



Exploring cooking skills, food preparation, and quality of dinner meals in Australian households during COVID-19

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Abstract

Introduction: *The unprecedented COVID-19 pandemic and associated lockdowns has had a significant impact on the socio-cultural and food environment in Australia and globally, with potential implications for dietary and culinary practices. We explored Australian primary food gatekeepers' cooking skills, meal preparation behaviours, and the quality of dinner meals based on food groups during the COVID-19 pandemic and its associated lockdowns.*

Methods: *A convenience sample of 25 primary food gatekeepers was recruited from different states of Australia to participate in semi-structured interviews. During the online interviews, the food gatekeepers were asked to share photographs of three dinner meals prepared by them. Meal quality (number of food groups), a food preparation scale, and a cooking skills tool were used to analyse the dinner photographs.*

Results: *Seventy-three dinner photographs were provided by the participants. The majority of meals (n = 51, 81%) were prepared by the gatekeepers using raw ingredients with only eight meals (11%) being categorised as takeout or restaurant meals. Peeling and chopping vegetables (100%); use of herbs and spices (92%); chopping, mixing and stirring foods (88%); boiling or simmering food (88%), and fry/stir-fry food (80%) emerged as the five most frequently practised cooking skills. The mean number of food skills used in dinner meal preparation was 6.68 (SD 1.52). Vegetables and legumes/beans (75%) and grains (75%) were the most popular core food groups for dinner meals. Fruits (12%) and dairy and/or alternatives (11%) rarely featured as part of the dinner meals. Besides the five core food groups, the use of unsaturated spreads and oils (79%) was very common during the preparation of dinner.*

Conclusions: *Overall, the primary food gatekeepers practised a variety of cooking skills and the quality of their dinner meals was relatively healthy. Future research could explore if these cooking skills and food preparation behaviours continue post COVID-19.*

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Introduction

The unprecedented COVID-19 pandemic arising from Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-Cov-2) infection has disturbed the daily life of millions of people around the globe (World Health Organization, 2021). In an attempt to contain this health crisis, several countries including Australia (Department of Health, 2020) adopted different preventive measures including sealing of inter-state and international borders, lockdowns, curfews, confinement at home, and physical distancing (Laborde et al., 2020). The enforcement of these measures was vital to mitigate the transmission of the deadly pathogen (Laborde et al., 2020). However, this enforcement had a significant impact on the socio-cultural and food environments (Laborde et al., 2020).

A new business model, that is, “working from home” emerged as one of the most striking changes in the socio-cultural environment (Kramer & Kramer, 2020; Laborde et al., 2020). Besides this, COVID-19 and its associated restrictions led to the closure of a number of business establishments resulting in widespread unemployment with associated financial burdens (Blustein et al., 2020; Hensher, 2020). In the same vein, the food environment was also challenged by the regulatory measures, (Hobbs, 2020; Laborde et al., 2020) that is, there were limitations over dining in restaurants in a number of countries, for example, New Zealand (Gerritsen et al., 2021), Australia (Victorian Department of Health and Human Services, 2020) and also restaurants were only permitted to offer take-away or home delivery services as seen in the state of Victoria, Australia (Victorian Department of Health and Human Services, 2020).

In view of these societal changes, people in Australia as well as other parts of the world made changes to their cooking and eating practices, meal planning and food purchasing behaviours (De Backer et al., 2020; Menon et al., 2021; Murphy et al., 2021; Ronto et al., 2021). The fear of infection and long queues in supermarkets compelled many consumers to shift to online shopping as it was convenient, safe, and time saving (Menon et al., 2021; Ronto et al., 2021). Some people resorted to “panic buying” as they were uncertain about the present and future food supplies (Hall et al., 2021; Murphy et al., 2021).

The limited functioning and/or closure of food service establishments considerably reduced the purchase of food from them (e.g., take-away meals) (Murphy et al., 2021; Scarmozzino & Visioli, 2020) with subsequent increases in home cooking (Carroll et al., 2020; Hobbs, 2020; Murphy et al., 2021) and food literacy (De Backer et al., 2020). Nevertheless, the stress, anxiety and boredom experienced by many during the lockdown resulted in increased consumption of food, especially unhealthy foods as seen in Italian (Scarmozzino & Visioli, 2020), Canadian (Carroll et al., 2020), and Australian (Buckland & Kemp, 2021) households. Collectively, these changes may have potential implications for dietary health (Neira et al., 2021). Therefore, it is important to understand the role of COVID-19 on the development of new cooking skills, the level of meal preparation (e.g., cooking from scratch) and the dietary quality of meals.

Many previous studies of home food preparation have relied on interviews or questionnaire surveys (Clifford Astbury et al., 2019; De Backer et al., 2020; Fertig et al., 2019; Han, 2018). In the present study we employed digital photography. Digital food photography (DFP) has recently attracted great attention in the context of dietary assessment. This increasing popularity is endorsed by several researchers who identify DFP as a valid and reliable dietary assessment tool used to quantify the energy and nutrient intake of both children (Martin et al., 2010; Nicklas et al., 2018; Williamson et al., 2013) and adults (Boushey et al., 2017; Martin et al., 2014; McClung et al., 2017; Williamson et al., 2002). Besides estimating dietary intake, DFP also may provide a valuable opportunity to gauge other aspects of mealtimes including food preparation, meal timing, meal setting and concordance, and quality and quantity of food items served to different family members (McCloskey et al., 2019). Beyond dietary assessment, digital photography has been widely implemented in health behaviour research for investigating

school-based health environments (Kontak et al., 2017), community-built environments (Chow et al., 2014), and the obesogenic environment of adolescents (Staiano et al., 2011). Photographs are a rich and compelling data source and have the potential to provide deep and comprehensive insights about the context of health and food-related behaviours (McCloskey et al., 2019).

The use of digital food photography has been quite popular among food consumers during COVID-19 pandemic as it allowed them to upload pictures of new recipes they had tried on social media (e.g., Facebook, Instagram) (MICHELIN Guide, 2021; Torres-Romay & Garcia-Miron, 2020). As part of our previous qualitative study on culinary behaviours (Ronto et al., 2021), we had asked our study participants, that is, Australian household food gatekeepers to share three photographs of the dinner meals consumed during the pandemic (Ronto et al., 2021). Therefore, the aim of the present study was to analyse these food photographs in order to explore the cooking skills, meal preparation behaviours, and quality of dinner meals based on food groups in Australian households during the pandemic.

Methods

A qualitative study was undertaken using semi-structured interviews as the data collection method to explore Australian primary food gatekeepers' cooking and food preparation skills during the COVID-19 pandemic and associated lockdowns. The primary food gatekeepers were invited to take part in the interviews through placing advertisements on social media (e.g., Facebook, Instagram, Twitter) and through personal networks. An informed consent form was provided to all participants. Prior to the interview, the participants were instructed to send three photographs of their dinners on different days (either weekdays or weekend) which they either prepared by themselves or purchased during the COVID-19 lockdown. All the dinner food photographs were sent by email and interviews were conducted using Zoom teleconferencing software between June and October 2020. At the beginning of the interview, participants provided a brief socio-demographic information and description of the dinner meals. This manuscript will report the analysis of Australian primary food gatekeepers' dinner meal photographs. Their perceptions of changes in culinary behaviours during the pandemic has been reported elsewhere (Ronto et al., 2021). Ethical approval was granted by Medicine and Health Sciences Subcommittee of Macquarie University (Project ID: 6692; Reference No. 52020669215870).

All dinner plate photographs were deidentified and coded with number of participant and number of the photograph, for example, Participant 1.1., Participant 1.2. and so on. The photographs were analysed to assess cooking skills, meal preparation behaviours, and the quality of dinner meals based on food groups. The research team, who are experts in public health nutrition, food literacy including cooking skills and qualitative research, created the data coding template and met on regular basis to discuss data coding. One investigator (NAME) did the initial coding, and two other investigators (NAME, NAME) cross-checked the data and made minor modifications to the coding.

First, the investigators identified, and coded cooking skills used to prepare home cooked meals using validated cooking skills confidence measure (Lavelle et al., 2020). Food photographs including take-away food bought outside from home were excluded from this analysis. Cooking skills refer to physical or mechanical skills used in the production of a meal encompassing cooking methods and food preparation techniques (Lavelle et al., 2020). In total, 14 cooking skills were used to code the data: peel and chop vegetables; use herbs and spices; chop, mix and stir foods, boil or simmer foods; fry/stir-fry food in a frying pan/wok with oil/fat; prepare and cook raw meat/poultry; make sauces and gravy from scratch; prepare and cook raw fish; roast food in the oven; blend foods to make them smooth, like soups or sauces; steam food; stew food; microwave food; and bake goods (Lavelle et al., 2020). The cooking skill "roast food

in the oven” was modified to “roast food in the oven/pan” as several participants roasted food on the pan rather than oven. Then, we calculated the frequencies of different cooking skills used by participants and the number of skills possessed by each participant. Second, we used a meal preparation scale to measure the level of meal preparation (McCloskey et al., 2019). This scale ranged from 0-3, in which 0 was given to a takeout or restaurant meal, 1 was given for a convenience or ready to heat or eat meal, 2 was given for a semi-convenience meal, and 3 was given to a non-convenience meal prepared mainly from raw ingredients (See Figure 1).

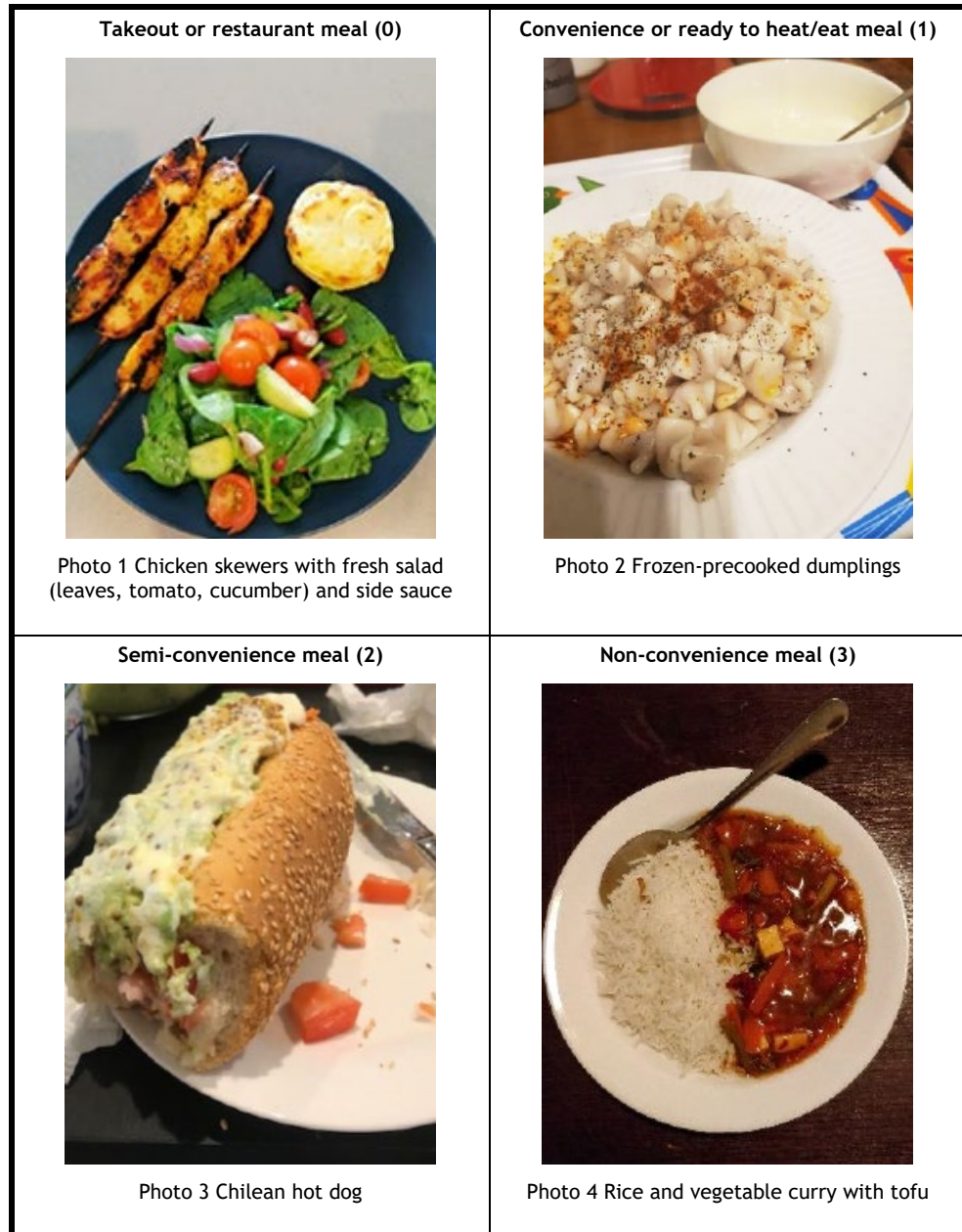


Figure 1 Meal prepareate scale with examples

Finally, we analysed participants' dinner plate photographs based on five core food groups using the Australian Guide to Healthy Eating (National Health and Medical Research Council, 2013): 1) vegetables and legumes/beans; 2) fruit; 3) grain; 4) lean meats and poultry, fish, eggs, tofu, nuts and seeds, and legumes/beans; 5) milk, yoghurt, cheese and/or alternatives, mostly reduced fat. We also assessed non-core food groups such as unsaturated spreads and oils, and discretionary choices. We calculated frequencies for both the level of meal preparation and food groups.

Results

Socio-demographic characteristics of the sample

Twenty-five gatekeepers participated in this study, who provided in total 73 photographs. Majority of our participants were females (84%) and had attained a university degree (84%). Three-fifths of the sample (60%) were aged between 31-40 years and 44% identified as Caucasian origin. Except for one gatekeeper, all the other gatekeepers were employed prior to the pandemic restrictions and four of them reported loss of their jobs during the pandemic. Nearly three quarters of the households did not have children (72%). The socio-demographic characteristics of the gatekeepers are presented in Table 1.

Table 1 Demographic characteristics of the sample (N = 25)*

Sociodemographic items		N	%
Gender	Female	21	84
	Male	4	16
Age	21-30 years	8	32
	31-40 years	15	60
	41-50 years	2	8
Education	High school/Diploma	4	16
	Bachelors	5	20
	Masters	12	48
	Doctorate	4	16
Ethnicity	Caucasian	11	44
	South Asian	12	48
	East Asian	2	8
Employment status before lockdown	Yes	24	96
	No	1	4
Employment status during lockdown	Yes	20	80
	No	5	20
Children <16 years living in the household	0	18	72
	1-2	5	20
	≥3	2	8

Note: *(Ronto et al., 2021)

Cooking skills used by primary food gatekeepers in preparing dinner meals

The majority of participants (≥80%) used the following five cooking skills in their dinner meal preparation: peeling and chopping vegetables (100%); use of herbs and spices (92%); chopping, mixing and stirring foods (88%); boiling or simmering food (88%), and fry/stir-fry food (80%) (Table 2). Cooking skills such as steam (12%) or stew (8%) food, microwave (8%) and bake goods (4%) were the least used in meal preparation by the participants. One third of participants (32%) used eight and nearly half of the participants (46%) used seven to 10 different cooking skills in

their meal preparation (Table 3). The mean number of cooking skills used in dinner meal preparation was 6.68.

Table 2 Type of cooking skills used by primary food gatekeepers in dinner meal preparation ($N = 25$)

Cooking skill	<i>N</i>	%
Peel & chop vegetables	25	100
Use herbs & spices	23	92
Chop, mix & stir foods	22	88
Boil or simmer food	22	88
Fry/Stir-fry food in a frying pan/wok with oil/fat	20	80
Prepare & cook raw meat/poultry	15	60
Make sauces & gravy from scratch	13	52
Prepare & cook raw fish	8	32
Roast food in the oven/pan	7	28
Blend foods to make them smooth, like soups or sauces	4	16
Steam food	3	12
Stew food	2	8
Microwave food	2	8
Bake goods	1	4

Table 3 The number of cooking skills used by participants ($N = 25$)

No of skills	<i>N</i>	%
Four	3	12
Five	1	4
Six	8	32
Seven	5	20
Eight	6	24
Nine	1	4
Ten	1	4

The level of meal preparation of dinner meals

The majority of meals (81%) were prepared by the gatekeepers using raw ingredients with only 12 meals (17%) being categorised as takeout or convenience meals (see Table 4).

Table 4 The level of meal preparation identified in dinner meal photographs ($N = 73$)

Level of meal preparation	<i>N</i>	%
Takeout or restaurant meal (0)	8	11
Convenience or ready to heat or eat meal (1)	2	3
Semi-convenience meal (2)	2	3
Non-convenience meal prepared primarily from raw ingredients (3)	59	81
*Non-convenience meal prepared primarily from raw ingredients (3) with takeout or restaurant meal (0)	1	1
*Non-convenience meal prepared primarily from raw ingredients (3) with convenience or ready to heat or eat meal (1)	1	1

Note: *Two levels of meal preparation have been used to prepare these dinner meals

Food groups identified in dinner meals prepared/purchased by primary food gatekeepers

The majority of meals (76%) included two to three food groups per meal. Vegetables and legumes/beans (Group 1) (75%), grains (Group 3) (75%) and meats/fish or alternatives (Group 4) (71%) were the most popular core food groups for dinner meals. Fruits (12%) and dairy and/or alternatives (11%) rarely featured as part of the dinner meals. Besides the five core food groups, the use of unsaturated spreads and oils (79%) was very common during the preparation of dinner meals. Only 12 meals (16%) included discretionary foods.

Table 5 Food groups used by primary food gatekeepers for dinner meal preparation (N = 73)

Presence of food groups in meals		N	%
Number of core food groups	0	2	3
	1	5	7
	2	26	36
	3	29	40
	4	10	14
	5	1	1
Types of food groups	Group 1 Vegetables and legumes/beans	65	89
	Group 2 Fruit	9	12
	Group 3 Grain	55	75
	Group 4 Lean meats and poultry, fish, eggs, tofu, nuts and seeds, and legumes/beans	52	71
	Group 5 Milk, yoghurt, cheese and/or alternatives, mostly reduced fat	8	11
	Unsaturated spreads and oils	58	79
	Discretionary choices	12	16

Discussion

Photographs of dinner meals provided by the household food gatekeepers along with the descriptions of these meals were used to explore the Australian primary household food gatekeepers' meal preparation behaviours and cooking skills, and the quality of the dinner meals. Overall, the photographs revealed that during the COVID-19 pandemic and associated lockdowns, the gatekeepers prepared healthy dinner meals from scratch, and they employed a variety of cooking skills to prepare these meals. Digital food photography (DFP) is becoming a popular tool in assessing food intake and plate waste and capturing details on eating context (e.g., use of utensils and food serving techniques) (Elliott et al., 2021; Lindsay et al., 2021; McCloskey et al., 2019; Norman et al., 2020) in different settings such as schools, preschools and day-care centres. The present study is unique in two ways. First, according to the best of the authors' knowledge, this is the first study that used DFP in capturing the household food gatekeepers' food preparation behaviours and quality of dinner meals during the COVID-19 pandemic and associated lockdowns. Secondly, this study demonstrated the new potential for employing DFP in deriving objective measurement of cooking skills.

Cooking meals at home from scratch have been shown to be associated with many benefits such as developing the cooking skills of family members, improving family food interactions, transferring food skills to children, and importantly improving the healthiness of meals (Mills et al., 2020; Wolfson & Bleich, 2015). A consumer survey conducted in pre-pandemic times reported that two-thirds of Australians prepared their dinner meal from scratch (Ipsos, 2016). This was high as 76% for older Australians (>60 years) whereas it was just over 50% for the 18-29 years old group (Ipsos, 2016). However, this survey identified that certain segments of the population such as young adults and young families showed an increasing tendency to eat away-from-home food (Ipsos, 2016). In our study, most of the dinner meals were prepared at home

from scratch. The online surveys done in the United Kingdom (Snuggs & McGregor, 2021), Croatia (Pfeifer et al., 2021), New Zealand (Gerritsen et al., 2021) during the COVID-19 pandemic and associated lockdowns report similar findings. The pandemic related circumstances (e.g., increase availability of time as most gatekeepers were working from home, reluctant to order food from food delivery services due to safety concerns, and limited- or non-availability of on-premises dining in food outlets) may have triggered this behaviour (Menon et al., 2021; Ronto et al., 2021; Snuggs & McGregor, 2021). Future studies should investigate whether these positive food preparation practices continue post-pandemic times.

Dinner plate photographs and the descriptions revealed that most gatekeepers employed cooking skills such as peeling, chopping, stirring, and boiling in preparing their dinner meals.

Also, most gatekeepers fried or stir-fried food with the use of oil or fat to prepare their dinner. Certain cooking skills such as cooking raw meat/ poultry and making sauces and gravy from scratch were employed by slightly over half of the gatekeepers, whereas cooking fish was employed by fewer participants. This could be because the gatekeepers had not prepared these animal sources over the three days that they took dinner photos. Even it could be due to their preference or even having lower skills in preparing these food items. Overall, a majority of gatekeepers exhibited 6-8 cooking skills through the three dinner plate photographs they shared. This may have helped the gatekeepers to prepare high quality and diverse dinner meals. Previous research has shown that there is a positive relationship between self-reported cooking skills and diet quality (Lavelle et al., 2020). Future research should explore whether the gatekeepers use these skills routinely in preparing their dinner meals in post-pandemic times.

In Australia, baked dinner (i.e., roasted meat with vegetables is most often prepared and served as a weekend dinner which is often enjoyed with the family members and guests (Lupton, 2000). In the present study, baking was used by just one gatekeeper in preparing dinner meals. There could be a few possible explanations for this. We did not specifically ask to take dinner meals at weekends, thus leaving out such meals if prepared. The qualitative interviews revealed that some of the gatekeepers increased baking of other food items such as cakes, cookies, and savoury pastries (Ronto et al., 2021). It could be another reason why they did employ the same cooking method to make their dinner. Only two gatekeepers reported using microwaving as a cooking skill in preparing their dinner meals. Most often, microwaving is used to re-heat food as opposed to cook meals (Lavelle et al., 2017). Perhaps this could be why microwaving was sparsely mentioned in this study.

Overall, a majority of dinner meals comprised of 2-3 core food groups (i.e., vegetables, grains and proteins sources were the frequent food groups) indicating the dinner meals were of high quality. A recent consumer survey reports similar findings where fresh vegetables, meat and poultry were the most common food groups followed by grain-based products such as rice, pasta, and bread in Australian dinner (Ipsos, 2016). Dinner is the most important meal of the day for most Australians (Litterbach et al., 2017; Lupton, 2000). Perhaps that is why the gatekeepers in our study tried to incorporate a few core food groups including vegetables in these dinner meals. Though there are no obvious differences in the types of food groups present in these dinner meals from that of previous research (Ipsos, 2016), there could be differences in types and complexity of dishes. As depicted by dinner photos, some of the meals were comprised of complex and elaborated (i.e., more time consuming to prepare) food items/ dishes.

As mentioned by these gatekeepers (Ronto et al., 2021), increased time availability associated with working from home enabled them to make more time-consuming dishes that they would not normally prepare for dinner during a typical pre-pandemic working day. Follow-up studies

should explore whether the gatekeepers continue to make these time-consuming and complex dishes post-pandemic times.

A higher number of dinner meals featured fats and oils as an ingredient or cooking medium. However, it is not known the type of fat or oil the gatekeepers used to prepare these meals. The Australian dietary guidelines recommend limiting the intake of food high in saturated fats to reduce cardiovascular disease risks (National Health and Medical Research Council, 2013). As mentioned earlier, future studies should explore gatekeepers' practices related to the use of fats and oils in their cooking. Such studies are important to understand the type, quantity, and frequency of using fats and oils in cooking and ways of supporting them in using healthier fats and oils in their cooking as required.

Strengths and Limitations

Several studies have reported the influence of the COVID-19 pandemic and associated lockdowns on food preparation and consumption behaviours of people (Caso et al., 2022; Hayashi & Takemi, 2021; Murphy et al., 2021; Pfeifer et al., 2021; Phillipou et al., 2020). These studies have employed the usual self-reported assessment of food preparation skills and food intake. The novelty of this study is the use of dinner plate photographs to derive objective measurements of the food preparation behaviours, cooking skills, and quality of dinner meals eaten during the COVID-19 pandemic and associated lockdowns. This method allowed us to capture the quality of dinner meals with minimal burden to the participants having to recall what they used to prepare their dinner meals. Multiple photographs from each gatekeeper provided diverse information related to their dinner practices compared to a single dinner photograph, which may therefore accurately exhibit their usual dietary habits during the pandemic and lockdowns.

This study did not intend to measure the number of servings of each food group presented in the study, therefore we did not provide the gatekeepers with any instructions related to food portion size. Thus, some gatekeepers took photos of their individual dinner meal whereas others took photos of their entire family dinner. However, this did not influence our analysis as we just counted and recorded the number of food groups present in each meal.

The participants were asked not to change their usual dietary patterns to take photographs for this study. However, it may be possible that some have made changes to their usual dinner meals to make them more appealing and healthier. Participants were asked to take photos of their dinner meals only. If they had anything later as a part of their dinner meals such as desserts, tea, coffee, these may not have been captured in these photos. Although most gatekeepers provided photographs of three dinner meals, the overall sample size was small. Also, the ethnic composition of the study participants could have influenced the types of cooking skills and core ingredients they used in preparing dinner meals. In future studies, a large sample with diverse ethnic backgrounds is needed to determine the quality and diversity of dinner meals in Australia. The participants were only asked to take photographs of the dinner plates. Therefore, we could not explore the eating location, food interactions, or utensils used during dinner time. In future studies, participants should be asked to capture both their dinner plates with actual food quantities they serve on to them along with the dinner set-up to capture these details.

Implications for research and practice

Capturing the photographs of daily meals can be used as a self-monitoring and reflecting tool, (Andersen et al., 2021) that is, opportunity to revisit the meals and think of how the meals align with one's personal nutrition goals, values, enjoyment, budget and so on. The household food gatekeepers should be taught how they can use the meal photos to monitor and track their cooking skills and diet quality and then make necessary amendments.

The pandemic and associated public health safety measures have caused many changes in the Australians' lifestyle and some of these changes may likely continue for quite a long period (for example, working from home). Therefore, such lifestyle changes may likely influence the food preparation and consumption behaviours of Australians over the next few years. A global cross-cultural study of meal practices using the photographs would capture the diversity of meals across households belonging to different ethnic groups and geographical locations. With a minimal burden to respondents, photographs can provide rich insights into the diversity of meals and food preparation practices (Bekelman et al., 2019; Lindsay et al., 2021; Mills et al., 2017) and explore the needs for improving the quality of meals.

Conclusions

In sum, during the COVID-19 pandemic and associated lockdowns, the primary food gatekeepers of this study used a considerable number of cooking skills in preparing their dinner meals. The majority of meals were prepared at home from scratch and overall, the meals were of high dietary quality.

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