Eating, shopping, and cooking while living with hardship during COVID-19

How the March–April 2020 COVID-19 lockdown impacted the food-related experiences of financially and food-insecure New Zealanders

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Abstract

In March 2020, New Zealand entered a strict Level 4 lockdown to curb the spread of the SARS-COV-2 coronavirus (COVID-19). The virus had emerged in China late in 2019, sparking the global COVID-19 pandemic. Border closures and orders to stay at home impacted employment, freedom of movement, and access to food. While these impacts were widespread, we wanted to study how the COVID-19 lockdown impacted the diets, shopping, and cooking habits of those living with hardship and those who lost income during the lockdown.

This thesis aimed to identify grocery shopping, cooking, and diet changes among participants who experienced financial difficulty before and during the lockdown compared to financially secure respondents.

The Covid Kai Survey was disseminated online through convenience and snowball sampling between 24 April and 13 May 2020 as part of the international Corona Cooking Survey project. This quantitative survey was available to those residing in New Zealand during the first COVID-19 Level 3 and 4 lockdowns in New Zealand. The survey asked participants 100 questions about how they cooked, shopped, and ate before and during the COVID-19 lockdown. Financial hardship variables were defined based on self-reported ability to make money last until payday (financial security) and ability to afford food (food security). These were derived from two Likert 7-point scales. A third binary hardship variable (loss of income) was derived from a Yes/No question asking if participants lost any income due to the lockdown. Welch 2-sample *t* tests were used to compare the difference in changes to cooking, shopping, and diet habits due to the lockdown between the high- /low-financial-security groups, between those who could usually afford food/those who frequently could not afford food, and between those who lost income /did not lose income due to the lockdown.

Data from 3,004 adults who completed the Covid Kai Survey were used in analyses, categorised as: high (n=1,812) or low financial security (n=298); high food security (n=2,287), very low food security (n=96), lost income (n=775) or did not lose income (n=2,229) due to the lockdown. Overall, financially insecure participants reported worse diets than the financially secure before the lockdown,

such as lower fruit and vegetable consumption. Although changes in diets were similar and dietary disparities were largely maintained during the lockdown, a disproportionately larger increase in the consumption of white bread ($p=0.011$) and sugary drinks ($p<0.001$) was identified among the low financial security group. The financially insecure increased their cooking from scratch by 9.8%, more than the 6.7% increase reported by the financially secure (p for the difference=0.040). Financial barriers ($p=0.003$) to cooking also improved more for the financially insecure. Stockpiling behaviours also differed between financial groups. For example, fruit ($p=0.002$), legumes ($p<0.001$), and flour ($p=0.029$) were stockpiled more by the financially secure participants than by the financially insecure. The already food-insecure did not stockpile several of the items which were stockpiled by the food secure, such as legumes ($P<0.001$) and salty snacks ($p=0.014$). Those who lost income during the lockdown increased their breadmaking more than those who did not lose income ($p=0.048$). Those who reported frequently struggling to afford food reported a significantly higher increase in their non-bread-baking ability, compared to those who could usually afford food ($p=0.35$).

Changes to shopping and cooking were largely universal, except stockpiling behaviours which were more pronounced among the financially secure. All groups had more time to cook and felt increasingly confident about cooking healthy meals. Diet disparities between those with and without hardship widened, with disproportionate increases in white bread and sugary drink consumption among those with prior hardship. Equitable support targeting those with the greatest disadvantage is required to overcome existing disparities, and the government should consider further financial support for those with existing hardship during any prolonged lockdown period, as although financial barriers did not increase overall for this group, they were less equipped to stock up on food than the financially secure, should they have needed to isolate.

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Glossary

Aotearoa: the Māori name for New Zealand, used interchangeably with New Zealand throughout the thesis.

Click and Collect: the process of ordering groceries online and collecting them from the supermarket.

Community Services Card: a card issued by Work and Income New Zealand for those with low incomes and/or many dependants which provides discounted health services.

COVID-19: the infectious disease caused by the SARS-CoV-2 coronavirus.

The Corona Cooking Survey: a survey developed in Belgium to explore the changes in diets, cooking habits, and shopping habits while isolating at home during the COVID-19 lockdown.

The Covid Kai Survey: the New Zealand arm of the Corona Cooking Survey

Deprivation decile: an ascending scale of deprivation levels from 1-10. It is used to describe material hardship among residents of a given district or neighbourhood.

Food security: food security relates to an individual's ability to consistently access culturally appropriate and healthy food. It is explicitly used in the Covid Kai Survey data analysis (chapters 3-6) to describe a participant's reported ability to afford food (see Table A1, Appendix question "how often is it a struggle to have enough money to afford food").

Financial security: financial security relates to an individual's ability to afford their essentials and their financial preparedness and resilience. This term is explicitly used in the Covid Kai Survey to describe a participant's ability to make their money last until pay day.

Hardship: participant food insecurity, financial insecurity, or loss of income.

The lockdown: the first stay-at-home order in New Zealand between March and April 2020, or the relevant early stay-at-home orders overseas for which dates and durations vary.

Lost income: the participant either lost all of their income through unemployment or lost part of their income due to reduced hours or temporary inability to work while still employed.

The pandemic: the COVID-19 pandemic.

1 Introduction

In late 2019, a novel coronavirus was identified in Wuhan, China. This highly infectious respiratory disease, SARS-CoV-2, was named COVID-19 (coronavirus disease 2019). The virus soon spread internationally, and in early 2020, New Zealand began preparing for the inevitable arrival of our first case, which was eventually reported on 28 February (New Zealand Doctor, 2022). On 25 March 2020, at 11:59 pm, New Zealand entered the strictest level of COVID-19 lockdown, Alert Level 4, for the first time (New Zealand Doctor, 2022).

From 25 March, all nonessential workers and students in Aotearoa New Zealand were directed to return and stay home, only leaving the house for essential services and exercise. In particular, the government determined that takeaway meals and independent butcheries, bakeries, and fruit and vegetable retailers were not essential, and these were therefore unavailable for the entire Alert Level 4 period. This strict lockdown was extended from an initial 4 weeks to 5, during which all meals had to be prepared in the home, and supermarkets dominated the grocery market (Gerritsen et al., 2020). At the same time, countries worldwide entered into lockdowns of their own, incorporating a variety of protective measures (De Backer et al., 2020). Following 5 weeks at Level 4, New Zealand restrictions were loosened to Alert Level 3, where contactless takeaway pick-up and delivery were available, and a wider variety of grocery retailers could reopen (Gerritsen et al., 2020). At Level 3, although hospitality workers returned to work, office workers and others often continued to work from home.

Worldwide, opinions and experiences of the lockdown were mixed. News and social media platforms featured content from those working from home who found more energy to exercise, bake bread, and cook more adventurous meals once they no longer had to battle the daily office commute (De Backer et al., 2020; Martin, 2020; Northern Advocate, 2020). In contrast, others found they increased their unhealthy behaviours, such as consuming more prepackaged treat food than usual, as they contended with the stress of the COVID-19 pandemic (Scarmozzino & Visioli, 2020). News reports drew attention to supply-chain interruptions and customers stockpiling toilet paper and nonperishable staple

food (Taylor, 2020; Wilson, 2020). Bare supermarket shelves also sparked concerns that the lockdown might have disproportionately impacted the food security of those experiencing increased hardship due to the COVID-19 pandemic (Raghavendran & McCarthy, 2020).

Early in the first lockdown, the government announced a wage subsidy scheme for employees and self-employed New Zealand residents who had lost work (Ministry of Social Development, 2020a). The scheme aimed to retain workers in employment even if their organisation could not operate at total capacity. This included a broad range of industries, such as tourism, hospitality, and nonessential retail. The self-employed were also eligible for wage subsidies, provided they could prove that their income reduced at least 30% compared to the year before (Ministry of Social Development, 2020c). During this period, The New Zealand Government (2020) announced that unemployment and other social welfare benefits would permanently increase by about $25 per week. For those who became newly unemployed due to the lockdown, a COVID-19 Income Relief payment was available for up to 12 weeks, paying up to $490 per week (Ministry of Social Development, 2020b). The Income Relief Payment and Wage Subsidy both offered significantly more income than what was attainable for existing beneficiaries, controversially creating two tiers of social welfare support – one for the usually poor and one for the temporarily poor (Rashbrooke, 2020). New Zealand's first lockdown was among the strictest worldwide at the time, with schools and businesses closed for many weeks (Gerritsen et al., 2020). Essential workers were required to continue working whilst managing their children's daily school video calls and homework, whereas others were able to earn the wage subsidy while working reduced hours. This was yet another area where differing levels of privilege and opportunities may have worsened the lockdown experience for some families. Undeniably, crises affect groups differently. It is crucial to study how the lockdown impacted those facing considerable hardship to gauge if the existing support services adequately cushioned the impact of the lockdown on the diets, cooking, and shopping habits of those already struggling and those who lost employment due to the lockdown in New Zealand.

This project was undertaken to research changes to the diets, cooking, and shopping habits of those with prior hardship and those who lost income due to the first March–April 2020 COVID-19

pandemic lockdown in Aotearoa. The four research objectives which guide the following chapters are as follows:

1) Investigate the literature on the effect of COVID-19 stay-at-home (lockdown) restrictions on the grocery shopping, cooking, and food assistance required by people living in poverty in New Zealand and other high-income countries.

2) Determine the proportion and sociodemographic characteristics of participants in the Covid Kai Survey who experienced financial difficulty before and during the lockdown, and those who lost income due to the lockdown.

3) Analyse changes to grocery shopping, cooking, and diet for Covid Kai Survey participants who experienced financial difficulty before and during the lockdown, and those who lost income due to the lockdown, compared to those who did not report financial difficulties or loss of income.

4) Based on the research findings, make recommendations for government, councils, and local community support services about the needs of New Zealanders experiencing financial difficulty during similar future situations.

2 Literature Review

This chapter addresses the first research objective, to investigate the literature on the effect of COVID-19 stay-at-home (lockdown) restrictions on the grocery shopping, cooking, and food assistance required by people living in poverty in New Zealand and other high-income countries.

2.1 Introduction

Financial hardship has a significant impact on how people eat and access food. This literature review aims to understand what we know of the effect of COVID-19 stay-at-home (lockdown) restrictions on the grocery shopping, cooking, and food assistance required by people experiencing financial hardship and food insecurity in New Zealand and other high-income countries. This chapter synthesises and discusses what the research tells us about changes in food-related behaviours among low-income populations in high-income countries as the world began to go into various lockdowns, quarantines, or shut-downs for the first time. Prior to this review, a New Zealand scoping review on the impact on mealtime behaviours of crises worldwide, including the COVID-19 pandemic, has been undertaken (Hunter, 2021), however, no previous COVID-19 literature review of studies specifically relating to the change in diets, food shopping, cooking, and food access of those experiencing hardship in high income countries exists to my knowledge. This chapter addresses the research objectives through two key related investigations which inform the experiences of the financially insecure during the initial 2020 COVID-19 lockdowns in high-income countries. Firstly, what nutritional barriers do low-income New Zealanders often face? Secondly, what changed once similarly precarious local and overseas populations were suddenly placed within the COVID-19 lockdown environment? This literature review will begin with a summary of the New Zealand literature prior to the COVID-19 pandemic to provide context for the precarious position of our low-income demographic. The COVID-19 literature will then be synthesised by theme and discussed.

2.2 Pre-COVID Food Habits for Disadvantaged Communities

This section explains the findings of a brief literature review outlining what is known about food-related habits and behaviours among low-income or financially insecure New Zealanders. This

provides context for the circumstances facing the financially insecure in high-income countries leading into the COVID-19 pandemic and lockdowns.

2.2.1 Methods

I conducted a search of New Zealand studies to contextualise low-income consumers' circumstances in a high-income country before the lockdown. This literature search sought a general overview of the link between financial hardship and diet, food-shopping habits, cooking habits, and demand for food assistance prior to COVID-19. Relevant pre-COVID-19 research was found through the Scopus database. Key search terms included (New Zealand) AND (poverty OR financial hardship OR financial insecurity OR low income) AND (diet OR food OR shopping OR cooking OR food assistance). There was little recent relevant research from New Zealand on this topic before COVID-19, and none surveyed low-income populations about their shopping or cooking habits. Seven relevant New Zealand journal articles published between January 2014 and March 2020 were included. This date range was chosen to ensure that the most up-to-date pre-COVID-19 research could be synthesised and provide context for the circumstances for low-income New Zealanders before the 2020 COVID-19 lockdown period. Five of the included studies researched children (Egli et al., 2020; Gerritsen, Harré, et al., 2019; Gerritsen, Renker-Darby, et al., 2019; Munday & Wilson, 2017; Rush et al., 2019; Schlichting et al., 2019), including one study which featured in two articles; and only one relevant study researched adults (Wilson et al., 2014).

2.2.2 Results

2.2.2.1 The Importance of the Home Food Environment. The home food environment shapes nutritional decisions for New Zealand households. Studies found that home food availability was the most significant dietary influence for adults and children (Gerritsen, Harré, et al., 2019; Gerritsen, Renker-Darby, et al., 2019; Wilson et al., 2014). For example, adults ate more high-fat foods when these were readily available at home (Wilson et al., 2014), and children ate more fruit and vegetables when these were available to eat (Wilson et al., 2014). The New Zealand research found that children rely heavily on their home food environments for their daily nutrition. Unlike the US and UK, during the 2014–2019 publication period, it was uncommon for New Zealand schools to provide

catered lunches. As of 2021, more than 200,000 students from New Zealand's poorest schools now receive government-funded school lunches after a pilot study in 2019 and 2020 was expanded to accommodate increasing childhood hardship following the first COVID-19 lockdown (Ministry of Education, 2021). In 2017, Munday and Wilson (2017) studied the impact of providing daily healthy meals to children at a low-income kindergarten. They found that the children ate a broader diet at home and unhealthy snack consumption decreased, but, in the short run, fruit and vegetable consumption did not change (Munday & Wilson, 2017). Despite the introduction of some school-based lunch programmes, children's diets remain primarily in the hands of their families. For those receiving school meals before the lockdown, the cost of feeding the family may have increased when this extra daily meal was not available for their children.

2.2.2.2 Food in schools. Prior to the 2019 introduction of the Ministry of Education (2021) school meals pilot "Ka ora, Ka ako", almost all meal provision in New Zealand schools was funded by charities or were a luxury available at a cost to families. Charitable services available prior to 2019 included lunchbox style meals like the Eat My Lunch "Buy One, Give One" programme (2021), which donated a meal to a school student for every meal purchased by the community, KickStart Breakfasts (2020) provided by cereal giant Sanitarium in the mornings before school, and a mixture of hot and cold meals for students experiencing significant hardship from the KidsCan school meal programme (2019). One public programme which has existed since 2005 is the Fruit in Schools programme, which provides daily fruit and vegetables to children with nutritional disadvantages (Ministry of Health, 2017). Despite the availability of a variety of support services for school students experiencing high deprivation and evidence that programmes such as the Fruit in Schools programme can improve the diets of school children (Watts, 2018), the pre-COVID literature did not discuss these programmes and their impacts.

2.2.2.3 The Takeaway Food Environment. Low-income New Zealanders often live in areas with a high density of takeaway outlets, which correlates to the consumption of calorie-dense foods (Egli et al., 2020). Egli et al. (2020) studied a cohort of Auckland primary and intermediate school children to investigate a possible relationship between childhood obesity and the density of

unhealthy food outlets on the way to and from school. None was found for this young sample. However, as fast-food consumption relates to the deprivation decile of the area (Gerritsen, Renker-Darby, et al., 2019), the availability of healthy or unhealthy food outlets is likely to be a significant predictor of consumption for some demographic groups. During the 2020 nationwide COVID-19 lockdown, fast-food restaurants and takeaway outlets closed for more than a month, which likely impacted the availability of calorie-dense foods for households living in these food deserts. Many of the unhealthiest foods consumed are produced outside the home (Wilson et al., 2014), and therefore the COVID-19 lockdown may have reduced the consumption of some unhealthy processed food types, such as hamburgers and fried foods.

2.2.2.4 Fruit and Vegetable Intake in Children. Children from low-income households tend to have poor fruit and vegetable intake (Gerritsen, Renker-Darby, et al., 2019; Rush et al., 2019; Schlichting et al., 2019). In 2018, in the most deprived quintile, only two-fifths of children were found to eat sufficient vegetables (Gerritsen, Renker-Darby, et al., 2019). In a study of New Zealand infants, Schlichting et al. (2019) found that infants from low-income households were more likely to be food-insecure and have poorer fruit and vegetable intake during complementary feeding than those from financially secure households. Before the onset of the COVID-19 pandemic, the research explored ways to improve fruit and vegetable consumption among low-income children (Gerritsen, Harré, et al., 2019; Gerritsen, Renker-Darby, et al., 2019; Rush et al., 2019). For example, Gerritsen, Harré, et al. (2019) and Gerritsen, Renker-Darby, et al. (2019) interviewed community members such as students, public servants, and teachers. They found a dominant belief among participants that teaching families about nutrition, how to cook for themselves, and how to grow food would improve the fruit and vegetable consumption of low-income children. Gerritsen, Renker-Darby, et al. (2019) argued that while cooking at home might enable healthier meals at a lower or equivalent financial cost to buying takeaways, time poverty and a skill gap are barriers for low-income families. During the March–April 2020 COVID-19 lockdown, the time-poverty gap likely reduced for some low-income households, while other barriers remained or possibly even emerged for the first time. While fruit and vegetable consumption may increase if purchased and available for children to eat, Gerritsen, Harré,

et al. (2019), Gerritsen, Renker-Darby, et al. (2019), and Schlichting et al. (2019) discussed accessibility and cost barriers to increasing fruit and vegetable consumption for infants and children. Gerritsen, Renker-Darby, et al. (2019) reported that low-income families prioritise purchasing food that is cheap and filling, which leads to high consumption of starches and few fruit and vegetables. Schlichting et al. (2019) also drew attention to accessibility and cost barriers to increasing fruit and vegetable consumption for infants from low-income families.

2.2.3 Summary

The pre-COVID-19 research demonstrates that low-income families struggle to access sufficient healthy food, and children's food intake largely depends on what is available in and around the home. A reduced time barrier and the closure of unhealthy food outlets may have given way to healthier eating during the COVID-19 lockdown. However, there is a risk that loss of income, poor accessibility of affordable grocery staples, and continuation of a skill gap may perpetuate and even worsen the diets of those with financial hardship. The closure of school-based meal programmes, and the changing financial circumstances in many homes, likely increased some nutritional barriers for low-income families and individuals.

2.3 COVID-19 Literature

This section outlines what we know about the effect of the early 2020 COVID-19 lockdowns on low-income, food-insecure populations in high-income countries.

2.3.1 Methods

I conducted a literature search to find relevant peer-reviewed studies of the changes in cooking, food shopping, diets, and demand for assistance among those experiencing financial hardship during the COVID-19 pandemic. The literature for this review was found primarily through the Scopus database. Additional searches were undertaken on PsycInfo and Google Scholar to find any missing articles. The search in Google Scholar was particularly advantageous as it cast a wider net, while the Scopus and PsycInfo databases returned more narrow and specific results. The search used the terms (COVID-19 OR pandemic OR coronavirus) AND (food OR diet OR "food shopping" OR "grocery

shopping" OR cooking) AND (poverty OR "low income" OR "financial difficulty" OR "financial hardship"). Financial hardship significantly increases an individual's chance of being food insecure (Siddiqi et al., 2021; Wilson et al., 2014). Therefore, because of the relative paucity of COVID-19 literature examining low-income populations, the search term *food insecurity* was included as a synonym for financial hardship. As few peer-reviewed studies were available on this topic during the search period to 18 April 2021, a wider variety of literature types was included than initially expected, such as several narrative reviews and an opinion piece. The search initially returned approximately 200 articles on Scopus, 11,900 on Google Scholar, and 10 articles on PsycInfo. The search was then narrowed to exclude studies of populations from low- and middle-income countries. The remaining literature on high-income countries was further narrowed to exclude a study of only high- and middle-income participants and review articles that did not discuss the impact of the COVID-19 lockdown on those experiencing financial hardship. No literature returned by the PsycInfo database was included in the review. After excluding irrelevant articles, 18 articles published up to 18 April 2021 were included in the review (Table 1). The 18 articles were imported into NVivo software, and relevant passages were coded to each relevant theme as these were identified. This method enabled key content across the literature to be sorted by theme to provide a simple overview of what the literature revealed about each theme.

2.3.2 Results

Of the 18 articles included in the literature review, 13 were from the US (Adams et al., 2020; Clay & Rogus, 2021; Dubowitz et al., 2021; Kinsey et al., 2020; McLoughlin et al., 2020; Molitor & Doerr, 2021; Nagata et al., 2021; Owens et al., 2020; Sampson et al., 2021; Sharma et al., 2020; Siddiqi et al., 2021; Wolfson & Leung, 2020a, 2020b), three from the UK (Baraniuk, 2020; Barker & Russell, 2020; Power et al., 2020), one from France (Deschasaux-Tanguy et al., 2021). Only one article included New Zealand data, the 38-country Corona Cooking Survey, which included countries of varying income levels (De Backer et al., 2020). No studies specifically surveyed a low-income New Zealand population. These articles include the results of 11 surveys, one case study, one opinion piece, and three narrative reviews of a variety of available quantitative and qualitative data. The 11

surveys are discussed in 13 papers, as two sets of study data were published twice, focusing on different aspects of the research. Survey participant numbers ranged from N=415 to N=90,971 (Table 1).

Table 1

Summary of Included COVID-19 Literature

Literature Summary						
Author	Title	Country	Sample	Details of research	Measure for food security	Strengths and limitations
			Surveys			
Adams et al., 2020	Food Insecurity, the Home Food Environment, and Parent Feeding Practices in the Era of COVID-19.	USA	N=584 parents • Random representative sample, residents in low-income zip codes.	Online survey. Data collection from 30 April 2020–23 May 2020.	• Six-item U.S. Department of Agriculture Household Food Security Module	Strengths: • Targets low-income group • Aimed to obtain a representative sample Limitations: • The parents were disproportionately white, partnered, college educated.
Clay & Rogus, 2021	Impact of Employment, Essential Work, and Risk Factors on Food Access during the COVID-19 Pandemic in New York State.	New York State (excluding New York City), USA.	N=415 • 50% black, 50% Hispanic, 50% low education or household income below $50,000 pa. • Quota-based. • Nonrepresentative.	Online survey. Data collection between May–June 2020.	• Asks about access to food, rather than food insecurity. • National Food Access Research Team survey questions used. • The authors state that food access and food security are closely related.	Strengths: • Decent binary gender representation, 56.6% female. • Targets demographics more likely to be deprived, equitable sampling. Limitations: • Not a representative sample, not necessarily generally transferrable.
De Backer et al., 2020	An Evaluation of the COVID-19 Pandemic and Perceived Social Distancing Policies in Relation to Planning, Selecting, and Preparing Healthy Meals: An Observational Study	Australia, Austria, Bahrein, Belgium, Brazil Canada, Chile, China, Denmark, Ecuador, Egypt, Finland, France, Germany, Greece, Ireland, Italy, Japan, Jordan, Kuwait, Lebanon Mexico, Netherlands, New Zealand, Oman,	N= 37,207 • Men, women, gender diverse. • Convenience sample.	Online survey (the Corona Cooking Survey). Data collection between April–June 2020. Meta-synthesis of studies across Corona Cooking	• Single question relating to food security: "In general, how often is it a struggle to have enough money to go shopping for food?"	Strengths: • Large international sample, asks questions about cooking and shopping habits which most studies do not. Limitations: • Does not target a low-income cohort and does not stratify results by income level, instead refers to financial stress, which does not equal financial hardship.

Literature Summary						
Author	Title	Country	Sample	Details of research	Measure for food security	Strengths and limitations
	in 38 Countries Worldwide.	Palestine, Peru, Poland, Qatar, Romania, Saudi Arabia, Singapore, South Africa, Spain, Uganda, United Arab Emirates, United Kingdom, United States.		Survey includes high-, middle-, and low-income countries.		• Some of the studies in the meta-synthesis are from low- and middle-income countries, which means the results may not be transferable to low-income populations in high-income countries. • Does not ask household income.
Deschasaux-Tanguy et al., 2021	Diet and Physical Activity During the Coronavirus Disease 2019 (COVID-19) Lockdown (March–May 2020) Results From the French NutriNet Santé Cohort Study.	France	N=37,252 52.3% women, 47.7% men • Existing longitudinal cohort, NutriNet Santé study.	Online survey Data collection between April–May 2020.	Measures monthly household income, does not measure food security.	Strengths: • Existing longitudinal study enables a large sample size. • The survey includes questions about shopping habits. • Compares pre-COVID-19 data with lockdown data. • Similar male and female representation. Limitations: • Does not target a low-income cohort but does identify trends among low-income participants.
Dubowitz et al., 2021	Food Insecurity in a Low-Income, Predominantly African American Cohort Following the COVID-19 Pandemic.	Pittsburgh, Philadelphia, USA.	N=607 • Demographic data defined as similar to 2018, which was 94% African American with mean age 62. • True demographic distribution of 2020 data not advised.	Longitudinal phone survey The Pittsburgh Hill/Homewood Research on Neighborhood Change and Health (PHRESH)	• 6-item Adult Food Security Survey Module.	Strengths: • Targets a low-income population. • Existing longitudinal study enables comparisons between pre-COVID-19 and lockdown data. Limitations: • Possibly not transferable to other low-income populations as the cohort tends to be older aged and disproportionately African American.

Literature Summary

Author	Title	Country	Sample	Details of research	Measure for food security	Strengths and limitations
Siddiqi et al., 2021	SNAP[1] Participants and High Levels of Food Insecurity in the Early Stages of the COVID-19 Pandemic.		N=598 • 62% Black, 83.8% female, mean age 62.	Data collection from 23 March–22 May 2020 Data collected via phone in 2020 due to COVID-19.		Strengths: • Targets a low-income population. • Existing longitudinal study enables comparisons between pre-COVID-19 and lockdown data. Limitations: • Disproportionately older, female sample
Molitor & Doerr, 2021	Very Low Food Security Among Low Income Households With Children in California Before and Shortly After the Economic Downturn from COVID-19.	California, USA	N=11,653 mothers • An annual representative phone survey. • Households at or below 185% of the federal poverty level[2].	Phone survey. Data collection from 27 April–21 July 2020. Simply describes the change in very low food security in this cohort.	U.S. Department of Agriculture 6-item Food Security Survey Module.	Strengths: • Large sample size. • Representative sample of low-income Californian households. • Annual survey enables comparisons and identification of changing trends. • The results were an anomaly among the literature, finding that unemployment led to improved food security for low-income Californian mothers. Limitations: • The brevity of this phone survey and subsequent paper means there was little depth and discussion, but this is expected with a sample this large and representative of a low-income group.
Owens et al., 2020	Prevalence and Social Determinants of Food.	Texas, USA.	N=651 • Response rate 4.4%. • Representative sample.	Online survey. Data collection in May 2020.		Strengths: • Targets a low-income, food-insecure student population. Limitations: • Low response rate.

[1] The United States Supplemental Nutrition Assistance Program
[2] Household income no more than 1.85 times the US income threshold for poverty

Literature Summary						
Author	Title	Country	Sample	Details of research	Measure for food security	Strengths and limitations
			• One Texan university.			• Disproportionately female population compared with U.S. student population.
Sharma et al., 2020	Social Determinants of Health-Related Needs.	Houston, Washington DC, Southwest Florida, and Chicago, USA.	N= 1,048 • 6.4% response rate. • Brighter Bites cohort is a low-income population receiving food assistance. • Representative sample. • Existing cohort. • 97% female participants responding on behalf of their family.	Online survey Data collection in April 2020	2-item Hunger Vital Sign screening questionnaire	Strengths: • Representative sample. • Existing longitudinal cohort. • Mixed-methods study design. • Targets low-income families. Limitations: • Low response rate. • Disproportionately female respondents.
Sampson et al., 2021	Financial Hardship and Health Risk Behavior During COVID-19 in a Large US National Sample of Women.	USA	N=90,971 • Women. • 27.14% “likely to have trouble paying bills.” • 23.93% “pay has decreased.” • Nonrepresentative, convenience sample (social media advertising).	Online survey Data collection from 20 March–10 April.	Food security was not measured, instead, the survey asked participants if they were likely to have trouble paying bills, had lost their job, were likely to lose their job, and whether they’d had a decrease in pay.	Strengths: • Very large sample. Limitations: • Convenience sample, not representative. • Did not collect income data, instead discusses financial hardship and stressors. • Disproportionately higher income sample.
Wolfson & Leung, 2020a	Food Insecurity and COVID-19: Disparities in Early	USA	N=1,478 adults <250% of the U.S. federal poverty line.	Online survey	18-question USDA food-security screener module	Strengths: • Samples a low-income cohort. • Aims to be a representative sample.

Literature Summary						
Author	Title	Country	Sample	Details of research	Measure for food security	Strengths and limitations
	Effects for US Adults.		• Aimed to be a representative sample of a low-income population.	Data collection from 19–24 March 2020		• Uses "gold standard" 18-question USDA[3] food-security questionnaire. Limitations: • Despite national eligibility, not all states represented and some with few respondents.
Wolfson & Leung, 2020b	Food Insecurity During COVID-19: An Acute Crisis With Long-Term Health Implications.		N=1,478 in March 2020 N=1,741 in June 2020 • Adults <250% of the U.S. federal poverty line[4].			Strengths: • Compares two cohorts during the pandemic to find change in food insecurity between March 2020 and June 2020. • Is the follow up to the previous Wolfson & Leung, 2020a study. • Higher response rate than the first survey. Limitations: • The data were less of a focus, the article more discusses the wider pandemic. • Very brief description of the results, mainly showing the difference between the March 2020 sample and the June 2020 sample.
Review articles						
Baraniuk, 2020	Fears Grow of Nutritional Crisis in Lockdown UK.	UK	n/a	A brief narrative review that discusses various survey data and other literature. Written by a freelance journalist	n/a	Strengths: • Briefly synthesises news articles on food insecurity in the UK during the lockdown. • Inclusion of grey literature broadens the scope of knowledge. • Published in the BMJ[5]. Limitations: • Review article not an independent study.

[3] United States Department of Agriculture
[4] Household income no more than 2.5 times the US income threshold for poverty
[5] British Medical Journal

Literature Summary						
Author	Title	Country	Sample	Details of research	Measure for food security	Strengths and limitations
				commissioned by the BMJ.		• Not a comprehensive or systematic review. • Journalist author. • Grey literature rather than academic sources. • Not peer reviewed.
Barker & Russell, 2020	Feeding the Food Insecure in Britain: Learning From the 2020 COVID-19 Crisis.	Britain	n/a	A narrative review that discusses foodbank data and other literature.	n/a	Strengths: • Synthesises literature showing the shortcomings of the British welfare system. • Discusses and provides an outline of the already existing and COVID-19 food-support services in Britain. • Does refer to academic sources when discussing food services existing pre-COVID-19. Limitations: • Literature review rather than an independent study. • Does not discuss much COVID-19 literature.
Kinsey et al., 2020	COVID-19 and Food Insecurity: An Uneven Patchwork of Responses.	USA	n/a	Evaluation of food assistance programmes during COVID-19 with interstate comparisons.	n/a	Strengths: • Summarises some U.S. government food-support programmes and their advantages and disadvantages. • Very relevant to one part of the research question. Limitations: • Not an independent study but instead a policy review. • Very brief, lacking detail that would have benefited an international audience unfamiliar with the U.S. food-assistance programmes.

Literature Summary						
Author	Title	Country	Sample	Details of research	Measure for food security	Strengths and limitations
Nagata et al., 2021	Perspective: The Convergence of Coronavirus Disease 2019 (COVID-19) and Food Insecurity in the United States.	USA	n/a	A narrative review.	n/a	Strengths: • Summarises known impact of COVID-19 on food insecurity. • Makes policy recommendations based on the authors' findings. Limitations: • Literature review rather than independent study.
Opinion piece						
Power et al., 2020	How Covid-19 Has Exposed Inequalities in the UK Food System: The Case of UK Food and Poverty.	UK	n/a	A peer-reviewed opinion article.	n/a	Strengths: • Peer reviewed. • Relevant academic authorship. • Makes policy recommendations. • Synthesises academic and grey literature. Limitations: • An opinion piece rather than a review.
Case study						
McLoughlin et al., 2020	Addressing Food Insecurity through a Health Equity Lens. A Case Study of Large Urban School Districts during the COVID-19 Pandemic.	Chicago, New York City, Houston, Los Angeles, USA.	N= four large school districts • The districts serve 4,174 schools. • Data collected from the schools' public websites.	Case study of food-assistance programmes in four school districts.	Census data enabled the identification of areas likely experience high deprivation, but individual food insecurity was not measured.	Strengths: • Helps us understand the role U.S. school districts had in feeding low-income students during the lockdown. • Large number of schools included. • Mixed-methods design. Limitations: • Data collected via public school websites may not reflect the lived experiences of the students and their families.

Seven overarching themes were identified across the COVID-19 lockdown research. These will be summarised into three categories. Firstly, the sufficiency of food (change in diet, change in food insecurity), food acquisition habits (changes to shopping, stockpiling behaviours, changes in demand for food assistance), and how food was prepared (changes to cooking).

2.3.3 Sufficiency of Food During COVID-19

2.3.3.1 Food Insecurity. Increasing food insecurity due to the pandemic was a dominant theme across the literature. The New Zealand Ministry of Health (2019) defines food insecurity as "a limited or uncertain availability of nutritionally adequate and safe foods or limited ability to acquire personally acceptable foods that meet cultural needs in a socially acceptable way" (Ministry of Health, 2019, p. 1). Across several studies, food security was measured in a variety of ways (Table 1). For example, the 18-question United States Department of Agriculture Food Security Module (2012) is considered the "gold standard" in the US for measuring food security (Wolfson & Leung, 2020a). Among the 18 questions, the questionnaire asks if households can afford balanced meals, if participants worry that food will run out before they can afford to buy more, and if adults cut the size of or skip meals due to cost.

During the lockdown, those with financial difficulty generally reported feeling increasingly food insecure (Adams et al., 2020; Baraniuk, 2020; Barker & Russell, 2020; Clay & Rogus, 2021; Dubowitz et al., 2021; Kinsey et al., 2020; McLoughlin et al., 2020; Nagata et al., 2021; Owens et al., 2020; Power et al., 2020; Sampson et al., 2021; Sharma et al., 2020; Siddiqi et al., 2021; Wolfson & Leung, 2020a, 2020b). A U.K. review of food-insecurity literature found that food insecurity was four times higher due to the pandemic (Barker & Russell, 2020). Another U.K. review found that during the lockdown, the proportion of children missing at least one meal per day increased from 25% to 35% due to school closures (Baraniuk, 2020).

Inequitable increases in food insecurity were particularly apparent in the U.S. literature, which studied several insecure populations. For example, Adams et al. (2020) asked U.S. families how the pandemic impacted their food security and identified a 20% increase in food insecurity due to the COVID-19

lockdown. Also, Wolfson and Leung (2020a) found that only 36% of low-income U.S. adults were food secure during the lockdown, and U.S. food insecurity increased significantly from 11% in 2018 to 38% in March 2020. A longitudinal survey of residents of Pittsburgh, Pennsylvania, found that low-income, predominantly African American participants reported an approximately 80% increase in food insecurity during the COVID-19 lockdown (Dubowitz et al., 2021). In contrast, the general population reported a 60% increase (Dubowitz et al., 2021). This suggests an ethnic disparity in changes to food security during the pandemic, with a widening food-security gap between African Americans and the general American public. As well as this ethnic disparity, the increase in food insecurity in the US was higher among those who relied on federal food assistance programmes (Dubowitz et al., 2021). These U.S. food assistance programmes include the Supplementary Nutritional Assistance Programme (SNAP) for low-income, employed residents and the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC). Before the COVID-19 pandemic, SNAP registration was available to low-income citizens working 20 hours or more a week (U.S. Department of Agriculture, 2021, October 01). WIC was accessible to eligible low-income pregnant, postnatal, and breastfeeding adults, and infants and children from low-income households until age 5 (United States Government, n.d.). The money provided under these federal food-support schemes could only be used for food and was regulated, restricting where food could be purchased and what participants could buy (U.S. Department of Agriculture, 2021, April 14). Siddiqi et al. (2021) found that existing SNAP members experienced a higher increase in food insecurity than those who were not registered for assistance. The U.S. disparities suggest that changes in food security were disproportionally worse for those already experiencing hardship, and the usual support services did not sufficiently correct for the widening gap.

Across the literature, one study identified an improvement in food security for low-income households. Molitor and Doerr (2021) examined changes in food insecurity during the lockdown. They found that Californian mothers reported an 11% increase in unemployment at the same time as a decrease in very low food security, which was likely due to the increase in support available for some U.S. families with children during the COVID-19 lockdown (Molitor & Doerr, 2021). These increases

include the federal Pandemic-Electronic Benefit Transfer (P-EBT), which provided up to $123 per eligible child per month and was used similarly to SNAP but with more inclusive eligibility criteria (California Department of Social Services, 2021). For example, while SNAP benefits usually required participants to work 20 hours per week, the P-EBT card was automatically sent to financially insecure families with children who usually received free school meals (California Department of Social Services, 2021). For children under 6, eligibility was based on the family's enrolment in the local SNAP programme, known as CalFresh (California Department of Social Services, 2021). The purpose of this programme was to support families in buying food while their children were unable to receive free meals at school, and the findings indicate that this may have successfully improved food security for already very food-insecure, newly unemployed Californian families (Molitor & Doerr, 2021).

2.3.3.2 Changes to Diet. During the COVID-19 lockdown in various countries, diets changed for better or worse. During the COVID-19 lockdown, consumers typically purchased more processed, shelf-stable foods than usual (Adams et al., 2020; Baraniuk, 2020; Sharma et al., 2020). In the 38-country Corona Cooking Survey and the French NutriNet Santé study, this behaviour was particularly pronounced among young women staying at home during the lockdown (De Backer et al., 2020; Deschasaux-Tanguy et al., 2021). In a study of U.S. families with children, a general shift toward less healthy food purchasing was found to be more pronounced for lower-income families (Adams et al., 2020). Whatever food is available in the home significantly influences our dietary choices (Wilson et al., 2014). Due to reduced access to food outside of the home during the lockdown, it is reasonable to assume these less nutritious purchasing decisions reflect what was eaten.

The magnitude and direction of dietary changes were associated with demographic trends. Financially insecure younger adults and children tended to increase their consumption of calorie-dense snacks and treat foods during the COVID-19 lockdown (Adams et al., 2020; Deschasaux-Tanguy et al., 2021). For example, French adults, who experienced the most disruption to their usual routine, often had the most significant changes to food-related behaviours (Deschasaux-Tanguy et al., 2021). Lower-income, highly educated young women in this study reported increasing their snack-food consumption due to experiencing worsening stress and anxiety while working from home during the COVID-19

lockdown (Deschasaux-Tanguy et al., 2021). This group also reported difficulty accessing their usual supermarket products, which would account for some changes in consumption (Deschasaux-Tanguy et al., 2021). In contrast, those already unemployed, retired, or continuing to work on-site, such as essential workers, reported the smallest change to their diet (Deschasaux-Tanguy et al., 2021). In the same study, higher-income participants with an unhealthy dietary pattern before the pandemic lockdown tended to eat a more balanced diet during the lockdown and were more likely to lose weight (Deschasaux-Tanguy et al., 2021). Women with childcare responsibilities tended to increase their high fat and sugary food consumption and reported a decrease in their consumption of fresh foods during the lockdown. This suggests that the increased burden of female-dominated care responsibilities was negatively associated with dietary decisions during this period (Deschasaux-Tanguy et al., 2021).

2.3.4 Food Acquisition During COVID-19

2.3.4.1 Changes to Access. During the COVID-19 lockdowns and social distancing regulations, low-income U.S. and U.K. households had to change how they accessed food (Barker & Russell, 2020; Kinsey et al., 2020; McLoughlin et al., 2020; Nagata et al., 2021; Power et al., 2020). Many low-income children in these countries usually had access to subsidised or free school meals, but assistance in the same format was not possible when schools were closed during COVID lockdowns. This likely increased the financial burden on families to feed their school-aged children at home (Adams et al., 2020; Barker & Russell, 2020; McLoughlin et al., 2020; Nagata et al., 2021), as school meals usually account for a significant proportion of the daily food intake for children experiencing hardship (McLoughlin et al., 2020). Difficulty accessing school meal-replacement services presented equity concerns in both the US and the UK. In response to the increasing food burden on families with children, several charitable and publicly funded services were established to provide food in the home for children who no longer had access to school meals. This included providing families with supermarket vouchers in the UK (Barker & Russell, 2020; Power et al., 2020) and food-box collection and delivery services in the US (Kinsey et al., 2020; McLoughlin et al., 2020). In the US, government funding for some school meals continued, enabling federally funded food assistance for children learning from home (McLoughlin et al., 2020). Due to various barriers,

including resource limitations and variations between U.S. school districts, these services were not universally accessible (Adams et al., 2020; Kinsey et al., 2020; Nagata et al., 2021; Power et al., 2020). McLoughlin et al. (2020) studied school meal-replacement services in four school districts and found that since school meals are responsible for about a third of the daily calorie intake of U.S. children, continuing to fund daily meals for school children was critical. Despite this, there were limitations in how these services were delivered. For example, the Houston school district provided large amounts of food, which was challenging to collect without a car, while the Chicago school district typically communicated to families in English only despite the city's sizeable Spanish-speaking population (McLoughlin et al., 2020). Kinsey et al. (2020) found that while some U.S. school districts delivered school meals via the usual school-bus route, others required families to pick up a week of meals at a time, again disadvantaging families without a car. In the UK, Barker and Russell (2020) discovered that school meal-replacement voucher schemes struggled to reach all children in need. Even if vouchers were available, not all supermarket chains accepted these, which added a barrier for families who lived far from participating supermarkets (Barker & Russell, 2020). This demonstrates that some students experiencing financial hardship may have had easier access to meals than others, depending on their location and family's access to a vehicle.

During the COVID-19 pandemic, the operating practices of some U.K. food banks were affected due to food shortages and staffing concerns. These charitable operations are often staffed by older volunteers who are likely to be more vulnerable to serious illness and cautious about continuing to work (Power et al., 2020). Many U.K. supermarkets chose to impose purchasing limits on essential food items to prevent food shortages (Power et al., 2020). Because of this, public foodbank donations reduced (Power et al., 2020) while demand for support significantly increased (Baraniuk, 2020; Barker & Russell, 2020; Nagata et al., 2021; Wolfson & Leung, 2020b). Due to social distancing rules, many existing recipients of support services had to change how they accessed these. Social meal programmes for children, such as breakfast clubs, had to close, and foodbanks moved to prepacked and food parcel deliveries (Power et al., 2020). These measures removed many social and personalised experiences previously possible (Power et al., 2020). In the US, some foodbanks had to

close, despite increasing demand, due to safety concerns for staff due to the risk of exposure to COVID-19 and a limited supply of food (Owens et al., 2020).

2.3.4.2 Change in Demand for Food Assistance. Much of the literature examined changes in demand for food-related assistance among precarious populations. These studies found that among most financially insecure groups, demand for assistance from charities and government support rose (Adams et al., 2020; Baraniuk, 2020; Barker & Russell, 2020; Kinsey et al., 2020; McLoughlin et al., 2020; Molitor & Doerr, 2021; Nagata et al., 2021; Owens et al., 2020; Power et al., 2020; Sharma et al., 2020; Wolfson & Leung, 2020b). An anomaly was found in a study of low-income, predominantly African American Pittsburgh residents (Dubowitz et al., 2021; Siddiqi et al., 2021). This study identified no significant change in demand for foodbank- and government-provided food assistance despite a significant increase in food insecurity in the cohort. This inconsistency was likely explained by many participants already receiving the highest level of available government benefits at the time and the stigma associated with seeking help (Dubowitz et al., 2021). The resistance to seeking support from foodbanks may also reflect demographic-specific or general accessibility barriers (Dubowitz et al., 2021). Notably, this cohort had a mean age of 62, therefore, these households were unlikely to be eligible for support aimed at families with children.

2.3.4.3 Government Assistance During COVID-19. Several U.S. studies asked their low-income participants which government support services they had benefited from during the COVID-19 lockdown (Adams et al., 2020; Dubowitz et al., 2021; Nagata et al., 2021; Sharma et al., 2020; Siddiqi et al., 2021). Of the 18 articles reviewed, only the US literature reported on food-specific government assistance, which existed prior to the lockdown. In contrast, the UK and New Zealand are welfare states which do not usually dictate how unemployment or supplementary benefits can be spent. Although specific food assistance like SNAP benefits reduces flexibility for participants, the ability to access data on these programmes provides a way to measure food-security changes in a crisis period. Receipt of SNAP and WIC food-assistance benefits was common among low-income U.S. families before and during the lockdown (Adams et al., 2020). The U.S. literature broadly demonstrates a change in the eligibility criteria and demand for these support services during the

lockdown. For example, Dubowitz et al. (2021) found that options for additional support were limited for those already receiving the maximum food-assistance benefit. However, later publications reported on expanded COVID-19-specific support that improved food security for participants who became unemployed during the pandemic (Molitor & Doerr, 2021). SNAP is usually only accessible to those working 20 hours or more each week (Owens et al., 2020). Therefore, there were initially restrictions on accessing SNAP benefits for full-time students and those newly unemployed due to COVID-19 (Adams et al., 2020; Owens et al., 2020; Wolfson & Leung, 2020a, 2020b). These benefits were later expanded as the pandemic progressed to increase eligibility for a wider variety of participants (Kinsey et al., 2020; Molitor & Doerr, 2021; Owens et al., 2020). During the U.S. COVID-19 lockdowns, the pandemic response programme for adults included extending eligibility for federal food-assistance programmes, such as expanding SNAP benefit limits by 15%, and increasing eligibility for university students (Nagata et al., 2021; Siddiqi et al., 2021). Despite this, many students eligible for government assistance did not enrol or increase their utilisation of SNAP during the early pandemic period (Siddiqi et al., 2021).

As the pandemic took hold and shopping in person became a significantly more high-risk activity, only 5 U.S. states enabled SNAP participants to buy their funded groceries online. Online SNAP redemption later expanded to 36 of the 50 states by May 2020 (Kinsey et al., 2020). As several states remained ineligible for online SNAP redemption, online food shopping to prevent exposure to COVID-19 became a privilege for the financially independent.

In contrast to the US, like New Zealand, the UK does not have a government food assistance programme for adults. Barker and Russell (2020) described how free school meals are the only government nutritional support service in the UK, only feeding school-aged children. Monetary support from the U.K. government was available, such as Universal Credit (unemployment benefits) and the Coronavirus Job Retention Scheme (furlough), which kept people paid and employed when they temporarily could not work (Barker & Russell, 2020). Most of the nutritional support for adults during the COVID-19 lockdown in the UK was from food banks and other charitable initiatives (Barker & Russell, 2020; Power et al., 2020).

2.3.4.4 Changes to Food Shopping.

Shopping habits among the financially insecure changed due to necessity, as supply and access barriers emerged during the COVID-19 lockdowns. Nine articles discussed the changes in shopping habits among low-income households (Adams et al., 2020; Barker & Russell, 2020; Clay & Rogus, 2021; De Backer et al., 2020; Molitor & Doerr, 2021; Power et al., 2020; Sharma et al., 2020; Siddiqi et al., 2021; Wolfson & Leung, 2020a). Seven of these articles describe surveys where participants were asked about their shopping habits (Adams et al., 2020; Clay & Rogus, 2021; De Backer et al., 2020; Molitor & Doerr, 2021; Sharma et al., 2020; Siddiqi et al., 2021; Wolfson & Leung, 2020a), and two reviewed existing literature (Barker & Russell, 2020; Power et al., 2020). During the early COVID-19 lockdowns, governments recommended that in-person shopping should be "as infrequent as possible" (Mason, 2020, para. 5) to limit exposure to shoppers who may be infectious, which required in-person customers to buy more than usual if they shopped less often (Benker, 2021). The U.S. government also recommended that people purchase extra food to enable less frequent shopping (Wolfson & Leung, 2020a). Two U.S. surveys (Clay & Rogus, 2021; Wolfson & Leung, 2020a, 2020b) asked participants how well they could comply with the government recommendations. These surveys found that the recommendations were unrealistic for food-insecure and low-income participants, putting them at higher risk of exposure to COVID-19 or inability to access sufficient food. This is evidenced by the studies finding that many low-income earners who did reduce their shopping frequency also experienced increasing food insecurity (Barker & Russell, 2020; Clay & Rogus, 2021; Kinsey et al., 2020; Sharma et al., 2020). As the financially secure could more often afford to stock up on food several weeks in advance, supply issues affected those who could not.

The international Corona Cooking Survey of 38 countries (De Backer et al., 2020) asked participants if they changed how they shopped for food. This study found that low-income shoppers started to shop more carefully and pay more attention to the nutritional value of the food they purchased, likely because what was available was more expensive than what they usually bought (De Backer et al., 2020). There may be differences in the way men and women experiencing financial hardship changed in their shopping habits during the pandemic. For example, the Corona Cooking Survey found that

women who generally struggled to make their money last until the next payday tended to make healthier food choices during the lockdown, compared to before the pandemic (De Backer et al., 2020). In contrast, men did not report a similar change (De Backer et al., 2020). Both men and women who lost income during the pandemic selected more healthy foods at the supermarket than usual (De Backer et al., 2020). Before the pandemic, U.S. low-income shoppers tended to shop strategically, travelling to several shops to follow the discounts (Kinsey et al., 2020). Because those experiencing financial hardship often could not afford to buy large quantities of food at once, supermarket trips tended to be more frequent than for higher-income shoppers (Kinsey et al., 2020). The trade-off between shopping strategically to save money and shopping less frequently to enable social distancing likely put low-income participants across these studies at risk of increasing food insecurity and contracting COVID-19.

The COVID-19 pandemic lockdown changed the way some low-income households purchased their food. As mentioned earlier, the U.S. SNAP benefits were usually only redeemable in person rather than via an online supermarket (Kinsey et al., 2020). At the onset of the COVID-19 pandemic, 5 states were piloting online redemption of SNAP benefits (Siddiqi et al., 2021). In the US, low-income households are less likely to have a private vehicle and often live in areas without reliable access to healthy food and therefore rely on public transport or help from friends and family to get to the supermarket (Siddiqi et al., 2021). When the pandemic impacted the availability of safe public transport, very few U.S. households dependant on SNAP assistance could shop online (Kinsey et al., 2020; Molitor & Doerr, 2021; Siddiqi et al., 2021). Adams et al. (2020) asked mainly low-income U.S. families about the food in their homes before and during the COVID-19 stay-at-home order. Despite food assistance being more accessible than before the pandemic, the amount of unhealthy food (processed, nonperishable foods) in U.S. homes increased more for low-income families than those with higher incomes (Adams et al., 2020). The same study found that total food in the home decreased for 23% of households during the lockdown and increased for 42%, meaning that although more meals were likely consumed in the home during the lockdown than before, some families could not afford to maintain even the quantities of food they had before (Adams et al., 2020). This suggests

a widening food-security gap in U.S. homes despite the increased ability to purchase food online using SNAP benefits in some states and the reduced accessibility of fast food.

2.3.4.5 Stockpiling Food During the COVID-19 Lockdowns. Food shortages in supermarkets drove rises in food insecurity for consumers experiencing hardship (Barker & Russell, 2020; Clay & Rogus, 2021; De Backer et al., 2020; Kinsey et al., 2020; Power et al., 2020). These shortages were primarily caused by the stockpiling behaviours of those who could afford to do so – unlike those experiencing financial hardship. Four studies and articles identified the impact of stockpiling behaviours on the financially insecure (Clay & Rogus, 2021; De Backer et al., 2020; Kinsey et al., 2020; Power et al., 2020). The stockpiling of food by those who could afford to do so particularly impacted the U.S. low-income populations who were receiving food-support benefits (Kinsey et al., 2020). For example, official sources recommended that U.S. citizens purchase more food at a time to reduce the frequency of their shopping trips (Wolfson & Leung, 2020a). As SNAP, WIC and other food- and financial-support payments were provided to recipients at specific times, this determined when they could go grocery shopping and meant less flexibility to work around the shortages (Kinsey et al., 2020). In contrast, the U.K. experience was more like New Zealand in that supermarkets chose to implement purchasing limits on staple foods (Power et al., 2020; Smith, 2021), and consumers were advised that there was no shortage of food being manufactured (Benker, 2021). Purchasing limits implemented in the UK aimed to prevent stockpiling; however, this contributed to a decrease in foodbank donations from the public (Power et al., 2020).

Because stockpiling behaviours led to shortages, studies found that U.S. and U.K. supermarkets offered fewer specials and multipurchase discounts, increasing the cost of food during the lockdown period (Power et al., 2020; Sharma et al., 2020). In particular, the food items stockpiled tended to be lower cost, generic-brand staple foods on which low-income consumers usually rely. There is evidence that across the 38-country Corona Cooking Survey, the stockpiling of low-cost goods meant that the very financially insecure were forced to purchase more expensive brands than they usually did due to the limited availability of the cheaper brands (De Backer et al., 2020). In New Zealand, these overseas experiences were later corroborated by the New Zealand Child Poverty Action Group report

2020–2021, demonstrating that disparities in being nutritionally resilient in a crisis are a widespread concern in high-income countries (McAllister et al., 2021).

2.3.5 How Food Was Prepared During the COVID-19 Lockdown

2.3.5.1 Changes to Cooking. Few studies have investigated how cooking habits changed among those living with financial hardship in high-income countries during the first COVID-19 pandemic lockdowns. Three articles discussed this theme, with findings that home cooking increased and takeaway/restaurant meal consumption decreased among low-income groups, which, due to closures and restrictions during the lockdown, also occurred among the general population (Adams et al., 2020; De Backer et al., 2020; Sharma et al., 2020). The results of two studies suggest that women's cooking habits changed differently from men's (De Backer et al., 2020; Deschasaux-Tanguy et al., 2021). The French study found that their low-income, highly educated young women cooked more frequently during the lockdown, but men did not (Deschasaux-Tanguy et al., 2021). The 38-country Corona Cooking Survey examined the psychological impact of the lockdown on participants' cooking habits, finding that, overall, financial stress and concerns surrounding food insecurity motivated men and women differently (De Backer et al., 2020). Women experiencing mental distress during COVID-19 reported reductions in their frequency of cooking from scratch, typically considered a woman's role in many countries. At the same time, men under stress cooked more than they did before the pandemic (De Backer et al., 2020). Women also developed healthier food-selection habits than men. This presents gender as a potential confounding factor when examining how financial stress influences cooking habits.

2.4 Discussion

2.4.1 Summary of Findings

The literature review found that during the COVID-19 lockdowns in several high-income countries, increases in undesirable food-related indicators such as food insecurity, unhealthy dietary patterns, and demand for food assistance disproportionally impacted those with existing financial insecurity. One exception was in a cohort of low-income Californian families (Molitor & Doerr, 2021). Food

insecurity among this group reduced as unemployment rose, presumably because much-needed assistance became available for these families for the first time with the expansion of government support services (Molitor & Doerr, 2021). The largely disproportionate impact on the already struggling suggests there are gaps and limitations to the existing and COVID-19-specific welfare policies in the included countries during the early lockdown period. This demonstrates that policy must be developed to ensure that financially precarious populations are adequately supported in other lockdowns and future pandemics. Further research must amplify the voices and experiences of those who struggle the most to best inform equitable policy development.

As of 18 April 2021, few studies had been published outside of the US. In particular, no non-U.S. studies specifically surveyed a targeted low-income population to examine how diets, cooking, shopping habits, and demand for assistance changed during the COVID-19 lockdown for financially insecure populations. The subsequent chapters of this thesis discuss the methodology and results of the Covid Kai survey, a New Zealand adaptation of the wider Corona Cooking Survey, to fill many of the gaps identified by the review.

2.4.2 Discussion of Findings

2.4.2.1 Food Insecurity. There is agreement throughout the literature that food insecurity worsened during the first lockdowns, despite differences in the existing social support structures, COVID-19 response policies, and population sizes between countries and states. For example, these include different approaches to the threat of food shortages. Supermarkets in the UK enforced purchasing limits (Power et al., 2020), while, in contrast, the U.S. government encouraged the public to stock up to reduce their shopping frequency (Wolfson & Leung, 2020a). The US also had an existing supplementary food-assistance scheme for low-income households (Dubowitz et al., 2021; Siddiqi et al., 2021), while the UK only had food supplementation for children through school meals (Barker & Russell, 2020). Although many studies demonstrated overall worse food insecurity during the lockdown, there is evidence that COVID-19 food-related assistance policies were the likely cause of improving food security in very food-insecure, increasingly unemployed, Californian households with children (Molitor & Doerr, 2021).

2.4.2.2 Cooking. While there is some evidence that low-income participants cooked from home more often during the early COVID-19 lockdowns, there is also evidence that very food insecure U.S. families had less food in the home during the first lockdown than they had before (Adams et al., 2020). This suggests that barriers to safely accessing meals prepared outside the home may have negatively impacted low-income households. As cooking habits increased during the lockdown period, this suggests that prior to the lockdown, meals were sourced externally to the home kitchen more often. As Adams et al. (2020) found that a significant number of food-insecure households had less food in the home than usual during the lockdown, we can reasonably assume that food insecurity increased during the lockdown in the US. The food that low-income UK and US families did have during the COVID-19 lockdown was also more likely to be processed, nonperishable food, which is often considered less healthy than fresh meal options (Adams et al., 2020; Baraniuk, 2020; Sharma et al., 2020). Adams et al. (2020) also reported that the more financially secure U.S. families often found the food in the home increased or stayed the same, suggesting that they could afford to purchase enough food (Adams et al., 2020). While both financially secure and insecure families in this cohort tended to snack more on unhealthy nonperishable foods during the lockdown, the increase in consumption for the financially insecure was more severe (Adams et al., 2020). These disparities demonstrate that simply cooking from home more often was not enough to indicate a healthier diet. Those who were struggling financially often did not have enough food and what was most accessible during periods of high demand was not the healthiest food.

2.4.2.3 Shopping. Very little research explored the shopping behaviours of a cohort of low-income people; therefore, the results had to be extrapolated from narrative reviews and contextual discussions from the literature. The results indicate that shopping for food during the lockdown was significantly more challenging for low-income participants, as the financially secure stocked up on large quantities of low-cost shelf-stable food, leaving little affordable food for those experiencing hardship (Kinsey et al., 2020). This was particularly impactful in the US for those receiving SNAP benefits, as these were paid to recipients on a particular day which varied between states, and

therefore recipients could not time their shopping trips strategically or purchase their groceries online. As in New Zealand, U.K. supermarkets chose to impose purchasing restrictions to prevent shortages (Power et al., 2020), and costs rose as supermarkets were disincentivised to encourage sales. This likely impacted the cost of feeding financially insecure households and demonstrates that shopping environments during the pandemic disproportionately disadvantaged those already poor and food insecure. Further research must explore the changes in shopping habits and experiences of a financially insecure participant group so that analysts can better understand the needs of food-insecure grocery shoppers during the lockdown.

2.4.2.4 Demand for Assistance. The U.S. data presented some inequities. For example, the expansion of food-assistance programmes significantly improved food security for some demographics and not for others. Notably, support services aimed at children were beneficial for young families but did not significantly impact older age groups. Food insecurity worsened significantly among the disproportionately older Pittsburgh Hill/Homewood Research on Neighborhood Change and Health (PHRESH) cohort (Dubowitz et al., 2021). Early in 2020, the U.S. Congress Families First Coronavirus Act (FFCA) enabled states to choose to expand the eligibility criteria for SNAP (Kinsey et al., 2020). However, the provisions did not extend the maximum benefit available to those already enrolled in SNAP early in the pandemic (Kinsey et al., 2020). Many of the Pennsylvanian PHRESH cohort already received the highest level of SNAP coverage, excluding them from additional nutritional support (Dubowitz et al., 2021). Despite reporting increased hardship, this group did not significantly increase their reliance on federal or charity food assistance (Dubowitz et al., 2021). In contrast, also through the FFCA, a significant boost was applied to food support for children with the P-EBT cards (California Department of Social Services, 2020). Many school districts also provided student meal packages (McLoughlin et al., 2020). Some U.K. schools provided supermarket vouchers when preprepared meals were not feasible (Power et al., 2020). School meal replacement services likely also helped increase food in the home for many families with school-aged children experiencing hardship. Government support for U.S. families with children was also often automatic (California Department of Social Services, 2020). These policies benefited low-income

families (Molitor & Doerr, 2021) while leaving older Americans, without children in the home, reliant on food parcels from charity, which they felt uncomfortable accepting (Dubowitz et al., 2021). Despite increased support for households with children, the literature identified barriers to accessing these, which may have stemmed from the nonhomogeneous methods of provision across the school districts in the US and limited supermarkets which accepted the vouchers issued to U.K. families (Power et al., 2020).

2.4.2.5 Diet. Across the predominantly U.S. literature, high-income people generally had better dietary outcomes than low-income participants before and during the lockdown. Presumably, if high-income populations faced barriers to eating well, these were likely to be mainly time barriers. Therefore, when the time barrier was removed for those who could work from home during the lockdown and access to takeaway and restaurant meals was reduced, it is understandable that the financially secure frequently developed healthier diets. The opposite was frequently reported by low-income participants, many of whom tended not to have the privilege of working from home during the lockdown or lost income while furloughed (Barker & Russell, 2020). Low-income workers were more likely to work in high-stress essential roles during the pandemic while enduring financial and food-access barriers, as their usually affordable food was stockpiled by the well-off (De Backer et al., 2020). The COVID-19 lockdown dietary outcomes are consistent with the pre-COVID-19 research demonstrating that food availability significantly influences consumption (Wilson et al., 2014). The results also show the importance of having enough money to buy food the way that suits each household, which SNAP benefits in the US and school meal replacement vouchers do not offer the flexibility to do (Barker & Russell, 2020; Kinsey et al., 2020). Barriers to access, such as redeeming benefits at specific supermarkets and picking up food parcels in person, have consequences for low-income households, which higher-income households do not experience (Barker & Russell, 2020; McLoughlin et al., 2020).

2.4.3 Implications for Research/Policy

While the literature search identified no New Zealand research, New Zealand's COVID-19 experience shared some similarities with the UK. For example, the Coronavirus Job Retention Scheme

(Government of the United Kingdom, 2021) and our wage subsidy scheme (Ministry of Social Development, 2020) were similar, and, like the UK, New Zealand does not have a food-assistance programme for adults. Therefore, the themes identified in the U.K. literature may be more relevant to informing what New Zealand-based research is required in the absence of similar New Zealand evidence. Based on what was found in the literature, there is a need for further research on a New Zealand financially insecure cohort. A significant gap in the literature review was a non-U.S. survey of a low-income or otherwise financially insecure population sample. This bias limits the generalisability of the conclusions formed from this literature review and its applications to New Zealand policy.

3 Methods

3.1 The Corona Cooking Survey

The 99-question Corona Cooking Survey, developed at the University of Antwerp in Belgium, was developed to investigate how the COVID-19 lockdown impacted diets, food shopping, cooking, and mealtime behaviours worldwide. The survey was disseminated to 38 high, middle, and low-income countries via the Qualtrics survey platform between 17 April and 25 June 2020 (De Backer. et al., 2020).

3.2 The Covid Kai Survey

Through a partnership between researchers at the University of Auckland and Victoria University of Wellington, the Corona Cooking Survey was adapted for the New Zealand context and renamed the Covid Kai survey, a name which incorporates the reo Māori word *kai* meaning *food*, and reflects the "COVID" terminology used most commonly in New Zealand to describe the pandemic. Adaptation for the Covid Kai Survey included adding an ethnicity question as per the Stats NZ guidelines and minor definition clarifications but otherwise was unchanged, including maintaining much of the terminology used in the original Corona Cooking Survey. The ethnicity question brought the Covid Kai Survey to 100 questions. The Covid Kai Survey received ethics approval under urgency as part of a scheme to prioritise COVID-19 research early in the COVID-19 pandemic and was disseminated online within New Zealand between 24 April and 13 May 2020. This period encompassed the Level 4 and 3 Alert Level restrictions colloquially known as "the lockdown." The Covid Kai Survey was estimated to take at least 30 minutes to complete (Gerritsen et al., 2020).

3.2.1 Recruitment

Between 24 April and 13 May 2020, the New Zealand-based Covid Kai team recruited 3,574 participants via convenience sampling on Facebook, Instagram, and Twitter. Paid advertising was used to target New Zealanders interested in nutrition and other related topics. An incentive of a $1 donation to the Salvation Army Foodbank was offered for each near-completed survey.

3.3 Initial Data Cleaning

The Covid Kai team in New Zealand completed data cleaning prior to the start of this project. This removed all participants who failed to complete at least 90% of the survey and participants likely to be spam. Potential spam included participants of improbable ages as their answers to the survey questions were considered unreliable. The dataset cleaned by the Covid Kai team included 3,005 participants; I then removed a participant with an unlikely age of 120 years, leaving a final dataset of 3,004 participants. The final participant age range was between 18 and 87.

3.4 Selecting Groups for Analysis – Financial Hardship

Three key questions determined participants' financial status: loss of income during the lockdown, usual financial security, and usual ability to afford food. Loss of income was a binary response, while financial security and the ability to afford food were collected via Likert 7-point scales. Hardship was gauged by asking the following questions: "how often is it a struggle to make money last to the end of the month/payday?" for financial security; "how often is it a struggle to afford food?" for food security; and "did you lose income during the lockdown?" for loss of income. These three questions were used independently rather than as a combined variable, as loss of income was not isolated to any one financial-security group, and the inability to afford food corresponded to a very small group. A 298-member low-financial-security sample was selected for the primary statistical analyses – 9.9% of all respondents. This sample consists of respondents who reported they struggled to make money last until the following month/payday *every time*, *very frequently*, or *frequently*. Food security was used for secondary analysis, as only 96 (3.2%) participants struggled to pay for food *every time*, *very frequently*, or *frequently*, a significantly lower number than participants who answered similarly to the general financial-security question.

Because responses to the two 7-point financial status items were significantly skewed towards high financial security and a high ability to afford food, I derived three variables for each. I achieved this by combining the three lowest financial-security responses as a 298 person "low financial security" sample and the highest two levels of financial security as a 1,812 person "high financial security" group. "Medium-level financial security" was derived from the remaining two answers (see Table 4).

For the ability to afford food variables, I created a 96-person "low ability to afford food" sample, combining the participants who selected the lowest three answers. The high ability to afford food group was derived similarly to the financial-security variables by combining the two highest answer groups as "high ability to afford food". Completion of some sections of the survey was not achieved by all participants, leading to variation in participant numbers across the data.

The cleaning process disproportionately excluded participants experiencing low financial security. Those who were removed due to not meeting the 90% completion threshold included 21.4% of participants who declared usually low financial security, compared to 14.2% of high-financial security participants. The Covid Kai team also removed 17.4% of middle-security participants for the same reason (see Table 2).

Table 2

Survey Completion by Pre-Lockdown General Financial Security

	General financial security n (%)			
Characteristics, n (%)	Low n (%)	Mid n (%)	High n (%)	χ^2
Completion (cleaned), 3,004 (100)	298 (100)	894 (100)	1,812 (100)	P=0.072
Finished, 2,657 (88.4)	255 (85.6)	781 (87.4)	1,621 (89.5)	
Unfinished, 347 (11.6)	43 (14.4)	113 (12.6)	191 (10.5)	
Completion (uncleaned), 3,574 (100)	379 (100)	1,082 (100)	2,113 (100)	P < 0.001
Finished, 2,658 (74.4)	255 (67.3)	781 (72.2)	1,622 (76.8)	
Unfinished, 916 (25.6)	124 (32.7)	301 (27.8)	491 (23.2)	

3.5 Questions

For the purposes of this thesis, I analysed a 26-question subset of the Covid Kai Survey data with 146 subquestions (see Table A1, Appendix). These included questions relating to the research objectives: general sociodemographic information, cooking habits, shopping for food, and diets. The survey was structured to repeat most questions to measure pre- and during-COVID-19 circumstances so that comparisons between the two time periods could be made. An exception to this pattern was stockpiling behaviours as part of the shopping topic, which asked about changes in the first instance.

3.5.1 Participant Demographics

Relevant demographic questions included employment status during the lockdown, age, gender identity, and ethnicity. Participant ages were banded into 4 groups, 18-29, 39-44, 45-60 and 60+ and the Stats NZ classification (Ministry of Health, 2017) guided ethnicity responses. When multiple ethnicity answers were chosen, these were prioritised in order of Māori, Pacific Peoples, Asian, New Zealand European or other (NZEO), so each participant was only counted once in analyses and independence could be maintained for the statistical models. Ethnicity comparisons were not analysed beyond the general demographic information due to insufficient sample sizes of non NZEO participants.

3.5.2 Shopping for Food – Grocery Shopping

Attitudes to food shopping before and during the lockdown were collected on a 7-point scale from *strongly disagree* to *strongly agree*. These questions explored stressors and enjoyment surrounding grocery shopping. How participants shopped before and during the lockdown was collected on a Likert 7-point scale anchored with *never* and *every time I go/went grocery shopping*. Options included shopping online for delivery, collection, or in-person shopping. Changes in purchasing quantities related to stockpiling were collected on a Likert 7-point scale anchored with *a lot less than usual* and *a lot more than usual*, and a midpoint answer indicated no change. Stockpiling was measured by asking about changes in purchasing of 23 different grocery items due to the pandemic, which I narrowed to 21 different relevant food groups for analysis. This excluded the alcoholic beverage and toilet paper variables which were not relevant to the research objectives. The 21 included food groups included items such as fruit, bread, and snack foods (see Table A1, Appendix).

General shopping behaviours before and during the lockdown were collected on a Likert 7-point scale. These asked, "At the moment (during the lockdown), how often do you usually do the following actions?" and included items such as "Make a list before you go shopping" and "Use the nutritional information panel (nutritional breakdown of the products) to make food choices" (see table A1, Appendix). These general shopping changes will be examined in the results by level of financial security only and not by level of food security or by loss of income status.

3.5.3 Cooking

The frequency of cooking from scratch before and during the lockdown was collected on a Likert 7-point scale anchored with *never* and *every time I ate these foods*. Variables included hot main meals, soups, baked goods, and bread. Skill level when preparing the above meal types was also collected on another ascending Likert 7-point scale anchored with *strongly disagree* and *strongly agree*. Enjoyment of cooking before and during the lockdown was also measured on a 7-point Likert scale, anchored with *strongly disagree* and *strongly agree,* with variables such as *too time-consuming* and *enjoyable*. Barriers to cooking and baking, such as time and access before and after the lockdown, were measured on another 7-point scale, *never* to *every time I cook(ed) or bake(d)*.

Three final items related to general cooking behaviours were also asked on Likert 7-point scales. These asked, "At the moment (during the lockdown), how often do you usually do the following actions?" and included items such as "cook meals at home using healthy ingredients" and "feel confident about cooking a variety of healthy meals". These general cooking changes will be examined in the results by level of financial security only and not by level of food security or by loss of income status.

3.5.4 Eating – What, Where, Why, and How

Changes in consumption of 18 food groups were measured through a Likert 7-point food-frequency questionnaire that queried consumption both before and during the lockdown. The seven options were *(almost) never, less than 1x a week, 1x a week, 2–4x a week, 5–6x a week, 1x a day, 2x or more a day*. These variables included a variety of commonly consumed food groups such as fruit, meat and animal protein, legumes/pulses, and milk. Food groups were combined into several related categories. Salty and sweet snack-food consumption responses were combined and averaged for each participant into a single "snacks" variable; "milk" and "other dairy products" consumption was combined into a "dairy" variable; and unprocessed "fish," "poultry," and "red meat" variables were also combined to a single "unprocessed meat" variable.

3.5.5 Attitudes to Shopping

Attitudes to shopping were measured via Likert 7-point scales, which included several positive and negative attitudes before and after lockdown. Positive variables: “relaxing,” “creative,” and “enjoyable” were combined and averaged for each participant, as were negative variables: “time consuming,” “frustrating,” and “stressful.”

3.6 Statistical Analyses

The primary analyses examined the effect of the lockdown on cooking, shopping, and diet in respondents with low financial security versus those with high financial security. Secondary analyses examined the data by level of food security, and loss of income status. The 7-point scales were converted to numerical scales, and changes in mean score over time within groups were calculated and compared using paired *t* tests. The differences between the changes experienced by low-and high-hardship groups were compared with Welch 2-sample *t* tests. Statistical analysis was completed using R Version 4.0.3, and tables were produced in Microsoft Excel Version 2110.

4 Results

4.1 Demographic Data

4.1.1 Overall

The Covid Kai survey was completed by 3,004 eligible respondents. The survey disproportionately attracted female participants, with only 311 men (10.4%) and 32 gender-diverse participants (1.1%). Women made up 88.6% of the total participants. The participant age range was 18–87, and the mean age was 44.4 years, with a standard deviation of 14.0. The sample was highly educated, with 48.1% holding a bachelor's degree, 20.5% with a master's degree, and 7.3% with a doctorate. Eighty-two per cent of participants self-identified as NZEO (non-Māori, non-Pacific Peoples, non-Asian), 10.5% as Māori, 2.6% as Pacific Peoples, and 4.4% as Asian. Seventy-seven per cent of participants were in paid employment, 15% were unemployed or retired, and 8% were students.

Ten per cent of participants reported low financial security, medium financial security was reported by 30%, and high financial security by 60% of the participants. The mean age for the low-financial-security group was 40.4, four years younger than the total participant group. The proportion of Māori in the low-financial-security group was 22%, twice the Māori representation in the total 3004 participant sample. Most Pacific Peoples were represented in the medium-financial-security group (59%), and 11% reported low financial security. Ethnicity was strongly correlated with financial- and food-security levels. Māori were disproportionately represented in low-security groups, and NZEO participants were overrepresented in the financially and food-secure groups. Loss of income was not correlated with ethnicity (see Table 4).

Three per cent of participants reported food insecurity. Medium-level food security was reported at 21%, and high food security at 76%. A quarter of the participants reported a loss of income due to the pandemic (see Table 3). The proportion of participants who lost income in each of the three financial-security groups was higher in the low- and middle-security groups than in the higher security group (see Table 3).

Table 3

Loss of Income by Usual Financial Security

Lost income during lockdown, n (%)	Low n (%)	Mid n (%)	High n (%)	χ^2
Total, 3,004 (100)	**298 (100)**	**894 (100)**	**1,812 (100)**	**P < 0.001**
Yes, 775 (25.8)	84 (28.2)	295 (33.0)	396 (21.9)	
No, 2,229 (74.2)	214 (71.8)	599 (67.0)	1,416 (78.1)	

Table 4

Participant Attributes by Financial Security Status, Food Security, and Loss of Income

	General financial security				Food security				Lost income during lockdown		
Characteristics, n (%)	Low n (%)	Mid n (%)	High n (%)	χ^2	Low n (%)	Mid n (%)	High n (%)	χ^2	Yes n (%)	No n (%)	χ^2
Gender, 3,004 (100)	**298 (100)**	**894 (100)**	**1,812 (100)**	P<0.001	**96 (100)**	**621 (100)**	**2,287 (100)**	P<0.001	**775 (100)**	**2,229 (100)**	P=0.767
Female, 2,661 (88.6)	269 (90.3)	797 (89.1)	1,595 (88.0)		85 (88.5)	565 (91.1)	2,011 (87.9)		692 (89.3)	1,969 (88.3)	
Male, 311 (10.4)	25 (8.4)	88 (9.8)	198 (10.9)		9 (9.4)	49 (7.9)	253 (11.1)		75 (9.7)	236 (10.6)	
Diverse, 32 (1.1)	4 (1.3)	9 (28.1)	19 (1.0)		2 (2.1)	7 (1.1)	23 (71.9)		8 (1.0)	24 (1.1)	
Age, 3,004 (100)				P<0.001				P<0.001			P=0.491
18–29, 508 (16.9)	72 (24.2)	171 (19.1)	265 (14.6)		18 (18.8)	144 (23.2)	346 (15.1)		128 (16.5)	380 (17.0)	
30–44, 1,070 (35.6)	115 (38.6)	329 (36.8)	626 (34.5)		36 (37.5)	219 (35.3)	815 (35.6)		261 (33.7)	809 (36.3)	
45–59, 939 (31.3)	84 (28.2)	285 (31.9)	570 (31.5)		33 (34.4)	183 (29.5)	723 (31.6)		255 (32.9)	684 (30.7)	
60+, 487 (16.2)	27 (9.1)	109 (12.2)	351 (19.4)		9 (9.4)	75 (12.1)	403 (17.6)		131 (16.9)	356 (16.0)	
Ethnicity, 3,004 (100)				P<0.001				P<0.001			P=0.870
NZEO, 2,475 (82.4)	216 (72.5)	696 (77.9)	1,563 (86.3)		60 (62.5)	456 (73.4)	1,959 (85.7)		640 (82.6)	1,835 (82.3)	
Māori, 317 (10.6)	64 (21.5)	104 (11.6)	149 (8.2)		28 (29.2)	92 (14.8)	197 (8.6)		80 (10.3)	237 (10.6)	
Pacific Peoples, 79 (2.6)	9 (3.0)	47 (5.3)	23 (1.3)		5 (5.2)	38 (6.1)	36 (1.6)		18 (2.3)	61 (2.7)	
Asian, 133 (4.4)	9 (3.0)	47 (5.3)	77 (4.2)		3 (3.1)	35 (5.6)	95 (4.2)		37 (4.8)	96 (4.3)	
Education, 3,004 (100)				P<0.001				P<0.001			P<0.001
Below NCEA Level 3, 74 (2.5)	19 (6.4)	22 (2.5)	33 (1.8)		5 (5.2)	23 (3.7)	46 (2.0)		26 (3.4)	48 (2.2)	
NCEA Level 3 or equivalent, 650 (21.6)	110 (36.9)	225 (25.2)	315 (17.4)		39 (40.6)	195 (31.4)	416 (18.2)		206 (26.6)	444 (19.9)	
Bachelor's degree, 1,446 (48.1)	126 (42.3)	450 (50.3)	870 (48.0)		39 (40.6)	283 (45.6)	1,124 (49.1)		385 (49.7)	1,061 (47.6)	
Master's degree, 615 (20.5)	31 (10.4)	159 (17.8)	425 (23.5)		7 (7.3)	103 (16.6)	505 (22.1)		124 (16.0)	491 (22.0)	
Doctorate, 219 (7.3)	12 (4.0)	38 (4.3)	169 (9.3)		6 (6.3)	17 (2.7)	196 (8.6)		34 (4.4)	185 (8.3)	
Pre-lockdown employment, 3,004 (100)				P<0.001				P<0.001			P<0.001
Employed, 2,323 (77.3)	207 (69.5)	687 (76.8)	1,429 (78.9)		59 (61.5)	451 (72.6)	1,813 (79.3)		610 (78.7)	1,713 (76.9)	
Not in paid employment, 454 (15.1)	47 (15.8)	114 (12.8)	293 (16.2)		24 (25.0)	79 (12.7)	351 (15.3)		87 (11.2)	367 (16.5)	
Student, 227 (7.6)	44 (14.8)	93 (10.4)	90 (5.0)		13 (13.5)	91 (14.7)	123 (5.4)		78 (10.1)	149 (6.7)	

Note: NZEO=New Zealand European and other; NCEA=National Certificate of Educational Achievement

4.2 Financial Security

The following analysis relates to those who did/did not struggle to make money last until payday before the lockdown. The financially insecure group was the largest examined hardship group.

4.2.1 Changes to Cooking

Both the low- and high-financial-security groups reported similar changes to the barriers to cooking/baking during the lockdown. The barriers of time, skill, finances, and access to equipment were reduced, and barriers to accessing food increased for both groups during the lockdown. Participants reported that the cooking barriers related to finances and lack of equipment reduced more during the lockdown for the financially insecure than for the highly financially secure group. Both low- and high-financial-security groups reported significant increases in different cooking skills during the lockdown, except for soup-making skills, for which no change was reported. There was no statistically significant difference in the reported changes in cooking skills between the two groups. During the lockdown, the low-financial-security group reported a significantly larger increase in their frequency of cooking hot main meals from scratch than the high-security group. Neither group reported a significant change in the frequency of cooking soups from scratch, but both groups reported increasing their frequency of baking bread and other baked goods during the lockdown, with no significant difference in the magnitude of the changes between the two groups. Both the low- and high-financial-security groups reported an increase in their general cooking confidence to try new recipes, cook a variety of healthy meals, and cook meals with healthy ingredients during the pandemic (see table 5).

Table 5

Changes in Cooking Habits by Level of Financial Security

	Low usual financial security, n=265			High usual financial security, n=1,603			Comparing both groups
Barriers to cooking	Before lockdown mean (SD)	Change in mean (SD)	P-value[a]	Before lockdown mean (SD)	Change in mean	P-value[a]	Significance of change difference between groups[b]
Time	4.36 (1.44)	-2.02 (1.91)	P<0.001	3.97 (3.97)	-1.79 (1.51)	P<0.001	P=0.070
Skill	2.05 (1.43)	-0.17 (0.96)	P=0.003	1.79 (1.18)	-0.25 (0.77)	P<0.001	P=0.232
Financial	3.72 (1.52)	-0.36 (1.46)	P<0.001	1.43 (0.84)	-0.09 (0.62)	P<0.001	P=0.003
Access to food	3.09 (1.40)	0.85 (1.70)	P<0.001	1.97 (1.13)	0.99 (1.50)	P<0.001	P=0.216
Access to equipment	1.94 (1.41)	-0.22 (1.22)	P=0.004	1.40 (0.88)	-0.04 (0.58)	P=0.005	P=0.021
Cooking from scratch (frequency)							
Hot main meals	5.60. (1.24)	0.55 (1.15)	P<0.001	6.01 (0.95)	0.40 (0.78)	P<0.001	P=0.040
Soups	4.14 (1.98)	0.15 (1.56)	P=0.108	4.41 (1.88)	0.04 (1.19)	P=0.143	P=0.267
Baked goods	3.83 (1.78)	0.95 (1.63)	P<0.001	3.92 (1.73)	0.77 (1.31)	P<0.001	P=0.092
Bread	2.35 (1.69)	0.88 (1.75)	P<0.001	2.54 (1.73)	0.87 (1.53)	P<0.001	P=0.907
Cooking skills							
Overall skill	5.99 (1.21)	0.26 (0.78)	P=<0.001	6.32 (0.96)	0.17 (0.61)	P<0.001	P=0.062
Hot meal without a recipe	6.34 (1.02)	0.10 (0.53)	P=0.003	6.50 (0.81)	0.05 (0.47)	P<0.001	P=0.174
Soup-making skill	6.06 (1.45)	0.03 (0.64)	P=0.390	6.25 (1.22)	0.03 (0.55)	P=0.030	P=0.923
Baking skill	6.09 (1.31)	0.13 (0.67)	P=0.001	6.20 (1.24)	0.05 (0.51)	P<0.001	P=0.063
Bread-making skill	5.09 (2.04)	0.30 (1.17)	P=<0.001	5.28 (1.85)	0.22 (0.85)	P<0.001	P=0.249
General cooking							
Cook meals with healthy ingredients	5.13 (1.17)	0.39 (1.21)	P<0.001	5.61 (1.02)	0.41 (0.98)	P<0.001	P=0.749
Feel confident about cooking a variety of healthy meals	5.08 (1.46)	0.21 (1.22)	P=0.003	5.74 (1.18)	0.16 (0.90)	P<0.001	P=0.449
Try new recipes	4.30. (1.23)	0.41 (1.55)	P<0.001	4.57 (1.16)	0.36 (1.18)	P<0.001	P=0.652
Change recipes to make them healthier	4.12 (1.31)	0.07 (1.23)	P=0.348	4.30. (1.26)	0.04 (0.90)	P=0.060	P=0.708

Notes: [a] paired *t* test for difference. [b] Welch 2-sample *t* test, yellow shading indicates a statistically significant result (P<0.05)

4.2.2 Changes to Shopping

Regardless of participants' reported financial security, participants reported increases in negative and decreases in positive attitudes towards shopping for food. Participants reported that during the lockdown, shopping was more stressful, time-consuming, and frustrating, less relaxing, enjoyable, and less of a creative outlet. The decrease in positive feelings was more pronounced amongst the low-financial-security group. However, no statistically significant difference was identified between the two groups with regard to the change in negative feelings.

Both the high- and low-financial-security groups reported that they used the nutritional panel and other information detailed on food packaging when choosing their food less often during the lockdown than before. Both groups were more likely to create a shopping list than before the lockdown, with no significant difference in the magnitude of the reported change between groups.

There were also no significant differences in the reported changes between high- and low-security respondents regarding the way they shopped during the pandemic. Both groups reported similar reductions in their frequency of shopping in person. The frequency of using click-and-collect services, where groceries are ordered online for pickup from the supermarket, increased for the high-security group only, although the difference between the two groups was not significant (see Table 6).

Table 6

Changes in Usual Grocery Shopping Habits During COVID-19 Lockdown 2020 in New Zealand by Reported Financial Security

	Low usual financial security, n=223			High usual financial security, n=1,288			Comparing both groups
Attitudes about grocery shopping	Before lockdown mean (SD)	Change in mean (SD)	P-value[a]	Before lockdown mean (SD)	Change in mean (SD)	P-value[a]	Significance of change difference between groups[b]
Positive (relaxing, creative, enjoyable)	3.73 (0.89)	-1.01 (1.46)	P<0.001	3.70. (0.87)	-0.78 (1.37)	P<0.001	P=0.030
Negative (time consuming, frustrating, stressful)	3.79 (1.37)	1.10 (1.94)	P<0.001	3.19 (1.21)	1.16 (1.61)	P<0.001	P=0.626
Shopping methods							
In person	6.15 (1.31)	-0.85 (2.16)	P<0.001	6.21 (1.18)	-0.91 (2.03)	P<0.001	P=0.724
Click and collect	1.86 (1.49)	0.10 (1.80)	P=0.415	1.66 (1.34)	0.19 (1.76)	P<0.001	P=0.498
Delivered to home	2.01 (1.57)	0.47 (1.99)	P<0.001	1.97 (1.59)	0.74 (2.06)	P<0.001	P=0.058
General shopping/ selecting foods	Low usual financial security, n=298			High usual financial security, n=1,812			
Make a shopping list	5.02 (1.70)	1.15 (1.74)	P<0.001	5.41 (1.62)	1.03 (1.51)	P<0.001	P=0.268
Uses food label to choose food	3.89 (1.62)	-0.36 (1.30)	P<0.001	4.23 (1.45)	-0.35 (1.06)	P<0.001	P=0.872

Notes: [a] paired *t* test for difference. [b] Welch 2-sample *t* test, yellow shading indicates a statistically significant result (p<0.05)

4.2.2.1 Stocking Up. The high-security group were more likely to stock up on fruit, fish, unsalted nuts and nut spreads, legumes and pulses, ready-made meals, plant-based milks, and flour than the low-security group. Both groups purchased fewer ready-made meals and bottled water than they would usually (see Table 7).

Table 7

Changes in Quantities Purchased[a], by Level of Financial Security

Groceries	Low-security mean (SD)	High-security mean (SD)	Significance of change difference between groups[b]
Fruit	0.36 (0.98)	0.58 (0.85)	P=0.002
Vegetables	0.61 (0.92)	0.73 (0.86)	P=0.077
Fish	-0.03 (1.08)	0.16 (0.89)	P=0.013
Meat	0.36 (1.13)	0.45 (0.94)	P=0.278
Vegetarian meat substitutes	0.12 (1.09)	0.27 (0.94)	P=0.065
Potatoes	0.46 (0.97)	0.34 (0.86)	P=0.069
Nuts/nut spread (unsalted)	0.12 (0.90)	0.26 (0.78)	P=0.036
Legumes/pulses	0.21 (1.16)	0.61 (0.96)	P<0.001
Sweet snacks	0.31 (1.40)	0.37 (1.08)	P=0.508
Salty snacks	0.31 (1.31)	0.39 (1.05)	P=0.385
Ready-made meals	-0.30 (1.18)	-0.08 (0.97)	P=0.008
Bread	0.21 (1.17)	0.30 (0.98)	P=0.246
Flour	0.45 (1.31)	0.66 (1.06)	P=0.029
Yeast	0.11 (1.21)	0.22 (0.99)	P=0.225
Pasta, rice, grains	0.57 (1.18)	0.69 (0.91)	P=0.140
Eggs	0.47 (1.01)	0.48 (0.85)	P=0.939
Milk	0.52 (1.13)	0.51 (0.88)	P=0.828
Other dairy	0.41 (1.02)	0.41 (0.80)	P=0.981
Plant-based drinks (e.g., soy milk)	0.06. (1.10)	0.22 (0.82)	P=0.037
Water	-0.09 (1.07)	-0.03 (0.73)	P=0.370
Other non-alcoholic drinks	0.15 (1.09)	0.16 (0.76)	P=0.901

Notes: [a] an answer of 0 is equivalent to no change, [b] Welch 2-sample *t* test, yellow shading indicates a statistically significant result (p<0.05)

4.2.3 Changes to Diet

Participants with the lowest reported financial security before the lockdown also reported less healthy diets before the lockdown than those with high financial security. Pre-lockdown disparities include, for example, fruit and vegetable consumption between the two groups. There was no statistically significant difference between the changes in consumption of the high- and low-financial-security groups for all but two variables. These variables were white bread consumption and consumption of sugary drinks. The low-financial-security group reported a significantly larger increase in consumption of these than the high-financially secure group. Individually, the high-security group reported statistically significant changes in 18 food groups, while the low-income group reported significant changes for eight (see Table 8).

Table 8

Changes in Consumption During the March–April 2020 COVID-19 Lockdown, by Level of Financial Security

	Low usual financial security n=298			High usual financial security n=1,812			Comparing two groups
Food groups	Usual consumption, mean (SD)	Change in mean	P-value[a]	Usual consumption, mean (SD)	Change in mean	P-value[a]	Significance of change difference between groups[b]
Fruit	4.87 (1.77)	-0.04 (1.24)	P=0.543	5.64 (1.53)	-0.05 (0.96)	P=0.040	P=0.971
Vegetables	5.89 (1.30)	-0.05 (0.98)	P=0.441	6.41 (0.99)	-0.05 (0.72)	P=0.003	P=0.911
Legumes/pulses	3.32 (1.44)	-0.26 (1.07)	P=0.004	3.61 (1.39)	-0.07 (0.93)	P<0.001	P=0.108
Unsalted nuts/nut spread	3.43 (1.70)	-0.26 (1.29)	P<0.001	3.87 (1.65)	-0.17 (0.98)	P<0.001	P=0.244
Processed meat/vegetarian alternatives	3.26 (1.36)	-0.32 (1.32)	P<0.001	2.91 (1.32)	-0.27 (1.10)	P<0.001	P=0.568
Unprocessed animal protein	2.70. (0.96)	-0.02 (0.56)	P=0.493	2.93 (0.90)	-0.08 (0.49)	P<0.001	P=0.098
Unprocessed vegetarian protein	1.88 (1.24)	-0.11 (0.82)	P=0.017	1.98 (1.20)	-0.13 (0.71)	P<0.001	P=0.693
Sweet or salty snack foods	3.75 (1.38)	0.29 (1.20)	P<0.001	3.60. (1.21)	0.36 (1.02)	P<0.001	P=0.333
Wholemeal bread, pasta, grains	4.03 (1.78)	-0.14 (1.49)	P=0.104	4.51 (1.71)	0.05 (1.15)	P=0.047	P=0.334
White bread, pasta, grains	3.44 (1.73)	0.33 (1.32)	P<0.001	3.26 (1.52)	0.13 (1.06)	P<0.001	P=0.011
Milk or other dairy products	4.35 (1.72)	0.14 (0.76)	P=0.005	4.81 (1.64)	0.08 (0.76)	P<0.001	P=0.241
Plant-based drinks	2.52 (2.12)	-0.06 (1.09)	P=0.396	2.18 (1.92)	-0.08 (0.84)	P<0.001	P=0.698
Non-sugared beverages	6.29 (1.44)	-0.09 (1.20)	P=0.193	6.62 (1.03)	-0.05 (0.86)	P=0.015	P=0.566
Sugared beverages	3.26 (2.25)	0.36 (1.34)	P<0.001	2.41 (1.93)	0.11 (1.08)	P<0.001	P=0.023

Notes: [a] paired *t* test for difference. [b] Welch 2-sample *t* test, yellow shading indicates a statistically significant result (p<0.05)

4.3 Food Insecurity

This section presents the results for the group that struggled to consistently afford food. While there was some overlap, far fewer participants reported food insecurity than did financial insecurity. Therefore, this group may have experienced hardship differently and has been examined separately.

4.3.1 Changes to Cooking

The high- and low-food-security groups reported statistically similar changes to all five cooking barriers, with reductions in the time barrier to cooking and increases in food access barriers most pronounced. Those with low food security reported a larger increase in their general baking skills due to the pandemic than the food-secure participants. Changes in other cooking skills were not significantly different between the two groups. Both groups cooked main meals and baked more

frequently during the lockdown than before, but there was no statistically significant difference in the frequency change between the two groups (see Table 9).

Table 9

Changes in Cooking Habits During the March–April 2020 Lockdown, by Level of Food Security

	Very low food security n=88			High food security n=2,023			Comparing both groups
Barriers to cooking	Before lockdown mean (SD)	Change in mean	P-value[a]	Before lockdown mean (SD)	Change in mean	P-value[a]	Significance of change difference between groups[b]
Time	4.23 (1.54)	-1.89 (1.99)	P<0.001	4.01 (1.37)	-1.83 (1.54)	P<0.001	P=0.791
Skill	1.90. (1.30)	-0.14 (0.78)	P=0.103	1.79 (1.19)	-0.24 (0.78)	P<0.001	P=0.205
Financial	4.60. (1.48)	-0.28 (1.69)	P=0.120	1.54 (0.90)	-0.11 (0.70)	P<0.001	P=0.332
Access to food	3.69 (1.53)	0.66 (1.77)	P<0.001	2.02 (1.16)	1.00 (1.50)	P<0.001	P=0.076
Access to equipment	2.00. (1.36)	-0.23 (1.27)	P=0.096	1.43 (0.93)	-0.05 (0.62)	P<0.001	P=0.203
Cooking from scratch (frequency)							
Hot main meals	5.49 (1.40)	0.72 (1.47)	P<0.001	5.98 (0.98)	0.43 (0.82)	P<0.001	P=0.077
Soups	4.44 (2.09)	0.24 (1.72)	P=0.197	4.38 (1.89)	0.03 (1.19)	P=0.285	P=0.259
Baked goods	3.97 (1.96)	1.06 (1.82)	P<0.001	3.89 (1.74)	0.78 (1.34)	P<0.001	P=0.165
Bread	2.53 (1.94)	1.07 (2.04)	P<0.001	2.51 (1.71)	0.86 (1.54)	P<0.001	P=0.353
Cooking skills							
Overall skill	5.98 (1.23)	0.27 (0.84)	P=0.003	6.31 (0.97)	0.18 (0.62)	P<0.001	P= 0.314
Hot meal without a recipe	6.35 (1.02)	0.09 (0.58)	P=0.145	6.49 (0.82)	0.05 (0.46)	P<0.001	P=0.561
Soup-making skill	6.08 (1.41)	0.16 (0.83)	P=0.075	6.25 (1.24)	0.03 (0.56)	P=0.006	P=0.165
Baking skill	6.13 (1.29)	0.24 (0.76)	P=0.004	6.18 (1.26)	0.06 (0.54)	P<0.001	P=0.035
Bread-making skill	5.11 (2.15)	0.34 (1.22)	P=0.010	5.27 (1.85)	0.24 (0.86)	P<0.001	P= 0.427

Notes: [a] paired *t* test for difference. [b] Welch 2-sample *t* test, yellow shading indicates a statistically significant result (p<0.05)

4.3.2 Changes to Shopping

Regardless of participants' financial-security level, participants reported increases in negative and decreases in positive attitudes towards shopping for food. There was no statistically significant change in the frequency of grocery shopping via click and collect or home delivery among those with low food security. There was a significant 4% increase in shopping by click and collect for those with high food security and a 14% increase in home delivery. The difference between changes reported by the two groups was not significant for any shopping attitude or shopping methods variables despite these significant changes among the highly food secure (see Table 10).

Table 10

Shopping Attitude and Method Changes During the March–April 2020 COVID-19 Lockdown by Level of Food Security

	Very low food security n=70			High food security n=1,627			Comparing both groups
Attitudes about grocery shopping	Before lockdown mean (SD)	Change in mean (SD)	P-value[a]	Before lockdown mean (SD)	Change in mean (SD)	P-value[a]	Significance of change difference between groups[b]
Positive (relaxing, creative, enjoyable)	3.71 (0.88)	-1.07 (1.38)	P<0.001	3.70. (0.84)	-0.78 (1.36)	P<0.001	P=0.087
Negative (time consuming, frustrating, stressful)	4.08 (1.52)	0.70 (2.08)	P=0.006	3.25 (1.24)	1.13 (1.62)	P<0.001	P=0.095
Shopping methods							
In person	6.21 (1.31)	-0.79 (1.99)	P=0.002	6.20 (1.19)	-0.86 (2.01)	P<0.001	P=0.769
Click and collect	3.94 (1.41)	0.01 (1.63)	P=0.942	3.10 (1.37)	0.13 (1.78)	P=0.004	P=0.567
Delivered to home	1.89 (1.63)	0.26 (2.19)	P=0.330	1.99 (1.59)	0.68 (2.02)	P<0.001	P=0.115

Notes: [a] paired *t* test for difference. [b] Welch 2-sample *t* test, yellow shading indicates a statistically significant result (p<0.05)

4.3.2.1 Stocking Up. Fruit, legumes, snack foods, and plant-based drinks were reportedly stockpiled significantly more by the food secure than the food insecure (see Table 11).

Table 11

Changes in Quantities Purchased[a] During the March–April 2020 Lockdown, by Level of Food Security

Stocking up by food-security status	Low-security mean (SD)	High-security mean (SD)	Significance of change difference between groups[b]
Fruit	0.20 (1.23)	0.56 (0.85)	P=0.019
Vegetables	0.59 (1.20)	0.71 (0.85)	P=0.394
Fish	0.04 (1.24)	0.15 (0.90)	P=0.491
Meat	0.49 (1.13)	0.44 (0.94)	P=0.767
Vegetarian meat substitutes	0.01 (1.20)	0.26 (0.93)	P=0.090
Potatoes	0.44 (1.03)	0.33 (0.86)	P=0.386
Nuts/nut spread (unsalted)	0.17 (1.06)	0.25 (0.80)	P=0.568
Legumes/pulses	0.00 (1.24)	0.60 (0.96)	P<0.001
Sweet snacks	-0.03 (1.61)	0.39 (1.09)	P=0.037
Salty snacks	-0.06 (1.50)	0.40 (1.06)	P=0.014
Ready-made meals	-0.34 (1.36)	-0.10 (0.99)	P=0.147
Bread	0.29 (1.21)	0.30 (1.00)	P=0.923
Flour	0.47 (1.39)	0.66 (1.08)	P=0.279
Yeast	0.16 (1.39)	0.21 (0.99)	P=0.770
Pasta, rice, grains	0.56 (1.18)	0.69 (0.93)	P=0.340
Eggs	0.56 (1.11)	0.49 (0.85)	P=0.625
Milk	0.54 (1.25)	0.51 (0.87)	P=0.819
Other dairy	0.57 (1.20)	0.43 (0.81)	P=0.326
Plant-based drinks (e.g., soy milk)	-0.33 (1.28)	0.21 (0.85)	P<0.001
Water	-0.13 (1.32)	-0.01 (0.74)	P=0.473
Other non-alcoholic drinks	0.03 (1.26)	0.17 (0.79)	P=0.349

Notes: [a] an answer of 0 is equivalent to no change, [b] Welch 2-sample *t* test, yellow shading indicates a statistically significant result (p<0.05)

4.3.3 Changes to Diet

The only statistically significant difference in diet change between very low- and high food-security groups was sweet and salty snack-food consumption, which increased more for the food secure than for the food insecure. The highly food-secure group reported changes to all consumption variables, while the food-insecure group reported only two statistically significant changes – decreases in unsalted nut and processed meat or vegetarian substitute consumption (see Table 12).

Table 12

Changes in Consumption During the March–April 2020 COVID-19 Lockdown, by Level of Food Security

	Very low food security n=96			High food security n=2,287			Comparing two groups
Food groups	Usual consumption, mean (SD)	Change in mean	P-value[a]	Usual consumption, mean (SD)	Change in mean	P-value[a]	Significance of change difference between groups[b]
Fruit	4.67 (1.88)	-0.11 (1.38)	P=0.419	5.56 (1.57)	-0.04 (1.01)	P=0.070	P=0.596
Vegetables	5.66 (1.33)	0.03 (1.04)	P=0.769	6.39 (1.01)	-0.04 (0.74)	P=0.011	P=0.510
Legumes/pulses	3.27 (1.79)	-0.14 (1.17)	P=0.258	3.59 (1.41)	-0.08 (0.94)	P<0.001	P=0.655
Unsalted nuts/nut spread	3.38 (1.81)	-0.43 (1.55)	P=0.008	3.87 (1.63)	-0.18 (1.01)	P<0.001	P= 0.119
Processed meat/vegetarian alternatives	3.26 (1.39)	-0.49 (1.58)	P=0.003	2.93 (1.30)	-0.27 (1.08)	P<0.001	P=0.173
Unprocessed animal protein	2.69 (1.02)	-0.04 (0.69)	P=0.554	2.91 (0.90)	-0.07 (0.50)	P<0.001	P=0.669
Unprocessed vegetarian protein	1.83 (1.25)	-0.11 (0.95)	P=0.240	1.98 (1.20)	-0.12 (1.19)	P<0.001	P=0.926
Sweet or salty snack foods	3.71 (1.48)	0.06 (1.34)	P=0.676	3.60. (1.22)	0.37 (1.03)	P<0.001	P=0.026
Wholemeal bread, pasta, grains	3.96 (1.87)	-0.17 (1.41)	P=0.250	4.44 (1.72)	-0.05 (1.19)	P=0.028	P=0.445
White bread, pasta, grains	3.51 (1.87)	0.21 (1.08)	P=0.063	3.26 (1.55)	0.15 (1.10)	P<0.001	P=0.599
Milk or other dairy products	4.46 (1.70)	0.09 (0.79)	P=0.274	4.77 (1.64)	0.09 (0.78)	P<0.001	P=0.970
Plant-based drinks	2.32 (2.04)	-0.19 (0.98)	P=0.063	2.21 (1.94)	-0.07 (0.87)	P<0.001	P=0.265
Non-sugared beverages	6.07 (1.72)	-0.19 (1.24)	P=0.143	6.63 (1.00)	-0.05 (0.85)	P=0.008	P=0.276
Sugared beverages	3.80. (2.40)	0.09 (1.19)	P=0.442	2.49 (1.97)	0.12 (1.12)	P<0.001	P=0.820

Notes: [a] paired *t* test for difference. [b] Welch 2-sample *t* test, yellow shading indicates a statistically significant result (p<0.05)

4.4 Loss of Income

This section described the results for those who did and did not lose part of their income due to the lockdown. Loss of income was prevalent across the levels of financial security; therefore, the results for these groups have been analysed independently.

4.4.1 Changes to Cooking

Participants who lost income due to the lockdown reported a larger reduction in cooking time and skill barriers than those who did not lose income. The group who lost income also reported no statistically significant change in the financial barrier to cooking. In contrast, the group that did not lose income reported a statistically significant decrease in financial barriers to cooking. Between the groups who lost and did not lose income due to the lockdown, there was no statistically significant difference in the reported changes in cooking skills. Those who lost income reported baking bread more frequently during the lockdown than those who did not lose income; however, no statistically significant differences were reported for the other cooking from scratch variables (Table 13).

Table 13

Changes in Cooking Habits During the March–April 2020 Lockdown, by Loss of Income Status

	Lost income n=670			Did not lose income n=1,975			Comparing both groups
Barriers to cooking	Before lockdown mean (SD)	Change in mean	P-value[a]	Before lockdown mean (SD)	Change in mean	P-value[a]	Significance of change difference between groups[b]
Time	4.05 (1.36)	-2.03 (1.59)	P<0.001	4.10 (1.37)	-1.79 (1.58)	P<0.001	P<0.001
Skill	1.89 (1.26)	-0.31 (0.90)	P<0.001	1.85 (1.20)	-0.22 (0.75)	P<0.001	P=0.022
Financial	2.12 (1.32)	0.07 (1.06)	P=0.079	1.91 (1.25)	-0.23 (0.82)	P<0.001	P<0.001
Access to food	2.34 (1.27)	1.08 (1.54)	P<0.001	2.22 (1.25)	0.95 (1.52)	P<0.001	P=0.056
Access to equipment	1.57 (1.08)	-0.13 (0.85)	P<0.001	1.54 (1.04)	-0.07 (0.74)	P<0.001	P=0.094
Cooking from scratch (frequency)							
Hot main meals	5.97 (0.99)	0.44 (0.86)	P<0.001	5.90. (1.03)	0.45 (0.88)	P<0.001	P=0.876
Soups	4.60. (1.86)	<0.01 (1.17)	P=0.897	4.31 (1.90)	0.06 (1.26)	P=0.033	P=0.300
Baked goods	4.01 (1.78)	0.85 (1.42)	P<0.001	3.88 (1.70)	0.77 (1.32)	P<0.001	P=0.188
Bread	2.57 (1.71)	0.96 (1.61)	P<0.001	2.48 (1.70)	0.82 (1.54)	P<.001	P=0.048
Cooking skills							
Overall skill	6.24 (1.08)	0.22 (0.75)	P<0.001	6.26 (0.97)	0.19 (0.63)	P<0.001	P=0.288
Hot meal without a recipe	6.50. (0.82)	0.06 (0.48)	P<0.001	6.45 (0.87)	0.06 (0.49)	P<0.001	P=0.795
Soup-making skill	6.30. (1.24)	0.03 (0.64)	P=0.194	6.20. (1.27)	0.03 (0.60)	P=0.028	P=0.983
Baking skill	6.19 (1.19)	0.09 (0.59)	P<0.001	6.16 (1.26)	0.07 (0.58)	P<0.001	P=0.476
Bread-making skill	5.38 (1.76)	0.26 (0.89)	P<0.001	5.17 (1.90)	0.25 (0.92)	P<0.001	P=0.770

Notes: [a] paired *t* test for difference. [b] Welch 2-sample *t* test, yellow shading indicates a statistically significant result (p<0.05)

4.4.2 Changes to Shopping

Whether or not income was lost, participants reported an increase in negative and decrease in positive attitudes towards grocery shopping. There was no statistically significant difference in the reported changes between the loss of income groups (see Table 14).

Table 14

Changes to Grocery Shopping Attitudes and Methods During the March–April 2020 COVID-19 Lockdown, by Loss of Income Status

	Lost income n=551			Did not lose income n=1,594			Comparing both groups
Attitudes about grocery shopping	Before lockdown mean (SD)	Change in mean (SD)	P-value[a]	Before lockdown mean (SD)	Change in mean (SD)	P-value[a]	Significance of change difference between groups[b]
Positive (relaxing, creative, enjoyable)	3.71 (0.83)	-0.76 (1.39)	P<0.001	3.73 (0.85)	-0.82 (1.38)	P<0.001	P=0.354
Negative (time consuming, frustrating, stressful)	3.40. (1.28)	1.08 (1.70)	P<0.001	3.31 (1.25)	1.12 (1.66)	P<0.001	P=0.711
Shopping methods							
In person	6.10. (1.27)	-0.89 (2.15)	P<0.001	6.20. (1.21)	-0.84 (1.98)	P<0.001	P=0.619
Click and collect	3.26 (1.42)	0.18 (1.79)	P=0.020	3.18 (1.36)	0.09 (1.73)	P=0.031	P=0.337
Delivered to home	1.96 (1.57)	0.72 (2.07)	P<0.001	2.01 (1.60)	0.65 (2.02)	P<0.001	P=0.519

Notes: [a] paired *t* test for change. [b] Welch 2-sample *t* test, yellow shading indicates a statistically significant result (p<0.05)

4.4.2.1 Stocking Up. Fish was stockpiled more by those who did not lose income than those who lost income, but otherwise, there were no statistically significant differences in the reported stockpiling behaviours between those who did and did not lose income (see Table A2, Appendix).

5 Discussion

5.1 Summary

The preceding chapters have outlined the relevant findings from the New Zealand-based Covid Kai Survey and how the March–April 2020 lockdown changed the diets, shopping, and cooking habits of financially precarious communities. The literature review has outlined what the international research identified on these themes throughout the first lockdowns in the US, UK, France, and other countries included in the Corona Cooking Survey project. The international literature also discussed changes in demand for food and financial-support policies in many of these included countries, data which were not collected as part of the Covid Kai Survey. Overseas literature found that, overall, restrictions during the first lockdown for COVID-19 disproportionately worsened food insecurity for disadvantaged communities. In contrast, the Covid Kai Survey data analysis in Chapter 3 found that changes to diets, cooking, and shopping habits in New Zealand were largely universal. New Zealand data did not demonstrate widespread disproportionate impacts for disadvantaged groups in the first national lockdown, unlike much of the overseas research. While changes were broadly similar between compared groups, the data highlight dietary inequalities between those with and without hardship which continued during the lockdown period. For example, the financially insecure consumed less healthy food, such as fruit and vegetables, and more calorie-dense preprepared snack foods both before and during the lockdown than the financially secure. For some groups, inequities were even reduced during the lockdown, such as financial barriers to cooking between those with high and low financial security, although those with prior hardship remained worse off.

When considering all three different approaches for measuring hardship ("loss of income," "financial insecurity," and "food insecurity"), there were relatively few areas where those with and without hardship reported different impacts. Even those who lost income during the first lockdown between March and April 2020 reported relative resilience during the lockdown. COVID-19 has since led to further lockdowns, and border closures continue to impact New Zealand's once strong tourism industry. Further research is required to examine longer-term and later impacts among those experiencing hardship as the pandemic continues.

5.2 Discussion of Findings

5.2.1 Theme 1: Differences Identified Between Examined Groups

Dietary inequities present beforehand continued during the March–April 2020 lockdown in New Zealand despite increased available support services. The Covid Kai Survey found that several unhealthy changes to diet during the lockdown were more pronounced for the financially insecure, including larger increases in consumption of white bread and sugary drinks. These are products that are available at low cost and are popular among those with socioeconomic disadvantage (Thornley et al., 2021). Therefore, during the lockdown, it is not surprising that financially insecure New Zealanders ate more of these affordable, palatable but unhealthy options. The disproportionate increase in consumption of unhealthy foods suggests that dietary disparities between those with and without financial hardship likely worsened in some areas during the lockdown. On the other hand, the food-insecure group reported no significant change in snack-food consumption. Snack-food consumption increased for every other examined group, including the financially insecure and those who lost income. This suggests that those who struggled to afford food could not afford to adopt many of the less healthy dietary changes experienced by every other group.

Stockpiling behaviours among the Covid Kai participants tended to be a privilege for those with the least hardship. This is consistent with overseas research, which found that stockpiling enabled the well-off to reduce their shopping frequency to stay safe at home, which disadvantaged groups could not (Clay & Rogus, 2021; De Backer et al., 2020; Kinsey et al., 2020; Power et al., 2020). This may have led to an increased risk of contracting COVID-19 in the community for those with the most socioeconomic disadvantage, many of whom also experience a higher incidence of co-morbidities, increasing their vulnerability to serious illness from COVID-19 (Sampson et al., 2021). On average, the food insecure reported no increase and even some decreases in quantities purchased of goods commonly stockpiled by the three most advantaged demographic groups. These included sweet and salty prepackaged snack foods, legumes, and plant-based drinks (see Table 11), which may have been considered expensive luxuries rather than necessities, which the food insecure might forgo to save money. This group also did not report a statistically significant increase in consumption of snack

foods (see Table 8), demonstrating that stockpiling behaviours were largely consistent with consumption during the lockdown. As discussed in the literature review chapter, dietary research demonstrates that the food available in the home significantly influences diet (Wilson et al., 2014). This likely influenced the Covid Kai Survey findings that those who struggled to afford food before the lockdown also could not afford to increase their snack-food consumption during the lockdown. While most food-insecure participants did not report significant increases in unhealthy dietary choices, they likely had less food in the home than those who could afford to stockpile. While the Covid Kai Survey results demonstrated similar increases in the food-access barrier across the levels of hardship, the differences in stockpiling behaviours suggest that food shortages had a larger impact on food-insecure New Zealanders.

The time-related barrier to cooking was greater for the low food and financial security groups before the lockdown, and lowest for the high-security groups. This suggests that before the lockdown, those with existing hardship felt they had less time to cook than those without prior financial or food insecurity. Despite disparities in the pre-lockdown position, there was a similar change regardless of hardship status during the lockdown for all but one hardship group. The only group to demonstrate a statistically significant difference in magnitude of their reported change to the time barrier to cooking was the group that lost income. This group had a statistically significant, larger reduction in the time barrier to cooking, presumably as their loss of income stemmed from reduced employment that would usually occupy their time. At this very early period during the pandemic, the self-employed, and those on casual contracts were likely among the first to lose work, spanning the three levels of financial security (see Table 3). However, these participants were likely eligible for financial support from the government's COVID-19 response fund (New Zealand Government, 2020).

5.2.2 Theme 2: Similar Changes Between Groups

The Covid Kai Survey participants at all levels of financial hardship reduced their consumption of processed meat and vegetarian meat alternatives, such as fried hamburgers and sausages, during the lockdown. This decrease may be related to the closure of takeaway outlets, which produce many

burgers and other processed, less healthy treat foods consumed by New Zealanders (Wilson et al., 2014).

Stockpiling was the most significant behaviour change related to shopping across the Covid Kai Survey data. On average, even the most financially secure Covid Kai Survey participants stockpiled only slightly more grocery items during the lockdown than beforehand. This was likely a consequence of quantity limits placed by major supermarket chains and participants following the Prime Minister's advice to shop as they usually would, to prevent shortages (Cheng, 2020, March 21). The scale was also subject to interpretation (see Table A1, Appendix), and reporting was subject to recall bias as all data was collected during the lockdown. Although participants on average stockpiled relatively moderately, even small amounts of stockpiling by each shopper could contribute to overall shortages.

Similar increases in consumption reported across the two financial-security groups were consistent with the stockpiling data, which shows that both high- and low-financial-security participants stocked up on bread and snack foods (Table 7). Early in the lockdown, low-income New Zealanders struggled to purchase their usual supermarket products, including staple foods such as bread, due to "panic buying" behaviours by other consumers (Child Poverty Action Group, 2020). The data suggests that the bread stockpiled by rich and poor alike was most likely white bread, as most groups increased their white bread consumption and not their consumption of wholemeal bread. It is reasonable to suggest that stockpiling cheap white bread would reassure households afraid of potential barriers to accessing bread during the lockdown. Bread is a staple lunch food in New Zealand, especially while fast food and takeaway lunches were unavailable during the lockdown (Gerritsen et al., 2020). Internationally, financially secure consumers stockpiling lower cost staples increased grocery costs for low-income families (Gerritsen et al., 2020; Power et al., 2020; Sharma et al., 2020). The extent of this occurring for the Covid Kai Survey participants was not measured; however, financially insecure participants did not identify increases in the financial barrier to cooking during the first lockdown. This suggests that price increases did not significantly impact cooking behaviours in the early lockdown period.

In general, participants shopped in person less often during the lockdown. Most groups also increased how often they shopped via click and collect and home delivery to a similar extent. This is consistent with experiences of New Zealanders struggling to access online shopping slots as demand increased during the lockdown (Gerritsen et al., 2020). New Zealanders diversified their grocery suppliers through independent online grocery providers such as meal kit services to find whatever socially distanced options were available (Anderson, 2020). In New Zealand, demand for online delivery and click and collect from grocery retailers increased significantly during Alert Level 4 (Gerritsen et al., 2020). In response to increasing demand, the major supermarket chain Countdown (2020) opened an online-only fulfilment centre in April 2020. This was a supermarket solely equipped to offer online delivery to Auckland consumers. Despite the new store increasing the available delivery slots in Auckland (Countdown, 2021, February 02), participants across the country may still have struggled to book online. During the survey period, New Zealanders were either at Level 3 or 4 for the first time, bringing much uncertainty regarding the safety of supermarket shopping. For this reason, repeating the survey during a later lockdown may have provided more data on the longer-term changes in shopping habits for New Zealanders that the March-April period could not reliably capture.

Apart from changes in stockpiling, the only statistically significant difference in shopping changes was in the positive attitudes towards grocery shopping among the financially insecure, who reported significantly less positive changes in attitudes to shopping than their financially secure counterparts. This suggests that, in general, changes to shopping were similar regardless of financial circumstances in New Zealand. At the same time, U.S. research identified greater barriers faced by those receiving food-support benefits due to specific regulations applicable to SNAP benefit redemption and receipt. As New Zealand does not have a specific food-related financial-support programme in its existing social welfare system, New Zealand beneficiaries were likely able to shop more easily than U.S. beneficiaries could. Instead of a regulated food stamp system, struggling New Zealanders could access a one-off cash payment food grant (Ministry of Social Development, 2020d). The significant differences in food assistance services between the US and New Zealand may explain some of the

differences between the overseas literature and what was reported by struggling Covid Kai Survey participants.

Changes in cooking habits were frequently similar between those with and without hardship and were likely a direct consequence of restaurant closures. For example, a significant increase in cooking from scratch was noted in all groups, which is not unexpected as restaurant and takeaway meals were unavailable for much of the lockdown (Gerritsen et al., 2020). On average, even the groups with the highest reported hardship in our survey were frequent and capable cooks before the lockdown, and these skills improved even more during the lockdown (see Tables 5, 9, 13). Across all hardship measures, the increase in cooking from scratch was most pronounced for all groups in an increase in bread making, which correlates with reports of widespread supermarket bread, yeast, and flour shortages during lockdown due to stockpiling behaviours early on (Gerritsen et al., 2020). This is also reflected in the stockpiling data (see Tables 7, 11, A2), demonstrating that many increased their bread purchasing – likely due to concerns about further shortages.

The less positive feelings toward shopping for those with hardship both before and during the lockdown suggest a need for more support for low-income shoppers, such as personalised food-parcel delivery services from a social supermarket or foodbank (Tanielu, 2021; Wellington City Mission, 2022) for those who could not afford to shop online from mainstream supermarkets. Increased accessibility to food support services could improve food security for those with hardship in future periods of isolation.

5.2.3 Theme 3: Positive Impacts of the Lockdown

The Covid Kai Survey identified encouraging levels of cooking ability and confidence among those experiencing hardship, which also improved during the lockdown. This contrasts with community beliefs identified prior to the lockdown that the poor would improve their diets if they learned to cook (Gerritsen, Harré, et al., 2019; Gerritsen, Renker-Darby, et al., 2019). The research participants interviewed often said that low-income families cannot cook and do not have the skills and equipment required to improve their diets (Gerritsen, Harré, et al., 2019; Gerritsen, Renker-Darby, et al., 2019).

The Covid Kai Survey results challenge this view, as it demonstrates that even our most financially disadvantaged participants were skilled and frequent cooks before the first lockdown. Instead, the significant barriers to cooking were insufficient money and time (see Tables 5, 9, 13). Not only were disadvantaged participants frequently cooking hot main meals from scratch before the lockdown, but they were also confident in their cooking ability. These participants also demonstrated similar baking skills to their financially secure counterparts. Despite disparities in the pre-COVID financial barriers, none of the hardship groups experienced an overall increase in the financial barrier during the first lockdown. These mild and sometimes positive effects contrast with much of the U.S. literature, which instead found that early in the first lockdowns, household food insecurity generally worsened among those experiencing hardship (see Chapter 2, Literature Review). While the Covid Kai survey results may reflect local policy triumphs, it is also likely that the Covid Kai survey hardship groups were not comparable to the groups examined overseas. In the US, many studies sampled recipients of existing support services and other groups known to be significantly disadvantaged.

During the lockdown, financial barriers to cooking were reduced for people who reported food or financial insecurity prior to lockdown and those who were more secure. However, amongst those who lost income because of the lockdown, cooking was as financially prohibitive as before (see Table 13). Expenses likely decreased for those who could work from home or otherwise retain their income during the first COVID-19 lockdown. In New Zealand, evening entertainment such as sit-down restaurants and live performances were unavailable for the Level 4 and 3 lockdowns, and with restrictions on travel outside of one's home suburb (New Zealand Government, 2022, February 22), costs incurred outside the home were minimised. Therefore, it is understandable that those experiencing hardship who retained their incomes found cooking more affordable than before the lockdown, while those who lost income did not. Those who lost income reported improvements in their time barriers to cooking, although financial barriers did not improve. With this extra time, those who lost income increased their breadmaking more, suggesting that those who lost work had more time to engage in productive cooking behaviours even though financial freedoms did not increase (see Table 13).

Interestingly, a few disparities were reduced during the lockdown. Many negative habits and attitudes worsened more for the food-secure than food-insecure participants. These included consumption of sweet or salty snack food and negative attitudes to grocery shopping. Despite some disparities reducing significantly, the food insecure continued to dislike grocery shopping more and ate more snack foods than the food secure. Positive changes also had a similar effect, with baking skills improving more for the food insecure than for the food secure. Similar intriguing impacts were found when comparing those with and without financial insecurity. For example, the financial barrier to cooking was reduced more for those with low financial security, as this barrier was initially significantly more than for the financially secure before the lockdown (see Table 5).

Both the low and high financial security groups reduced how many readymade meals and bottles of water they purchased. As sports and recreation outside the home were cancelled during the lockdown, participants did not need the quick dinner options and portable drinks they once needed as they rushed from the office to school sports and youth groups. This universal drop in demand for convenience foods and bottled water may have had positive impacts on both diets and the environment, with increased cooking from scratch as reflected in the data (see Table 5) and less plastic waste produced by households in lockdown.

5.2.4 Gaps Identified in the Research

It is not clear from the analysis completed so far what impact the loss of income had on the shopping habits of New Zealanders. Other than a higher increase in fish purchasing during the lockdown among those who did not lose income, all stockpiling results were statistically similar whether or not income was lost. This suggests that loss of income was not correlated with the ability to purchase extra food to prepare for a long period at home. Loss of income was more common among those with low to medium financial security; however, the results demonstrated that loss of income also affected a significant proportion of financially secure participants (see Table 3). These results suggest that further analysis may be needed to determine the changes for those who lost income within a subgroup of a larger sample of those with low financial or food security than were sampled in the Covid Kai Survey.

The Covid Kai Survey attracted a large sample; however, only 96 of these participants reported high food insecurity. This small sample frequently reported similarly large behaviour changes to that of the food-secure sample that failed to reach statistical significance, such as an 8% reduction in consumption of plant-based drinks and a 6% increase in white bread consumption (see Table 12). Further study in New Zealand should target a larger financially and/or food-insecure population or survey a representative population sample to improve the reliability of the significance tests. A mixed-methods study design would also be advantageous for this group, with quantitative data collection for statistical comparisons and the opportunity for those with considerable hardship to explain their lived experiences beyond the inevitable limitations of a quantitative survey.

As groups with existing hardship were not the primary focus when the Corona Cooking Survey was created, the measures of hardship used were not comprehensive. Further study should use a more comprehensive measure of food and financial security as could be adapted from the NZiDep - the New Zealand Index of Socioeconomic Deprivation for Individuals (Salmond et al., 2014). This questionnaire includes eight questions measuring different ways that hardship may have manifested for New Zealanders over a 12-month period, such as avoiding purchasing fresh fruit and vegetables as other expenses took priority, forgoing home heating due to cost, reliance on food banks, and receipt of a social welfare benefit. Another option could be to adapt the New Zealand Health Survey children's food-security questionnaire to better suit adult participants (Ministry of Health, 2019). The Covid Kai Survey found that some inequities reduced during the lockdown, and only a few dietary inequities worsened. The closing of inequities in cooking habits between groups and similar changes to a lot of dietary behaviours identified in the Covid Kai Survey contrast with most of the U.S. research, which surveyed citizens enrolled in food-support programmes and those living close to the poverty line and identified increasing hardship (Adams et al., 2020; Dubowitz et al., 2021; Sharma et al., 2020). The Covid Kai Survey results may not be an accurate representation of the experiences of poor New Zealanders, given that convenience sampling attracted a disproportionately highly educated and financially secure survey population (see Table 4). The survey appears to have underrepresented financially insecure respondents, who were my main focus of study and were at most risk during the

pandemic (Galicki, 2020). Subsequent research has also identified challenges low-income New Zealand families face when trying to feed their children, who were previously receiving food programmes at school (Tipene-Leach & McKelvie-Sebileau, 2021). This barrier to accessing school meals has parallels with experiences in U.S. school districts but was not examined by the Covid Kai Survey. Measuring hardship more broadly and improving the representation of those with hardship in future research would provide a clearer picture of the circumstances faced by the most vulnerable to food insecurity during periods of isolation so that appropriate policy changes can be made.

5.3 Policy Recommendations

The findings from the Covid Kai survey demonstrate that those with food insecurity cannot afford to stock up on groceries should they need to self-isolate, unlike those without hardship. Therefore, even though overall financial barriers did not increase, existing disparities mean that those with financial hardship are likely more vulnerable to potential food shortages. Ultimately, financial support must increase, and/or food costs must reduce for those in need to ensure that a healthy diet becomes affordable for all New Zealanders during periods of increased personal hardship. The policies implemented to protect those with material hardship during future crises should incorporate monetary payments for those with existing hardship, such as a package that helps a household stay afloat during isolation. The highest available monetary support during the first lockdown was for those who were unable to work due to the Level 4 lockdown. This support included the wage subsidy, which subsidised staff wages while businesses were closed, and the 12-week Covid-19 Income Relief Payment for those who had lost their jobs because of the pandemic (Ministry of Social Development, 2020b). While social welfare benefits increased by about $25 per week (New Zealand Government, 2020), the benefit limit for most existing beneficiaries controversially remained much less than was available to those eligible for the Income Relief Payment or Wage Subsidy (Rashbrooke, 2020). Our data suggest that those who lost work were largely financially secure during the first 2020 lockdown, likely due to available wage subsidies and the COVID-19 Income Relief Payment. The relative resilience of participants who lost income is encouraging. However, these financial support benefits

only provide for those who lost income or employment due to the lockdown and not those with prior hardship, whom our data showed continued to have less healthy diets.

According to the Covid Kai survey results, changes for New Zealanders during the lockdown were largely universal, without significant disproportionate disadvantage for those experiencing hardship. However, those who were the worse off financially tended to have less healthy diets and food-preparation habits both before and during the lockdown, demonstrating that existing policies are limited in their ability to support dietary resilience for those living with hardship. Equitable food-support policies must target those with the least ability to afford food, whom our research has demonstrated could not afford to stock up on many food items as most people could. Our insecure participants' significant barriers to cooking were not a lack of skills but financial barriers (see Tables 5, 9). The Covid Kai Survey data demonstrated that those with hardship have worse diets and food insecurity than those without even outside of the lockdown period. Therefore, while improving support during a crisis is necessary, permanent support services should also be developed and improved. A universal basic income, or food subsidy as part of the community services card (a card providing discounted social services for those with low incomes), could be considered to ensure food remains affordable.

An issue stressed by the Salvation Army 2021 report (Tanielu, 2021) was that food parcels, which were a critical and government-supported food-support service during the lockdown, do not enable recipients to do their own shopping and choose the products that best suit them and their families (Tanielu, 2021). While these parcels were in high demand during the lockdown, food parcels tend to contain a nonpersonalised selection of whatever products are donated, leading to large amounts of tinned goods that do not comprise a whole meal on their own. Because of personal preferences and dietary needs, the government should explore options for direct grocery support, which empowers those experiencing hardship to purchase their preferred products. This should not be like the U.S. food-support SNAP programme discussed in the literature review chapter, as this restricts where recipients can shop and what products can be purchased, which adds barriers for those already experiencing hardship (Kinsey et al., 2020). In New Zealand, a 2013 study found that the food-

insecure spent more on food, not just on luxuries, when given extra money with the freedom to spend it how they liked (Smith et al., 2013). It is essential for those with hardship to be empowered to manage their own shopping list and not restrict freedoms under a discriminatory assumption that the poor waste their money, which is a belief that the U.S. SNAP scheme reinforces by not allowing recipients to spend the money how they see fit (Kinsey et al., 2020). One option currently operated by the Wellington City Mission (2022) that could be explored further in New Zealand is a social supermarket, where recipients can select their preferred items at no cost. Empowering food-support recipients to choose their groceries would likely reduce waste compared to prepacked food parcels, as social supermarket patrons are only taking home the items they choose.

It is important to understand the impact the COVID-19 pandemic has had on the diets, shopping, and cooking habits of the poorest New Zealand residents. Therefore, policy researchers should explore options to link survey platforms to support existing recipients, such as through Work and Income New Zealand, or the Salvation Army, to obtain the necessary data in more appropriate and effective ways which target those with considerable hardship. Surveys should also be repeated in subsequent lockdowns to identify if resilience has developed or if food security is worse at various points in time.

5.4 Strengths and Limitations

A significant strength of the Covid Kai Survey was the rapid collection of data online during the lockdown period, where face-to-face data collection was not possible. This was the first and, to my knowledge, still the only comprehensive quantitative survey of nutritional and other food-related impacts of the first COVID-19 lockdown in Aotearoa, New Zealand. The survey also asked comprehensive questions about shopping, cooking, and stockpiling habits in New Zealand, while most existing research focused on changes to food security in U.S. populations. Outside of COVID-19, most of the New Zealand dietetics research focused on the food consumed rather than these broader considerations like shopping and cooking behaviours. It is also valuable that the Covid Kai survey examines the diets of adults, as the pre-lockdown research disproportionately studied the diets of children (Gerritsen, Harré, et al., 2019; Gerritsen, Renker-Darby, et al., 2019; Munday & Wilson, 2017; Rush et al., 2019; Schlichting et al., 2019).

The extent to which the Covid Kai Survey results reflect the changes to diet, shopping, and cooking habits for those experiencing hardship is limited by several considerations. Firstly, due to the nature of the convenience sampling study design, the Covid Kai Survey population was not representative of the New Zealand population or our target demographic. In particular, the survey was completed by predominantly female, financially secure New Zealand European participants. Most participants reported that they were responsible for the cooking and shopping for their households, which reflects the predominance of women in household shopping and cooking roles in New Zealand (Gerritsen et al., 2020); however, the low representation of men does prevent comprehensive analysis of the habits of men who do hold these roles. Participants were more highly educated than the New Zealand population overall (OECD, 2019), with 76% of respondents holding a bachelor's degree or higher compared to 35% of 25–65-year-olds estimated nationally. The survey took on average 30 minutes to complete, and many participants reported that the survey was excessively long in the free-text comment section, with many taking as long as 45 minutes to complete. This likely contributed to the number of incomplete surveys. Those experiencing financial hardship finished the survey less often than higher security participants (see Table 2), which means the data-cleaning process disproportionately hindered participants with low financial security.

The survey questions did not adequately provide a clear picture of the circumstances facing our low-security participants. The survey did not measure household income or receipt of a benefit or food parcel. Instead, financial hardship was measured by self-reported experiences of struggling to make money last, afford food, and whether the participant lost any income due to the lockdown. This research would have been strengthened using a recognised, comprehensive food security and hardship questionnaire such as an adaption of the Childhood Nutrition Survey.

The cultural relevance of the survey to New Zealand participants was a limitation due to the overseas origins of the survey. For example, the survey used American English terminology such as "convenience shop" rather than "dairy" and "takeout" rather than "takeaways". No questions related to cultural methods of acquiring food were included, such as hunting, fishing, or gathering shellfish. While the survey asked how often consumers shopped at supermarkets rather than other grocery

providers, it did not ask how frequently respondents shopped in person. Also, several participants provided feedback that the survey poorly measured changes to an already vegan or vegetarian diet, which may reflect dietary differences in New Zealand compared to Belgium, where the Corona Cooking Survey originated. The wording of some of the questions may not have been familiar to New Zealanders or well understood. For example, the examples of processed meats included in the dietary questions did not include popular New Zealand lunch meats, such as ham. Participants may have therefore underreported their processed meat consumption. Questions may have also been unintentionally stigmatising, as employment options included "I did not work" rather than "not in paid employment". With no questions about foodbank use either, the impact of lockdown on demand for assistance could not be ascertained.

The small sample of food-insecure participants recruited was a limitation. This subsample was 96 participants, and several questions were completed by only 88 of them. This compromised the statistical power of some of the significance tests. For example, several variables demonstrated larger or similar changes for those who struggled to afford food, but these were not statistically significant, suggesting that there was an insufficient sample size for many of these comparisons. The small and frequently positive impacts of the lockdown in the New Zealand study compared to the negative experiences overseas suggest that while the Covid Kai Survey explored subsamples of those experiencing hardship, it may not have sampled a sufficient range of people experiencing hardship. A more extensive study of financially insecure participants during a lockdown may be warranted. In 2021, a significantly longer lockdown period was enforced for Auckland once the highly infectious Delta variant of COVID-19 arrived in New Zealand and with the spread of the Omicron variant in 2022, increasing numbers of food-insecure New Zealanders will be required to self-isolate while infectious.

6 Conclusion

This thesis has included analyses from an international literature review and a national online survey during the lockdown in early 2020, which together contribute to understanding the impacts of

COVID-19 lockdowns on the diets, shopping, and cooking habits of those experiencing hardship. The New Zealand Covid Kai Survey did not identify extreme disparities in the impacts of lockdown, which contrasted with much of the United States experience. Generally, dietary habits were less healthy for those with hardship both before and during the lockdown, demonstrating that the COVID-19 lockdown perpetuated nutritional inequities in New Zealand. Positive impacts also occurred for both the financially- and food-insecure, with time and financial barriers to cooking reducing and cooking skills and confidence increasing; however, circumstances generally remained less favourable for those with insecurity. Stockpiling habits were most pronounced in the financially secure, suggesting that of those who were self-isolating at home with COVID-19, who could not easily shop for food while unwell, the financially and food secure had a significant advantage.

Limitations to the study design and the paucity of comprehensive international research mean these findings may not be generalisable to other deprived communities. Therefore, further research is advised that specifically surveys a population experiencing hardship, such as those enrolled with Work and Income New Zealand, while also allowing qualitative data collection. Further research must explore participants' foodbank use, receipt of a wage subsidy and other changes in demand for assistance. This is critical for gauging the severity of food insecurity within a population and the sufficiency of available support. Charitable organisations tell us that food parcels do not adequately empower and meet the needs of diverse recipients. Therefore, the New Zealand government should explore methods to provide nutritional support which allows recipients to affordably choose and be delivered their groceries, especially as COVID-19 continues to spread in New Zealand

Appendix

Table A1

Full Description of Questions Analysed Throughout this Thesis and Potential Answers

		Possible answers								
	Socio-demographic									
1	What is your gender?	Female	Male	Gender Diverse						
2	What is your age?	1-120								
3	In which category is your highest qualification situated?	Under a high school qualification (No qual, NCEA Level 1-2)	High school qualification (NCEA Level 3-6)	Bachelor's degree	Master's degree	Doctorate				
4	Before the lockdown, what was your employment status?	I was a student	I worked	I didn't work						
5	Have you lost (a part of) your income since the lockdown?	Yes	No							
6	In general, how often is it a struggle to make your money last until the end of the month/payday?	Never	Very rarely	Rarely	Sometimes	Frequently	Very frequently	Every time		
7	In general, how often is it a struggle to have enough money to go shopping for food?	Never	Very rarely	Rarely	Sometimes	Frequently	Very frequently	Every time I go shopping for food		
8	Which ethnic group do you belong to?	New Zealand European	Māori	Samoan	Cook Island Māori	Tongan	Niuean	Chinese	Indian	Other, please specify
	General food behaviour									
	Before the lockdown, how often did you usually do the following actions?									
9	Make a list before you go shopping	Never	Very rarely	Rarely	Sometimes	Frequently	Very frequently	Every time		

		Possible answers								
10	Use the nutritional information panel (nutritional breakdown of the products) to make food choices (see example picture below [Figure A1])	Never	Very rarely	Rarely	Sometimes	Frequently	Very frequently	Every time		
11	Use other parts of the food label to make food choices (like which ingredients are in the product)	Never	Very rarely	Rarely	Sometimes	Frequently	Very frequently	Every time		
12	Cook meals at home using healthy ingredients	Never	Very rarely	Rarely	Sometimes	Frequently	Very frequently	Every time		
13	Feel confident about cooking a variety of healthy meals	Never	Very rarely	Rarely	Sometimes	Frequently	Very frequently	Every time		
14	Try a new recipe	Never	Very rarely	Rarely	Sometimes	Frequently	Very frequently	Every time		
	At the moment (during the lockdown), how often do you usually do the following actions?									
15	Make a list before you go shopping	Never	Very rarely	Rarely	Sometimes	Frequently	Very frequently	Every time		
16	Use the nutritional information panel (nutritional breakdown of the products) to make food choices (see example picture below [Figure A1])	Never	Very rarely	Rarely	Sometimes	Frequently	Very frequently	Every time		
17	Use other parts of the food label to make food choices (like which ingredients are in the product)	Never	Very rarely	Rarely	Sometimes	Frequently	Very frequently	Every time		
18	Cook meals at home using healthy ingredients	Never	Very rarely	Rarely	Sometimes	Frequently	Very frequently	Every time		
19	Feel confident about cooking a variety of healthy meals	Never	Very rarely	Rarely	Sometimes	Frequently	Very frequently	Every time		
20	Try a new recipe	Never	Very rarely	Rarely	Sometimes	Frequently	Very frequently	Every time		
	Shopping for food – Grocery Shopping									
	Before the lockdown, grocery shopping was									
21	Too time consuming	Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree		
22	Frustrating	Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree		
23	A type of relaxation for me	Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree		
24	A way I could play out my creativity, discover new things	Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree		

		Possible answers								
25	Enjoyable	Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree		
26	Stressful	Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree		
	At the moment (during the lockdown), grocery shopping is									
27	Too time consuming	Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree		
28	Frustrating	Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree		
29	A type of relaxation for me	Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree		
30	A way I could play out my creativity, discover new things	Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree		
31	Enjoyable	Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree		
32	Stressful	Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree		
	Before the lockdown, how did you usually organise your grocery shopping?									
33	I physically went to the supermarket, shop, market, farmer, vendor to select and buy food	Never	Very rarely	Rarely	Sometimes	Frequently	Very frequently	Every time I went grocery shopping		
34	I ordered my food and picked it up at a seller's point	Never	Very rarely	Rarely	Sometimes	Frequently	Very frequently	Every time I went grocery shopping		
35	I ordered my food online and had it delivered at home	Never	Very rarely	Rarely	Sometimes	Frequently	Very frequently	Every time I went grocery shopping		

		Possible answers								
	At the moment (during the lockdown), how do you organize your grocery shopping?									
36	I physically go to the supermarket, shop, market, farmer, vendor to select and buy food	Never	Very rarely	Rarely	Sometimes	Frequently	Very frequently	Every time I go grocery shopping		
37	I order my food and pick it up at a seller's point	Never	Very rarely	Rarely	Sometimes	Frequently	Very frequently	Every time I go grocery shopping		
38	I order my food online and have it delivered at home	Never	Very rarely	Rarely	Sometimes	Frequently	Very frequently	Every time I go grocery shopping		
	Before the lockdown, where did you usually go for grocery shopping?									
39	A supermarket	Never	Very rarely	Rarely	Sometimes	Frequently	Very frequently	Every time I went grocery shopping		
40	Corner shop/convenience store	Never	Very rarely	Rarely	Sometimes	Frequently	Very frequently	Every time I went grocery shopping		
41	Organic/fairtrade food shop	Never	Very rarely	Rarely	Sometimes	Frequently	Very frequently	Every time I went grocery shopping		
42	Straight from the farmer/producer; this can be via a cooperative or at a farmers' market as well	Never	Very rarely	Rarely	Sometimes	Frequently	Very frequently	Every time I went grocery shopping		
43	Speciality stores: bakery, butcher, delicatessen/deli	Never	Very rarely	Rarely	Sometimes	Frequently	Very frequently	Every time I went grocery shopping		
44	Via meal kits/meal boxes (with all you need to cook a meal)	Never	Very rarely	Rarely	Sometimes	Frequently	Very frequently	Every time I went grocery shopping		

		Possible answers								
	At the moment (during the lockdown), where do you grocery shop?									
45	A supermarket	Never	Very rarely	Rarely	Sometimes	Frequently	Very frequently	Every time I go grocery shopping		
46	Corner shop/convenience store	Never	Very rarely	Rarely	Sometimes	Frequently	Very frequently	Every time I go grocery shopping		
47	Organic/fairtrade food shop	Never	Very rarely	Rarely	Sometimes	Frequently	Very frequently	Every time I go grocery shopping		
48	Straight from the farmer/producer; this can be via a cooperative or at a farmers' market as well	Never	Very rarely	Rarely	Sometimes	Frequently	Very frequently	Every time I go grocery shopping		
49	Speciality stores: bakery, butcher, delicatessen/deli	Never	Very rarely	Rarely	Sometimes	Frequently	Very frequently	Every time I go grocery shopping		
50	Via meal kits/meal boxes (with all you need to cook a meal)	Never	Very rarely	Rarely	Sometimes	Frequently	Very frequently	Every time I go grocery shopping		
	How much did you stock up on any of the foods/items below because of the COVID-19 pandemic?									
51	Fruit (fresh, frozen, canned)	A lot less than usual	Less than usual	A little less than usual	Not more or less than usual	A little more than usual	More than usual	A lot more than usual		
52	Vegetables (fresh, frozen, canned)	A lot less than usual	Less than usual	A little less than usual	Not more or less than usual	A little more than usual	More than usual	A lot more than usual		
53	Meat (fresh, frozen, canned)	A lot less than usual	Less than usual	A little less than usual	Not more or less than usual	A little more than usual	More than usual	A lot more than usual		
54	Vegetarian alternatives (fresh, frozen, canned)	A lot less than usual	Less than usual	A little less than usual	Not more or less than usual	A little more than usual	More than usual	A lot more than usual		

		Possible answers								
55	Potatoes	A lot less than usual	Less than usual	A little less than usual	Not more or less than usual	A little more than usual	More than usual	A lot more than usual		
56	Nuts or nut spread (unsalted)	A lot less than usual	Less than usual	A little less than usual	Not more or less than usual	A little more than usual	More than usual	A lot more than usual		
57	Legumes/pulses (e.g., beans, lentils, chickpeas: dried or tinned)	A lot less than usual	Less than usual	A little less than usual	Not more or less than usual	A little more than usual	More than usual	A lot more than usual		
58	Sweet snacks (e.g., sweets, cookies, pies, cakes)	A lot less than usual	Less than usual	A little less than usual	Not more or less than usual	A little more than usual	More than usual	A lot more than usual		
59	Salty snacks (e.g., crisps, salted nuts)	A lot less than usual	Less than usual	A little less than usual	Not more or less than usual	A little more than usual	More than usual	A lot more than usual		
60	Ready-made meals	A lot less than usual	Less than usual	A little less than usual	Not more or less than usual	A little more than usual	More than usual	A lot more than usual		
61	Bread	A lot less than usual	Less than usual	A little less than usual	Not more or less than usual	A little more than usual	More than usual	A lot more than usual		
62	Flour	A lot less than usual	Less than usual	A little less than usual	Not more or less than usual	A little more than usual	More than usual	A lot more than usual		
63	Yeast	A lot less than usual	Less than usual	A little less than usual	Not more or less than usual	A little more than usual	More than usual	A lot more than usual		
64	Pasta, rice, couscous or other grains	A lot less than usual	Less than usual	A little less than usual	Not more or less than usual	A little more than usual	More than usual	A lot more than usual		
65	Eggs	A lot less than usual	Less than usual	A little less than usual	Not more or less than usual	A little more than usual	More than usual	A lot more than usual		
66	Milk	A lot less than usual	Less than usual	A little less than usual	Not more or less than usual	A little more than usual	More than usual	A lot more than usual		
67	Other dairy products (e.g., yoghurt, cheese)	A lot less than usual	Less than usual	A little less than usual	Not more or less than usual	A little more than usual	More than usual	A lot more than usual		

		Possible answers								
68	Plant-based drinks (e.g., rice, oat, soy, almond)	A lot less than usual	Less than usual	A little less than usual	Not more or less than usual	A little more than usual	More than usual	A lot more than usual		
69	Water	A lot less than usual	Less than usual	A little less than usual	Not more or less than usual	A little more than usual	More than usual	A lot more than usual		
70	Other non-alcoholic drinks	A lot less than usual	Less than usual	A little less than usual	Not more or less than usual	A little more than usual	More than usual	A lot more than usual		
	Cooking and baking									
	Before the lockdown, how often did you usually prepare the following foods from scratch?									
71	A hot main meal from basic ingredients (e.g., starting with raw vegetables, meat)	Never	Very rarely	Rarely	Sometimes	Frequently	Very frequently	Every time I ate these foods		
72	Soup (from fresh or frozen vegetables)	Never	Very rarely	Rarely	Sometimes	Frequently	Very frequently	Every time I ate these foods		
73	Baked goods (e.g., cake, cookies, pie)	Never	Very rarely	Rarely	Sometimes	Frequently	Very frequently	Every time I ate these foods		
74	Bread	Never	Very rarely	Rarely	Sometimes	Frequently	Very frequently	Every time I ate these foods		
	At the moment (during the lockdown), how often do you prepare the following foods from scratch?									
75	A hot main meal from basic ingredients (e.g., starting with raw vegetables, meat)	Never	Very rarely	Rarely	Sometimes	Frequently	Very frequently	Every time I eat these foods		
76	Soup (from fresh or frozen vegetables)	Never	Very rarely	Rarely	Sometimes	Frequently	Very frequently	Every time I eat these foods		
77	Baked goods (e.g., cake, cookies, pie)	Never	Very rarely	Rarely	Sometimes	Frequently	Very frequently	Every time I eat these foods		
78	Bread	Never	Very rarely	Rarely	Sometimes	Frequently	Very frequently	Every time I eat these foods		
	How do you perceive your own cooking skills? To what extent do you agree with the following statements?									

		Possible answers								
	Before the lockdown:									
79	I considered my cooking skills as sufficient	Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree		
80	I had the skills to prepare a hot main meal without a recipe	Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree		
81	I had the skills to prepare soup	Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree		
82	I had the skills to bake (e.g., cake, cookies, pies)	Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree		
83	I had the skills to bake bread	Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree		
	At the moment (during the lockdown):									
84	I consider my cooking skills as sufficient	Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree		
85	I have the skills to prepare a hot main meal without a recipe	Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree		
86	I have the skills to prepare soup	Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree		
87	I have the skills to bake (e.g., cake, cookies, pies)	Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree		
88	I have the skills to bake bread	Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree		
	Before the lockdown, preparing food was:									
89	Too time consuming	Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree		
90	Frustrating	Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree		

		Possible answers								
91	An important type of relaxation for me	Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree		
92	A way I could play out my creativity, discover new things	Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree		
93	Enjoyable	Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree		
94	Stressful	Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree		
	At the moment (during the lockdown), preparing food is:									
95	Too time consuming	Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree		
96	Frustrating	Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree		
97	An important type of relaxation for me	Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree		
98	A way I could play out my creativity, discover new things	Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree		
99	Enjoyable	Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree		
100	Stressful	Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree		
	Before the lockdown, how often did you experience the following barriers to cooking and/or baking?									
101	Time (I didn't have time to cook or bake)	Never	Very rarely	Rarely	Sometimes	Frequently	Very frequently	Every time I cooked or baked		
102	Cooking skills (I couldn't cook or bake)	Never	Very rarely	Rarely	Sometimes	Frequently	Very frequently	Every time I cooked or baked		

		Possible answers								
103	Money (I didn't have the funds for the food/ingredients I needed or wanted)	Never	Very rarely	Rarely	Sometimes	Frequently	Very frequently	Every time I cooked or baked		
104	Access to food (I didn't have access to foods/ingredients I needed or wanted)	Never	Very rarely	Rarely	Sometimes	Frequently	Very frequently	Every time I cooked or baked		
105	Access to cooking facilities (I didn't have (access to) the facilities needed to cook or bake: stove, oven, kitchen equipment)	Never	Very rarely	Rarely	Sometimes	Frequently	Very frequently	Every time I cooked or baked		
	At the moment (during the lockdown), how often do you experience the following barriers to cooking and/or baking?									
106	Time (I don't have time to cook or bake)	Never	Very rarely	Rarely	Sometimes	Frequently	Very frequently	Every time I cook or bake		
107	Cooking skills (I can't cook or bake)	Never	Very rarely	Rarely	Sometimes	Frequently	Very frequently	Every time I cook or bake		
108	Money (I don't have the funds for the food/ingredients I needed or wanted)	Never	Very rarely	Rarely	Sometimes	Frequently	Very frequently	Every time I cook or bake		
109	Access to food (I don't have access to foods/ingredients I needed or wanted)	Never	Very rarely	Rarely	Sometimes	Frequently	Very frequently	Every time I cook or bake		
110	Access to cooking facilities (I don't have (access to) the facilities needed to cook or bake: stove, oven, kitchen equipment)	Never	Very rarely	Rarely	Sometimes	Frequently	Very frequently	Every time I cook or bake		
	Eating – what, where, why and how									
	Before the lockdown, how often did you eat the following (portions of) foods? Please indicate how often you had at least <u>one portion</u> of the following foods and drinks. For example, a serving/portion is a handful of grapes, an orange, a salad, a slice of bread, a glass of soft drink									
111	Fruit (fresh or frozen)	(almost) never	Less than 1x a week	1x a week	2-4x a week	5-6x a week	1x a day	2x or more times a day		
112	Vegetables (fresh or frozen)	(almost) never	Less than 1x a week	1x a week	2-4x a week	5-6x a week	1x a day	2x or more times a day		
113	Legumes/pulses (e.g., beans, lentils, chickpeas)	(almost) never	Less than 1x a week	1x a week	2-4x a week	5-6x a week	1x a day	2x or more times a day		

		Possible answers								
114	Nuts or nut spread (unsalted)	(almost) never	Less than 1x a week	1x a week	2-4x a week	5-6x a week	1x a day	2x or more times a day		
115	Processed meat/poultry/fish/vegetarian alternatives ("processed" refers to transformations to enhance flavor or improve preservation. Think of hamburgers, sausages, fried foods, spreads, and so on)	(almost) never	Less than 1x a week	1x a week	2-4x a week	5-6x a week	1x a day	2x or more times a day		
116	Unprocessed fish	(almost) never	Less than 1x a week	1x a week	2-4x a week	5-6x a week	1x a day	2x or more times a day		
117	Unprocessed poultry	(almost) never	Less than 1x a week	1x a week	2-4x a week	5-6x a week	1x a day	2x or more times a day		
118	Unprocessed red meat (refers to all mammalian muscle meat including beef, veal, pork, lamb, mutton, horse, and goat)	(almost) never	Less than 1x a week	1x a week	2-4x a week	5-6x a week	1x a day	2x or more times a day		
119	Unprocessed vegetarian alternatives (e.g., tofu, tempeh, seitan)	(almost) never	Less than 1x a week	1x a week	2-4x a week	5-6x a week	1x a day	2x or more times a day		
120	Sweet snacks (e.g., sweets, cookies, pies, cakes)	(almost) never	Less than 1x a week	1x a week	2-4x a week	5-6x a week	1x a day	2x or more times a day		
121	Salty snacks (e.g., crisps, salted nuts)	(almost) never	Less than 1x a week	1x a week	2-4x a week	5-6x a week	1x a day	2x or more times a day		
122	Wholemeal bread, pasta, grains	(almost) never	Less than 1x a week	1x a week	2-4x a week	5-6x a week	1x a day	2x or more times a day		
123	White bread, pasta, grains	(almost) never	Less than 1x a week	1x a week	2-4x a week	5-6x a week	1x a day	2x or more times a day		
124	Milk	(almost) never	Less than 1x a week	1x a week	2-4x a week	5-6x a week	1x a day	2x or more times a day		
125	Other dairy products (e.g., yoghurt, cheese)	(almost) never	Less than 1x a week	1x a week	2-4x a week	5-6x a week	1x a day	2x or more times a day		
126	Plant-based drinks (e.g., almond, oat, soy, rice)	(almost) never	Less than 1x a week	1x a week	2-4x a week	5-6x a week	1x a day	2x or more times a day		
127	Non-sugared beverages (e.g., water, coffee, tea)	(almost) never	Less than 1x a week	1x a week	2-4x a week	5-6x a week	1x a day	2x or more times a day		
128	Sugared beverages (e.g., soft drinks, sugared coffee/tea)	(almost) never	Less than 1x a week	1x a week	2-4x a week	5-6x a week	1x a day	2x or more times a day		
	At the moment (during the lockdown), how often do you eat the following (portions of) foods? Please indicate how often you have at least <u>one portion</u> of the following foods and drinks. For example, a serving/portion is a handful of grapes, an orange, a salad, a slice of bread, a glass of soft drink									

		Possible answers								
129	Fruit (fresh or frozen)	(almost) never	Less than 1x a week	1x a week	2-4x a week	5-6x a week	1x a day	2x or more times a day		
130	Vegetables (fresh or frozen)	(almost) never	Less than 1x a week	1x a week	2-4x a week	5-6x a week	1x a day	2x or more times a day		
131	Legumes/pulses (e.g., beans, lentils, chickpeas)	(almost) never	Less than 1x a week	1x a week	2-4x a week	5-6x a week	1x a day	2x or more times a day		
132	Nuts or nut spread (unsalted)	(almost) never	Less than 1x a week	1x a week	2-4x a week	5-6x a week	1x a day	2x or more times a day		
133	Processed meat/poultry/fish/vegetarian alternatives ("processed" refers to transformations to enhance flavor or improve preservation. Think of hamburgers, sausages, fried foods, spreads, and so on)	(almost) never	Less than 1x a week	1x a week	2-4x a week	5-6x a week	1x a day	2x or more times a day		
134	Unprocessed fish	(almost) never	Less than 1x a week	1x a week	2-4x a week	5-6x a week	1x a day	2x or more times a day		
135	Unprocessed poultry	(almost) never	Less than 1x a week	1x a week	2-4x a week	5-6x a week	1x a day	2x or more times a day		
136	Unprocessed red meat (refers to all mammalian muscle meat including beef, veal, pork, lamb, mutton, horse, and goat)	(almost) never	Less than 1x a week	1x a week	2-4x a week	5-6x a week	1x a day	2x or more times a day		
137	Unprocessed vegetarian alternatives (e.g., tofu, tempeh, seitan)	(almost) never	Less than 1x a week	1x a week	2-4x a week	5-6x a week	1x a day	2x or more times a day		
138	Sweet snacks (e.g., sweets, cookies, pies, cakes)	(almost) never	Less than 1x a week	1x a week	2-4x a week	5-6x a week	1x a day	2x or more times a day		
139	Salty snacks (e.g., crisps, salted nuts)	(almost) never	Less than 1x a week	1x a week	2-4x a week	5-6x a week	1x a day	2x or more times a day		
140	Wholemeal bread, pasta, grains	(almost) never	Less than 1x a week	1x a week	2-4x a week	5-6x a week	1x a day	2x or more times a day		
141	White bread, pasta, grains	(almost) never	Less than 1x a week	1x a week	2-4x a week	5-6x a week	1x a day	2x or more times a day		
142	Milk	(almost) never	Less than 1x a week	1x a week	2-4x a week	5-6x a week	1x a day	2x or more times a day		
143	Other dairy products (e.g., yoghurt, cheese)	(almost) never	Less than 1x a week	1x a week	2-4x a week	5-6x a week	1x a day	2x or more times a day		
144	Plant-based drinks (e.g., almond, oat, soy, rice)	(almost) never	Less than 1x a week	1x a week	2-4x a week	5-6x a week	1x a day	2x or more times a day		
145	Non-sugared beverages (e.g., water, coffee, tea)	(almost) never	Less than 1x a week	1x a week	2-4x a week	5-6x a week	1x a day	2x or more times a day		
146	Sugared beverages (e.g., soft drinks, sugared coffee/tea)	(almost) never	Less than 1x a week	1x a week	2-4x a week	5-6x a week	1x a day	2x or more times a day		

Figure A1

Example of a Nutrition Information Panel Provided to Survey Participants

NUTRITION INFORMATION		
Servings per can: 2		
Serving size: 210g		
	Average Quantity Per serving	Average Quantity Per 100g
ENERGY	895kJ	425kJ
PROTEIN	10.8g	5.1g
FAT: TOTAL	1.2g	0.6g
-SATURATED	0.2g	0.1g
CARBOHYDRATE	33.7g	16.1g
-SUGARS	15.5g	7.4g
DIETARY FIBRE	11.9g	5.7g
SODIUM	1300mg	620mg
POTASSIUM	650mg	310mg
IRON	2.7mg	1.3mg

Table A2

Changes in Quantities Purchased[a] During the March–April 2020 Lockdown, by Loss of Income/No Loss of Income

Stocking up by loss of income status	Lost income, mean (SD)	No loss of income, mean (SD)	Significance of change difference[b]
Fruit	0.54 (0.87)	0.51 (0.87)	P=0.597
Vegetables	0.69 (0.89)	0.69 (0.85)	P=0.969
Fish	0.03 (1.01)	0.13 (0.91)	P=0.035
Meat	0.40. (1.03)	0.43 (0.95)	P=0.592
Vegetarian meat substitutes	0.28 (0.94)	0.23 (0.97)	P=0.255
Potatoes	0.34 (0.96)	0.34 (0.87)	P=0.990
Nuts/nut spread (unsalted)	0.24 (0.85)	0.21 (0.81)	P=0.432
Legumes/pulses	0.58 (1.03)	0.53 (0.98)	P=0.300
Sweet snacks	0.30 (1.17)	0.39 (1.13)	P=0.158
Salty snacks	0.35 (1.16)	0.38 (1.09)	P=0.618
Ready-made meals	-0.17 (1.08)	-0.13 (1.03)	P=0.513
Bread	0.29 (1.03)	0.29 (1.02)	P=0.990
Flour	0.62 (1.22)	0.62 (1.10)	P=0.979
Yeast	0.15 (1.08)	0.17 (1.02)	P=0.776
Pasta, rice, grains	0.67 (1.04)	0.66 (0.95)	P=0.896
Eggs	0.49 (0.91)	0.48 (0.88)	P=0.887
Milk	0.49 (0.94)	0.51 (0.90)	P=0.694
Other dairy	0.38 (0.91)	0.42 (0.82)	P=0.395
Plant-based drinks (e.g., soy milk)	0.15 (0.94)	0.18 (0.90)	P=0.567
Water	-0.06 (0.90)	-0.02 (0.80)	P=0.276
Other non-alcoholic drinks	0.10 (0.96)	0.16 (0.82)	P=0.179

Notes: [a] an answer of 0 is equivalent to no change, [b] Welch 2-sample *t* test, yellow shading indicates a statistically significant result ($p<0.05$)

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