



Dietary health perceptions and sources of nutritional knowledge in an urban food environment: a qualitative study from Indonesia

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Abstract

Objective: To investigate dietary health understandings, healthy foods access perceptions and the main sources of nutritional knowledge of residents in three urban communities of varying socio-economic make-up.

Design: An ethnographic approach to primary qualitative data collection, involving frequent visits to study areas over 4 months and in-depth interviews. Interviews were recorded, transcribed verbatim and analysed through an iterative approach.

Setting: Yogyakarta, Indonesia.

Participants: A purposive sample of 45 participants divided equally among the 3 communities. Participants were mostly female (93%), aged between 27 and 75 years (mean 47.7) and largely identified as the person responsible for household food-related decisions (93%).

Results: Three overarching themes emerged: (i) dietary health understandings; (ii) healthy foods access perceptions and (iii) sources of nutritional knowledge. Participants employed multifaceted conceptualisation of dietary health. Most identified healthy foods with traditional plant-based foods, inexpensive and locally available from multiple sources. Thus, all participants perceived healthy foods as highly available in the local environment and most (80%) as affordable. Reported affordability issues referred to specific foods (particularly animal source products) and were independent of income levels. Participants acquired nutritional knowledge from multiple sources, including many community-based initiatives. These were overall perceived as useful, but also as presenting some limitations.

Conclusions: The variety in dietary health understandings reported by study participants, and their high perceptions of healthy foods availability in the local environment reinforce the idea that individual- and food environment-level determinants of nutritional behaviours are highly contextual.

Keywords
Nutrition
Health
Food environment
Qualitative
Indonesia

Unhealthy diets are a recognised major risk factor for several non-communicable diseases (NCD), including heart disease, stroke, diabetes and certain types of cancer^(1,2). Low- and middle-income countries (LMIC) are experiencing a rapid shift towards increased NCD burden⁽³⁾. By some estimates, LMIC now account for four out of five deaths from nutrition-related NCD⁽⁴⁾. Shifts towards unhealthy dietary patterns in LMIC have been linked with several structural drivers. These include growing availability of fast food outlets and ultra-processed foods (UPF), rising

incomes and decreased time available to prepare meals at home, which increases reliance on UPF^(4–7) and in turn heightens NCD risk^(6,8,9). Urban areas are generally thought to experience these shifts first, and the rising numbers of urban dwellers in LMIC are thus thought particularly under threat^(5–7,9–11).

Alongside structural drivers, there is general agreement that individual-level determinants should also be considered when trying to elucidate nutritional behaviours within populations^(5,12–14). These determinants are highly

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contextual and culturally varying^(15–19). They include differing attitudes towards food and eating in general^(20,21) and towards specific products such as UPF and fast foods⁽²¹⁾. Perceptions of what constitutes a healthy diet have also been found to differ, for example, due to the influence of popular dietary trends, the media, family and friends, and expert nutritional advice⁽²²⁾. Traditional food cultures are also a key influence on individual nutritional behaviours. For example, preference for traditional cuisines has often been found resilient to socio-economic change^(23,24) and increasingly coexists with that for 'new' foods made available by rapidly globalising food systems^(25,26). The social and symbolic meaning attributed to particular foods and eating occasions can also vary greatly across food cultures^(27,28).

The important role that individual-level determinants play in driving nutritional behaviours is widely acknowledged^(2,5). Yet, existing literature focused on food environments of LMIC has generally emphasised quantitative studies of structural drivers over qualitative investigations of individual-level determinants. For instance, a recent article reviewing existing studies on food environments in LMIC highlights an increased attention to the topic in recent years, discussing 70 studies from 22 countries published between 2009 and 2017⁽²⁹⁾. However, Southeast Asia is overall underrepresented in this body of literature, with only one study each from Indonesia, Malaysia, the Philippines, Thailand and Vietnam. Moreover, the majority of the articles reviewed approach the issue quantitatively. Only 25 (35 %) employ qualitative or mixed methods. Of these, only five focus on community-level drivers (in El Salvador, Mexico, Samoa and South Africa). This suggests that further qualitative investigations targeting food environments of understudied regions – such as Southeast Asia – are timely and necessary.

This article contributes to filling this gap with the case study of an Indonesian city. More specifically, this study investigates dietary health perceptions of residents in three urban communities of different socio-economic make-up, to test the hypothesis that contextual sociocultural factors will be a key influence on these. The study also evaluates the extent to which foods that are considered healthy are perceived as accessible, to understand how local food environments have responded to increased infiltration from modern food retailers and UPF. Additionally, considering that nutritional knowledge has been found to influence individual perceptions of dietary health⁽²²⁾, the study examines the main sources of nutritional information available to local residents.

Country background

As many other LMIC, Indonesia has recorded remarkable growth on several socio-economic indicators over the past decades, including urbanisation⁽³⁰⁾. Concurrently, the country has experienced a rising burden of NCD.

According to Global Burden of Disease data⁽³¹⁾, from 1990 to 2017, the estimated share of deaths over total attributed to NCD in Indonesia has risen from 48 % to 75 % (the second highest share in Southeast Asia after Vietnam at 79 %). CVD and diabetes – both conditions for which diet plays a key moderating role – are responsible for 35 % and 6 % of these respectively⁽³²⁾. Similarly, over the same time period, the share of deaths attributed to dietary risk factors in the country has increased from 15 % to 24 %⁽³¹⁾ – the highest share (together with Malaysia's) in the region. At the same time, Indonesia represents a particularly interesting case to study the links between urban living and nutritional behaviours in LMIC. Major investments in healthcare over the past few decades⁽³³⁾ have improved the quantity and quality of information on health and nutrition available to the local population. Concurrently, Indonesia presents a strong retention of preference for traditional diets^(34–38), and a large variety in local food cultures, reflecting the wide sociocultural diversity of the archipelago nation⁽³⁹⁾.

Yet, qualitative literature studying dietary perceptions and nutritional knowledge in Indonesia is limited⁽⁴⁰⁾. Existing studies have generally focused on specific groups, interventions and health outcomes. Some have assessed the impact of nutrition education interventions among caregivers of children with stunting^(41,42). Other studies have focused on primary carers' understandings of childhood overweight⁽⁴⁰⁾, on their food choices⁽⁴³⁾, and on their perceived ability to provide food for the family⁽⁴⁴⁾. Further research has sought to investigate consumers' understanding of health claims reported on specific products⁽⁴⁵⁾, their knowledge and attitudes towards UPF consumption^(46,47), and the nutritional behaviours of specific groups, such as urban adolescents^(48,49) and pregnant women⁽⁵⁰⁾. Qualitative studies are also available that describe the dietary habits of particular ethnic groups, for instance, the Minangkabau in Sumatra^(35,36) and the Sasak in Lombok⁽³⁸⁾. To date, no study exists that explicitly seeks to understand how Indonesian urbanites conceptualise dietary health. A better understanding of how individuals conceptualise the link between diet and health can facilitate the design of public health interventions that build on pre-existing perceptions and are thus more likely to succeed in improving nutritional health⁽⁵¹⁾.

Methods

Study areas background

The study took place in Yogyakarta city. While not among Indonesia's biggest cities at 417 000 residents (as of 2016)⁽⁵²⁾, Yogyakarta is a major cultural centre within the country. This is reflected in the fact that it attracts people from throughout the archipelago, for instance, youth studying in the city's many educational institutes; and in the fact that it still retains a strong sense of identity and many of its traditions, including food-related ones. These features



make Yogyakarta a valuable location to study how nutritional behaviours of urban residents can develop between local traditions and increased exposure to food systems modernisation and socio-economic change.

The study focused on three urban communities, henceforth named after their respective administrative district: Cokrodiningratan, Sagan and Terban. The three communities are located at short distance one from the other. Cokrodiningratan and Terban are in the vicinity of river Code, which cuts through Yogyakarta. Historically, the banks of the river have hosted many squatter settlements inhabited by migrants coming to the city from the surrounding rural regions. Slum-upgrading programmes initiated in the 1980s have significantly improved the local infrastructure⁽⁵³⁾. This has resulted in a heterogenous mix in both the socio-economic make-up of the area and in its physical features, with brick and mortar housing frequently coexisting with more precarious dwellings. The third study location, Sagan, is located farther away from the river. The area presents the physical features of a more urbanised and densely populated settlement and is generally home to a more affluent population.

Sampling and recruitment strategy

Information was collected by the principal researcher and two research assistants from a purposive sample of 45 participants, divided equally across the three study areas. Sample size was determined a priori, based on the funding available for the study and the priority given to depth over quantity of data collected⁽⁵⁴⁾. It was confirmed to be appropriate as the study progressed, as data saturation from interviews was reached. Participant selection focused on recruiting the person in charge for food-related decisions in the household. Selection was guided first by informal inquiries with local community leaders in the three areas. Subsequently, it followed a 'snowballing' approach⁽⁵⁴⁾ with participants suggesting additional possible interviewees. The decision to combine purposive sampling based on a predetermined characteristic (namely to be the 'gate-keeper' to food-related decisions in the household) and snowball sampling was deemed appropriate considering the study objective – the in-depth investigation of a cultural phenomenon – and the characteristics of the study locations – three close-knit communities whose residents showed strong relationships one with the other⁽⁵⁴⁾.

Data collection and analysis

The value of ethnography in nutrition and health research has been widely recognised, particularly when studying culturally varying and hardly quantifiable phenomena, as is the case with dietary health perceptions^(55,56). Based on this realisation, data collection followed an ethnographic approach on two levels. First, it proceeded through multiple visits to the communities (three times a week on average) over an extended period of time (4 months).

This strategy enhanced the quality and validity of data collected. It helped dissipate initial curiosity connected with the presence of the research team in the communities, thus reducing the issue of *reactivity* (participants changing their behaviour when aware they are being studied) and ensured sustained engagement on the part of the interviewers⁽⁵⁴⁾. Between one and three individual face-to-face interviews were carried out during each visit. While interviews were the main source of data, repeated visits to the study areas also allowed for informal interactions with participants and key informants (such as local community leaders). These interactions served to ask follow-up questions, clarify emerging observations from data collected, and gather additional information on the study areas. Second, data collection combined information from interviews with observations gathered during transect walks. Walking as a means of collecting data has been recognised as particularly valuable in urban settings, where it can help capture everyday practices that are central to the daily life of urban dwellers^(57,58). Transect walks were conducted in the study areas prior to the start of the interviews. They served to perform a (non-exhaustive) mapping of local food outlets, including informal ones that are generally not captured by available maps. Food outlet maps were then used during interviews to contextualise and interpret responses from participants, particularly regarding their perceived access to healthy foods in the local environment.

Interviews lasting between 35 min and 1.5 h were carried out in Indonesian, recorded, transcribed verbatim and then translated to English for analysis. All participants provided written consent to the collection and dissemination of data gathered. The study received ethical clearance from the Research Ethics Office, King's College London (Research Ethics Number: MR/17/18-244). Participants were asked to discuss their understanding of dietary health, their perceived ease of accessing healthy foods, in both physical and economic terms, and their main sources of nutritional information.

Data analysis followed the iterative procedure described by Tracy⁽⁵⁹⁾. Rather than 'grounding' meaning only in the data emerging from interviews, an iterative approach to data analysis combines derivation of meaning from the information collected (emic perspective) with reflexive and purposeful use of theories, models and explanations from existing literature (etic perspective)⁽⁵⁹⁾. The alternation between emic and etic readings encourages a reflexive process, in which the original research objectives are progressively fine-tuned as new evidence from data emerges^(54,59). During a primary-cycle coding phase, interview transcripts were read multiple times. Descriptive codes were identified to group data in broad categories that were meaningful for the theoretical background of the study. The theoretical background draws on general frameworks of nutritional health and dietary change that outline the interconnectedness between distal and proximal determinants^(1,2,5,6,60,61). These frameworks were

Table 1 Descriptive statistics of the study sample (*n* 45) and breakdown by study location

	Total	%	Cokrodiningratan	%	Sagan	%	Terban	%
Female	43	93	14	93	14	93	14	93
Age (average)	47.7		49.8		45.2		48.2	
Ethnic Javanese	43	93	14	93	13	87	15	100
Muslim	40	89	15	100	11	73	14	93
Household size (average)	4.7		4.5		5.4		4.2	
Responsible for household food decisions	43	93	14	93	14	93	14	93
Originally from Yogyakarta	23	47	5	33	9	60	9	60
Migrated from rural area (of those not originally from Yogyakarta)	18	75	10	100	3	50	5	83
Employed	32	71	13	87	10	67	9	60
Monthly income, IDR 1 mil. (GBP equivalent)								
0–0.5 (£0–28)	6	13	3	20	0	0	3	20
0.5–1 (£28–55)	14	31	4	27	4	27	6	40
1–1.5 (£55–82)	8	18	3	20	2	13	3	20
1.5–2 (£82–110)	6	13	2	13	3	20	1	7
> 2 (> £110)	11	24	3	20	6	40	2	13
Education								
No formal education	3	7	2	13	0	0	1	7
Primary school	5	11	3	20	0	0	2	13
Middle school	8	18	1	7	2	13	5	33
High school	20	44	8	53	5	33	7	47
University	9	20	1	7	8	53	0	0

contextualised based on existing literature on urban food environments^(14,15,29,62–67), to account for determinants specific to urban settings and on sociocultural drivers of nutritional behaviours^(12,22,27). In this phase, initial broad-brush codes were refined as the analysis progressed to accommodate new meaning as it emerged from the data. In a subsequent phase of second-cycle coding, data were interpreted and categorised into more nuanced analytical groupings. NVivo 12 (QSR International Pty Ltd) was used to facilitate data analysis.

Results

Table 1 provides a summary overview of the study sample. Most participants were female (93%) and identified as the person in charge for food-related decisions in the household. Some variation was observed in terms of socio-economic make-up across the three areas. Income levels were skewed towards the lower and higher end of the spectrum in Terban and Sagan, respectively, and more evenly distributed in Cokrodiningratan. Educational levels were overall highest in Sagan, with over half of the participants reporting completion of tertiary education.

As is generally the case in Indonesia⁽⁶⁸⁾ and in many LMIC^(15,69,70), the local food environments were highly diverse. A wide variety of traditional food retailers (both formal and informal) and modern ones was available at short walking distance to residents of all three areas. Among, traditional retailers were *warung* (open-air or indoor small shops, offering raw ingredients and/or cooked foods), wet markets, mobile food vendors and *angkringan* (semi-mobile carts, typical of Yogyakarta, serving beverages and small snacks). Modern retailers

included supermarkets and convenience stores, international and local fast food chains, restaurants, and cafes. Figure 1 presents a non-exhaustive mapping of food outlet types in the study areas.

Understandings of health in relation to food

Six main conceptualisations of dietary health emerged from the interviews: *nutritional discourse*; *non-nutritional qualities*; *ingredients and cooking methods*; *food safety*; *holistic view*; and *relativistic view*. Many participants used multiple conceptualisations at once when discussing their understanding of healthy diets.

Some participants defined foods as healthy based on specific nutrients or food groups. Many participants in this group started off by citing the slogan '*empat sehat, lima sempurna*' ('four are healthy, five are perfect'). The slogan dates back to a 1950s government nutritional awareness campaign that encouraged consumption of foods across five categories, namely carbohydrates, proteins, vegetables, fruits and milk. Other participants mentioned more explicitly the need to acquire certain macro-nutrients (carbohydrates and proteins) or micro-nutrients, referring generically to vitamins or to more specific compounds such as calcium and iron. A few participants identified healthy foods with those that 'do not have many calories'.

A second group of participants defined foods as healthy based on qualities that went beyond their nutritional value. Healthy foods were most frequently identified with 'natural', fresh, organic and home-cooked foods. A quote from one participant exemplifies this conceptualisation well:

Healthy food is food that we cook ourselves. I mean, we know the composition and what we add there,



Fig. 1 (colour online) Location of Java within Indonesia (a) of Yogyakarta within Java (b) and mapping of food outlets in the three study areas: Cokrodiningratan (1), Terban (2) and Sagan (3)

we can choose if we want to use either organic or ordinary vegetables... And for the rice too, we can choose either the organic or the ordinary one. It's our own process. (Female, 29, high-income (5), Sagan)

A third group of participants referred to the use or avoidance of certain ingredients or cooking methods to define healthy foods. According to this discourse, healthy foods are those that do not contain preservatives and are prepared from scratch, as opposed to 'instant' and 'fast' foods:

There are lots of options, but most of them are instant food. There's baby food in packs now, right? It's not good. How can carrots, or spinach, or mustard greens stay in a pack for months? (Female, 54, low-income (1), Cokrodiningratan)

[Healthy foods] are not like those foods that you buy and eat right away, or after only short preparation time. What are those called... fast foods? (Female, 39, high-income (5), Cokrodiningratan)

Other participants referred instead to healthy foods as those not containing artificial flavourings and those prepared according to specific cooking methods, such as steaming, boiling, roasting and stir-frying. Some participants mentioned deep frying as a negative example,

although also noting its popularity as a cooking method in the area.

A fourth group of participants emphasised food safety as the key defining feature of food healthiness. Food safety concerns related to adulteration and contamination issues, and to the cleanliness of cooking facilities and food outlets:

It depends on the place. If the food is healthy but the place is dirty, well it's not healthy then. (Female, 27, low-income (2), Terban)

Everyone [in the family] likes chicken. But we know it's not good to eat too much of it [...] chickens are given medicines now. (Female, 46, high-income (4), Sagan)

A fifth group of participants defined healthy foods based on a holistic discourse of balance and interconnected physical and mental well-being:

All food is healthy, we just need to balance it well. (Female, 68, low-income (1), Terban)

Finally, a sixth group of participants defined healthy foods through a relativistic view. According to this conceptualisation, 'healthy food' is not a static concept: it evolves across different stages of life and thus varies across different



population groups. Participants in this group differentiated in particular between food that is healthy for children *v.* adults, and for younger *v.* older people. One participant highlighted how the concept of healthy food can also vary spatially and culturally, citing specifically the heterogeneity existing between ethnic groups in Indonesia:

[The concept of healthy food] is relative. Healthy food is different in different places (...) Because our country has lots of different ethnic groups, customs, and traditions. For example, people in Kalimantan think that eating horse meat is healthy; but it's not necessarily considered healthy here, right? (Male, 58, low-income (2), Sagan)

Healthy foods: examples, availability and ease of access

When prompted to give an example of a healthy food or meal, most participants mentioned products common in the local culinary tradition. Fruits and vegetables were the food groups most often identified as healthy. A healthy meal was generally described as containing rice, vegetables, fruits and a 'side dish' (*lauk*). In the local culinary tradition, this refers to a wide range of small dishes that accompany a serving of rice, containing for example chicken, fish or soy-derived products such as tempeh and tofu. As a result, all participants across the three study areas felt that healthy foods were highly available in the city, at the local market or from door-to-door vendors and roadside stalls:

Yes it's easy to get healthy foods here ... it's not like I have to go to special places to get what I want to eat. (Female, 43, low-income (2), Sagan)

Yes, it's easy [healthy foods] are all available at Kranggan [local wet market]. (Female, 54, low-income (1), Sagan)

While some participants mentioned some degree of price fluctuation, for example, depending on seasonality, foods described as healthy (and particularly local vegetables, fruits and other plant source foods) were perceived by most as affordable:

Yes, I think it's easy [to consume healthy food]. It's easy, cheap, you can find it in the *warung* around here. It doesn't have to be expensive to be healthy, you know? (Female, 48, middle-income (3), Terban).

Yes, it's easy, you can easily get [healthy foods] at the market, even in the small *warung* ... there are many people who sell them. And the prices are cheap. (Female, 32, low-income (2), Cokrodiningratan)

Nevertheless, some participants – roughly 20% of the sample – mentioned economic difficulties in consuming more frequently some foods they perceived as healthy. This concerned specifically animal source products.

Issues of affordability were reported regardless of income levels:

I think for good nutrition we should eat vegetables, a side dish and fruits. But sometimes we can only afford either the side dish or the vegetables. (Female, 27, low-income (2), Terban)

[Healthy foods] should include fruits and milk also. But I don't always have enough money for it. Maybe for fruits, but I cannot afford milk. (Female, 66, high-income (4), Cokrodiningratan)

Only two participants – both in the highest income category – identified healthy foods with a specific fruit (avocado) rather than with plant source foods more generally, with products that are not local (e.g. olive oil) or have premium characteristics (e.g. certified organic). Both participants thus perceived that, at times, maintaining a healthy diet could be expensive:

It's easy to consume [healthy foods] but sometimes it can be more expensive to maintain this lifestyle. For example, I replace vegetable oil with olive oil, and buy organic eggs, so that's more expensive. (Female, 37, high-income (5), Sagan)

[Eating healthy foods] is kind of expensive to be honest. For example, you could say avocado is a healthy food, but it's like 30 or 50 thousand [Indonesian rupiah] per kilo, and that only gets you few avocados. That can be expensive, especially if you compare it with other plant foods. (Female, 35, high-income (5), Sagan)

Sources of nutrition information

Participants reported several different sources through which they acquire information on nutrition and healthy eating. The most frequently cited sources were *puskemas* (primary healthcare centre) and *posyandu* (integrated health service post), community initiatives managed by the local district administration. Such initiatives were those that took place more regularly. However, due to their mandate, they would generally focus on a broad range of basic health issues (e.g. blood pressure monitoring for older people, or weight and height measurement for babies) rather than on nutrition specifically. Only one participant recalled attending a meeting organised by the local *posbindu* (integrated village NCD prevention post), a health programme seeking to facilitate early detection and prevention of NCD and risk factors for these, including diet-related ones⁽⁷¹⁾. Many participants reported receiving nutritional advice at events organised by students from local universities, as part of their community service duties. Other reported sources of nutritional information were health professionals (doctors and hospital staff), the media (TV, internet, magazines and newspapers), friends, neighbours and others in the community. Many participants relied on multiple sources



of information at once, as exemplified by the following quote:

I usually get information [on nutrition] from the local group for older people. We have a monthly meeting here in the community, the doctor comes to give information, takes measurement and gives us some healthy foods. (...) I find the rest of the information I need on the internet, through my phone. I can ask anything there! (Female, 56, high-income (4), Cokrodiningratan)

Overall, participants perceived information received through these sources as useful, but also identified several issues. For example, nutrition-specific initiatives were often organised as one-off events, or more regularly but over a short time period:

Yes, the information is useful, I have learnt many things that I didn't know before. But I'd need more, one meeting per month is not enough. (Female, 50, middle-income (3), Cokrodiningratan)

Other issues related to the learning materials and methods employed during the events. Some participants felt that materials did not cover topics perceived as important were too generic or repetitive. Others reported that learning methods were ineffective, for example, with organisers distributing leaflets or taking measurements without providing explanations or discussing the results:

The meetings [from local university extension] took only place once, maybe twice. (...) I got confused when they explained things though! They should have started with 'what is healthy food', but instead they presented many different things at once, so it got confusing. (Female, 47, middle-income (3), Sagan)

Finally, some participants reported that they felt excluded by particular events that were not open to the whole community, or that only focused on specific groups:

No, there is no specific nutrition training that I attend now. I used to attend the one from puskesmas as it was about nutrition for toddlers, but now it's not relevant anymore, they don't talk about food and nutrition for the family. Even community service events are generally for babies or older people. (Female, 35, high-income (5), Sagan)

When asked whether information received did in fact influence their everyday food choices, some participants reported that trainings resulted in new knowledge, which they could apply easily and effectively in their daily life. Reported examples include moderating portion sizes, avoiding or selecting specific foods based on their health properties, and changing cooking methods:

Yes [the information] was really helpful, we try to put it in practice when deciding what foods to buy. For example, they told me: 'if you have digestive problems, try to eat more papaya'. I did that, and it

worked for me. (Female, 64, low-income (1), Cokrodiningratan)

I was told that we cannot eat noodles with rice, because it's too much carbohydrates, it leads to obesity. So, I still cook noodles as a side dish, but not as much as before, I reduce the portions. (Female, 36, middle-income (3), Terban)

However, many participants reported that, while information from the events they attended was useful, they were not always able to put it in practice. This was due to financial reasons, or to preference for certain foods, which they would consume regardless of the potential health effects:

Yes [the information] is useful to expand our knowledge on nutrition. But I put in practice only some of it, not all. (...) For example, they tell you: 'to eat healthy you have to eat a lot of meat'. But meat is expensive, you know. (Female, 32, low-income (2), Cokrodiningratan)

I do use some of the information when deciding what to eat. I put in practice only what I can (...) in part it's because of financial reasons; but also, sometimes there are foods that are 'prohibited' that I feel like eating, and I eat them anyway! (Female, 66, high-income (4), Cokrodiningratan)

Discussion

This study is the first to date to investigate dietary health understandings and healthy food access perceptions in an Indonesian urban food environment. Contrary to observations from urban food environments of other LMIC, where food safety concerns were the key defining feature of healthy foods^(19,51), participants reported multiple conceptualisations of dietary health and showed a good level of nutritional knowledge. This was observed regardless of socio-economic status, unlike what reported in other instances^(19,40,72). Findings align with observations from multi-country studies on healthy eating perceptions in high-income countries and LMIC^(12,22), reinforcing the idea that 'dietary health' is a highly nuanced term in how it is interpreted.

Many participants referred to the '*empat sebat, lima sempurna*' slogan when prompted to define dietary health. The advice derives from Indonesian government guidelines drafted in the 1950s. These associated healthy diets with the consumption of foods across five groups – carbohydrates, proteins, vegetables, fruits and milk – without however giving any indication as to recommended quantities for each. The emphasis on diversity over quantity of foods consumed is likely due to the nutritional priorities of the time, focused on addressing undernutrition. The concept has been updated with the launch, in 1995, of a new set of guidelines, entitled '*Pedoman Umum Gizi Seimbang*'



(PUGS), or 'Balanced Nutrition Guidelines'⁽⁷³⁾. Unlike the preceding guidelines, the PUGS emphasise the importance of balancing quantities between different food groups and the relevance of non-dietary factors (e.g. physical activity) for individual health. Many participants identified healthy nutritional behaviours in line with advice from the PUGS – for example, eating a varied diet, accompanying starches with vegetables and fruits and with small amounts of animal or plant proteins, drinking water frequently, and limiting the intake of oils, sugar and salt⁽⁷³⁾. However, none of them cited the PUGS guidelines as a source of information. In their study of child overweight perceptions in Indonesia, Rachmi and colleagues⁽⁷⁴⁾ similarly observed frequent reference to the outdated guidelines, but not to the PUGS.

Participants identified healthy foods with everyday foods that form integral part of the local culinary tradition, including vegetables, fruits, tofu and tempeh. Such foods were reported by all as locally available from multiple sources, and thus as easily accessible in physical terms. This observation contrasts with perceptions of low healthy foods availability often reported in studies focused on 'food deserts' – underprivileged urban areas with little or no access to healthy food options⁽⁶²⁾ – in high-income countries^(67,75). Findings feed into a growing body of evidence showing that the concept of food desert – which originated in the context of anglophone high-income countries – may not apply directly or universally to cities of LMIC^(15,18,63,64).

While some have observed the existence of food deserts in urban areas of certain LMIC^(70,76,77), findings from this study suggest instead a concurrent high availability of both UPF and healthy foods in the urban food environment of Yogyakarta. This resembles more closely what has been termed a 'food swamp'⁽⁷⁸⁾ – as described for example by Bridle-Fitzpatrick in her study from urban Mexico⁽⁷⁹⁾. More generally, these observations suggest that the link between urban food environments and nutritional behaviours is highly contextual rather than universal⁽³⁴⁾. For example, there is some evidence that smaller urban centres often retain stronger links with their rural surroundings, which has in turn important implications in terms of (healthy) food availability and accessibility⁽⁸⁰⁾.

With regard to economic access, healthy foods were perceived as affordable by most participants – but not by all. Reported issues of affordability related mostly to specific products, particularly meat and milk, and were reported regardless of income levels. This contrasts to what observed by others in Indonesia – for example by Rachmi and colleagues⁽⁴³⁾, who report money issues as a key driver of food choice in low-income families, but not in high-income ones. One possible explanation for this observation relates to the characteristics of the study location. Informal conversations with participants that had moved to Yogyakarta from other parts of Indonesia revealed that the local cost of living was perceived as comparatively

much lower. With regard to food, this was partly because a wider variety of products is produced within the city or its immediate surroundings. Conversely, participants noted that in other locations there is a greater reliance on food imports, which results in added costs from transportation. This might in part explain the heightened perception of animal source foods prices as much higher, in relative terms, compared to plant source options.

Additionally, two participants identified healthy foods with a specific plant product (avocado), with non-local items (e.g. olive oil) or with items with specific premium characteristics (certified organic). Interestingly, the two participants shared a combination of characteristics that was otherwise rare in the sample: they were both university graduates in the highest income category and had spent significant periods of time living outside of Yogyakarta, one in Europe and the other in Indonesia's megacity capital, Jakarta. This reinforces the working hypothesis of this study, that exposure to different food environments, and to the differing sociocultural influences that underpin them, can reflect in differing perceptions of what constitutes a healthy food.

Participants acquired nutritional knowledge from multiple sources and reinterpreted it based on their personal, internalised understandings of (nutritional) health^(12,22). Overall, participants reported mixed views on the usefulness of local health programmes. A key limitation was the lack of focus on nutritional advice beyond specific at-risk groups, such as children and older people. Dietary risk factors for NCD such as overweight and obesity have only relatively recently started to garner attention in Indonesia and, although substantial progress has been made over the past decades, the country is still burdened by undernutrition and related health implications^(32,81,82). As a result, nutritional advice from government policies and interventions, including the nationwide community-based programmes attended by participants, has traditionally focused largely on undernutrition⁽⁷⁴⁾. This may partly explain the reported lack of attention, within such initiatives, to encouraging dietary behaviours that can help prevent NCD.

Based on findings from this study, a key policy recommendation is to further disseminate advice from the PUGS nutritional guidelines, which take a holistic approach to healthy diets and lifestyles. The decentralised governance approach in Indonesia, which delegates primary healthcare decision-making to city and district administrations⁽³³⁾, together with the many ongoing community-based initiatives, represent an excellent opportunity to do so. For example, the contents of community events organised by puskesmas and local universities could be revised, to include more explicitly dietary advice aimed at NCD risk prevention. In addition, such initiatives should expand their focus beyond specific at-risk groups (e.g. older people and young mothers), to guide the management of everyday nutritional needs of the whole



household. Further research into dietary health perceptions and nutritional behaviours of specific age and sex groups can help identify specific entry points for these interventions.

Limitations

A key limitation of this study is the purposive nature of the sample. While appropriate to elicit in-depth discussion, this approach does not allow to generalise results beyond the study sample. Similarly, the study focuses on three particular food environments in a specific city and is thus not representative of all the food environments existing in Indonesia. Finally, the sample studied included mostly ethnic Javanese adult female participants. As nutritional behaviours can vary substantially by age, sex and ethnic group, focusing specifically on younger or older people, on male participants, or on participants of other ethnicities might have yielded different results.

Conclusions

The variety in dietary health perceptions reported by study participants, and their identification of healthy foods with locally available, inexpensive plant source products suggest that individual- and food environment-level determinants of nutritional behaviours are highly contextual. Findings highlight the importance of in-depth qualitative research in elucidating how drivers of nutritional behaviours vary by geographical and sociocultural settings and thus underscore the need to gather further evidence from (urban) food environments across Indonesia and other LMIC. By expanding the evidence base on the determinants of nutritional behaviours in LMIC, such evidence can also inform the (re)design of public health nutrition interventions that can more effectively help tackle the rising burden of diet-related NCD.

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