discussion and provide access to multiple viewpoints on various topics (Dilshad & Latif, 2013). Participants who relayed difficulties, such as limited time and availability, would be offered the option of an individual interview to facilitate their participation. Semi-structured interviews were chosen with the intention to guide interviews while being flexible, dependent upon the discussion and related topics. Interviews were planned to take

place remotely via video conferencing, primarily due to COVID-19 restrictions at the time in China, and as virtual interviews can reduce scheduling constraints (Owens, 2022) and help participants feel more comfortable (Weller, 2017). For the data analysis, an inductive approach was chosen to identify themes from the underlying structure of experiences or processes (Thomas, 2006). This study followed guidelines from the Consolidated Criteria for Reporting Qualitative Research (COREQ) (Tong et al., 2007).

2.2. Recruitment and participant eligibility

A combination of purposive sampling and snowballing was used to recruit parent-child pairs for this study. Each pair comprised a parent and their child aged 6–11 years, living in Beijing or Dongying (a city within the northern Shandong Province). Both sites, in northern China, lie north of the Qinling Mountains, and were selected for their similar geographical environments, histories, food cultures, and dietary habits (Song & Cho, 2017). Recruitment was initiated on WeChat, the Chinese social media platform, with the highest usage rate among social networking applications in China (China Internet Network Information Center, 2016). Parents who met the eligibility criteria were provided with a brief introduction to the study and what participation would entail. Interested parents were given more details and scheduled for an interview. Participants were also encouraged to refer prospective participants (within their networks) who met the eligibility criteria, to contact the study team. Each parent was offered a supermarket voucher for RMB 150 (approximately £15), to acknowledge their time and contribution to the study.

2.3. Interview schedules

Two interview schedules (interview guides comprising the list of topics and associated questions and prompts) were developed; one for parents and one for children. Each schedule incorporated open-ended questions and prompts which covered the same topics; however, questions were expressed more simply and used age-appropriate language in the children's interview schedule. The questions and prompts were developed to explore various aspects of the home food environment, such as the types of food available at home, parents' child-feeding practices, family food rules, and family meal routines. Questions included: *What kinds of foods would you find in your refrigerator? Would you say that there is anything about your child's food choice or diet that you'd like to change, or are you happy with their food choice and diet? Are there any 'rules' that you have for food or eating in your home, and can you tell me more about these?* A question on COVID-19 was incorporated into the schedule for parents, to try to account for the lockdown and the nationwide home quarantine which was in place at the time (The State Council of the People's Republic of China, 2022). To ensure consistency, the same interview schedules were used for focus group and individual interviews.

The schedules were developed before testing in English with six Chinese parents (of children aged 6–11 years) who were bilingual in Chinese and English. Feedback was used to refine the schedule, e.g. question order and wording. The schedules were then reviewed by two academic researchers, beyond the study team, with expertise in public health nutrition. Feedback focused on question appropriateness, breadth and order. The focus group schedules and other documents (including the participant information sheets and consent forms) were then translated using the forward-backward translation method (Beaton et al., 2000) by four researchers, all bilingual in English and Chinese.

2.4. Data collection

The interviews were conducted in June 2022, by two researchers RM and XW (both female postgraduates) trained in qualitative data collection methods. The researchers were unknown to the participants before

recruitment. All interviews were conducted in Chinese (the native language of the two researchers) and took place remotely using video conferencing software. The interviews were recorded following informed consent. In the case of children, interviews followed parental informed consent and child assent.

In all cases, parents were interviewed before children (during the same session). At the start of each session, researchers introduced themselves and the study objectives. Immediately after their interviews, parents were asked to complete a short online questionnaire, to provide basic demographic characteristics. Once parents had completed the online questionnaire, which was administered using an online survey platform (Jisc, Bristol, UK), interviews with the children were conducted without delay.

During each interview, one researcher conducted the interview while the other took notes on the key points discussed. Reflexivity was practised by the researchers to consider their role in the process and minimise bias (Swift & Tischler, 2010). Specifically, researchers wrote notes and discussed the data collected and subsequent data analysis, including with the wider research team. The data were collected until considered sufficient for data saturation (Hennink & Kaiser, 2022), with no new points arising in discussions.

A total of 25 interviews were conducted with parents ($n = 30$) and their children aged 6–11 years ($n = 28$; two children dropped out just before the interview for unknown reasons). Data collection comprised fourteen individual interviews, ten focus group interviews (with three or more participants), and one paired interview. The duration of interviews varied, typically lasting 30–40 min, depending on the number of participants.

2.5. Data analysis

Interviews were transcribed using a denaturalised approach, which focused on the content while removing interview noise like stutters and pauses (Oliver et al., 2005). The transcripts were cross-checked with the video recordings to ensure accuracy, then anonymised and translated into English. This was done collaboratively by the two researchers who conducted the interviews: one researcher transcribed and translated, and the other reviewed the transcript and translation for accuracy. Translated transcripts were imported into NVivo 12 Plus software (QSR International, Melbourne, Australia) for data management and analysis.

An inductive approach was adopted for the data analysis, entailing data exploration, inductive coding and thematic analysis (Thomas, 2006). Each transcript was read multiple times by two researchers and coded. Coding was conducted iteratively, with discussion among the research team after each round of coding. Relevant themes then summarised the final set of codes.

Ethical approval for this study was granted by the Faculty Research Ethics Committee at the University of Leeds.

3. Results

A total of 30 parents (24 mothers and 6 fathers), and 28 children (15 girls and 13 boys) participated in the study, Table 1. Parents were all between 31 and 50 years old, with most (73 %) aged 36–40 years. All apart from three parents were Han, which is the largest ethnic group in China (Ning, 2021). Most parents held an undergraduate degree or higher, and all apart from one household was in an urban area. Nearly two-thirds of households had one child, reflecting China's one-child policy between 1980 and 2016 (Feng et al., 2016). All parents interviewed were the primary caregiver, except for three parents who shared this responsibility with another person and another three cases where grandparents were the primary caregiver. Meanwhile, almost half of parents were responsible for all or most of food preparation/cooking, and just over half for the food/grocery shopping (13 and 16 parents, respectively). Almost two-thirds of the household monthly incomes, that were reported by parents, were RMB 6000 or more, indicating that most

Table 1

Demographic characteristics of parents and children taking part in interviews in Beijing and Dongying.

Parents (n=30)		Children (n=28)	
Sex		Sex	
Female	24	Female	15
Male	6	Male	13
Age		Age	
31–35 years old	3	6 years old	4
36–40 years old	22	7 years old	3
41–45 years old	1	8 years old	4
46–50 years old	4	9 years old	8
Ethnicity		10 years old	4
Han	27	11 years old	5
Hui	3		
Education ^a		Households	
High school	1	Place of residence ^a	
College	6	Urban area	27
Undergraduate degree	19	Rural area	1
Postgraduate degree and above	3	Household monthly income ^a	
Employment status		2000–3999 RMB	3
Working full time	27	4000–5999 RMB	6
Working part time	2	6000–10,000 RMB	9
Homemaker	1	> 10,000 RMB	8
Child caregiving responsibility		Household composition ^a	
Primary caregiver	24	1 adult & 1 child	1
Equal share with another adult	3	2 adults & 1 child	10
Grandparents	3	2 adults & 2 children	4
Extent of responsibility for food preparation & cooking		3 adults & 1 child	3
All or most	13	4 adults & 1 child	4
About half	3	4 adults & 2 children	6
Less than half	9	> 5 adults & 1 child	1
None	5		
Extent of responsibility for food shopping			
All or most	16		
About half	4		
Less than half	9		
None	1		

^a Not all parents provided a response.

families belonged to a high-income group in China (95 % of the population in China has a monthly income of less than RMB 5000 (Fenghuangwang, 2023). Parents were equally split between Beijing and Dongying, and the demographic information collected were similar.

Data analysis provided four themes: (1) parents' knowledge and understanding; (2) children influencing food in the family home; (3) home food practices and food rules; (4) grandparents' role in the family home. These themes and respective sub-themes are presented in Table 2 and described below, along with quotations. Unique identifiers have been assigned to participants, for example, P1 and C1 denote the parent

Table 2

The home food environment for children in Northern China: themes and respective sub-themes from analysis of interviews with parents and children in Beijing and Dongying.

Themes	Sub-themes
Parents' knowledge & understanding	Dietary diversity Green foods Traditional Chinese medicine
Children influencing food in the family home	Children's food preferences Children's requests Children helping with meal & food preparation
Home food practices & food rules	Encouraging, coaxing and forcing Restriction Food and reward Avoiding dining out & takeaways Food rules – no TV
Grandparents' role in the family home	Buying fresh foods Preparing dinner

and child participants from the same family.

3.1. Parents' knowledge and understanding

Parents discussed various factors and principles that influenced their family food provision. Many parents chose foods for their children, based on their personal knowledge and understanding of food and nutrition. Specifically, parents prioritised dietary diversity, 'Green Foods' and principles from traditional Chinese medicine.

3.1.1. Dietary diversity

During discussions, parents explained how they considered the variety in their children's diets, and this was particularly with respect to shopping for groceries.

I don't let him [son] eat one type of food all the time, I switch things around and give him different types of food. (P6)

... For example, right now I have oranges and apples at home. In the summer, I often buy watermelon. After a while, I will buy other kinds of fruit, such as blueberries... So, there won't be the same fruit in the fridge all the time. (P19)

I pay attention to the nutritional mix [of our food]. Our diet will not be [exclusively] meat or vegetable. There will be both vegetables and meat, but there will probably be more vegetables and less meat. (P23)

3.1.2. Green Foods

In several interviews, parents mentioned the importance of avoiding foods produced with the use of chemicals (i.e. pesticide, fertilizers and additives), due to concerns that these might harm their families' health. They expressed a preference for 'Green Foods' (a food certification system in China for foods cultivated with a controlled and minimized use of pesticides, accompanied by a rigorous testing regimen for pesticide residues (Paull, 2008)).

Nowadays, people tend to choose Green Foods... The vegetables sold [in the food market] are all organic and do not use chemical fertilisers, so I think they are fresher, and I go there more often. (P10)

I think a lot of vegetables nowadays are grown in greenhouses, not exposed to sunlight, and are not naturally grown foods but have received too much human intervention. That's why I think Green Foods is healthier and doesn't receive too much human intervention... Meat nowadays is also artificially farmed. Nowadays, some vegetables have been artificially grown to look particularly beautiful, and I don't accept that kind of food. I don't care what the food looks like. I don't like this kind of food. I feel eating Green Foods is more reassuring. (P19)

3.1.3. Traditional Chinese medicine

Some parents mentioned that, when selecting foods, they followed traditional Chinese medicine principles. This involves categorising foods as cold, hot, or neutral based on their Chinese medicinal properties; for example, pomegranate is considered hot, and bitter melon is cold (Cai & Liu, 2015). In the discussions, these parents talked about aiming for a "neutral balance" in their children's diet, and for instance, would prioritise 'hot' foods when the weather is cold and choose 'cold' foods when their child experiences "heat" (characterized by an excess of yang energy in traditional Chinese medicine principles) to achieve a "neutral balance" (Dashtdar et al., 2022).

If he [son] has been eating more cold foods for a while, I will buy some hot foods to neutralise it. (P6)

She [daughter] sometimes eats too much fruit, and I don't think she should eat too much at once, no matter what the food is. If she eats

too much fruit, she will have a cold spleen and stomach. The doctor advised eating less of those cold fruits. (P8)

If she [daughter] has eaten a lot of meat recently, I buy her some cold fruits, such as dragon fruit or watermelon. In summer, it is easy to experience 'heat', [therefore] I would buy watermelon, and sometimes buy mangosteen, but not too much. (P22)

3.2. Children influencing food in the family home

In some interviews, parents recognised the role that their children played in the provision of food at home. In particular, children's preferences and requests influenced what food was purchased and how parents prepared meals. In some cases, parents mentioned that their children actively helped to prepare food and meals for the family at home.

3.2.1. Children's food preferences

About a third of parents reported how their children's preferences were a factor influencing their food purchases, and that they "buy food according to their child's taste", and that most food purchased was "the food that my children love to eat".

Usually, I buy things that they [children] like to eat. I see that they like it and I keep buying it back. (P3)

We have a lot of shrimp in the fridge because our children love shrimp. (P4)

I don't buy celery often as he [son] doesn't like it. (P20)

3.2.2. Children's requests

Parents reported that they would consult with their children before shopping about what to buy. Parents' purchases were then influenced to varying degrees by their children's requests. Most parents would comply with their children's requests, whilst others may or may not, depending upon the food, the quantity requested, and how often their children consumed those food.

We [parents and child] all decide together. Usually, we [parents] allow the child to choose one or two snacks. (P21)

I would take my child with me [to the supermarket]. She [daughter] would also pick out some food that she wanted to eat, and I think I would occasionally buy some for her. For example, if she picks five or six foods on her own, I might buy two or three for her... because she usually wants to buy fudge and marshmallows. But [for] the bread and crisps, I would agree to buy for her. She is not allowed to eat them very often. Occasionally, I'd buy these. (P8)

He [son] would tell me in advance what he wanted. After we discussed it, if it felt right, I would buy it for him; if not, I wouldn't buy it. (P30)

Some parents thought that their children did not make any specific requests for 'unhealthy' or indulgent foods (such as potato crisps, pork ribs) because the children were able to control their eating behaviour, or because the parents thought that their children did not have any specific needs or requests.

We make her [daughter] whatever food she wants to eat. For example, sometimes she wants to eat pork ribs, so we make her pork ribs. She doesn't ask for much. (P21)

She [daughter] rarely asks for ingredients [for cooking] - if she does, I will go and buy these the next day. For snacks: before I go to the supermarket, she will tell me what she wants to eat - I'll buy it for her, and most of the time it's crisps. (P24)

3.2.3. Children helping with meal and food preparation

About a third of participants (including parents and children) reported that children occasionally assisted in meal and food preparation, with some simple tasks, such as "*washing vegetables*", "*washing dishes*", and "*wiping the table*". However, this depended on the child having completed their homework or being "in a good mood", when they were more willing to help.

... Only when she [daughter] has time [will she help]... for example, when she has finished her homework or something. (P29)

[I] Didn't help yesterday. But I help mother after (I finish) homework or when I am on holiday. (C8)

If she [daughter] is in a good mood, she might get involved... She will not participate in cooking if she is in a bad mood. (P6)

In contrast, some parents reported that their children were rarely involved in meal preparation due to busy homework schedules. Some even discouraged their children from helping, expressing concerns about potential disruptions in the kitchen.

She [daughter] doesn't help... because she usually has to do her homework and there is no free time. (P1)

My son is sometimes curious about cooking and wants to get involved, but there are times when I don't want him [son] to help because he can't do anything and makes a mess in the kitchen and takes up time. (P23)

3.3. Home food practices and food rules

Most parents tried to influence their children's food intake by encouraging, forcing or limiting specific foods – and aimed to increase the consumption of fruits and vegetables and reduce snacks or fried foods. Some felt, however, that these methods were ineffective, and may have a detrimental effect.

3.3.1. Encouraging, coaxing and forcing

Several parents and children reported that parents used encouraging words to prompt their children to eat certain foods, especially fruits and vegetables.

If I cut up a melon, I ask my child, "Do you want to eat the melon?" She [daughter] says "No". But I'll go on to say, "How about you take a bite?". If it's one of those crunchy, sweet fruits, she'll be able to eat a bit more. Otherwise, she won't eat. (P2)

At every meal, I would make her [daughter] eat green vegetables. I would say, "Take two bites, take two bites, please, please, please." (P6)

In addition, parents reported various food practices (typically cutting up food and/or mixing with other foods) to promote the consumption of certain foods.

She [daughter] doesn't like fruit very much, so we [parents] cut it into small pieces and coax her to eat it... feeding the fruit to her mouth before she opens her mouth to take a bite. She will eat some fruit, and she likes to eat mixed fruit with yoghurt. I cut the fruit into small pieces and mix it with yoghurt, and she can eat a bowl of it. (P4)

When I eat vegetables, they [parents] mix the ones I love with the ones I don't. There would be more of the ones I loved and less of the ones I didn't, so I wouldn't get the taste of the vegetables I didn't like. (C8)

At meal times he [son] will be rationed and I will say to him, "You have to finish this." I would tell him, "Which of these dishes are going

to be eaten today? And how many? If you can't finish any of them, you have to eat that one, which I think is more nutritious." (P13)

A minority of parents reported that they occasionally forced their child to eat certain foods, such as milk and vegetables. Others however felt that forcing their children to eat certain foods would create a backlash and lead to a greater aversion to those foods.

I bought her [daughter] a cute little plate and put the vegetables on that plate and force her to finish them. (P4)

Both of our children don't like milk and I force them to drink it, otherwise, they hardly drink it. (P17)

We [parents] have forced him [son] to eat some foods, but to no avail. He may only eat one or two bites and then reject them even more. (P26)

Forcing him [son] to eat vegetables would not work, he would not listen to me. If he is forced to eat vegetables, he will refuse them and develop a rebellious attitude. (P10)

3.3.2. Restriction

The majority of parents reported restricting certain foods at home for their children, especially snacks, sugar-sweetened beverages, and fried foods. Parents explained that this was for the sake of their children's health.

If it's something like 'Latiao' (a spicy wheat-based snack, common in China), I won't buy them for my child. There is no point in my child begging me, I will not let my child eat this stuff. (P6)

I have started to restrict her [daughter] from eating meat, I think she is getting a bit fat. If this keeps up, I'm worried that she'll grow up to be a fat person. (P4)

[We] must have [some restriction]... He has had orthodontics, and he likes to drink sugar-sweetened beverages and things like that, but we stop him from drinking them. We would say to him, "Sugar-sweetened beverages will hurt your teeth". (P19)

When I want to get a drink [sugar-sweetened beverage], they [parents] don't buy me one. They tell me that this is bad for my health. (C23)

However, a small minority of parents expressed concern that excessively restricting a child's diet might impact their overall childhood experience.

When my child was younger, I would restrict his diet more strictly. I would only allow him to have ice cream two or three times a year and I wouldn't let him eat more of that kind of food. But now that he is older, [I realise] it may mean that he misses out, and he will later look back on the snacks he ate during his childhood without fondness. So now he is properly satisfied. (P23)

I think it's not good for a child if you use force or reward to get him to eat. When we were young, my parents never forced me to eat a food either. If he [son] was forced to eat, he would instead become resistant and he might never touch such foods again. (P14)

3.3.3. Food and reward

Parents and children talked about using confectionery or snacks as rewards for children's good behaviour, and parents occasionally incentivised the consumption of other specific foods with preferred activities.

If he [son] does well in his exams, I will allow him to go to the supermarket and choose something he likes to eat. (P28)

We don't reward her [daughter] with food. Occasionally, (we) will go to a restaurant, for example, if she is well behaved (P11)

When I eat, for example, when I finish a certain vegetable, my mother rewards me with chocolate or ice cream or something like that. (C5)

I was quite skinny when I was little and my mum always tried to make me eat, and I wouldn't. She would tell me that if I ate, she would take me out and buy me comics that I particularly liked or things that I liked. (C8)

If he [son] eats more of a certain food, I will buy him an item (as reward). But it hardly works. (P27)

3.3.4. Avoiding dining out and takeaways

Several parents talked about avoiding dining out or avoiding ordering takeaways (with few exceptions), because they believed that home-cooked meals were healthier.

Because I am particularly conscious of eating healthy, I rarely order takeaway, such as KFC, McDonald's and pizza. (P9)

Our family goes to restaurants less often because my partner doesn't like to go there. She thinks the food cooked outside will use more (unhealthy) ingredients and we rarely go to restaurants for dinner. (P1)

I like eating out, but I'm worried it's not safe. I still like to eat at home. (C18)

Unless it's a get-together with a close friend whom I haven't seen for a long time, there are hardly any meals out. We don't eat out very often, not even once a week. (P19)

Some parents also talked about how they consumed home-made meals more often and reduced eating out during COVID-19. This was sometimes attributed to their being at home during lockdown and having more time to cook.

When COVID-19 was more severe, our family would eat out significantly less often. Before COVID-19, we used to order takeaways. But after COVID-19, we ordered takeaway much less often. (P24)

The biggest change in our family is that we don't go out to eat as often as before. The frequency of ordering takeaways has also decreased, and now we may order takeaways once a month or twice. (P21)

Nothing much has changed in terms of what I eat. But there seem to be some changes in terms of the noodles. Since I'm at home, I have more time to prepare meals, so I'm eating more noodles... or I could have more time to learn how to make noodles. There will be a bit more complexity to consider in the main dishes, because noodles take more time. (P30)

3.3.5. Food rules – no TV

A third of parents referred to banning TV during meals, citing concerns about its impact on dining and the value of mealtimes as conducive to conversation within family. A few parents also mentioned permitting TV on special occasions, like during holidays or on Friday nights.

We don't often watch TV during meals... Usually, when we eat, we don't do much activity, because we [parents] all know from a young age that watching TV during meals can affect digestion. (P10)

Our family doesn't watch TV during dinner, we just chat. (C9)

From Monday to Thursday, I don't allow her [daughter] to watch TV [during meal times], but on Friday nights she watches TV. On weekend evenings, the child has classes, so she doesn't watch TV either. It's only on Friday nights that we watch TV together. (P22)

3.4. Grandparents' role in the family home

Grandparents played important and distinct roles in food provision, food shopping and meal preparation in three-generation households.

3.4.1. Buying fresh foods

In approximately half of households, food shopping duties were shared between the interviewed parent and co-residing grandparent/s. In these cases, grandparents typically handled the purchase of fresh foods, while parents took charge of buying other foods, such as snacks and beverages.

Usually, the elders [grandparents] in the family do the shopping. We [parents] don't do a lot of grocery shopping, but the elders in the family do. They usually just buy enough vegetables to eat for a day or two, once every two days, usually. (P3)

Because my husband and I leave work late. The children's grandmother is mainly responsible for the shopping, and she decides on the food in the house... Our family's shopping list is decided by the children's grandmother, and we are rarely involved in making decisions. I might buy some food like fruit, but the children's grandmother is the one who is mainly responsible for shopping in our house. (P11)

My mum usually buys some nuts and some snacks, then my grandmother buys vegetables, meat and fruit. (C3)

Small snacks and other food items are decided by my husband. I work a lot and I don't have time to shop. The children's grandparents make more frequent purchases. The ingredients needed for cooking are the responsibility of the children's grandparents and don't need to be handled by me. (P18)

3.4.2. Preparing dinner

Grandparents held a prominent role in preparing evening meals, and almost a third of parents and children referred to "Grandmother" or "Grandfather" as the key figure involved in making family dinners.

The elders [grandparents] are the ones who cook in our house, we [parents] don't cook. (P3)

One thing I feel very fortunate about is that the child's grandmother cooks for us at home. Sometimes, we are very busy at work, come home tired and don't have the energy to cook, so we might order takeaway... We are quite busy at work and don't have time to cook at home. (P19)

In some other families, the child's parents and grandparents shared the responsibility of cooking together.

When I am at home, I cook. When I am not at home, the children's grandmother cooks. (P9)

Yes, I usually cook. But now that she [daughter] is on holiday, the child is at home with her internet classes and her grandmother is coming to our house, so she [grandmother] is the one who cooks. (P24)

My grandmother usually cooks at home. If my grandmother is away, my mother is the one who cooks. (C28)

4. Discussion

This study explored parents' and children's perspectives on their home food environment, in particular food availability, food practices and routines were explored. Findings revealed a number of important factors and highlighted the substantial influence that children can have on home food purchases, both directly and indirectly. Parents took into account their children's food preferences and needs when buying food.

They also employed various strategies to try to influence their children's food intake. Notably, grandparents played a key role in the home food environment, often taking responsibility for purchasing and preparing meals.

In this study, children exerted substantial influence on home food purchases. Parents were found not only to consider their children's food preferences, but also to take into account their own knowledge and understanding of food, as well as their children's health and nutritional requirements. Many parents indicated that their children's food preferences held considerable sway over their food-purchasing decisions. Parents were more willing to buy foods their children liked to ensure food intake was not disrupted by disliked foods. Existing literature supports the notion that children's food preferences can shape parental food acquisition (Russell et al., 2015). Further, children's food preferences have been reported a barrier to parents' efforts to make healthy food purchasing decisions in low-income area (Screti et al., 2024).

It is important to note that in the present study, while parents prioritised purchasing foods that their children preferred, this was generally limited to meal ingredients, e.g. vegetables, meat. For other types of food, such as snacks, e.g. potato crisps, or confectionery, only a minority of parents would unconditionally buy whatever their children requested – these parents believed that their children were able to control their eating behaviour and would not overindulge in such foods. Nevertheless, most parents negotiated purchases with their children to some extent, depending on the type and quantity of food. Previous studies have shown that children can exert considerable influence on their parents' food-purchasing through discussion and negotiation (Baldassarre et al., 2016; Turner et al., 2006). This has also been shown to depend on the type of food children choose, with the impact of children's 'pester power' diminishing when parents focus more on the nutritional value and quality of the food (Baldassarre et al., 2016). This is similar with findings of Hughner and Maher (Hughner & Maher, 2006), where parents limited certain types of "junk food" such as McDonald's, and confectionery because of concerns about children's diet.

This present study revealed a strong preference among some parents for selecting foods that they considered nutritious for their children. Previous research has shown that the nutrition and health are important motives influencing parents' food choices for their family (Russell et al., 2015). Specifically in China, consumers have reported that the nutritional content of food is one of the main factors influencing food purchasing (Liu & Niyongira, 2017). Other work has also highlighted parents may lack sufficient knowledge about the nutritional content of many foods (L. Ma et al., 2023), so that parents may tend to purchase what they believe to be more nutritious foods.

Moreover, several parents in the present study expressed a preference for 'Green Foods' (foods certified as having been cultivated with a controlled and minimized use of pesticides (Paul, 2008)), believing these to be "healthier". The preference for 'Green Foods' however was not universal and although uncertain, this may be due to the premium price associated with 'Green Foods' (Zhu et al., 2013). Household income and the price of 'Green Foods' have been highlighted as factors influencing consumers' purchasing of 'Green Foods' (Yu et al., 2014), and in general, consumers with higher incomes tend to be more likely to buy 'Green Foods' (Zhu et al., 2013). Previous work has also found that younger people are more willing to pay for 'Green Foods' (Yu et al., 2014) – whilst older individuals may be less likely to change their dietary habits and not prioritise 'Green Foods' as much.

When discussing food provision for their children, some parents also referred to traditional Chinese medicine, whereby each food is considered to possess either a cold, hot or neutral property (Dashtdar et al., 2022) – and human health is the outcome of balancing these two properties, with an excess of either hot or cold in the diet leading to an imbalance and subsequent health issues (Lee & Shen, 2008). In this way, parents carefully balanced the type of food their child consumed based on their own understanding of the traditional Chinese medicinal

functions of foods, e.g. selecting fruit to avoid any discomfort caused by an imbalance in the intake of hot and cold fruits. Wang-Chen et al. (Wang-Chen et al., 2022) also reported that the principles of traditional Chinese medicine can influence food choice in China. Scientific empirical evidence in this respect is limited; previous studies have indicated though, how cold-hot attributes may relate to micronutrient content (for example, 'cold' foods associated with a higher iron content) (Liu et al., 2012), and how 'cold' foods may be associated with anti-inflammatory processes (Ormsby, 2021).

Parents reported using various methods, such as encouragement, reward, coercion, or restriction, to influence their children's food intake – particularly to consume more fruits and vegetables and fewer snacks. Verbal encouragement and coaxing were the predominant strategy, with parents citing the nutritional value and health benefit of the food to their children. Parents also employed other strategies, such as cutting up foods (for example, fruit) and mixing disliked foods with preferred ones. Parents felt that this, as well as encouragement and coaxing was effective. Previous research has highlighted the relevance of encouragement to children's better dietary intake, with one study finding encouragement to be associated with higher consumption of vegetables, fruit and water and lower consumption of sugar-sweetened beverages (Inhulsen et al., 2017).

Parents used food, mostly confectionery or snacks, as a reward for their children's good behaviour (food-related or otherwise). Using food as a reward may have a negative impact, and previous work has shown how this may be associated with increased snack consumption (Sleddens et al., 2010), increased intake of energy-dense snacks and decreased fruit intake (Rodenburg et al., 2014). Other research has also shown that, although parents may recognise that using food as a reward may not be ideal, they find it an effective feeding strategy (Campbell et al., 2007).

Most participants reported imposing restrictions, particularly on food that they considered unhealthy, such as 'Latiao' (a spicy wheat-based snack, common in China), sugar-sweetened beverages, and fried foods. A few participants expressed scepticism about the effectiveness of this approach, suggesting that excessive restriction may lead to children rebelling and not consuming certain foods. Previous studies have shown the benefits of moderate restriction on children's food intake (Gibson et al., 2012) and how children exposed to a high degree of food restriction are more likely (than children exposed to lower levels) to have unhealthy dietary habits, such as consumption of calorie-dense foods (Loth, 2016).

In interviews with parents, some reported forcing their children to eat certain foods. Others expressed that forced eating could be counterproductive, potentially leading to children developing negative associations with these foods. Previous research has also indicated that forced consumption of certain foods may result in a long-term reported aversion to those foods (Batsell, Brown, Ansfield, & Paschall, 2002). Interestingly, some parents in the present study shared their own childhood experiences of rejecting foods they were forced to eat. A study of South Korean adults (Kim, 2023) found that a third of respondents had experienced being forced to eat certain foods, particularly vegetables, during their childhood either in school or at home. For these individuals, this experience was directly linked to a reduced acceptance of these vegetables in adulthood (Kim, 2023).

A key finding of this study was the pivotal role that grandparents played in the home food environment of some households, particularly in the purchasing of fresh food and preparation of dinner, often due to parents' busy schedules. In three-generation households, grandparents were often responsible for food preparation and shared food shopping responsibilities with parents. Specifically, grandparents focused on purchasing fresh foods such as vegetables and meat, while parents tended to handle purchasing of other foods, including snacks. The influence of grandparents was evident, although possibly not as pervasive as indicated in other studies. A study by Jiang et al. (Jiang et al., 2007) found that grandparents, as primary caregivers in three-generation

households, substantially impacted a child's nutrition and dietary habits. Many grandparents tended to urge their grandchildren to eat more and larger meals; with profound memories of hunger and poverty, grandparents wanted to ensure children were not hungry and provided plenty of food, often leading to overfeeding practices (Jiang et al., 2007).

The role of grandparents reflects the family structure in China; although the number of two-generation households (parents and children) is increasing, three-generation (grandparents, parents and children) households still accounted for over 20 % of households in 2020 (Zhang & Wang, 2022). The present study did not include grandparent participants, and further studies to understand their role within three-generation households would be valuable. This is particularly relevant given that previous work has highlighted how grandparents can hold inappropriate perceptions, knowledge and behaviour, such as childhood obesity being a sign of children being well cared for, and obesity-related diseases only occurring in adults (Li et al., 2015).

Approximately two-thirds of this study's families had one child, owing to China's Family Planning Policy in the recent past. The relaxation of the one-child policy was also reflected, and families with two children made up the remaining one-third of participating households. The relevance of family structure in China to child-feeding practices are important to consider in subsequent research, particularly as previous work has found that children in one-child families are significantly more prone to overweight or obesity (Li et al., 2017).

Findings from this work highlight the interactions that influence the home food environment. These include children's substantial influence, with parents choosing foods based on their children's preferences, as well as some parents prioritising foods perceived as nutritious, and children's requests for food leading to negotiation, in some cases. Further, in three-generational households, the interactions involved grandparents who could play a role in purchasing fresh foods and preparing evening meals. These findings point to public campaigns, targeting parents and grandparents, and focused on increasing awareness of healthy food choices and food practices, and managing children's food requests. Likewise, policy measures to provide children with school-based food activities, should be considered. As well as offering more opportunity for preparing and cooking food, and the associated experiential learning, such activities could aim to promote nutrition education.

The present study has limitations. Whilst conducting online interviews offered advantages, such as reduced constraints on time and location, this may have excluded some participants with limited internet access and technology. Depending upon participants' availability, data originated from focus group and individual interviews. These two formats may have led to different data, with focus group discussions influenced by responses of group members, potentially leading some to express ideas consistent with mainstream viewpoints. Similarly, individual interviews may have lacked the dynamic discussions facilitated by group interactions. Further, in some instances, parents and children may have been in earshot of the other during the interviews. This may have influenced the discussions, and is particularly relevant for children, where their responses may have been subject to parents' expectations. Likewise, this study relied on children's recollections, which may have introduced inconsistencies to the actual events. In addition, researcher-led interviews can lead to social expectation bias, as participants adjust their responses to perceived interviewer expectations. It is also important to acknowledge sample bias and limits in the diversity of perspectives and experiences, and participants may not reflect perspectives of other families with primary school age children. Attention should be paid to the demographic characteristics of the parents, most of whom were mothers, educated to at least undergraduate level, and with a monthly household income of RMB 6000 or more. Further research with families from different demographic characteristics and in other areas of China would be of great value.

5. Conclusion

This study revealed important features of the home food environment for families in Northern China, including how children, parents and grandparents can each play a role in family food provision. Multiple factors were important when purchasing food, such as children's food preferences and the perceived nutritional value. Grandparents were found to have an integral role in the purchase and preparation of family food in three-generation households, thereby influencing children's food intake. Additionally, most parents adopted various strategies, to some extent, in order to encourage their children to eat more vegetables and fruits, and limit their intake of snacks and confectionery. Further work, to gain a deeper understanding of the home food environment, including the effectiveness of parents' strategies and the influence of grandparents within different household structures, is recommended. This may be particularly relevant in the development of targeted interventions within family households.

CRedit authorship contribution statement

R. Ma: Methodology, Formal analysis, Writing – original draft, Writing – review & editing. **X. Wang:** Methodology, Formal analysis. **Y. Y. Gong:** Methodology, Writing – review & editing. **H. Ensaff:** Conceptualization, Methodology, Writing – review & editing.

Consent for publication

All participants consented for de-identified quotations to be used in publications.

Ethics statement

This study was conducted following approval granted through the University of Leeds' Faculty Research Ethics Committee (AREA 21–076). All parents provided informed consent to participate in this study, and for their children to participate in this study; all children provided assent.

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Declaration of competing interest

None.

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Data availability

The datasets presented in this article are not readily available because of ethical restrictions. Consent from participants to share data was restricted to the research team.

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