

Understanding the healthfulness of outlets providing lunch and dinner meals: a census of a rural food retail environment in Victoria, Australia

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Unhealthy diets, particularly those with an excessive intake of over-processed foods and low intake of fruits and vegetables,¹ have been acknowledged as a major driver of global increases in preventable non-communicable diseases (NCDs) over the twentieth century.² Rural populations experience higher rates of diabetes, cardiovascular diseases and preventable cancers³ and this disparity has been associated with poorer access to healthcare, geographical isolation, and differences in behavioural risk factors, particularly in high-income countries.³ In Australia, seven million people live outside metropolitan areas. According to the 2017–18 National Health Survey, rural-dwelling Australians were more likely to consume sugar-sweetened drinks daily (14%) than their counterparts in major cities (8%), while less than 10% of rural people met guidelines for vegetable intake.³ Modelling studies indicate that Australians meeting dietary guidelines would reduce cardiovascular disease mortality by as much as 50% in rural areas, and reduce inequities in rates between rural and metropolitan areas.⁴

The United States Centers for Disease Control and Prevention (CDC) define food environments as places where there is any physical presence of food that may affect a person's diet, including food availability, accessibility and the distribution of food stores and services.⁵ Food environment healthfulness has an influence on the prevalence of obesity

Abstract

Objective: To undertake a census of the healthfulness of food venues providing lunch or dinner meals in a rural Australian setting and compare healthfulness by remoteness, using two measurement tools.

Methods: A census of the rural local government area food venues was undertaken using two validated tools: the Healthfulness Rating Classification System (HRCS) and the Nutrition Environment Measures Survey (NEMS-R). Data were collected covering an area of 3,438 square kilometres in Victoria, Australia, with a population of >21,000. Healthfulness by remoteness was described and variability between tools was explored.

Results: Data were collected from all 95 eligible food venues. Both tools classified the food venues as relatively unhealthy. The mean HRCS score was -2.9 (unhealthy) and the mean NEMS-R score was 10.8 (SD 7.0; possible range -27 to 64). There were no significant differences in healthiness of venues by remoteness (as measured by the Modified Monash Model), although the outer-rural region had lower scores.

Conclusions: This census of a rural food retail environment showed low access to healthy menu options along with minimal provision of nutrition information and promotion of healthy food in food venues. This environment has the potential to affect the dietary intake of more than 21,000 rural-dwelling Australians and action to improve rural food environments is desperately needed.

Implications for public health: If unhealthful rural food environments are not addressed, inequalities in the diet-related disease burden for rural Australians will continue to persist. This study shows that interventions are needed for independent venues that could be targeted by researchers, local health promotion officers, community nutritionists or community education programs.

Key words: rural, food environment, assessment tools, retail, regional

and preventable disease, above and beyond individual knowledge, skills and willpower.⁶ The World Health Organization has identified improving the health of food environments to support healthy diet as a priority target worldwide, especially in disadvantaged rural communities.^{7,8} Evidence suggests that access to healthy food is low in non-metropolitan

areas in Australia⁸ and that dietary intake of fruit and vegetables is improved when access is higher.⁷ For example, Moayyed et al. found, across 10 regional Australian towns, that participants who lived in an area with a higher healthfulness rating (compared to the median score) were more likely to consume more fruit and vegetables.⁷

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Australians now spend more money on eating outside of the home than ever before.⁹ Eating food outside the home, in settings such as restaurants and cafés, has been found to be associated with higher rates of overweight and obesity, along with increased consumption of sugar and saturated fat.^{10,11} Bezerra et al. reviewed 27 studies, finding that more than 60% demonstrated a positive association between eating out and higher body weight, with the majority of studies showing equal effects for both genders.¹¹ One study noted an increase in BMI of around 0.20 kg/m² over three years in people who reported increasing their consumption of fast food outside the home.¹²

Despite increasing awareness of the influential role of food environments in the rising prevalence of overweight, obesity and NCDs, there are still many unknowns with regard to the best ways to measure and quantify the healthfulness of environments.¹³ Efforts to measure the healthfulness of food retail environments, particularly in rural areas, remain limited.¹³ Recent international¹⁴ and Australian¹⁵ systematic reviews highlighted a lack of consistency in approaches to measure healthfulness of food environments, limiting the ability to make comparisons between measures, synthesise evidence, or draw conclusions to support policy or practice interventions to address healthfulness of food environments. To date, there are no peer-reviewed Australian studies that compare food retail environment healthfulness by different levels of remoteness as defined by standardised classification systems.

This study aimed to undertake a census of the healthfulness of venues providing lunch or dinner meals (food venues) within a large rural local government area in Victoria and to compare the healthfulness of food venues in the medium-sized rural town and the outer rural region, using two measurement tools.

Methods

Ethics approval

Ethical approval for this study was received from the Deakin University Human Ethics Advisory Group (HEAG-H 73_2019).

Setting

The study examined all eligible food venues providing lunch or dinner meals (food venues) located within one Victorian Local Government Area (LGA). The selected LGA

had a population of more than 21,000 people and covered 3,438 km², with the largest town in the LGA situated approximately 81 km from the nearest regional city. In 2017, this LGA had an obesity rate of 28.4% (95%CI 22.4, 35.2), higher than the state average of 19.3% (95%CI 18.6, 20.0). The study region was classified as an outer regional area by the Australian Statistical Geography standard,¹⁶ which in turn includes two different levels of remoteness according to the Modified Monash Model (MMM).¹⁷

Measurement tools

Remoteness

The MMM classifies areas into seven different categories of remoteness, based on the Australian Statistical Geography Standard-Remoteness Areas, along with population and township sizes. The classification ranges from 'Major cities' (MM1) to 'Very Remote' (MM7). In the study region, there were two different levels of remoteness: a 'Medium Rural Town' (MM4) and 'Small Rural Towns' (MM5).¹⁷

Nutrition Environment Measures Survey – Restaurants (NEMS-R)

The NEMS-R assessment tool involves observing food availability and promotion within food stores providing lunch or dinner meals from the perspective of a regular consumer and reviewing the menu offerings and signage around the venue. The tool includes allocating items relating to healthy food availability, nutrition information and promotions with a score between -27 (less healthy) and +63 (more healthy).¹⁸ A children's menu, if available, is assessed separately to the main menu with a score between -6 and +24 (see Supplementary File 1). We used the NEMS-R protocol¹⁸ to classify and count the healthy options available on menus, along with consensus between the two researchers (who have dietetics, nutrition and health promotion expertise) undertaking the census. A total score was generated for each of the venues according to the NEMS-R protocol.¹⁸

Healthfulness Rating and Classification System

The Healthfulness Rating and Classification System (HRCS) was developed by Moayyed et al. It rates the healthfulness of food venue types (e.g. a bakery or café) frequently found in Australian neighbourhoods¹⁹ and was adapted from an earlier tool developed by Thornton et al.²⁰ Food venues are classified

based on a description of venue type and allocated a score on the healthfulness scale ranging from -10 (being least healthy) to 10 (most healthy).¹⁹ The scoring system was developed by using a Delphi consensus process with a sample of Australian public health and nutrition experts.¹⁹ Table 1 shows the categorisation of venues included in this study according to the HRCS.

Food venues

The municipal authority within the rural LGA provided a list of active food premises for the 2018-2019 financial year, which included the food venue name, type and address. The list was further validated via searching publicly available information online and ground-truthing. A total of 99 of the premises met the criteria for the NEMS-R tool.¹⁸ At the time of the census, four of the venues were closed, resulting in a complete sample of 95 venues.

The inclusion and exclusion criteria for this study (food venues) were guided by the NEMS-R tool protocol,¹⁸ which gives overarching criteria for the venues that are eligible to be assessed by the NEMS-R and includes mostly venues that have menus and serve lunch and dinner meals to capture the availability of meals available outside of the home. This study excluded meals prepared at home or ready-to-eat meals purchased from the supermarket. One additional criterion relevant to the study region was added and is highlighted with an asterisk (*) below.

Inclusion criteria:

- Serve lunch or dinner type meals and include a menu of offerings (e.g. sit down or takeaway meals like sandwiches, rolls, sushi, soups, hot meals, chips) to the community
- Available to all members of the community (e.g. does not have an entry age of over 18 years and is not a club)
- Open during the two-month data collection period*

Exclusion criteria:

- 'Fine dining' or speciality restaurants with high pricing, not regularly accessed by the community
- Sporting clubs available to members only, or only open on weekends or during seasonal periods
- Workplace cafeterias

In addition, if supermarkets or service stations included an attached takeaway venue or

on-site cafeteria, these were classified as 'Restaurant/cafe local independent' or a 'Takeaway local independent' to be consistent with the HRCS.

Data collection

In-venue assessments were undertaken using the NEMS-R tool between July and October 2019 by two members of the research team who undertook NEMS-R specific training.²¹ One researcher classified venues according to the HRCS.¹⁹ Premises meeting the inclusion criteria were informed of the study and the census procedures through a leaflet that was posted to all venues in the study region. No objections were received from the venue owners. Venue owners were not advised of exactly when data collection visits would take place. The cuisine of venues was recorded, as it was advertised by the store. For example, a pizza shop advertised themselves as providing 'Italian cuisine'; a Chinese takeaway shop as 'Chinese cuisine' and pubs were classified as providing 'Australian/mixed cuisine'.

Analysis

All statistical analyses were conducted using Stata SE 15 (StataCorp LLC, USA)²². A p-value <0.05 was considered statistically significant. The food retail environment characteristics of venues located in Medium Rural Town (MM4) and the rest of the region (MM5) were compared using Fisher's exact test for categorical outcomes (such as facilitators of healthy eating) or t-test for numerical scores (such as HRCS, NEMS-R and NEMS-R score for the children's menu). Two composite scores were generated from the original NEMS-R score using the survey items related to: a) healthy food availability; and b) healthy food promotion. The 'healthy food availability' score included availability of fruit with no added sugar, non-fried vegetables, healthy salads (defined by the NEMS-R tool protocol), the number of healthy salad options, wholegrain bread options, low-fat milk, low-fat dressings as options for salads, diet soft drink, and an option of reduced portion sizes (possible range 0–27). The 'healthy food promotion' score included signs encouraging healthy eating, highlighted healthy options, nutrition information available on the menu and/or the counter, and a menu highlighting healthier options (possible range 0–12). The relationship between NEMS-R and HRCS scores was investigated: a) calculating the Spearman correlation coefficient; and b)

Table 1: Healthfulness classification and rating system ratings and venues as defined by Moayyed et al., 2017.¹⁹

Venue types audited in this study (as described by Moayyed et al.)	Healthfulness Rating and Classification System
Takeaway franchise	-10
Takeaway local independent	-8
Pub	-5
Convenience store	-5
Restaurant/cafe local independent	0
Bakery/cake venue	0
Restaurant franchise	0
Sandwich shop	5

Note:
Sourced from Moayyed et al.,¹⁹ includes only food venue types included in this study.

by summarising the NEMS-R score, and the 'healthy food availability' and 'healthy food promotion' sub-scores with the HRCS scores.

Results

Of the 95 venues included in this census, 50 (52.6%) were located in the Medium Rural Town (MM4) and the rest were located within surrounding Small Rural Towns (47.5%). One supermarket was included as it had an on-site café, so this was classified as 'Restaurant/cafe local independent'. The supermarket section of the store was not assessed. There were no

significant differences in the type of venues between the two regions (Table 2). The most common food venue, using the categories from Moayyed et al.,¹⁹ was independently owned restaurants/café (42.1%) followed by pubs (19.0%). When classified by the cuisine offered, 28.4% of the sample was made up of venues selling general takeaway foods (28.5%) or café-style food (30.5%).

Table 2 shows takeaway franchises (n=5) were only located in the main rural township. Small Rural Towns had a slightly higher proportion of pubs (24.4% compared to 14.0% of venues) and locally owned/independent cafés or restaurants (48.9% compared to 36.0%). Overall, across venue categories, NEMS-R scores were highly variable. The one restaurant franchise in the sample had the highest score of 33, followed by sandwich shops that had the second-highest mean NEMS-R score of 13 (range 7, 17). Takeaway local independent shops had the lowest mean NEMS-R score of 7.4 (range -3, 19). Mean NEMS-R scores by cuisine type were also highly variable, with venues serving Vietnamese cuisine rating as the most healthful with a mean score of 25.5 (range 19,32) with the venue serving Japanese cuisine (n=1) rating lowest with a score of 1. There was significantly more signage to promote unhealthy eating in food venues

Table 2: Characteristics of the food venues by HRCS category type and by location (as classified by the Modified Monash Model) within the study area.

	Medium Rural Town (MM4) n (%)	Small Rural Towns (MM5) n (%)	Total n (%)	Mean NEMS-R scores (range)
Total Number of venues (%)	50 (52.6)	45 (47.4)	95 (100.0)	
HRCS categories				
Pub	7 (14.0)	11 (24.4)	18 (19.0)	10.2 (3,20)
Restaurant/cafe local	18 (36.0)	22 (48.9)	40 (42.1)	12.1(-3,32)
Convenience venue	4 (8.0)	4 (9.0)	8 (8.4)	8.3(0,19)
Takeaway local	10 (20.0)	5 (11.1)	15 (15.8)	7.4(-3,19)
Bakery/cake venue	3 (6.0)	1 (2.2)	4 (4.2)	12 (7,15)
Takeaway franchise	5 (10.0)	0 (0.0)	5 (5.3)	9.4(-3,28)
Sandwich shop	2(4.0)	2(4.4)	4 (4.2)	13 (7,17)
Restaurant franchise	1 (2.0)	0 (0.0)	1 (1.1)	33(33)
Type of cuisine predominantly provided by venue				
General take-away	16 (32.0)	11 (24.4)	27 (28.4)	8.9 (-3,28)
Café style	14 (28.0)	15 (33.3)	29(30.5)	13.2 (6,26)
Chinese cuisine	3 (6.0)	4 (8.9)	7 (7.4)	9.7 (2,17)
Indian cuisine	0 (0.0)	1 (2.2)	1 (1.1)	7(7)
Thai cuisine	2 (4.0)	2 (4.4)	4 (4.2)	8.3(0,15)
Japanese	0 (0.0)	1 (2.2)	1 (1.1)	1(1)
Vietnamese	2 (4.0)	0 (0.0)	2 (2.1)	25.5 (19,32)
Italian	4 (8.0)	1 (2.2)	5 (5.3)	11.2(-2,33)
Australian/mixed	9 (18.0)	9 (20.0)	18 (19.0)	9.5(3,19)
Vegetarian cuisine	0 (0.0)	1 (2.2)	1 (1.1)	13(13)

Abbreviation Notes: HRCS- Healthfulness Rating and Classification System; NEMS-R: possible range -27-64

located in the Medium Rural Town ($p=0.030$), and the four food venues that had nutrition information available were located in the Medium Rural Town (Table 3). There were no significant differences in the availability of healthy foods on menus between the two areas, while venues in the Small Rural Towns (MM5) had a slightly higher overall healthfulness rating (-2.3 compared to -3.2). Conversely, the mean NEMS-R score was 1.3 points lower than the Medium Rural Town. The children's menus had a less healthy rating in the outer Small Rural Towns when compared to the Medium Rural Town.

Figure 1 shows the distribution of NEMS-R scores within levels of HRCS classifications. The NEMS-R score and the healthfulness classification were slightly positively associated (Spearman's correlation 0.26 [95%CI 0.07, 0.45]). Of note, one of the venues with HRCS score of -10 was a multi-national franchise which had a high NEMS-R score. When this one venue was excluded the correlation strengthened to 0.30 (95%CI 0.11, 0.49). There was large variability in the NEMS-R score for the 45 venues rated as '0' which included restaurant franchises, locally owned restaurants/cafes and bakeries.

Table 4 summarises the 'healthy food availability' and 'healthy food promotion' NEMS-R scores by levels of the HRCS scores. The NEMS-R score for 'healthy food availability' was associated with the HRCS (Spearman correlation: 0.32 [95%CI 0.13, 0.52]), while the NEMS-R score for 'healthy food promotion' was not associated (0.043, [95%CI -0.15, 0.23]), see Table 4.

Discussion

In this study, it was observed that there is substantial room for improvement in the availability and promotion of healthy food across food venues such as cafes, restaurants, pubs, convenience venues and takeaway venues in one rural region. This observation highlights the barriers rural communities face in accessing healthy options when eating outside of the home. This study also provides evidence that rural communities experience minimal exposure to the promotion of healthy food in food venues. There were small differences between the Medium Rural Town and outer Small Rural Towns. Children's menus in outer Small Rural Towns scored lower than those in the Medium Rural Town, and conversely, the promotion of unhealthy food was higher in the Medium Rural Town. The findings of this study are consistent with other findings in the assessment of rural food retail environments that have found that rural Australians face multiple barriers to achieving an optimal diet.^{8,23-26} Unhealthy food environments place rural communities at increased risk of diet-related and preventable disease and compromise the health of people of all ages.²⁷

By venue type, independently owned takeaway shops had the lowest rating NEMS-R scores, indicating this type of venue may be the least healthful. These venues made up almost 16% of the sample. Conversely, sandwich shops that rated as the healthiest on average only made up around 4% of the sample. A plausible consideration for future policy would be incorporating support programs for venues in rural communities comparable to this study to improve the healthfulness of retail food environments. Additional support and monitoring could be provided to venues that typically score lower, for example, independently owned takeaway shops, and could be targeted by local health promotion officers, nutritionists or community education programs. This could be achieved through

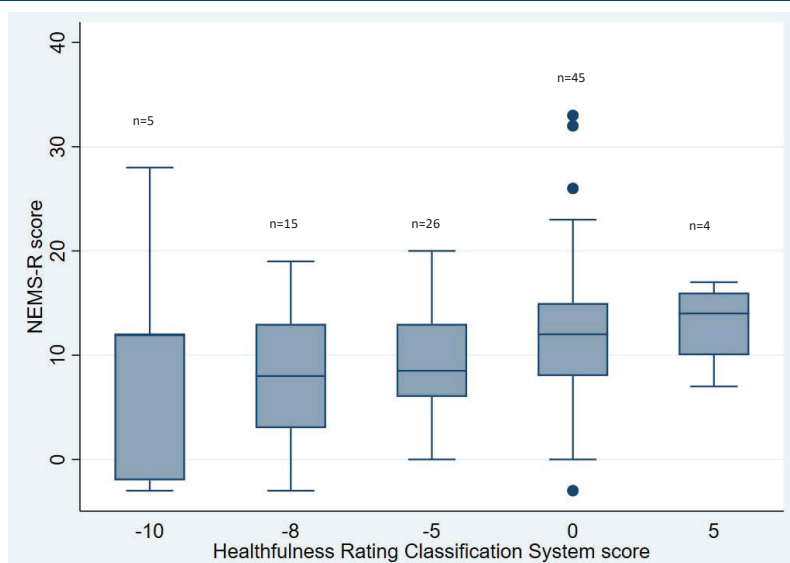
Table 3: Presence of NEMS-R defined facilitators of healthy eating and availability of healthy foods in venues by location.

	Medium Rural Town (MM4)	Small Rural Towns (MM5)	P value*	Total
Venue level facilitators of healthy eating				
n (% of total venues in region)				
Signage highlighting healthy options	9 (18.0)	12 (26.7)	0.333	21 (22.3)
Signage encouraging healthy eating	10 (20.0)	9 (20.0)	1.000	19 (20.2)
Signage promoting unhealthy eating	31 (62.0)	19 (42.2)	0.030	50 (53.2)
Nutrition information available	4 (8.0)	0 (0)	0.119	4 (4.3)
Venue availability of healthy foods				
n (% of total venues in region)				
Healthy salads available	14 (28.0)	15 (33.3)	0.658	29 (30.9)
Vegetables (without sauce or added fats) available on menu	22 (44.0)	20 (44.4)	1.000	42 (44.7)
Fresh fruit (with no additives) available on menuN (%)	7 (14.0)	8 (17.7)	0.779	15 (16.0)
Overall environment scores				
Mean (95%CI)				
Healthfulness rating ^a	-3.5 (-4.7, -2.3)	-2.3 (-3.4, -1.3)	0.139	-2.9 (-3.7, -2.1)
NEMS-R score ^b	11.9 (8.8, 13.4)	10.6 (8.9, 12.4)	0.560	10.8 (9.3, 12.2)
Children's menu NEMS-R score ^c	6.8 (4.4, 9.3)	2.6 (0.7, 4.6)	0.098	4.9 (3.2, 6.6)

Notes:

Fisher's exact test a: Score range -10 to +10; Fisher's exact test b: Score range -27 to 63; c: Score range 6 to 24 and t-test used. ^aVenue level facilitators of healthy eating' and ^bVenue availability of healthy foods' are sub-sections of the NEMS-R tool. Abbreviation Notes: NEMS-R, Nutrition Environment Measures Survey-Restaurants

Figure 1: Distribution of the NEMS-R scores across levels of HRCS classification, in the total sample.



Abbreviation Notes: HRCS- Healthfulness Rating and Classification System. NEMS-R, Nutrition Environment Measures Survey-Restaurants

simple education strategies and the provision of resources such as those available through the Healthy Eating Advisory Service, facilitated by Nutrition Australia²⁸ and the Nourish Network.²⁹ There are international examples of simple interventions to improve the healthiness of retail venues such as restaurants. For example, a randomised control trial in a rural community of the United States found that using a participatory approach and encouraging both restaurant and supermarket owners to implement at least three strategies to increase availability, point-of-purchase labelling and promotion of healthier items significantly improved food environment scores from 13.4 to 24.1 ($p < 0.01$).³⁰ The study also found that, on average, half of the 10 possible intervention strategies were still implemented one month after the intervention, which was found to be highly feasible to the rural retailers.³⁰ Similar studies could be trialled in regional Australia to address the lack of health promotion and availability of healthy foods in regional Australian retail settings.³⁰ A further consideration would be understanding the environment from the retailer perspective, especially in the rural setting, when supporting retailers to make changes. Incorporating the measurement of business outcomes in understanding the impact of healthier changes to the retail setting should also be incorporated, as suggested by Blake et al.³¹

This study was the first to explore correlations between two different measures of the food retail environment in the same setting, being the NEMS-R (in-venue) and the HRCS. Both tools, although highly variable, showed that the overall food retail environment in this rural study region was generally not health-promoting. Despite this, there was minimal correlation in scores between the two tools, and high variability in the NEMS-R score across the venue types and ratings. This highlights the challenges of obtaining consistent food retail environment data across large-scale study areas. It is likely that measures that do not include some form of internal measurement system (such as the HRCS) will not capture the large variability that can occur within venue environments. Variability within venue types was also high, demonstrating that it is almost impossible to classify venues as healthy or unhealthy based on the category of venue without assessment of the internal environments. Further exploration is needed to understand

Table 4: Distribution of the NEMS-R score related to 'healthy food availability' and 'healthy food promotion' by levels of HRCS classification.

HRCS Healthfulness rating	Number of food venues	'Healthy food availability' and 'healthy food promotion' score	
		Mean (SD)	Mean (SD)
-10	4	6.5 (2.9)	1.5 (1.7)
-8	15	9.2 (5.1)	1.2 (2.5)
-5	26	9.7 (3.7)	1.5 (3.5)
0	45	11.8 (4.7)	1.5 (2.2)
5	4	13.3 (6.1)	2.3 (2.8)

Notes:

One multi-national franchise venue excluded due to being a significant outlier. See Figure 1 for inclusion of outlier. The 'healthy food availability' score included availability of fruit with no added sugar, non-fried vegetables, healthy salads (defined by the NEMS-R protocol), number of healthy salad options, wholegrain bread options, low fat milk, low fat dressings as options for salads, diet soft drink, an option of reduced portion sizes (possible range 0-27). The 'healthy food promotion' score included signs encouraging healthy eating, highlight healthy options, nutrition information available on the menu and/or the counter, menu highlighting healthier options (possible range 0-12). Higher scores indicate more healthful environments.

how scoring systems like the HRCS and the NEMS-R tool can be combined and used to generate composite index scoring systems that generate more comprehensive assessments of the healthfulness of food environments. Such a tool, or standardisation of composite scoring, could reduce the onerous resourcing needed to complete in-venue assessments.³² Completing studies using the same methodology over a larger geographical region with more venues would require significant time and resources, and for maximum uptake of a tool and use in policy settings, it would be important to minimise resource usage and ensure tool simplicity. The relatively high healthfulness score achieved by the multi-national franchise company is worth exploration. Franchises are typically well-resourced, in comparison to community-owned food venues, and can therefore invest in extensive marketing campaigns, the provision of nutritional information and menu variety. Based on these elements, this franchise was able to score as healthy by the validated and highly cited food environment tool used here (NEMS-R). However, despite the presence of these elements, it is still possible for a venue to have many negative features and menu items that are not health-promoting. Importantly, the tools used in this study are not designed to reflect what the predominantly sold items from venues are.¹⁸ A more in-depth analysis of the menu that is sales-weighted (potentiality supplied by the venue owners), along with observing the marketing practices of franchises may assist in more comprehensive assessments of the community food retail environment. It is important to consider that this level of detailed data collection and analysis would add time and complexity to monitoring efforts and would be limited by available data.

Several public health groups have called for increased regulation of food retail environments to ensure improvements in the healthfulness of food environments as a whole.³³ The Australian *Food Amendment Act 2011* mandates the provision of nutrition information for food sold that is ready for consumption, but this only relates to food venues that are classified as chain or franchise businesses.³⁴ The aim of these regulations is to provide consumers with basic nutrition information that may assist with making healthier and more informed choices when purchasing food and help with the promotion of healthy foods in retail environments.³⁴ The legislation does not apply to community and privately owned food venues that are more common than franchise venues in rural areas. For example, Whelan et al. found that of the 28 food venues audited in an Australian rural area, none were considered to be franchise venues⁸ and therefore would not fall under the Act. In light of this evidence, it could be assumed that the provision of nutrition information in the rural Australian environment is largely un-regulated, translating to a lack of nutrition information for rural people. Further measurement of rural food retail environments and intervention evidence is needed to understand how such well-intended policies could be adapted to have equal impacts across multiple contexts, and to meet the needs of rural areas.

Strengths and limitations

A strength of this study was that it was a census of all venues (selling lunch and dinner meals) of a rural local government area. The study also used two validated tools to measure the healthfulness of a rural food retail environment; these tools also provided a detailed picture of the large variability within food environments as a whole. A

further strength is that data collection was undertaken by two highly trained researchers with dietetics, nutrition and health promotion expertise who came to a consensus on scores, reducing bias. A limitation of the study included that frequent changes in community food retail environments, including changes to menus, promotions and availability of options in the independent retail context, were not able to be captured. The study only looked at venues that provided lunch and dinner meals, and therefore did not collect data on bakeries or other venues where community members could buy lunch supplies and subsequently prepare a meal at home. Another limitation is that the study did not measure people's behaviours including how often they ate out or what they bought from these venues. A further limitation is that we didn't measure whether people regularly drive to other towns, outside of the LGA, to eat out; however, due to the distance to the next shire, this was not likely to be a major issue with interpreting the data. The interaction of the healthfulness of the food retail environment and behaviour of those exposed to it is an important consideration for future research.

Conclusion

This census of a rural food retail environment showed that there are limited healthy options in venues providing lunch and dinner meals along with minimal promotion of healthy food and nutrition information across the rural region. This has the potential to impact the dietary intake of more than 21,000 rural-dwelling Australians. The use of the two food environment tools highlights the high variability between measures and the difficulties in obtaining comprehensive and consistent evidence on food retail environments. Research into streamlined and comprehensive food environment measurement tools is needed, along with support to guide food venue owners to improve the healthfulness of food retail environments in rural areas.

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References

1. Swinburn BA, Sacks G, Hall KD, et al. The global obesity pandemic: Shaped by global drivers and local environments. *Lancet*. 2011;378(9793):804-14.
2. Ronto R, Wu JH, Singh GM. The global nutrition transition: trends, disease burdens and policy interventions. *Public Health Nutr*. 2018;21(12):2267-70.
3. Australian Institute of Health and Welfare. *Rural & Remote Health* [Internet]. Canberra (AUST): AIHW; 2019 [cited 2020 Jan 1]. Available from: <https://www.aihw.gov.au/reports/rural-remote-australians/rural-remote-health/contents/summary>
4. Alston L, Jacobs J, Allender S, Nichols M. A comparison of the modelled impacts on CVD mortality if attainment of public health recommendations was achieved in metropolitan and rural Australia. *Public Health Nutr*. 2020;23(2):339-47.
5. Centers for Disease Control and Prevention. *General Food Environment Resources* [Internet]. Atlanta (GA): CDC; 2014 [cited 2019 Apr 24]. Available from: <https://www.cdc.gov/healthyplaces/healthtopics/healthyfood/general.htm>
6. Story M, Kaphingst KM, Robinson-O'Brien R, Glanz K. Creating healthy food and eating environments: Policy and environmental approaches. *Annu Rev Public Health*. 2008;29:253-72.
7. Moayyed H, Kelly B, Feng X, Flood V. Is living near healthier food stores associated with better food intake in regional Australia? *Int J Environ Res Public Health*. 2017;14(8):88.
8. Whelan J, Millar L, Bell C, et al. You can't find healthy food in the bush: Poor accessibility, availability and adequacy of food in rural Australia. *Int J Environ Res Public Health*. 2018;15(10):2316.
9. Australian Bureau of Statistics. *Household Expenditure Survey, Australia: Summary of Results, 2015-16* [Internet]. Canberra (AUST): ABS; 2016 [cited 2020 Jan 6]. Available from: <https://www.abs.gov.au/household-expenditure>
10. Ayala GX, Rogers M, Arredondo EM, et al. Away-from-home food intake and risk for obesity: Examining the influence of context. *Obesity (Silver Spring)*. 2008;16(5):1002-8.
11. Bezerra IN, Curioni C, Sichieri R. Association between eating out of home and body weight. *Nutr Rev*. 2012;70(2):65-79.
12. Duffey KJ, Gordon-Larsen P, Jacobs DR Jr, Williams OD, Popkin BM. Differential associations of fast food and restaurant food consumption with 3-y change in body mass index: The Coronary Artery Risk Development in Young Adults Study. *Am J Clin Nutr*. 2007;85(1):201-8.
13. Rose D, Hutchinson PL, Bodor JN, et al. Neighborhood food environments and Body Mass Index: The importance of in-store contents. *Am J Prev Med*. 2009;37(3):214-19.
14. Love P, Whelan J, Bell C, McCracken J. Measuring rural food environments for local action in Australia: A systematic critical synthesis review. *Int J Environ Res Public Health*. 2019;16(13):2416.
15. Needham C, Sacks G, Orellana L, Robinson E, Allender S, Strugnell C. A systematic review of the Australian food retail environment: Characteristics, variation by geographic area, socioeconomic position and associations with diet and obesity. *Obes Rev*. 2020;21(2):e12941.
16. Australian Bureau of Statistics. *The Australian Statistical Geography Standard: Remoteness Structure* [Internet]. Canberra (AUST): ABS; 2019 [cited 2019 Oct 30]. Available from: <https://www.abs.gov.au/websitedbs/d3310114.nsf/home/remoteness+structure>
17. Australian Department of Health. *Modified Monash Model* [Internet]. Canberra (AUST): Government of Australia; 2019 [cited 2020 Jan 3]. Available from: <https://www.rdaa.com.au/documents/item/740>
18. Saelens BE, Glanz K, Sallis JF, Frank LD. Nutrition Environment Measures Study in restaurants (NEMS-R): development and evaluation. *Am J Prev Med*. 2007;32(4):273-81.
19. Moayyed H, Kelly B, Feng X, Flood V. Evaluation of a 'healthiness' rating system for food outlet types in Australian residential communities. *Nutr Diet*. 2017;74(1):29-35.
20. Thornton LE, Kavanagh AM. Association between fast food purchasing and the local food environment. *Nutr Diabetes*. 2012;2:e53.
21. Honeycutt S, Davis E, Clawson M, Glanz K. Training for and dissemination of the Nutrition Environment Measures Surveys (NEMS). *Prev Chronic Dis*. 2010;7(6):A126.
22. STATA: statistical software. College Station (TX): Stata Corporation; 2019.
23. Cuttler R, Evans R, McCluskey E, Purser L, Klassen KM, Palermo C. An investigation of the cost of food in the Geelong region of rural Victoria: Essential data to support planning to improve access to nutritious food. *Health Promot J Austr*. 2019;30(1):124-7.
24. Love P, Whelan J, Bell C, et al. Healthy diets in rural Victoria - Cheaper than unhealthy alternatives, yet unaffordable. *Int J Environ Res Public Health*. 2018;15(11):2469.
25. Palermo C, McCartan J, Kleve S, Sinha K, Shiell A. A longitudinal study of the cost of food in Victoria influenced by geography and nutritional quality. *Aust N Z J Public Health*. 2016;40(3):270-3.
26. Innes-Hughes C, Boylan S, King LA, Lobb E. Measuring the food environment in three rural towns in New South Wales, Australia. *Health Promot J Austr*. 2012;23(2):129-33.
27. Melaku YA, Renzaho A, Gill TK, et al. Burden and trend of diet-related non-communicable diseases in Australia and comparison with 34 OECD countries, 1990-2015: Findings from the Global Burden of Disease Study 2015. *Eur J Nutr*. 2019;58(3):1299-1313.
28. The Healthy Eating Advisory Service. *The Healthy Eating Advisory Service Can Help Your Organisation Provide And Promote Healthier Foods And Drinks*. Melbourne (AUST): Nutrition Australia Victoria Division; 2020.
29. The Nourish Network. *Healthy Retail Promotion* [Internet]. Melbourne (AUST): Deakin University; 2020 [cited 2020 Sep 28]. Available from: <http://nourishnetwork.org/healthy-food-retail-promotion>
30. Martinez-Donate AP, Riggall AJ, Meinen AM, et al. Evaluation of a pilot healthy eating intervention in restaurants and food stores of a rural community: A randomized community trial. *BMC Public Health*. 2015;15:136.
31. Blake MR, Backholer K, Lancsar E, et al. Investigating business outcomes of healthy food retail strategies: A systematic scoping review. *Obes Rev*. 2019;20(10):1384-99.
32. Sacks G, Robinson E, Cameron AJ. Issues in measuring the healthiness of food environments and interpreting relationships with diet, obesity and related health outcomes. *Curr Obes Rep*. 2019;8(2):98-111.
33. World Health Organisation. *Global Strategy on Diet, Physical Activity and Health* [Internet]. Geneva (CHE): WHO; 2004 [cited 2020 Feb 20]. Available from: https://www.who.int/dietphysicalactivity/strategy/eb11344/strategy_english_web.pdf
34. ACT Legislation Register. *Food (Nutritional Information) Amendment Act 2011*. Canberra (AUST): Australian Capital Territory Parliamentary Council; 2011.