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Letter

Indicators of a health-promoting local food environment: a conceptual framework to inform urban planning policy and practice

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Global obesity prevalence has risen dramatically over the past 30 years in both adults and children.[1] This presents a major public health challenge because of its contribution to chronic disease and inequities in the distribution of obesity within populations.[1]

Obesity arises from the energy imbalance associated with dietary intake, physical activity and sedentary behaviours.[1] Built-environment attributes (land use, density, transport) appear to influence these behaviours.[2] While associations between built-environment attributes and physical activity are well established,[2] the relationship between the built environment and dietary behaviour is less well understood and evidence is inconsistent.[3]

Local food environments

A model developed by Glanz and colleagues[4] widely used to understand the food environment depicts the policy, environment and individual factors that influence dietary behaviour. It recognises the importance of the: 'community food environment' (type, location and accessibility of food outlets); 'organisational food environment' (food availability around workplace, home and school); and 'consumer food environment' (affordability, promotion and placement of food within the outlet).[4] Glanz's model has advanced our understanding of how food environments appear to influence dietary intake, but for this to inform the development of urban planning policy, spatial indicators to measure and monitor food environments are required. Local food environments (LFE) are small geographic areas where people shop for food within a walkable or short driving distance in urban areas.[5] We need to know which LFE spatial measures are most useful for assessing dietary and health outcomes in local areas, the most appropriate geographical scale to apply these measures, and how they can inform urban planning policy and practice.

The density of and proximity to food outlets[3] in a neighbourhood or around a household are examples of spatial measures commonly used to assess LFE. However, for these measures to be translated into policy and practice, more specific information is required to inform optimal outlet density or proximity. For example, evidence-informed spatial metrics (how many food outlets, how close to households) could assist local governments seeking to increase fresh food access in a local area through urban planning policy. Evidence suggests access to supermarkets may support dietary health[3] and access to fast-food outlets may be associated with obesity.[6] A recent study[7] found geographical scale to be an important factor in the association between these types of food outlets and obesity. For example, participants who lived within 1 km of a fast-food restaurant were more likely to be obese. However, a larger geographic scale (participant's postcode) was required to detect a protective effect of supermarkets on obesity. The study concluded that it is likely that people travel longer distances by car to the supermarket to purchase groceries. Therefore, optimal spatial

measures will vary depending on the food outlet type and travel mode used to access it (walking, cycling, car).

A conceptual framework to inform urban planning policy and practice

Evidence-based LFE indicators for the specific purpose of informing urban planning policy and practice in local areas have potential for identifying dietary and health inequities. Accordingly, we have devised a new conceptual framework (Fig. 1) that shows the hypothesised pathways through which built-environment attributes of the LFE may influence immediate behavioural outcomes (dietary intake, physical activity, sedentary behaviour) through to intermediate and long-term health outcomes. Upstream urban planning policies (towards the left of Fig. 1) provide the policy context that influences neighbourhood attributes associated with downstream behavioural and health outcomes.

Development of conceptual framework

A review of the literature was undertaken to first, develop the conceptual framework; and second, identify potential LFE spatial measures associated with dietary intake and weight. Well-established associations in the literature guided the development of the conceptual framework, which was then refined through an iterative process by the multi-disciplinary study team. To identify potential spatial measures, the electronic databases Medline, Embase, Web of Science and Scopus were searched for adult studies in English-language literature to the end-2014, using combinations of the terms 'local food environment', 'neighbo*hood food environment', 'indicators', 'index' or 'indices'. After removing duplicates, and studies with 'child*' in the title, 177 papers were reviewed. Previous reviews and their references were searched, as were Victorian planning documents to identify spatial measures currently applied in policy.[†] Criteria for selecting the measures were that they: mapped to the conceptual framework; could be spatially applied at the neighbourhood level; and came from

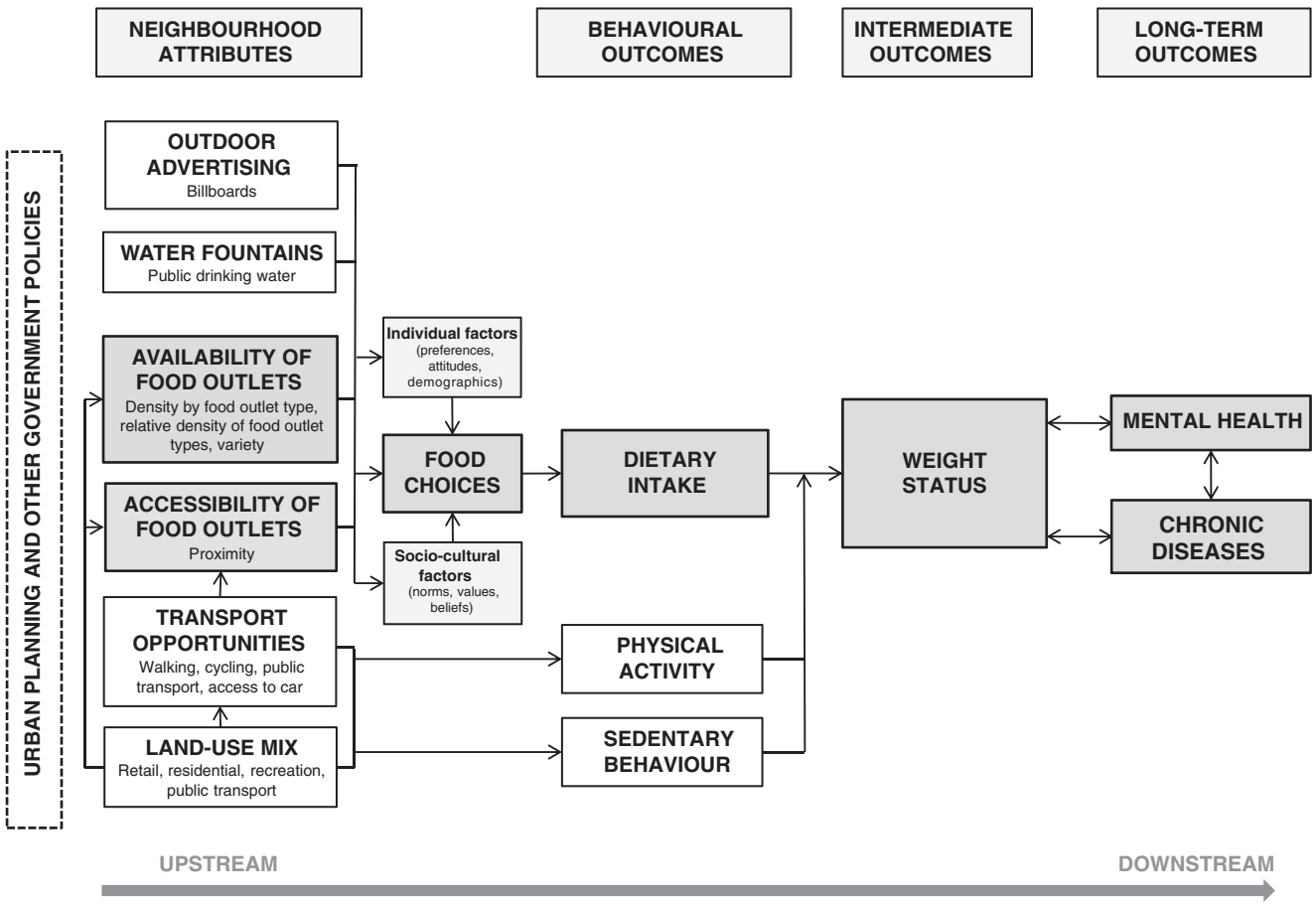

Fig. 1. A conceptual framework of the local food environment and health to inform urban planning policy and practice. Shaded boxes depict the hypothesised pathway from neighbourhood attributes of the local food environment though to long-term health outcomes.

[†]A list of academic and urban planning policy documents reviewed is available from the authors.

urban studies in high-income countries. Potential measures were assessed against each criterion. Studies focused on 'in-store' food environment indicators and regional/national-level indicators were excluded.

Neighbourhood-level attributes influencing dietary intake include food outlet availability (density, relative density, variety) and accessibility (proximity).[3] Other attributes (Fig. 1) such as land-use mix affect the availability and accessibility of food outlets;[2] and 'transport opportunities' influences how people travel to food outlets.[5] These attributes also influence physical activity and sedentary behaviours.[2] Individual factors (food preference, attitudes, demographics) and socio-cultural factors (norms, beliefs, values) are intermediary variables influencing food choice.[1,4] Together, dietary intake, physical activity and sedentary behaviour impact weight status, contributing to chronic disease and mental health conditions and vice versa,[1] downstream (towards the right) of the conceptual framework.

Spatial measures

Four LFE spatial measures showing significant associations with dietary intake, food purchasing or obesity risk were identified in the literature that met our criteria: density of supermarkets (associated with healthy diet);[6,8] density of fast-food outlets (associated with obesity);[7] relative density of supermarket to fast-food outlets (healthy food purchasing);[9] and proximity to supermarkets (associated with healthy diet and weight).[6,8] Victorian planning policies only contained one LFE spatial measure: residential development guidelines recommend households are located within 1 km of a town centre to allow for provision of a supermarket.[10] This paucity of spatial measures in Victorian planning policy underlines the importance of developing LFE indicators for urban planning policy and practice.

The conceptual framework and measures were developed in Victoria, Australia. Melbourne is Australia's fastest growing capital city[11] and faces challenges in common with other rapidly urbanising cities in high-income countries.

Next steps

In order to develop a set of LFE indicators to inform urban planning policy and practice, the spatial measures will be linked to existing health data and tested at appropriate geographical scales to examine associations with dietary behaviour and weight. Measures will be tested in Victoria and the most promising will be validated in other Australian cities using population health data. The findings will provide a set of validated LFE indicators to inform relevant Australian state and local government urban planning policy for improved dietary and health outcomes in local areas and to reduce inequities.

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