UNHEALTHY FOOD AT YOUR FINGERTIPS:
A Cross-Sectional Analysis of the Takeaway Outlets on Uber Eats
New Zealand

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ABSTRACT

Background – Online food delivery (OFD) platforms have become increasingly popular due to advanced technology, changing the way consumers purchase food prepared outside of home. There is limited research investigating the healthiness of the digital food environment. Little is also known of its influence on consumer choice and dietary behaviours. This cross-sectional analysis is one arm of a multi-national study, which is the first to examine the nutritional quality and marketing attributes of menu items from popular independent and franchise takeaway outlets on New Zealand's market-leading OFD platform (UberEATS®).

Methodology – Based on publicly available data, Auckland was chosen as the primary location of interest, being the largest city in New Zealand with high concentrations (~30%) of young consumers (15-34 years), who are the primary users of OFD services. A total of 374 popular independent and franchise takeaway outlets were identified to form a database of complete menus and marketing attributes. All 25,877 menu items were classified into 38 food and beverage categories based on the Australian Dietary Guidelines, which is consistent with the New Zealand Eating and Activity Guidelines. Marketing attributes analysis (i.e., popularity cue, photos, value bundles, special promotions, nutritional information and dietary labelling) was conducted simultaneously.

Results – Of complete menus, almost three-quarters (73.3%) and of most popular menus, 83.8% were categorized as unhealthy. Unhealthy menu items were two times more likely to be categorized as most popular, accompanied by a photo, offer special promotions and almost five times more likely to be offered as a value bundle. Two of the three unhealthy mixed meal categories were significantly less expensive than their healthier counterparts ($p < 0.001$). Nutritional information was not available for a majority of the menu items on Uber Eats.

Conclusion – This study found that Uber Eats predominantly consists of unhealthy food choices and marketing attributes promote more of these menu items, making unhealthy food more appealing, available and accessible to the users of OFD platforms. This finding indicates the need for public health policy and requirement for further research to explore direct associations with nutritional quality of OFD platforms and consumers' dietary choices, hence its effect on population obesity rates and nutrition-related diseases.

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STATEMENTS OF CONTRIBUTION

This research study is intended to be published into a peer-reviewed journal article. The relevant sections of the future publication which I will have contributed to are:

- Review of the relevant literature (Chapter One)

- Methodology - nutritional and marketing attribute analysis & descriptive and inferential data analysis (Chapter Two)

- Results – written and presented into tables and figures (Chapter Three)

- Discussion - interpretation of the findings and their implications (Chapter Four)

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GLOSSARY

ASA   Advertising Standards Authority

BMI   Body Mass Index

COVID-19   Coronavirus Disease of 2019

CVD   Cardiovascular Disease

EDNP   Energy-Dense, Nutrient-Poor

FDA   Food Delivery App

FES   Food Environment Score

FFG   Five Food Group

HSR   Health Star Rating

kJ   Kilojoule

NIHI   National Institute for Health Innovation

NRF   National Retail Federation

NCD   Non-Communicable Disease

NZ   New Zealand

OECD   Organization for Economic Co-operation and Development

OFD   Online Food Delivery

SSB   Sugar-Sweetened Beverage

T2DM   Type Two Diabetes Mellitus

TAM   Technological Acceptance Model

UK   United Kingdom

USA   United States of America

WHO   World Health Organization

INTRODUCTION

The younger generation (i.e., Millennials and Generation Z) incorporate the multiple uses of smartphones and modern technology in everyday life, more than any other generation (1). Individuals crave for convenience in present-day hectic lifestyles (2). In addition to the various uses of smartphones, unsurprisingly, they have also enabled instantaneous access and availability to food (3). This has introduced a new food environment, called 'the digital food environment', that includes online food delivery (OFD) services (i.e., Uber Eats, Menulog, etc.), online grocery delivery services, as well as social media platforms such as Facebook and Instagram (3). Before public health professionals could tackle and solve the global burden of obesity and nutrition-related diseases that had emerged from the 'traditional' food environment, this new digitally-led world has brought additional challenges for the professionals and risks to the younger generation. Since the onset of the recent COVID-19 pandemic, the use of modern technology and the digital environment has become a new normal. Consumers seek not only convenience, but also safety which has effectively been provided by the digital environment through innovative ways (4).

Human diet is a major contributor of health outcomes. The unfavourable nutritional content of the 'western diet' and foods prepared outside of the home (i.e., energy-dense, high in sodium, saturated fats and added sugars), more predominantly consumed by the younger generation, is concerning due to its adverse health outcomes such as obesity and associated metabolic conditions such as type-2 diabetes, cardiovascular diseases and cancers, as compared to the healthier food groups (i.e., Five Food Group (FFG)) (5-7). Although obesity and associated nutrition-related diseases are multi-factorial with multiple individual and environmental factors, the digital food environment may be considered as the most impactful in current times, accelerating the global prevalence of obesity, especially amongst the younger generation (8).

OFD platforms have become a booming industry and has further been accelerated since the recent pandemic (9,10). Further growth and developments are expected due to developing technology and the growing demands of the consumers. However, little has been researched and implemented in this new space of the digital food environment. There are still gaps in the literature regarding the nutritional quality of the foods sold and promoted on these platforms. More research in this area will enable making associations with the nutritional quality of the digital food environment and its health consequences. Further research in this space will also highlight the importance of public health interventions to dampen the likely effects of this environment on health.

This research aims to evaluate the digital food environment created by the market-leading OFD platform, Uber Eats in New Zealand. The two key primary research questions are as follows:

(i)   What proportion of menu items are classified as 'Discretionary' or 'FFG'?

(ii)   What is the association between the nutritional quality of menu items and marketing attributes?

     a) What proportion of menu items promoted using marketing strategies are classified as 'Discretionary' or 'FFG'?

     b) What food/beverage categories are commonly promoted using marketing attributes?

Obtaining answers to these research questions will enable a deeper understanding of the digital food environment created by one of the popular OFD platforms in New Zealand and would also enable comparisons with similar studies conducted in other countries.

This document has been separated into four key chapters:

1. <u>Chapter One</u> is a literature review, stating what already has been researched and explored in this area of the digital food environment in various countries and their findings. This chapter also

introduces Uber Eats, the OFD platform of interest in this study and identifies gaps in the literature that are worth exploring to gain a better insight into the digital food environment.

2. <u>Chapter Two</u> demonstrates the methodology of this research, outlining the methods of nutritional and marketing attribute analysis, as well as data analysis, including both descriptive and inferential statistics. Methods of this research was informed from the other arm of this study conducted in Sydney, Australia (11), to enable comparisons in the digital food environments between the two countries.

3. <u>Chapter Three</u> presents the results of this research into relevant tables and figures informed from the Australian study for ease of comparison. This chapter has also been separated into subheadings using the research questions where relevant for ease of interpretation.

4. <u>Chapter Four</u> then interprets the results of this research by comparing and contrasting it with relevant literatures to create an informed discussion of the current digital food environment. Furthermore, this chapter also discusses the implications of the results of this research and OFD services on the population health, and also provides recommendations for future research and intervention in this space.

I hope this thesis provides you with a better insight into the digital food environment, specifically the OFD services. Furthermore, this thesis should broaden your knowledge and understanding of the associations of this new and emerging space with public health consequences, highlighting the significance of this issue, hence the necessity of a promising intervention.

CHAPTER ONE

Literature Review

1.1. Obesity: *a global epidemic*

Obesity has become a global health concern with an alarming increase in prevalence (1), particularly for young adults (2). According to the World Health Organization (WHO), 39% of the adult population (18 years and over) were overweight and 13% were obese in 2016 globally (1). WHO has defined overweight and obesity as abnormal or excessive fat accumulation that may impair health (1). Body Mass Index (BMI) is universally used to classify individuals into the category of underweight, normal weight, overweight or obese based on their weight and height. It is calculated by an individual's weight in kilograms, divided by the square of their height in meters (kg/m^2). For adults, WHO defines overweight as BMI greater than or equal to 25, and obese as a BMI greater than or equal to 30 (1). The New Zealand (NZ) Health Survey 2019/2020 conducted by the Ministry of Health (3) found that approximately 31% of the adult population (aged 15 years and over) were obese. A higher prevalence was observed amongst Māori and Pacific populations and those living in the most socioeconomically deprived areas. New Zealand has also been ranked second highest in Organisation for Economic Co-operation and Development (OECD) for childhood obesity with 40% of New Zealand children identified as overweight or obese (4). Excess body weight and obesity is associated with the onset of multiple chronic non-communicable diseases (NCD) such as Type 2 Diabetes Mellitus (T2DM), cardiovascular diseases (CVD), stroke, and cancers (1,4,5)

1.2. The 'Western' Diet

Human diet and nutrition have been known to influence health outcomes (6). Furthermore, diet is a modifiable determinant of health. The escalating global prevalence of obesity is predominantly driven by dietary changes and lifestyle behaviours (1). Overweight and obesity is believed to be caused by an

imbalance in energy intake and energy expenditure (1). More specifically, overconsumption of energy-dense, nutrient-poor (EDNP) foods and an increase in sedentary lifestyle, have shown to be an important contributor to increasing body weight and related comorbidities (1). In parallel to the rising obesity epidemic, there has also been a rise in popularity of the 'Western Diet' which is also known as a diet high in discretionary foods (i.e., saturated fats, sodium and added sugars). Saturated fats are mostly derived from animal-based foods like red meat and full-fat dairy, as well as tropical fats like coconut and palm. These types of fats have been associated with an increase in the risk of heart diseases (7). Sodium is a mineral predominantly found in table salt, however in the western diet, sodium now largely comes from packaged and processed foods. A diet high in sodium is linked to raising blood pressure, further increasing the risk of heart diseases (8). Finally, added sugars are sugars or nutritive sweeteners which have been added to foods during the preparation or processing of the food, or just before consumption. A diet high in sugars is linked to causing an increase in the overall calorie intake, associated with overweight and obesity, and increasing the risk of metabolic conditions such as diabetes (9). In addition to an overconsumption of sweets, desserts, sugar-sweetened beverages (SSB), processed meats, high-fat dairy products, and packaged, ultra-processed snacks, the western diet also comprises a lower consumption of fruits, vegetables, and wholegrains, that are beneficial for optimal health (1,5,10,11).

1.3. The Food Environment

The food environment has been identified to be one of the factors in the cause of obesity (11). It has been defined as the physical, economic, political and socio-cultural context in which consumers engage with the food system to make their decisions about acquiring, preparing and consuming food (10,12). One segment of the food environment is the foodservice sector, which includes dining restaurants, cafés, and fast-food or quick-service restaurants that can provide foods and drinks for immediate consumption (10). The modern food environment acts as a contributor to poor health of young adults in New Zealand. Food from outside of home e.g. takeaways and fast-foods have gained immense

popularity in the recent decades and are a key driver of the escalating global prevalence of overweight and obesity due to their unfavourable nutritional content. Although obesity is a multi-factorial disease with complex relationships, larger portion sizes and overconsumption of energy-dense foods have shown to be strong contributing factors (11,13,14).

Takeaway foods are defined as hot meals made to order and taken away to be eaten outside of the small, independent food outlets (11,15,16). Fast-food is defined as foods from national/multinational fast-food chains, e.g. McDonald's, Subway, Pizza Hut, Burger King, Domino's Pizza, Kentucky Fried Chicken, etc., which also provide options for dining-in (11,17). In addition to takeaways and fast-foods, out-of-home foods can also include foods from coffee shops, convenience stores, and public vending machines (11,18).

1.3.1. The Global Food Environment

In the modern world, working individuals have much busier and hectic lifestyles, hence the desire to spend less time and effort preparing food (19). One study demonstrated that working individuals intended to spend less time clearing up after meals and more time remaining for other professional activities (20). This finding indicates that in addition to the time constraints experienced by busy individuals, advancing technology may also increase the consumption of out-of-home energy-dense foods (11). This has therefore caused fast-food outlets, takeaways, restaurants, and coffee shops to become increasingly popular in the recent decades due to the rise in demand for convenience and readily available and accessible retail foods, as they provide foods and drinks meant for immediate consumption; however, with an unfavourable nutritional content which has further been promoting an obesogenic environment (10).

Multiple studies have shown that takeaways and fast-foods tend to be less healthy as they are mostly classified as being EDNP, with high levels of saturated fats, added sugars and sodium (discretionary

foods) (11,21-23). Furthermore, consumption of takeaway foods has become more frequent amongst young adults with reduced intake of fruits and vegetables (24). A cross-sectional study conducted in three cities in England found that 28% of young children aged 9-11 years, consumed takeaways at least once per week. As compared to the children who hardly consumed takeaways, those who consumed takeaways once per week had higher LDL-cholesterol levels, total cholesterol and body fat mass, hence increasing the risk of long-term heart diseases (25). Various studies have also demonstrated that frequent consumption of takeaways and fast-foods have been associated with a poor diet quality resulting in a higher BMI and a higher risk for obesity-related comorbidities (11,26-29). Furthermore, in the past few decades, the portion sizes of fast-foods have increased along with the calories, fat, sugars, and sodium levels, further intensifying the ongoing risk of worldwide obesity epidemic (30).

1.3.2. The New Zealand Food Environment

The total sales of takeaway foods in New Zealand have been steadily increasing each year with the total sales in 2018 being just under 2.75 billion NZ dollars (31). In 2016, many major fast-food chains in New Zealand had experienced growth, with Domino's Pizza achieving the highest market growth of 39%, followed by Sushi and Indian quick-service restaurants experiencing significant growth rates of 20% and 27% respectively (32). From a survey in 2018, approximately 80% of children in New Zealand aged between 10 and 14 years stated that they had fast-food or takeaway food at least once per week (33). Similarly, based on a 2008/09 NZ Adult Nutrition Survey, young adults in New Zealand (15-34 years) have shown to have a high fast-food and takeaway consumption (34). Food choices of young adults can be influenced by various factors such as limited food budgets, moving out of the parental home, low levels of cooking skills, and poor time management skills (35).

Unhealthy foods taste appetizing, appear tempting and are often low priced to attract young adults (35). According to Stats NZ, the food price index for New Zealand in 2020 reported that approximately 27% of the food budget was spent on ready-to-eat and restaurant meals which was a slight increase from

26% in 2017, and only 13% on fruit and vegetables which had fallen from 15% in 2017 (36-38).

Ready-to-eat and restaurant meals had shown to be the biggest growth area of the food subgroups

(37,38). People living in Auckland region had shown to be spending the highest proportion (32%) of

their food budget on takeaways and restaurant meals as compared to the national average of 27%. The

average expenditure of food budget of an average Kiwi household on takeaways and restaurant meals

had also steadily risen from 22% in 2000 to 27% in 2020 (37). However, the expenditure patterns for

consumer goods and services in 2020 was likely to be impacted by the recent global pandemic.

Furthermore, research shows poor compliance of the young adults in New Zealand with the dietary

guidelines. According to the NZ Health Survey 2019/2020, only approximately 40% of the young

population (aged 15-34) met the recommended fruit and vegetable intake (39). Additionally, according

to a research conducted by the University of Otago and the Ministry of Health, 53% of males and 40%

of females aged 15-18 years consumed soft drinks at least three times a week in 2011 (40).

In addition to the modern food environment, a sedentary lifestyle also plays a significant role in the

increasing risk of youth obesity and NCD (1). According to the NZ Health Survey 2019/2020, only

about 53% of the young population (15-34 years) met the adult guidelines of at least 30 minutes of

moderate-intensity physical activity per day (41). This result is backed up by the evidence that NZ

youths are among the world's biggest internet users, spending above average time on the internet than

their peers in most other countries (42). Furthermore, lockdowns and restrictions due to the global

pandemic may have also increased screen time and promoted a sedentary lifestyle amongst the young

population, due to the shift to online learning and work-from-home practices (43). Although increased

screen time promotes a sedentary lifestyle and is detrimental to health, it is an encouragement for

online apps and services such as food delivery services. However, an escalation in this space is likely

to promote unfavourable health outcomes due to easy accessibility and availability to foods with poor

nutritional quality.

1.4. Online Food Delivery System

In recent years, the introduction of internet and smartphone technology has enabled food prepared outside of the home to be at consumers' fingertips. Young adults are especially more up-to-date and advanced with the latest technology and its multiple uses to make everyday living more convenient (35). With the introduction of smartphones, come together mobile applications or "apps". Mobile apps are defined as a software application developed specifically for small, wireless computing devices, such as smartphones and tablets, rather than desktop or laptop computers (44). The increasing popularity and adoption of smartphones and mobile apps globally has changed how consumers interact with a brand.

Mobile apps also provide an efficient way for companies to engage with their consumers (44). Smartphones have provided quick and easy accessibility and availability to food outlets away from home to order food directly to the consumer's address, at their convenience through online food ordering systems (35). There are two types of retailers that have been described to provide food delivery services. The first category are the food retailers themselves, such as Pizza Hut, McDonald's, Domino's Pizza, etc., who also independently offer food delivery services to the consumers. The second category is OFD platforms that provide delivery services for multiple restaurants and other foodservice outlets (45). This category includes Uber Eats (46), Menulog (47) and Delivereasy (48), some of the popular OFD platforms in New Zealand (49). Some food retailers such as Domino's Pizza, Subway, Pizza Hut, etc. fit in both categories as they offer independent food delivery services and also delivery services through OFD platforms.

Since the last decade, the e-commerce market has shown a rapid growth, where the consumers are attracted to a product online and are encouraged to complete the transaction in an offline setting (50). This shift in the consumer's purchasing and shopping behaviours have been due to various factors and worldwide changes. Some of these changes include: an increase in disposable income; longer working

and commuting hours; improved safety and reliability of electronic payments; an increase in the number of retailers having an online presence; as well as a greater awareness of e-commerce by customers (50). E-commerce, also known as online-to-offline services have been developed in various fields including food, i.e. OFD services (50). The increasing use of digital technology in everyday life and the demand for easy accessibility and convenience has escalated the use and reliability of OFD services.

OFD have been defined as "websites or smartphone applications that allow customers to order menu items from food outlets for pick-up or delivery by freelance couriers" (51). This process occurs through OFD platform such as 'Uber Eats' in the United States of America (USA) and various other countries, 'Just Eat' in United Kingdom (UK), 'Swiggy' in India, etc. (50). These platforms enable consumers to choose from a variety of food choices including hundreds of menu items provided by a broad range of foodservice outlets offering various cuisines, taking food order and passing on this information to the individual food outlets, managing of online payments, delivery of the food to the consumer at their convenience, and providing order tracking facilities through the online website or the food delivery mobile apps; all through the click of buttons or tap on the screens, via consumers' personal OFD accounts (Figure 1) (10,44,50,51).
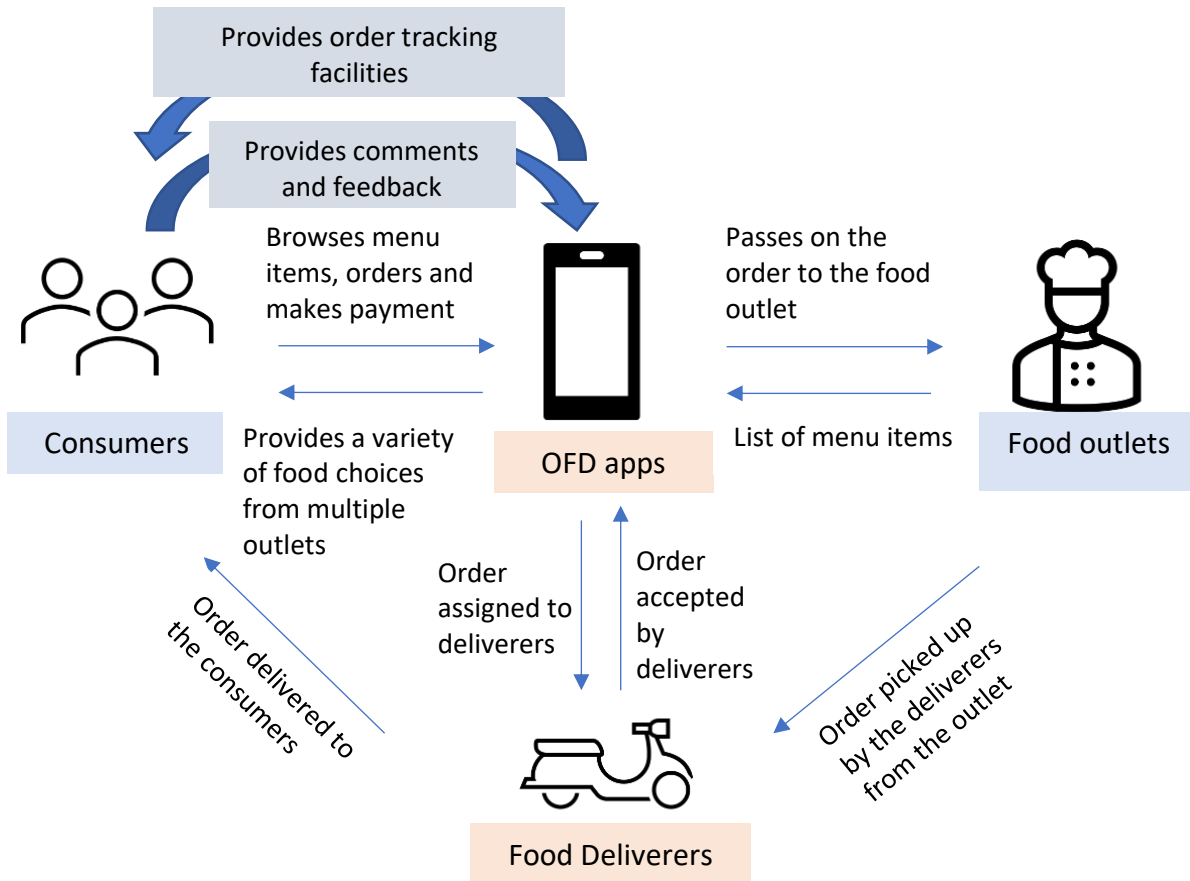
Figure 1. The Operation of an OFD Platform. Indicating movement of information between consumers and food outlets (adapted from Li et al., 2020) (50)

1.4.1. Uber Eats

The global revenue in the OFD segment was projected to reach US $151,526 million in 2021 and US $439 million in New Zealand (52). Young individuals have shown to be the largest users of OFD's, approximately 48% globally and over 25% reported users in Australia and New Zealand (51,53). More specifically, amongst the younger generations, Millennials (individuals born between 1976-1990) and Generation Z (individuals born between 1991-2005), have shown to be the largest users of meal delivery services (53). Internationally, Uber Eats is the most popular food delivery service, with 66 million users (54). Uber Eats is an American OFD and food ordering platform launched in 2015 by Uber in San Francisco, California. Uber Eats, previously known as Uber Fresh started from delivering freshly made soups and sandwiches in Santa Monica, California (55,56). Locally, the company started to expand by increasing their menu options and coverage area. Soon, Uber Eats had expanded globally and their services reached Auckland, New Zealand in 2017. Uber Eats since then remains the largest and the most popular food delivery company in Australia and New Zealand (53,57,58).

1.5. Intentions for the use of OFD

1.5.1. Consumers Seek Convenience

The use of OFD platforms has been increasing worldwide, especially by young adults (aged 15-34) and the working population. Convenience is the major driver of OFD services since food is readily available for consumers at all times through modern technology. Individuals now have easy access to foods from their favourite restaurants as well as a huge variety of cuisines delivered right at their doors, instead of having to go out (10,59,60). An Australian study found that working young adults commonly use OFD services due to busy schedules, having higher disposable incomes, and increased cravings for fast-foods and takeaways, driving dietary choices (10). Convenience, time-saving and reduced efforts have shown to be the key driver for consumers to use online services (45,61). Previous studies have

shown that consumers tend to have a positive attitude and perceptions towards online if the service is able to provide the ability to shop online anytime and anywhere, hence providing consumers with access to convenience and flexibility (45,62). In addition, consumers tend to have a positive perception of online services as they do not have to physically travel to purchase the goods, hence saving time and effort (45). Various studies have demonstrated that when consumers can save time, it improves attitudes through ease-of-use and usefulness, and are also more likely to use OFD services (45,63,64).

A 2019 report of the most frequently used OFD service in USA called 'DoorDash', revealed that 66% of Americans reported that food delivery was the most popular and preferred way to eat dinner over cooking and picking up a takeaway. Moreover, the report also revealed that weekdays at 7pm was the most popular time people ordered food delivery as that is when busy, working individuals are not keen to cook and clean the mess in the kitchen after a tiring day (65). Another cross-sectional study conducted by Keeble et al. investigated the prevalence of OFD service use and sociodemographic characteristics of consumers in Australia, Canada, Mexico, the UK and the USA (66). The results showed that 15% of the respondents across the five countries reported OFD service use in the past seven days. Additionally, almost two-thirds of the respondents had purchased food prepared away-from-home directly from food outlets rather than using an OFD service. This study also found that those who used the OFD service to get their food delivered, preferred this mode of order compared to the traditional way of ordering food directly from the food outlets (66). This finding suggests that OFD services can disrupt the conventional modes of food ordering; however, as most of the consumers had also purchased food directly from the food outlets, this suggests that the traditional methods of purchasing foods in-person still exist. Based on this study's results, the consumers of OFD services were likely to be younger, have higher education or live with children aged under 18 years, hence having limited time and resources to prepare food at home. Individuals much older in age were less likely to use OFD services due to unfamiliarity with advanced technology and loyalty towards the conventional modes of ordering food (66).

A 2019 survey carried out in China with 1000 university students reported that approximately 72% had been using OFD for at least two years and 85% of them used OFD more than once a week (67). Other studies showed that Chinese students prefer using OFD services because it saves time, is convenient, and can provide food options that are tastier or different compared to the canteen meals (68,69). However, the use of OFD has also shown to differ in different populations around the world due to differences in culture, technology and economy. In contrast to the Chinese study, similar study was carried out with Greek university students which reported that most of the students cooked at home and rarely ate out or had food delivery (70). New Zealand being a multi-cultural country is home to people from various different countries and ethnicities. Additionally, in urban cities of developed countries where the western lifestyle is predominant, the use of OFD services are likely to be high, especially by young working adults.

1.5.2. Increased Accessibility

The OFD platforms have also led to an increase in the food environment range through the smartphone apps. Traditionally, the neighbourhood food environment could be indicated as being approximately within the range of 1.6km or 20-minute walk from home, school or workplace (71,72). With the booming industry of OFD services, the range of food environments has expanded to 10km (71). This largely increases the consumer's availability and accessibility to foods from various cuisines, including the ones further away from their neighbourhoods and those which the consumer's would not necessarily physically travel to purchase. OFD platforms provide the options of getting delivered cooked meals, in addition, they also provide the opportunity to get delivered fresh foods and daily grocery items. Although the OFD services increase accessibility to healthy foods like fruits and vegetables, it provides a broader exposure to unhealthy foods, particularly fast-foods that are lower priced with multiple offers available (71).

1.5.3. Advantages of Apps

Despite the growing appetite for smartphones and mobile apps, there is lack of research done to understand the online food ordering system and to identify mobile app characteristics. A majority of the research has primarily focused on consumers' acceptance of mobile applications and the adoption of advanced technology. Many previous studies have used the Technology Acceptance Model (TAM) to understand the factors which influence consumer's acceptance and use of a new technology (73).

1.5.3.1. Characteristics of OFD Services

Numerous studies have been conducted in various countries to understand consumers' motives to use OFD services or food delivery apps (FDA). One Indonesian study demonstrated that order conformity, politeness and friendliness of messengers and administrative workers, cleanliness of food box, a good condition of received ordered food and affordable delivery costs are the top five attributes of consumer needs (74). Additionally, the study also outlined the top five technical requirements that have found a positive relationship. These included: provision of skills training to messengers and administrative workers, periodic evaluations of service performance, regular addition of food outlet members, providing map feature on the company website, and the provision of ordering applications, that have all shown to be essential for customer satisfaction (45,74).

A study conducted by Maimaiti et al. in China investigated the opportunities and challenges brought by the food delivery industry (71). This study acknowledged the heavy growth in e-commerce market and changes in the food shopping habits from online-to-offline food delivery in China. In contrast to the conventional telephone food ordering system, where each restaurant is responsible for their own food orders and delivery, the online food ordering services act as a third party with their own platform and deliverers to provide food delivery services for multiple registered food retailers (71). This system also makes it more convenient and user-friendly for the consumers as compared to the traditional ordering system, as the orders can be easily placed through a smartphone application and delivered in a short

period of time with the ability of tracking delivery status, upload review as well as receive personalised recommendations, all through one app (Figure 1).

1.5.3.2. Taste or Price?

Chandrasekhar et al. investigated consumers' perceptions and preferences, buying behaviours, likings and intentions of using the most popular OFD platforms in India (75). They recruited participants from the city of Bangalore with a response rate of 85%. A majority of the respondents were students who were most likely to use the services. This study demonstrated that OFD services primarily depend on the taste and quality of the food, and delivery services (75). Approximately half of the surveyed population had said that taste was the most important factor for them while ordering food online. However, along with the taste, the population also wanted the food to be reasonably priced. In addition, the requirement of the population for the delivery services was that it should be quick for added convenience (75). However, this study also demonstrated that the consumers had issues with delivery services, specifically with delays in delivery, hygiene issues, and highly priced delivery services, which made consumers lose brand loyalty and switch between delivery platforms (75). As young adults are most common users of smartphones and OFD services, they are more likely to be drawn to price discounts, given the limited food budgets of full or part-time students (35).

As OFD platforms provide consumers with the options of choosing amongst multiple food retailers in their geographical area, this allows consumers to buy foods after comparing it to offers and prices from other retailers. This indicates the importance of price for consumers when purchasing goods or services online. Self-efficacy has also shown to be a strong and significant variable demonstrating the consumers' attitudes and intentions when using online delivery services (45,76).

1.5.3.3. Collaboration

Collaboration has shown to be one of the most important characteristics which encourage consumers to use OFD platforms (44). Collaboration has been defined as alliances between multiple e-commerce players to increase leads and make higher sales (44). One of the examples given by a study investigating the impacts of technology on food ordering systems, was a collaboration between an online payment system and an OFD platform in India (44). As described in this study, when an individual chooses to use a particular OFD platform that collaborates with the online payment system and chooses to pay through that system, they receive a cashback on the final bill. Through this system, the consumers save money; however, the online payment app is also downloaded and frequently used by the customer and food is ordered through the particular OFD platform, hence leading to an increase in sales for both companies through the partnership (44). These strategies enable consumers to save money, hence encouraging them to increase engagement with the apps.

1.5.3.4. Visually App-ealing

As per previous studies, visual design and aesthetics of the mobile apps is also an important characteristic defining the ease of use and influencing a consumer's decision and loyalty with a particular brand (44). Visual design refers to the app's look and feel, including the colours and fonts used, etc. which influence the consumer's engagement with the app (44). In addition to the visual appeal, apps also need to be well-structured, which has shown to influence consumer's purchase decisions (44).

Using smartphones or other advanced technology is not a very difficult task for a majority of the population, especially for the younger generation who are more likely to be technologically literate and use OFD services (45). Although this system provides convenience, easier accessibility, and food availability, it also presents risks and challenges to the public health system and the social environment (71).

1.6. Risks and Challenges of using OFD services

1.6.1. Nutritional Quality of Food Prepared Outside of Home

Although OFD services are becoming more and more popular globally, there have been concerns raised regarding the nutritional quality of the meals offered on such platforms. Eating outside of home is generally associated with food being ultra-processed and higher in energy, sugars, sodium and fats, linked to overweight and obesity (77). A recent study conducted by Partridge et al. in Sydney, Australia and Auckland, New Zealand demonstrated that the most popular food outlets on the market-leading OFD platform Uber Eats, are unhealthy and 86% of the popular menu items are mostly discretionary foods and beverages, that are high in added sugars, saturated fats and sodium, with low nutritional value (51). A more recent cross-sectional study conducted by Wang et al. also analysed the nutritional quality of complete menu items from independent takeaway outlets available on Uber Eats (58). This study demonstrated that of the complete menus, approximately 81% were discretionary foods and discretionary menu items were more likely to be categorised as most popular (58). Poelman et al. conducted a cross-sectional observational study in three international cities: Chicago (United States), Amsterdam (The Netherlands), and Melbourne (Australia) (78). These cities were chosen as they were based in large high-income countries based on different continents. This study found that most of the foods available for delivery in each city were considered unhealthy (78). Additionally, lower socioeconomic neighbourhoods were found to be more likely exposed to unhealthy food types.

Based on the 2020 Uber Eats Report for USA, requests for "extra sauce" and "sauce on the side" increased the most in quarantine during the recent pandemic (79). As per Uber's 2018 annual review, the most popular menu item of the year was butter chicken, the most-searched-for item was burgers, and a Big Mac® Combo was the number one item ordered after midnight across the country (80). Similar trends have also been noted from other OFD platforms (65). As per the 2019 report released by the most frequently used OFD app in the USA, 'DoorDash', the most popular orders by Americans for

the year included cheeseburger and fries, pizza, nachos, cheesecake and spring rolls, hence, foods higher in energy and lower in nutritional quality (65). The Eating and Activity Guidelines for New Zealand Adults by the Ministry of Health state that foods high in energy, saturated fat, added sugars and sodium should be limited to prevent diet-related health conditions (81). Additionally, a systematic review showed that individuals who consumed foods away from home had higher intakes of energy, saturated fats, sugars and sodium, hence further increasing health risks such as the global escalation of obesity as well as T2DM (28,82). This review also found that men and younger adults consumed more energy and nutrients of public health concern from foods prepared outside of home than any other groups (28). This finding was backed up by the findings from other dietary studies showing that weight gain had been the steepest in young adults and men in recent years in some countries, due to an increase in energy-dense and poor quality diets (28,83-85).

1.6.2. Food Safety

One of the major challenges of OFD services as discussed by Maimaiti et al. is maintaining food safety and hygiene (71). Incorrect food handling and preparation could lead to serious food-borne illnesses (86). Food delivered through OFD platforms are not temperature regulated. Temperature control is an essential aspect of maintaining food quality and safety. There is evidence showing the importance of regulating time and temperature of processed foods as it can lead to bacterial growth and food quality degradation (87). Furthermore, delivered food is not immediately consumed once prepared (71). As OFD services provide consumers with the flexibility to get their food delivered to them at their doorstep, this process of food delivery can take anywhere between 15 minutes to half an hour, depending on the distance between the food retailer and the delivery address. Additionally, it is not always necessary that the consumer is going to eat the food as soon as it is delivered to them. This means that it could be sometimes up to an hour or even more from the time the food has been prepared to when it is consumed, hence further increasing the risk of food degradation and bacterial growth. Unhygienically or inappropriately packed food further raises food safety concerns. Poor container

quality, especially plastic containers with hot food can become unsafe for consumers (71,88). Containers not tightly sealed as well as unhygienic handling of the food packages by the deliverers in their personal vehicles can be a risk (71). Furthermore, if the consumers do not reheat the delivered food properly, it can also affect the food's quality and safety (71,89).

1.6.3. Promotes a Sedentary Lifestyle: *Food delivered right at your door-step*

A study demonstrated that most people who choose to order food online are at work, which includes the white collar workers and students as the major consumers (71). People choose to get their food delivered when they are unwilling to go out, lack of time available or cooking skills, attracted by sales promotion, experiencing bad weather, fond of the flavour of the delivery food, or taking a habit (71,90). Most of these reasons for choosing to use OFD services may lead to behavioural changes such as reduced physical activity, as consumers are not having to physically travel to collect the food, therefore promoting a more sedentary lifestyle by keeping people at home or workplace. Furthermore, it also reduces the need to go grocery shopping and saves time and effort on having to do the cooking and dishwashing (71). These behavioural changes promoting a sedentary lifestyle may lead to negative health outcomes and contribute to the global increasing burden of overweight and obesity.

1.6.4. Disrupting the Traditional Food Culture and Eating Behaviour

In addition to the behavioural changes OFD services are likely to create, these services are also likely to affect people's lifestyle and family structure in the long run (71). Most Asian, Middle Eastern and Southeast European cultures have strong traditional values and cooking is a ritual, a way of family bonding and passing of traditional cooking knowledge to the next generation (71). Cooking at home with other members of the family is not just a task, however studies have shown that it improves family relationships, promotes communication and has positive effects on stress management (71,91). The increasing use of OFD services, especially by the young generation, has become a social concern as family cooking may no longer be a part of the daily routine (71). This behaviour may negatively affect

the traditional family structures as OFD systems have started to change these habits of the younger generations, with losing interests in grocery shopping and cooking activities, or participating in traditional family food cultures (71). Therefore, this technological innovation may lead to a shift in dietary pattern, from a traditional diet high in wholegrains and fruits & vegetables, to a more westernised diet high in saturated fats, sugars and sodium from highly processed and packaged foods and beverages prepared away from home (16).

1.7. Economic, Social and Environmental Impacts of OFD

1.7.1. Economic

One of the economic impacts of OFD has been an increase in job opportunities in various roles, including as chefs in restaurants, food deliverers, or as mobile app developers or programmers for online websites (50). Uber Eats has over ten thousand employees (92), whereas the 'Meituan' and 'Eleme' food delivery platforms in China employ around 1.17 million people just as food deliverers (93). Despite OFD services providing high job opportunities, job satisfaction has shown to be quite low due to poor working conditions of the deliverers, high workload, limited training received, and the risk experienced to their personal safety while delivering the food (94,95). As more people started to use OFD platforms to order food online, the traditional restaurant industry has also been impacted as there has been a decrease in in-store dining (50). However, lockdowns due to the recent pandemic have also shown that OFD platforms allowed most of the food businesses to survive. Additionally, in areas where OFD services have been well developed, most restaurants cut costs by reducing their dining capacity and expanding their services through the OFD platforms. This trend has been known as 'ghost kitchens' which has become common in the UK, USA and India where food businesses exclusively provide online delivery services and do not offer physical dining-in services at all (96-99).

1.7.2. Social

One of the major social impacts of OFD services include disruption of communication and interaction between family members over meals (50). The traditional pattern for families while carrying out food-related family life such as grocery shopping, preparing and cooking traditional food together at home, etc. has been impacted due to OFD services (50). There has been mixed evidence regarding the social impacts of OFD services depending on people's cultural values. For example, married Korean women have shown to be less likely to use OFD services because they believe they are morally obliged to prepare home-cooked meals for their families (100). On the other hand, studies carried out in China (101) and the UK (102) have revealed that consumers prefer using OFD services to quickly provide meals to spend less time preparing food, and more time to spend with their families. Additionally, OFD services give an opportunity to people who wish to eat alone without compromising on the taste or the quality of the food. In contrast, the service also provides an opportunity for those who wish to eat together and are willing to socialize, to do so without stressing about purchasing the ingredients and preparing it themselves (50). OFD services have also shown to be used by individuals who wish to eat late-night due to their lifestyle choices or working conditions, such as working overtime or studying till late (50). Although OFD services have shown to be quite time-saving and convenient to consumers, it however poses a risk to the population health due to an increase in the availability and accessibility to unhealthy food choices (50).

1.7.3. Environmental

As mentioned earlier, OFD services have increased employment opportunities for people as food deliverers. However, this has also impacted on the traffic systems and has increased road congestions (50). Food deliverers often rush to meet their delivery deadlines, impacting road safety and increasing road accidents. In the first six months of 2019 in a city in China, there had been 3357 road accidents related to food deliveries on electric bikes resulting in multiple injuries and deaths (67). In addition, food delivery via cars and motorbikes has been a concern for the environment due to carbon dioxide

emission, contributing to air pollution. Therefore, OFD services have been exploring alternative opportunities to deliver food to the consumers, including bicycles, electric bikes, and even drones (50). These methods would not only be less polluting to the environment, but they are also likely to reduce congestion on the roads.

In addition to air pollution, an increase in the volume of plastic waste generated from food packaging due to OFD services has also been an environmental concern (50). There is also evidence for lack of knowledge regarding recycling and reusing disposable containers, bags and cutleries. A majority of the students surveyed in China indicated not separating food wastes from the recyclable containers, hence limiting the ability to recycle (103). Food waste has also been a rising concern with increasing use of OFD services. This occurs commonly because consumers tend to over order usually when trying to meet the 'minimum price' criteria to achieve free delivery services, but then discard the leftover foods either because they are unwilling to have the same meal again, the difficulty of taking the leftover food home from their workplace, or because they do not have appropriate storing facilities (101). Moreover, despite most of the menu items displaying images and descriptions of the foods offered on the OFD platform, it is quite difficult for the consumers to determine the portion sizes and taste when choosing meals online, which can also lead to food waste (50). In terms of enhancing environmental and social sustainability, policy-makers could increase awareness through public education.

1.8. The Impact of COVID-19

During the first outbreak of COVID-19 (coronavirus disease of 2019, a disease caused by the SARS-CoV2 virus) (104) in March 2020 in New Zealand, the country was moved into Alert Level 4, which was the toughest restriction placed where the public were advised to stay at home, unless they were essential workers, to break the chain of transmission of the virus. This movement created challenges and disruptions to the cultural and social food practices performed in New Zealand, such as eating together with friends and colleagues (105). The pandemic also resulted in 'panic buying' behaviours

across the country which resulted in supermarkets running out of food supplies and struggling to meet an increase in demand.

1.8.1. Changes in Dietary Pattern during Lockdown

A study conducted in New Zealand investigating New Zealander's behaviours and attitudes towards food purchasing and attitudes during COVID-19 lockdown, found an increase in home-cooking and baking activities (105). Although food cooked at home is expected to be healthier in terms of nutritional quality as compared to food cooked outside, this study found that food cooked at home during lockdown was not always healthy, especially in households with children, with a shift in dietary pattern towards more salty and sweet snacks, alcohol and sugary drinks. Only essential businesses such as supermarkets, fuel stations and dairies were open during Alert Level 4 which mostly sell EDNP, highly-processed and marketed foods (106). Although OFD services such as Uber Eats had to come to a halt during Level 4 lockdown in New Zealand, fruit and vegetable shops and butcheries were also closed. The easy accessibility to ultra-processed foods with long shelf-life from supermarkets and dairy shops further reduced the options and possibility of purchasing healthier foods during lockdown (105).

1.8.2. The Impact of COVID-19 Lockdown on OFD Platforms

Since the onset of COVID-19 in December 2019 and WHO declaring the disease as a global public health emergency and pandemic, there has been an acceleration in the demand for OFD services. This shift from offline to online purchasing of food through online delivery services, as compared to the conventional mode of "eating out" and dining-in in restaurants had already been happening since the last decade. However, the pandemic had accelerated this movement when people across the world were forced to stay at home during the lockdown to help stop the spread of the disease and hence relied more on food delivery apps to enjoy their favourite fast-foods and takeaways (107). Additionally, restaurants and other food outlets in most countries were forced to close during the initial lockdown, hence food delivery became a lifeline to ensure some continuation of the businesses (108). Furthermore, the 'new

normal' life post-COVID-19 of social distancing practices and avoiding physical contact and crowding of public spaces suggest that restaurants and food outlets in most of the countries may not re-open to their full abilities (107). Hence, OFD services have been meeting the growing demand of consumers at home by offering contactless delivery services by leaving the order at their doors.

This growing demand of OFD services align with Uber's report that delivery bookings grew 113% in the second quarter of 2020 and revenue increased by 103% in August 2020 globally, as compared to the previous year (109). Not only OFD services have increased in sales since the pandemic, Uber Eats had reported seeing a 30% increase in customers signing-up for the service (110). In addition, more restaurants have also shown to be connecting with Uber Eats as they looked for additional ways to connect with their customers due to the forced-shutdown (110). Since the beginning of the pandemic, most of the restaurants and food outlets have also increased their geographical delivery distance to reach more consumers, hence increasing the reach and accessibility of food outlets (111). In addition to the increased demand for takeaways, there has also been an increase in demand for convenience and grocery items. Uber Eats also offers delivery services for grocery items which is getting increasingly popular recently as it means people do not have to step out of the house, line up in queues and end up being in close proximity of the contagious virus.

The increase in demand of OFD services has led to an increase in ordering of unhealthy food choices from the platforms. An observational study was conducted recently, which investigated how the onset of COVID-19 crisis and developing social distancing policies have influenced individuals' feelings, ultimately leading to changes in planning, selecting and preparing healthier foods in 38 countries worldwide, including New Zealand (112). Due to the social distancing rules and lockdowns, people were likely to have more time at home hence observed positive increases in planning, preparing and selecting healthier foods. However, since working from home brought its own challenges and stress to some people, the study also found that stay-at-home policies corresponded to decreases in selecting healthier foods as well (112). In specific, the study found that women with young children experienced

more stress and time constraints when working from home hence were more likely to select unhealthier foods. Moreover, the results also showed that financial stress caused by the loss of income due to the COVID-19 crisis also led to a decrease in planning and preparing of healthier meals (112). As per the 2021 report from the leading OFD app in the UK, 'Grubhub', the top convenience orders for the year included delivery of discretionary packaged sweet snacks (i.e., candies and lollies) (113).

Prior to the COVID-19 pandemic, Uber Eats was the most popular OFD app on both Google Play store and iOS (Apple) App store in New Zealand. However, Uber Eats has now become the second-most popular OFD app in New Zealand, after 'Delivereasy', on both iOS and Google Play stores (49). Delivereasy is a local food delivery company started in Wellington in 2016 and now providing services across the country (48,114). Similar to Uber Eats, Delivereasy also provides online food ordering and delivery services through mobile app and website from nearby restaurants and takeaway outlets available in the geographical area of the consumers (48). The company experienced a rapid growth just before the initial nationwide lockdown in 2020 and during Alert level 3 when contactless delivery services were permitted. Since this is a New Zealand-based delivery service, the population across the country has played a role in supporting local businesses which is likely to be the reason for the rise in popularity of this app (114).

1.9. Marketing on OFD Platforms

Not only do OFD platforms allow consumers to order food and get it delivered to them at their convenience, but they also use intensive marketing strategies to attract consumers so that their food delivery services are used frequently (115,116). Since the first national lockdown enacted in New Zealand on the 26 March 2020, movements were restricted for all except the essential workers. The Alert Level 4 lockdown also meant that fast-food restaurants, takeaways and all other food outlets were closed and food delivery was restricted. However, these restrictions were eased out slightly from the 28 April, 2020 under Alert Level 3 when contactless delivery and pickup was acceptable. There has been

multiple evidence showing that companies globally have used the COVID-19 pandemic to advertise unhealthy products such as foods and drinks & tobacco and alcohol to show empathy and enhance their own image to increase brand loyalty; known as COVID-washing (117,118). A majority of these companies use social media platforms to engage and build good relationships with their consumers, extend reach, and improve brand loyalty. Young adults specifically are more active online, hence tend to have a higher exposure to unhealthy foods and beverages by actively engaging with brands and companies advertising them (115).

1.9.1. Marketing Strategies: *Increasing App-etite*

OFD platforms portray appealing images of the food, offer discounts and free deliveries, combos, meal deals, etc. which are most commonly directed at unhealthy meals (115,116). A study conducted in Brazil aiming to describe the advertisements published on an OFD platform during the COVID-19 pandemic showed that unhealthy foods such as ultra-processed beverages and sandwiches predominated in the advertisements whereas healthier meals were advertised less frequently (115). Additionally, marketing tactics such as discounts and free deliveries were used to persuade the consumers to purchase these products. Furthermore, the study found a greater participation for free deliveries and combos during dinner time which was also when the advertisement for unhealthy foods were higher. Another recent Australian study found that price, value for money food items, and appealing images of the food highly influence young people's preferences to eat foods prepared away from home (35). The other arm of this research conducted in Sydney, Australia also investigated the associations between the nutritional quality and marketing attributes of menu items sold on Uber Eats (58). They found that a higher proportion of discretionary menu items were offered as a value bundle. Additionally, discretionary menu items and most popular menu items were also more likely to have an image compared to the other menu items.

In addition to these marketing tactics, OFD platforms also have other tactics to influence the consumers' choices. For example, OFD platforms commonly show options of 'Popular Near You' or

'Most Popular' which can influence a consumers' food preferences and choices and encourage selecting unhealthier food items when ordering online (58). These strategies are similarly used by placing food options on the first screen in an online grocery store context as well as product placements at eye-level at supermarket shelves and check-out counters, all with the intention of making some products appear more easily than others to influence customers' purchasing behaviours (58,119,120).

The OFD industry has been effectively developing new markets globally and influencing consumers' eating habits. In 2018, an Indian OFD company named 'Foodpanda' held a promotion campaign by offering large discounts to the consumers, which increased its number of users by tenfold (121). Furthermore, 'Eleme', another OFD platform in China, increased its market share to more than 50 percent of the Chinese market through a successful marketing strategy by spending three billion Yuan (US$443 million) over three months (122). By implementing marketing strategies such as providing discounts, free deliveries, opportunities to the consumers to purchase meals at a cheaper price; OFD platforms are manipulating consumers' eating behaviours and encouraging them to reduce cooking at home or even going out to eat. Alternatively, encouraging consumers to order food in their comfort space (121).

1.9.2. Marketing on Social Media Platforms

In addition to food delivery apps and the OFD platforms, the digital food environment also covers social media and digital marketing (35,115). Access to smartphones appear to influence young peoples' choices and preferences of meals. As OFD platforms are also aggressively marketed on social media platforms such as Facebook and Instagram, it may stimulate impulse purchasing and may make the consumers tempted to use OFD services (123). Advertising of OFD platforms on social media expose young adults to appetizing food images that may influence their food choices when eating away from home, specifically stimulating hunger and the urgency to eat (35,123). Additionally, many social media influencers also regularly post images of food. Multiple studies have found that marketing of unhealthy

foods and drinks increases preferences for unhealthy food products, purchasing, and consuming total energy intake in both children (124-126) and adults (127,128).

Globally, the WHO has restricted the marketing of unhealthy food and non-alcoholic beverages through various marketing mediums and techniques to protect children and young adults up to the age of 18 (129). Similarly, advertisements in New Zealand are regulated by the Advertising Standards Authority (ASA) that have a special code for children and young adults up to the age of 18 inclusive (130). This code implies that advertisements for foods and non-alcoholic beverages that are only meant for occasional consumption (i.e. are energy-dense and higher in saturated fats, sodium and added sugars), should not target children and young adults and should also not indicate that it is acceptable for children's consumption. However, online advertising is largely missed out by these government regulations, making social media platforms highly unregulated.

1.9.3. COVID-Washing during the Pandemic

Gerritsen et al. conducted a study to identify, classify and quantify the COVID-19 related marketing strategies used on the public social media accounts of unhealthy food and beverage brands as well as fast-food restaurants in New Zealand, during the initial stage of the pandemic in 2020 (57). This study found that a majority of the major fast-food brands in New Zealand participated in COVID-washing during the nation-wide lockdown. About 70% of the fast-food brands had referred to the COVID-19 pandemic in social media posts with each brand posting multiple times with reference to the pandemic. The study also found that a majority of the COVID-19 themed posts were on Facebook (52%) and Instagram (29%). The COVID-19 crisis allowed unhealthy food and beverage companies and food brands to empathize and demonstrate themselves as caring and contributing members of the society to promote their brands (36% of social media posts) (57). Some examples of messages and phrases included: *"Kia kaha [Stand strong]"* (McDonald's), *"#allinthistogether"* (Domino's), etc. Approximately 32% of the social media posts were on offering home delivery of the foods and another 32% on the companies' hygiene policies to reduce the risk of transmission of the virus, such as

complying with the social distancing rules and offering contactless payment options. Furthermore, most of the brands promoted their products by providing ideas of "Isolation Activities", mostly targeting young children, which included recipes of their products, hunts, quizzes, and colouring sheets. For example, during Easter in 2020, most of the companies participated in the nationwide 'Teddy Bear Hunt' to promote their brands. Furthermore, companies also used the marketing tactic of applauding the frontline/essential workers and the healthcare staff on social media for their services and making donations during the lockdown to empathize and grab the consumer's attention (57). This shows just how effectively the major fast-food and beverage companies have used the opportunity to promote their brand and products by reaching out to more consumers, especially when a majority of the viewers were at home due to lockdown at that time, hence more vulnerable to binge eating and spending more time online. However, marketing and promotion of unhealthy food and beverages during the COVID-19 pandemic is highly undesirable as multiple studies have indicated that individuals carrying excess bodyweight and/or those with other NCD's such as diabetes and hypertension (i.e., high blood pressure), have an increased risk of mortality from COVID-19 (131,132).

1.10. Implications for Public Health Policies

An excessive marketing of energy-dense and nutrient-poor foods on OFD platforms puts the target population of working young adults at a higher risk of obesity and obesity-related comorbidities, and hence, policies and interventions need to be introduced. Food delivery apps and OFD platforms need to be regulated to prevent it from becoming an unregulated space for the marketing of unhealthy foods (115). Currently, there are no public health nutrition policies that have been specifically targeting OFD platforms globally (10). However, implementation of policies and initiatives have been introduced internationally, including labelling policies (front and back-of-pack and menu labelling), mass media campaigns, reformulation and portion size (10). OFD platforms and other food delivery apps could be improved by providing nutrition information and menu labelling to enable consumers to make more informed decisions when choosing meals and to encourage healthier meal options (35,115). Bates et al.

has outlined three policies relevant to OFD platforms (10). The first one is 'Menu Kilojoule Labelling', a state-based initiative, and the other two are 'Health Star Rating' and 'Healthy Food Partnership', which are policy initiatives. Currently, there is no evidence that any of these policies are applied to the OFD platforms specifically.

1.10.1. Menu Kilojoule Labelling

The mandatory menu kilojoule (kJ) labelling policy requires the foodservice outlets to display the nutrition information, specifically the energy content (kJ or kcal) of the foods and beverages for the consumers to make decisions at the point-of-purchase (10,35). This policy has been implemented in some countries including some Australian states (New South Wales, Victoria, Queensland, South Australia and the Australian Capital Territory) in franchise food outlets only (10). For example, if a foodservice operator has its food outlets in twenty or more locations in a state or fifty or more nationally, they must display the energy content of the standard food item in kJ. This policy has also been implemented by some other countries such as the USA (35). They are also required to display the recommended average daily kJ intake on the app or website (10). This policy includes all ready-to-eat meals sold by the foodservice outlet either in single or multiple serves, requires standardisation for portion size and must be shown on the menu or labelled, clearly visible for the consumers (10). Although this policy has been implemented in Australia's franchise stores, it still has not been implemented on OFD platforms which still remains highly unregulated. In New Zealand, in addition to there being no policy for OFD platforms, neither the franchise food outlets nor the independent takeaway food outlets have implemented any menu kJ labelling policy.

As OFD platforms already display a variety of information regarding the foods and drinks available for purchase via the food outlets such as offers and promotions, images and description of the food, etc., it should be technologically feasible to also display kJ information to enable consumers to select healthier choices (10). For example, when choosing meal options on OFD platforms, consumers could be encouraged to choose healthier options by making those to appear as default or also to provide an

option of displaying healthier alternatives to the meals selected (10). Additionally, promotions and offers could also be applied to only healthy meal items in contrast to them being applied to unhealthy options currently, to encourage the intake of healthy foods. In addition, menu kJ labelling could encourage food outlets to reformulate their food items to improve its nutritional quality as there is evidence showing that nutrition labelling has encouraged food manufacturers to reformulate their products to make it healthier (10,133). However, smaller food businesses may be disadvantaged with this mandatory menu labelling policy due to the cost of implementation. A systematic review carried out to demonstrate the effectiveness of the menu-labelling policies demonstrated that 9 out of 15 studies showed a reduction in energy consumption or ordering of lower energy options (134). Based on the studies that calculated the energy intake, the results showed a decline in energy consumption by 419.5kJ (134). Likewise, a Cochrane review including three different randomised controlled trials showed a decrease in the energy of the food purchased by the participants in restaurants displaying the energy labelling, as compared to the restaurants not displaying the menu kJ labelling (135).

1.10.2. The Health Star Rating Policy

The Health Star Rating (HSR) is a voluntary front-of-pack food labelling policy (10,136). This policy is specifically targeted to packaged food products sold in Australia and New Zealand and enables consumers to compare between different brands of like products based on the number of stars the product has received. The products get a rating between 0.5 to 5 stars with half star increments, taking into account the energy content as well as other nutritional composition of the product, especially saturated fats, added sugars, sodium, fruit and vegetable content, nut and legume content, dietary fibre and protein. The higher the number of stars given to a product, the healthier it is. This system therefore makes it particularly easier for people who have limited nutritional knowledge to be able to read the back-of-pack nutrition information panel or to be able to understand the kilojoule labelling system. However, as this system is voluntary, not all food manufacturers display this information, hence limiting consumers' ability to make healthier choices. Although there is evidence showing that HSR

allow consumers to make healthier food purchases as compared to the back-of-pack nutrition information panel, it is more common for HSR to be available on healthier food products (137). In addition to the packaged food products, there is possibility for this system to be also applied to fast-foods sold in food outlets and to also be applied to meals offered on OFD platforms to enable consumers to choose healthy meal options (138).

1.10.3. The Healthy Food Partnership

Finally, other policies target promoting healthier food choices by educating the public regarding healthy eating and portion sizes to reduce the prevalence of overweight and obesity. The 'Healthy Food Partnership' is one such example, a partnership between the government, the public health sector, and the food industry in Australia, which also works on product reformulation and promoting healthy eating and food choices (10). There is possibility for OFD platforms to be included in this partnership to increase awareness and encourage healthier food choices, in addition to the other mandatory policies such as the menu kJ labelling.

Evidence shows that voluntary actions do not provide significant effects (139). As both the HSR and Heathy Food Partnership policies are voluntary actions, they are less likely to provide long-term positive effects in isolation. In addition to these policies not being currently specifically applied to OFD platforms, they also do not target the marketing tactics used by OFD platforms, which have shown to be effective in attracting new consumers and negatively impacting population health through marketing and promotions (10).

1.11. Gaps in the Literature – *What is still unknown?*

There is currently very limited research done on the use of marketing techniques by OFD platforms to target consumers which is a clear gap that needs to be addressed. To our knowledge, only one study so far has investigated the associations between the nutritional quality and marketing attributes of the

menu items on an OFD platform in Sydney, Australia (58); and no study investigating this has been carried out in New Zealand. However, this Australian study had only evaluated the nutritional quality and marketing attributes of independent local takeaway outlets, unlike this current study conducted in New Zealand which also includes franchise takeaway outlets. Additionally, apart from the research done by Partridge et al. (51) and Wang et al. (58), there are not many studies that have evaluated the nutritional quality of the menu items on OFD platforms, and only one carried out in New Zealand (51). Furthermore, OFD platforms or food outlets in New Zealand do not apply nutritional information to their menu items. Thus, this study will advocate for mandatory menu labelling on OFD platforms to encourage healthier food choices and product reformulations. Prior studies have only evaluated the healthiness of the popular food outlets and the nutritional quality of menu items on the market-leading OFD platform Uber Eats in New Zealand. However, investigation of marketing attributes and public health policy is lacking. Previous studies conducted have investigated the nutritional composition of meals from franchise food outlets such as McDonald's or KFC that also have menu labelling (140). However, very limited research exists investigating the nutritional composition of the independent takeaway outlets that are not franchises, i.e., local Chinese, Indian, kebab shops, etc. which do not have menu labelling, however also offer OFD services (16,51,58,141).

1.12. Conclusion

Food, whether prepared away from home or at home, is associated with health outcomes; in both, keeping individuals in good health or becoming a key determinant of adverse health conditions. With the escalating prevalence of obesity worldwide, especially in countries that have adopted the western-diet, has shown to be energy-dense and nutrient-poor with large portion sizes and a sedentary lifestyle. Given the increasing popularity of OFD platforms due to advanced technology and growing demand for convenience, increasing use of marketing and promotional tactics to target consumers is leading to an increase in the consumption of fast-foods and takeaways by young adults; posing threat to the public health system. Health promotion policies and initiatives to improve the nutritional quality of menu

items as well as to encourage healthier food choices could possibly improve the diet quality and slow down the increasing global prevalence of overweight and obesity amongst the target population. Because most young adults are up-to-date with advanced technology and using OFD platforms, it is a good opportunity to increase the availability of healthy food options on such platforms to positively influence consumers' food choices. However, OFD platforms must also be willing to make such positive changes and co-operation from them is required which can be challenging (10).

Despite there being various studies conducted globally on food environment and OFD services, there are still opportunities regarding the New Zealand food environment that requires analysis. This study, analysing the Uber Eats platform for nutritional quality and marketing strategies will provide an insight into the healthiness of the digital food environment in New Zealand. The primary aim of this study was to evaluate the nutritional quality of all menu items from popular takeaway outlets available on Uber Eats in New Zealand. The secondary aim was to investigate the associations between the nutritional quality and marketing attributes of all menu items, including popularity cue, use of photos and promotional offers.

CHAPTER TWO

Methodology

2.1. Introduction

This cross-sectional observational study aims to examine the quality of the digital food environment created by Uber Eats in New Zealand. The cross-sectional study design provides an insight into the types of foods offered on OFD platforms with data being collected at one point in time. This study will enable us to make conclusions regarding the nutritional quality and the marketing strategies used by such platforms to attract the population of interest. Furthermore, this study may also assist in future opportunities and decision-making processes for implementing public health policies to regulate OFD platforms. This research is one arm of a multi-national study; conducted in Sydney, Australia (58) to define the digital food environment created by Uber Eats in urban cities. However, this current New Zealand study also includes popular franchise takeaway outlets and the local independent takeaway outlets, unlike the Australian study. The data collected for this current study in New Zealand is independent from the data used in the Australian study. A similar study is intended to be conducted in China and UK in the future.

My role in this research project was to analyze the digital food environment created by Uber Eats in New Zealand using the food and nutritional knowledge as a Student Dietitian. The primary outcome of this study was to evaluate the nutritional quality of the menu items of popular takeaway outlets on Uber Eats in New Zealand. The secondary outcome was to evaluate the associations between nutritional quality and the marketing attributes used to promote these menu items. The key research questions this study will aim to answer are as follows:

i) What proportion of menu items are classified as 'Discretionary' or 'FFG'?

ii) What is the association between the nutritional quality of menu items and marketing attributes?

a) What proportion of menu items promoted using marketing strategies are classified as 'Discretionary' or 'FFG'?

b) What food/beverage categories are commonly promoted using marketing attributes?

This chapter will outline the methods of this research, using the research questions as subheadings where relevant for ease of interpretation. Additionally, this chapter will also outline the methods of identifying popular takeaway outlets, data extraction, nutritional and marketing attribute analysis, data analysis and ethical considerations.

2.2. Study location/Setting

This observational study was carried out in New Zealand with a majority of the takeaway outlets selected in the Auckland region. Auckland was purposely chosen as the location of interest in this study for multiple reasons. Primarily, Auckland is the largest city in New Zealand with high concentrations of young consumers (15-34 years) who are the primary users of OFD services and Uber Eats in general (34,51). The population of Auckland in 2018 was approximately 1.5 million with nearly 27.3% of the Auckland population aged 15-34 years (142). In New Zealand, the young population has the highest consumption of fast-foods and takeaways and are the main users of OFD services, hence are the target population in this study (34). Furthermore, Aucklanders have shown to be spending approximately 32%, the highest proportion of their food budget on takeaways and restaurant meals (37). Additionally, Auckland was also the first city in New Zealand to launch Uber Eats and comprises many restaurants and takeaway outlets on the OFD platform, compared to all the other cities in New Zealand (51).

Other than Auckland city, this study also included a takeaway outlet each from Wellington and Christchurch in New Zealand. Wellington, the capital city, is the second largest city in the North Island of New Zealand and Christchurch is the largest city of the South Island and the third largest city of New Zealand (143-145). Wellington and Christchurch are also the second and third most populated cities in New Zealand respectively after Auckland in 2021 (146). Furthermore, Wellington and

Christchurch are home to two of the top Universities in New Zealand (i.e., Victoria University of Wellington and University of Canterbury respectively), based on the QS World University Rankings 2020 (147). These two cities therefore are also likely to be home to high populations of young consumers. Furthermore, individuals living in the city are more likely to get their meals delivered compared to those living in the country areas (53). Due to these purposes, in addition to Auckland, Wellington and Christchurch were also chosen to be a part of this study to evaluate the nutritional quality and the marketing attributes of menu items on Uber Eats in New Zealand.

A similar cross-sectional observational study was carried out in Sydney, Australia, where they evaluated the nutritional quality and the marketing attributes of complete menus from popular independent takeaway outlets on Uber Eats (58). For this cross-sectional study, Auckland and Sydney were chosen to compare different populations in two high-income countries with similar proportions of young people. However, the Australian study only evaluated the menus from local independent takeaway outlets, i.e., local Chinese, Indian, kebab shops, pizzerias, etc., excluding the franchise food outlets such as Subway, McDonald's, Domino's Pizza, etc. which also offer OFD services on Uber Eats. This current New Zealand study however evaluated the associations between the nutritional quality and the marketing attributes of menu items from both popular independent local takeaway outlets and franchise food outlets. The nutritional composition of meals from franchise takeaway outlets (chain stores that prepare and sell meals/snacks ready for immediate consumption, offered in specialized packaging, e.g., McDonalds or KFC) are subject to mandatory menu kilojoule labelling in certain Australian states such as New South Wales, Victoria, Queensland, South Australia and Australian Capital Territory (10). This policy however has not been implemented on OFD platforms yet in Australia. In New Zealand, neither the local independent nor the franchise takeaway outlets are subject to this regulation and OFD platforms therefore remain highly unregulated. Thus, putting the young population in New Zealand at a higher risk of health issues due to excessive marketing and promotion of poor nutritional quality foods on OFD platforms (115).

2.3. Identification of Online Food Delivery Service

Young people (aged 15-34) have shown to be the largest users of OFD's, approximately 48% globally and over 25% reported users in Australia and New Zealand (51,53). Globally, Uber Eats is the most popular food delivery service (61). Out of all the active OFD platforms in New Zealand, Uber Eats was chosen as the preferred OFD platform in this study as it remains the market-leader in Australia and New Zealand (53,57,58).

2.4. Identification of Popular Takeaway Outlets

In total, 186 Auckland suburbs were searched between 9 and 22 February 2020 to form a database of complete menu items for both independent and franchise food outlets, that were identified previously by another cross-sectional study conducted in Sydney, Australia and Auckland, New Zealand (51). Searches of the popular takeaway outlets were conducted using the New Zealand Uber Eats website by searching for Uber Eats in the Google search bar (46). Although all searches were done using personal computers, researchers were not logged into their personal Uber Eats accounts during the search and at the time of data extraction to avoid possible biased results. The Uber Eats website provides options for the consumers to choose from either 'delivery', 'pickup' or 'dine-in' on the top left of the webpage. For this study, the 'delivery' option was selected at the time of data collection. The researchers entered the name of the suburb and postcode, (e.g., Auckland Central 1010) in the 'delivery details' bar without entering any specific residential or workplace address (51). The Uber Eats website also allows consumers to schedule their delivery date and time (46). Consumers can select delivery date up to a week in advance and the delivery time is divided into 30-minute increments up until midnight. For this study, the delivery time was set for 6:00 PM – 6:30 PM on the day of the data collection for consistency and this is usually the time when food outlets operate for dinner (51).

Since the time data extraction was completed between 9 and 22 February 2020 and by the time nutritional analysis was conducted, there were 20 food outlets that no longer offered OFD services on Uber Eats and "Nothing to eat here" sign appeared on the screen when the webpage link to the outlet was copied and pasted onto the browser. These outlets were excluded from the analysis. Additionally, franchise stores in different locations were considered as individual outlets or "unique". Unique food outlets were defined as having a distinct physical location, (e.g., Subway Botany, Subway Mission Bay, etc.) (58). Researchers identified a set of unique food outlets, and these were compiled for analysis.

2.4.1. Ten Most Popular Food Outlets

Similar to the previous cross-sectional studies conducted in Sydney, Australia and Auckland, New Zealand (51,58), the 10 most popular food outlets were extracted from the "Popular near you" section for areas with above-average populations of young people (>30%, 15-34 years), who are the leading users of OFD platforms (51). However, unlike the cross-sectional study conducted in Sydney (58), this study also included franchise takeaway outlets in addition to the independent takeaway outlets.

Once a suburb name is entered in the delivery details bar, multiple food outlet categories appear on the screen as suggestions, to make it easier for consumers to choose from the different types of food outlets available in their geographical area. Some examples of these categories include: "Healthy Eating", "Today's Offers", "Buy 1, get 1 free", "Loved by Locals", "Popular near you", etc. In this study, "Popular near you" was used to select the popular food outlets (including both independent and franchise outlets) in each selected suburb. The researcher filtered the list using the 'see all' option under the "Popular near you" category for each selected suburb. The 10 'most popular' food outlets were identified under this category, and these were included in this study for analysis. Food outlets that appear under "Popular near you" are within a geographical radius set by individual outlets and lists the

most popular food outlets in a particular geographical location that are willing to deliver food to the consumer's delivery address (51).

2.4.2. Classification of Food Outlets: Food Environment Score

The Food Environment Score (FES) is a healthiness score tool developed by researchers for identifying food outlet types in Australian residential communities (148). This is a classification system which uses a 20-point scoring tool ranging between -10 (least healthy) to +10 (most healthy) (148). The FES tool was used to assign classification and a healthiness score to food outlets like it has been used in previous studies (51,58,149). For this study, an adapted FES tool was used to classify the healthiness of the food outlets, based on a study conducted in Australia (149). This adapted FES tool classed the food outlets into three groups based on the 'healthiness': healthy (FES range +5 to +10); less healthy (FES range -4 to +4) and unhealthy (FES range -10 to -5) (149). University-qualified dietitians were involved in the classification, scoring and grouping of the food outlets (51). The FES tool was considered appropriate for this study as there are no known significant differences between the food outlets in Australia and New Zealand.

This study focused on evaluating the 374 takeaway outlets identified using the FES Tool (148-150). Out of 374 takeaway outlets, 119 (31.8%) takeaway outlets evaluated were identified as independent takeaway outlets and 255 (68.2%) were identified as franchise takeaway outlets (Figure 2). For this study, franchise takeaway outlets have been defined as chain stores with outlets in two or more locations with the name, brand, logo and menu being consistent across all locations, e.g., McDonald's, KFC, Subway, Pizza Club, Wild Bean Café, etc. (151,152). In contrast, an independent takeaway outlet does not have any other chains and is run by an independent owner, e.g., Glen Eden Kebab, Mangere Bridge Takeaways, etc. (151). Each food outlet was searched by typing its name on Google to classify them as either franchise or independent food outlets by identifying the number of chain stores they owned.
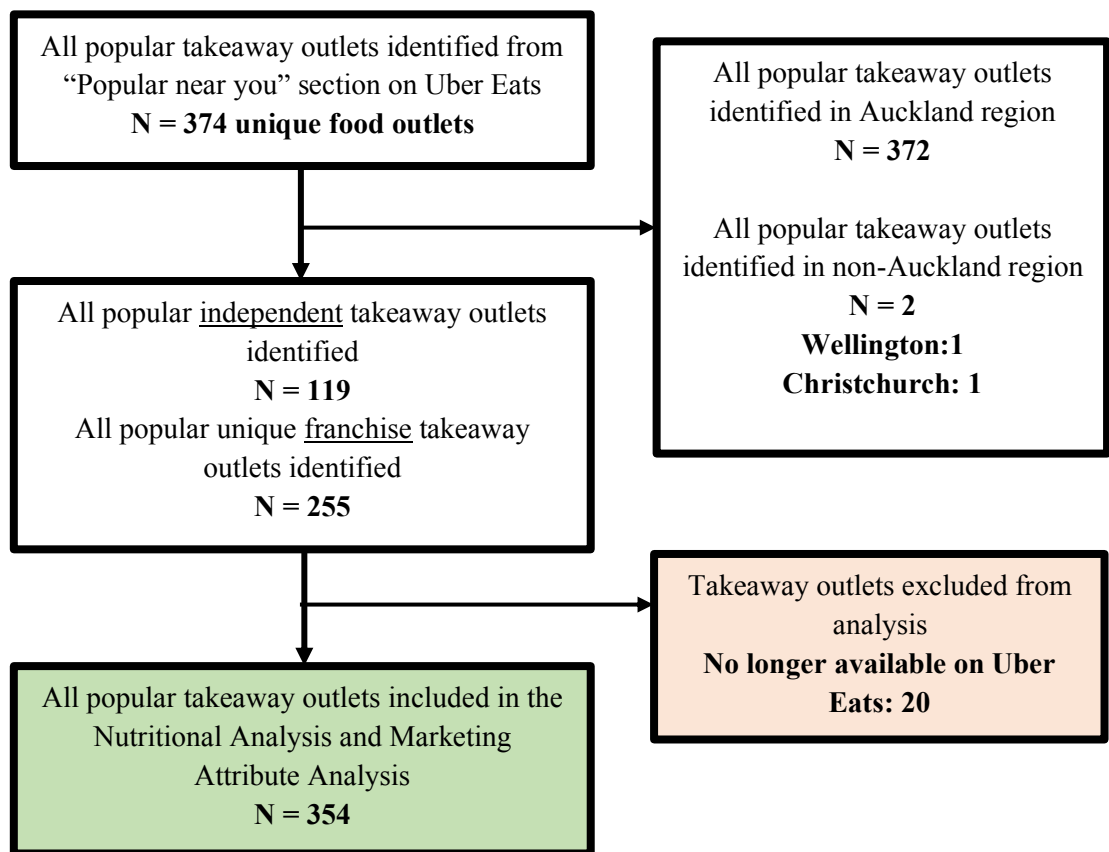
Figure 2. Inclusion of Food Outlets. Flow diagram of unique food outlets in Auckland and non-Auckland regions (Wellington and Christchurch) in New Zealand included in the nutritional and marketing attribute analysis.

2.5. Data Extraction

Publicly available complete menus were extracted from the Uber Eats website on 10 September 2020 (via web scraping, ScrapingSolutions) (58). In this study, complete menus include all menu items available from independent takeaway outlets and franchise outlets as displayed on their Uber Eats webpage. Data extracted from menus for each food outlet include: the menu items' names, descriptions and the Uber Eats categories the menu items are included under (e.g., burgers, vegetarian pizzas, mains, desserts, sides, drinks, etc.). Price of the menu items (in NZD), images, nutritional information (e.g., the macronutrient profile), and any dietary labelling if available (e.g., vegan, vegetarian, gluten-free, etc.) were also included in the data extraction. Other information collected for each of the food outlets

included the name of the country, suburb, address, postcode, Uber webpage address to the food outlet, and the geographical coordinates. All the extracted data from the Uber Eats website was saved onto Microsoft Excel and the database was shared between researchers.

In previous studies carried out in Sydney, Australia; most popular menu items were extracted for analysis from the 'Most Popular' section on each of the food outlet's menu page (51,58). However, in New Zealand, only McDonald's and Burger King outlets displayed 'Most Popular' items on their menu page on the Uber Eats website. Once a McDonald's or Burger King outlet is selected on Uber Eats, the five most popular menu items from the outlet are displayed at the top of the webpage. Unlike previous studies where 'Most Popular' was used to identify the most popular menu items from each food outlet, most of the food outlets on Uber Eats in New Zealand use 'Picked-for-you' instead. Similar to 'Most Popular', once a food outlet is selected on the Uber Eats website, the five 'Picked-for-you' menu items are displayed at the top of the page. For this study, we assumed that 'Picked-for-you' was the same as 'Most Popular', as this modification was made by Uber Eats after the data extraction and there hasn't been any research done to define the difference between the two. Table 1 provides a summary of definitions and the derivations of the data extracted.

Since the time data extraction was completed from the Uber Eats website and when the menu items were analyzed, there were some menu items that the food outlets no longer sold hence they were excluded from the analysis. In contrast, some food outlets had new menu items that had not been extracted therefore these were manually added to the data spreadsheet. Most of the menu items had modifications in the prices, description and photos of the menu items, therefore all these changes were made manually by the researcher during nutritional analysis on the spreadsheet where the data was extracted. Furthermore, most of the food outlets on Uber Eats provide menus in different categories, e.g., Breakfast, Lunch, Dinner, etc. Some of these menu items appear more than once in these categories, however these were not duplicated during analysis. For example, menu item 'kumara fries' available in all 'Breakfast', 'Lunch' and 'Dinner' sections was only analyzed once during the

nutritional analysis for the unique food outlet and was not duplicated in each category. Each menu item duplication was noted under 'Uber Eats category duplicate' column on the spreadsheet by entering the name of the category duplicated in.

2.6. Outcome Measures

The primary outcome of this study was to evaluate the nutritional quality of complete menus from popular independent and franchise takeaway outlets available on Uber Eats in New Zealand. The secondary outcome was to investigate the associations between nutritional quality and marketing attributes for complete menus, including popularity cue, use of images and promotional offers.

Table 1. Defining Variables. Summary of definitions and derivations of data extracted from complete menus of each independent and franchise food outlet on Uber Eats and study outcomes.

Data Extracted	Definition
Menu item name	The name of menu items from a food outlet's webpage
Menu item description	The description provided for menu items from a food outlet's webpage. This description is located below the menu item name. Not all menu items have descriptions.
Uber Eats category	The menu category, which menu items are grouped within on a food outlet's webpage (e.g., Beverages, Main Meals).
Catering and party packs	Any menu item with "catering", "party", or similar terms in either the Uber Eats category or the menu item name. These menu items were suspected to serve more than 10 people.
Uber Eats category duplicate	The duplicate menu items that varied only by the Uber-Eats category. These menu items were listed both as "Most Popular" and as another Uber Eats category (e.g., Chicken Burger listed under Most Popular and Burger categories).
Meal deal	Any menu item that included multiple food components which could be purchased individually from the food outlet (e.g., burger with chips and drink). These menu items were available at a reduced price compared to buying the individual components separately. This was determined using the menu item description in the context of the food outlet's complete menu.
Family deal	Any menu item intended to serve more than one person and suspected to serve less than ten people. These items contained the terms "for two", "for three", "family", or similar in the UberEATS category, menu name or description.
Discretionary food or beverage	Foods and beverages, which are defined as items high in added salt, saturated fat, sugar, and low in fibre by the Australian Dietary Guidelines (51,153). Internationally, they are also referred to as junk food or non-core.

Table 1. *Cont.*

Data Extracted	Definition
Five Food Group (FFG) food or beverage	Foods and beverages, which have food(s) or combination of foods from the five food groups defined by the Australian Dietary Guidelines: vegetables and legumes/beans, fruit, grain (cereal) foods, mostly wholegrain and/or high cereal fibre varieties; lean meats and poultry, fish, eggs, tofu, nuts and seeds and legumes/beans; and milk, yoghurt, cheese and/or alternatives, mostly reduced fat (51,153). Internationally these are also referred to as core foods.

Study Outcomes	Definition
Most popular menu items	Menu items listed as "Most Popular" in the Uber Eats category. These items are typically positioned at the top of a food outlet's Uber Eats webpage and app interface, attracting greater visibility. All other menu items are referred to as regular menu items.
Picked for you menu items	Assumption made that it is similar to most popular menu items.
Value bundles	This is a collective term for meal deals and family deals.
Special Promotions	Menu items that include promotions such as "Buy 1, get 1 free", "one free drink", "$0 delivery fee (spend $20)", etc. This was determined using the menu item description or food outlet webpage.
Photo	The photo accompanying the menu item name, description, and price. Not all menu items have images.
Price ($)	The price of menu items from a food outlet's webpage, in NZ dollars.
Combination Meals	Menu items containing more than one food/beverage item. Each food/beverage item is analyzed individually for nutritional quality.
Nutritional Information	Any information provided on the OFD platform that quantifies any macronutrient(s) of a menu item (e.g., energy, protein) or micronutrient(s) (e.g., sodium). Not all menu items have nutritional information.
Dietary labelling	Any menu item label associated with a dietary requirement (e.g., vegan). Religious dietary labelling (e.g., halal) and heat scale labelling (e.g., spicy) was excluded from this data. Not all menu items have dietary labelling.

2.7. Research Question (i); Primary Outcome - Nutritional Analysis: *Classifying Menu Items as FFG or Discretionary*

All menu items from the most popular takeaway outlets on Uber Eats included in the analysis were classified into 38 food and beverage categories (see Appendices: Table A3) based on the menu item description and/or image, using a modified version of a classification system previously proposed for a sub-study of the MYMeals project (154). All menu items from each popular food outlet were defined using the food types derived from the Australian Dietary Guidelines into Five Food Group (FFG) and

discretionary classifications (51,153). In addition, each category from the 38 food and beverage categories were assigned a FFG or discretionary classification. Menu items classified as FFG (also known as core) contain food(s) or a combination of foods from the five food groups: vegetables and legumes/beans; fruit, grain (cereal) foods, mostly wholegrain, and/or high cereal fibre varieties; lean meats and poultry, fish, eggs, tofu, nuts and seeds, and legumes/beans; and milk, yoghurt, cheese and/or alternatives, and mostly reduced fat (51,153). Australian Dietary Guidelines defines discretionary foods as foods and drinks that are unnecessary for consumption to provide nutrients the body needs but may add variety. However, many of these foods are high in saturated fats, sugars, salt and/or alcohol and lower in dietary fibre, therefore are considered to be "energy-dense" and "nutrient-poor" (153). The Australian Dietary Guidelines were used in this study for consistency between similar studies conducted previously (51,58). They also align with the New Zealand Eating and Activity Guidelines, specifically with the recent modifications made to the New Zealand guidelines to match the Australian Dietary Guidelines (81).

2.7.1. Methods of Nutritional Analysis

The nutritional analysis of all menu items was conducted by Student Dietitian (NM). A random 20% of the data was cross-checked by Registered Dietitian (RR). Throughout the nutritional analysis, the Student Dietitian was not signed into her personal Uber Eats account to prevent biased results, however Uber Eats automatically chose a delivery location (Auckland suburb) which could not be changed. All menu items were analyzed between 14 April - 1 December 2021, including the nationwide Level 4 lockdown period in New Zealand from 18 August to 21 September 2021. During Level 4 lockdown, food delivery services, including Uber Eats had to come to a halt to reduce movement and contact between people in order to stop the spread of the virus. However, nutritional analysis was still possible during this period using the food outlet's webpage address, extracted during the data extraction process.

The Uber Eats website address collected for each of the popular food outlets during data extraction was copied and pasted onto the browser to begin the nutritional analysis. Safari was chosen as the web browser by default. Each menu item on the Uber Eats website was categorized using the 38 food and beverage classification on a Microsoft Excel spreadsheet. The researcher checked the description of each menu item, price and image link to see whether they were still relevant, or else they were updated to match the current one. New menu items that were added onto the website since the data extraction were added on manually. Similarly, menu items that were no longer available were removed from the spreadsheet, hence excluded from the analysis.

There were multiple menu items the researcher was unfamiliar with. In these situations, if an image or a detailed menu item description was not provided on Uber Eats, a Google search was done to learn about the most common recipe (ingredients and cooking methods) to help with the nutritional analysis. For consistency with nutritional analysis, if the common recipe indicated addition of discretionary ingredients (i.e., cream, butter, processed meats, etc.) or cooking methods such as deep frying, then all similar menu items offered by all other food outlets were categorized as discretionary regardless of whether a menu item description was provided on Uber Eats or not. In contrast, there were menu items and cuisines which the researcher was highly familiar with, and these items were then analyzed based on the pre-existing food knowledge together with the menu item description if provided. However, for as much as possible, menu items were analyzed based on the image and description provided on Uber Eats for consumers, who may not necessarily have adequate food and nutrition knowledge, and not based on the researcher's personal food knowledge. This decision was made because we wanted to gain an insight into the type of food environment that has been created by Uber Eats, as some food outlets may choose not to indicate the addition of discretionary ingredients on the website, which may have made our nutritional analysis to be generous to an extent.

Menu items with insufficient information such as stir-fries, without adequate detail in the description (although stir-fries have excessive sodium and would be considered discretionary if the saturated fat content is >5g/100g), a conservative approach was taken. These menu items were classified as a FFG type dish. However, when a menu item contained a discretionary ingredient (e.g., battered or crumbed meats and seafood, processed meats such as sausages or bacon, katsu (fried) chicken, cream-based curries or hot chips and SSB as part of a meal deal), then the menu item was classified as discretionary (51,58) (See Appendices: Table A1 and A2 for additional details regarding inclusions and exclusions for food and beverage nutritional analysis). For consistency with the Australian study (58), we assumed menu items with paneer have cream added. Additionally, since paneer is approximately >500kJ/serve, all paneer dishes were categorized as discretionary as they are considered to be energy-dense (155). Menu items as part of a value bundle (i.e., meal deals, family deals, etc.) or combination meals, were categorized for each food item included. For example, burgers, chips and drink as part of a meal deal or combo were all separately analyzed for the nutritional quality. Combination meals in this study have been defined as menu items consisting of more than one food/beverage item. For example, 'fish and chips' is considered a combination meal as both 'fish' and 'chips' are individual food items assigned to different food categories (i.e., 'Meat or alternative-based mixed meals (Discretionary)' and 'Fried potato (or similar)' respectively). Therefore, similar to value bundles, each food/beverage item in combination meals were also analyzed separately. Additionally, all SSB (i.e., beverages containing added sugars or nutritive sweeteners such as soft drinks, bubble teas and milk or alternative-based beverages with discretionary items such as syrups and sweeteners) were classified as discretionary (see Appendices: Table A1 and A2). For food outlets that allowed consumers to design their own meal, e.g., Subway; the nutritional analysis was based on the image and description provided as a suggestion for consumers. Furthermore, some menu items that lacked substantial data were classified as "undetermined" as there were multiple categories they could be assigned to (e.g., "drink" or "meat dish" with no image or description provided for classification). Additionally, some inedible menu items

(e.g., cutlery) were classified as "non-consumable". All menu items categorized as undetermined and non-consumable were excluded from data analysis.

2.7.2. Research Question (ii); Secondary Outcome - *Analyzing Marketing Attributes of Menu Items*

The web scraping company extracted marketing attributes during data extraction from the Uber Eats website. These included popularity (Uber Eats category of 'Most Popular'), price, photo, nutritional information and dietary labelling of the menu items. In addition to the 'Most Popular' menu items category for each food outlet collected during data extraction, 'Picked-for-you' menu items were manually entered during the nutritional analysis, since this was a new category added by Uber Eats after the data was extracted. For the 'Most Popular' menu items that had already been extracted from food outlets, the menu items were updated manually on the spreadsheet during the nutritional analysis as 'Most Popular' menu items are changed frequently. Value bundles such as meal deals and family deals were coded manually during the nutritional analysis using the menu items' name and description. The definition of value bundles in this study was all menu items which either included meal deal or family deal offers. Menu items with value bundles (i.e., meal deals and family deals) were expected to increase the median price of the menu items due to their higher costs, thus were excluded from the price analysis. Table 1 provides a summary of the definitions of these study outcomes. In addition to the 'Most Popular' and 'Picked-for-you' categories, other promotional offers such as 'Buy 1, get 1 free', 'Free with $20 purchase (add to cart)', etc., categories displayed by some food outlets were also manually entered under 'Special Promotions' column during the nutritional analysis. This was another addition to this study as the Australian study did not investigate the prevalence of special promotions on Uber Eats. Marketing strategies that target price and offer value for money food items have shown to highly influence young people's food preferences and are also more likely to be discretionary menu items (35,58).

2.8. Analysis Techniques

There was a large amount of data collected during the data extraction process. The spreadsheet therefore required some formatting to improve the layout and to allow simpler navigation during analysis. Before beginning the nutritional analysis, the raw data spreadsheet was copied and pasted into another tab on the same spreadsheet. This tab was where the nutritional analysis and marketing attribute analysis was carried out therefore was modified and formatted, without making any modifications to the 'raw data'. Some columns were hidden for ease of use and simpler navigation. Additional columns were created to add comments for justifying the nutritional analysis or any other comments regarding the food outlet or the menu item. Colour coding was used for particular columns and rows for easier navigation. Similarly, to ensure easier readability of the spreadsheet, the rows and columns were formatted so that all the text was visible.

For most franchise food outlets that had multiple outlets in different locations, e.g., Subway and McDonald's, a separate tab was created for each franchise outlet within the same spreadsheet, e.g., a separate tab for McDonald's and another tab for Subway. These tabs included the completed nutritional analysis data for the particular franchise outlet as franchise outlets have a very similar menu across their unique outlets (i.e., outlets in different geographical location). This data was then used each time a unique franchise outlet had to be analyzed by being able to copy and paste the data to ensure consistency with analysis across all unique outlets and to be time efficient. However, all the menu items were still compared with the particular Uber Eats franchise takeaway outlet webpage to ensure there were no differences in the menus or prices.

2.9. Data Analysis

All data was collated on Microsoft Excel (Version 16.56, Microsoft Corporation, Redmond, Washington, DC, USA). In order to analyze the nutritional quality and the marketing attributes of all menu items, most popular/picked-for-you menu items and combination meal menu items, descriptive

statistics were used which provided results of interest from the collected data. The descriptive statistical analysis and the inferential statistical analysis were both conducted by Student Dietitian (NM), with supervision and guidance from Registered Dietitian (RR) (The University of Auckland). For consistency with the Australian study and ease of comparison, the results data (tables and figures) for the Australian study were replicated for this research (58).

Out of all the food and beverage categories (see Appendices: <u>Table A1 and A2)</u>, only 38 food and beverage categories were of interest and therefore were included in the 'total' of all results tables. This list of included food and beverage categories is attached in the appendices for reference (see Appendices: <u>Table A3)</u>. Descriptive statistics were completed using Excel filter option for relevant tables and figures. The filter option was used to determine the total number of menu items included in the nutritional analysis, marketing attribute analysis and the price analysis. Additionally, it was also used to determine the number of menu items which were excluded in the analysis. As combination meals in this study were analyzed individually for each food and beverage item included in the unique menu item, they were analyzed separately for consistency with the results of the Australian study. Furthermore, since combination meal menu items create an overlap of food and beverage categories as they contain more than one food and/or beverage item, and because analysis of combination meals was beyond the scope of this study, inferential statistics was not conducted for combination meals and only descriptive statistics was carried out.

The Australian study was used to replicate the inferential analysis for this research (58). Categorical variables (nutritional quality, popularity, value bundles, photo, special promotions, nutritional information and dietary labelling) were summarized using frequencies and proportions. A new spreadsheet was created with only relevant variables and appropriate coded data for inferential statistical analysis. All inferential statistical analysis were performed using SPSS Statistics Version 27 (IBM, Armonk, New York, NY, USA). Chi-squared tests with the Bonferroni multiple comparisons correction and odds ratios were used for categorical variables to identify significant differences

between (i) discretionary and FFG menu items and (ii) most popular/picked-for-you and regular menu items. The distribution of continuous variables (price) was assessed using histograms and measures of skewness and kurtosis. The variable 'price' was summarized as medians and interquartile intervals. Finally, Kruskal-Wallis tests with multiple comparisons corrections were used for continuous variables to identify significant differences between (i) most popular/picked-for-you and not most popular/picked-for-you menu items and (ii) comparable discretionary and FFG food and beverage categories.

2.10. Ethical Considerations

As there are no human participants in this study, ethical considerations were not required. All data was collected from the publicly available website of Uber Eats (46). No other confidential data was collected from the website for inclusion in this study.

2.11. Timeline

All data was extracted over a two-week period between 9 and 22 February 2020. All menu items were analyzed for nutritional quality and marketing attributes by NM over an eight-month period from April to December 2021. Once the data had been analyzed for nutritional quality and marketing attributes, it was analyzed using descriptive statistical analysis and inferential statistical analysis as mentioned earlier, throughout the month of January 2022, by NM with guidance from RR.

2.12. Conclusion

The methodology used in this study was aimed to find answers to the key research questions identified in the beginning of this chapter. The results obtained from the nutritional analysis of menu items from popular takeaway outlets on Uber Eats in New Zealand will provide a deeper understanding of the digital food environment that has been created. Whether a majority of the available menu items are classified as FFG or discretionary, will provide an insight into the long-term effects on health

consequences of the population of interest and an opportunity to implement public health policies and strategies to further improve the current digital food environment. The results from the analysis of marketing attributes of menu items will also provide a greater understanding of the digital food environment created by Uber Eats to target the population of interest through marketing and promotions. Since the OFD platforms are highly unregulated, there are high chances that food outlets and OFD platforms may promote an overall unhealthy food environment through marketing strategies. However, there are opportunities for the implementation of public health policies and to use marketing attributes in a positive manner to promote a healthier food environment.

CHAPTER THREE

Results

A total of 354 popular unique independent and franchise takeaway outlets were available on Uber Eats in New Zealand to be analyzed for nutritional quality and marketing attributes. The results of this study have been separated into subheadings with reference to the two research questions where relevant for ease of interpretation. The results obtained from this research have been compared with the similar study carried out in Sydney, Australia (58).

Unlike the Australian study, this research also included an analysis of combination meals. Combination meals have been defined in this study as unique menu items consisting of more than one food/beverage item. Each food/beverage within unique combination meals were separately analysed for nutritional quality using the 38 food and beverage categories. For example, 'fish and chips' is a combination meal menu item, and both 'fish' and 'chips' were categorised individually for nutritional quality, (i.e., fish = Meat or alternative based mixed meal (Discretionary) and chips = Fried potato (or similar)). Since the Australian study did not include combination meals in their analysis, a decision was made during the data analysis for this research to analyse combination meals separately, for consistency with the results between both the studies. Furthermore, since an inferential statistical analysis of the combination meals was beyond the scope of this thesis, results for combination meals have been described using descriptive statistics (i.e., frequencies and proportions) for nutritional quality and marketing attributes.

3.1. Selection of Menu Items for Analysis

Figures 3 and 4 provide an overview of the menu items included and excluded in the nutritional quality and marketing attribute analysis. Figure 3 excludes combination meals for consistency with the Australian study and Figure 4 only provides an overview of the menu items that were combination meals.

A total of 29,764 menu items were available from complete menus of 354 unique popular independent and franchise takeaway outlets available on Uber Eats in New Zealand (Figure 3). After 3887 undetermined, non-consumable, and combination meal menu items were excluded, 25,877 menu items remained for analyses of nutritional quality and all marketing attributes, excluding price. See Appendices Table A3 for the list of 38 food and beverage categories included in the nutritional quality analysis and marketing attribute analysis. Out of 25,877 menu items, 1571 were categorised as either most popular/picked-for-you on Uber Eats. Following further exclusion of 513 catering and party packs, meal deals, family deals, and menu items with price unavailable, 25,364 menu items remained for price analysis, out of which 1518 were either most popular/picked-for-you category.
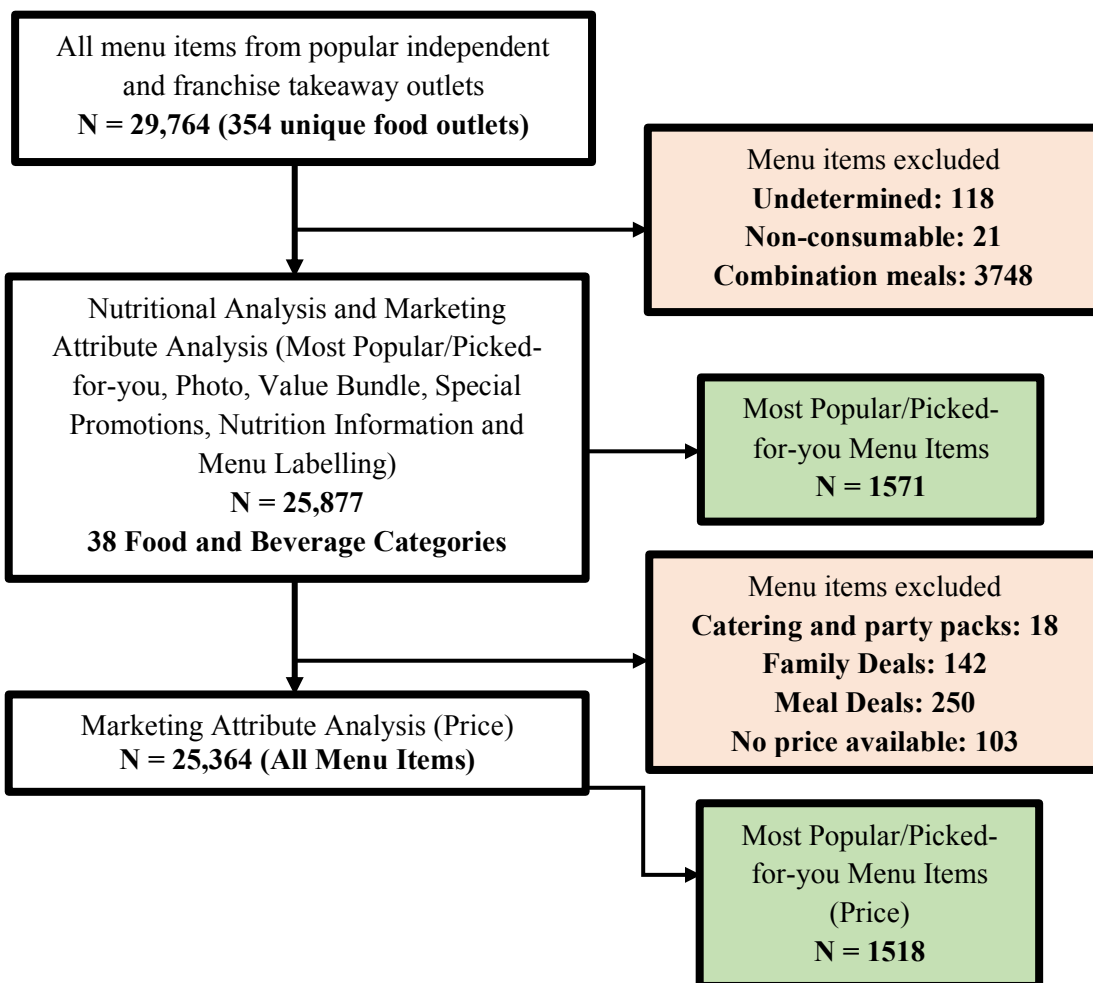
Figure 3. Inclusion of Menu Items. Flow diagram outlining the inclusion of menu items in each analysis, excluding combination meals.

Out of 29,764 menu items, 3748 (12.6%) were combination meals (Figure 4). Of the 354 takeaway outlets that were analysed, 86.2% (305 / 354) included combination meals. After excluding 2 undetermined menu items, 3746 combination meal menu items remained for analyses of nutritional quality and all marketing attributes, excluding price. Out of 3746 combination meal menu items, 442 were categorised as either most popular/picked-for-you by Uber Eats. As combination meals consist of more than one food/beverage category, analysis for nutritional quality and marketing attributes was conducted by including all menu items which contained the food/beverage categories of interest. Following further exclusion of 2212 catering and party packs, meal deals, and family deals, with 6 menu items consisting of both catering and party packs and family deals, 1545 menu items were available for price analysis, out of which 194 were either most popular/picked-for-you.
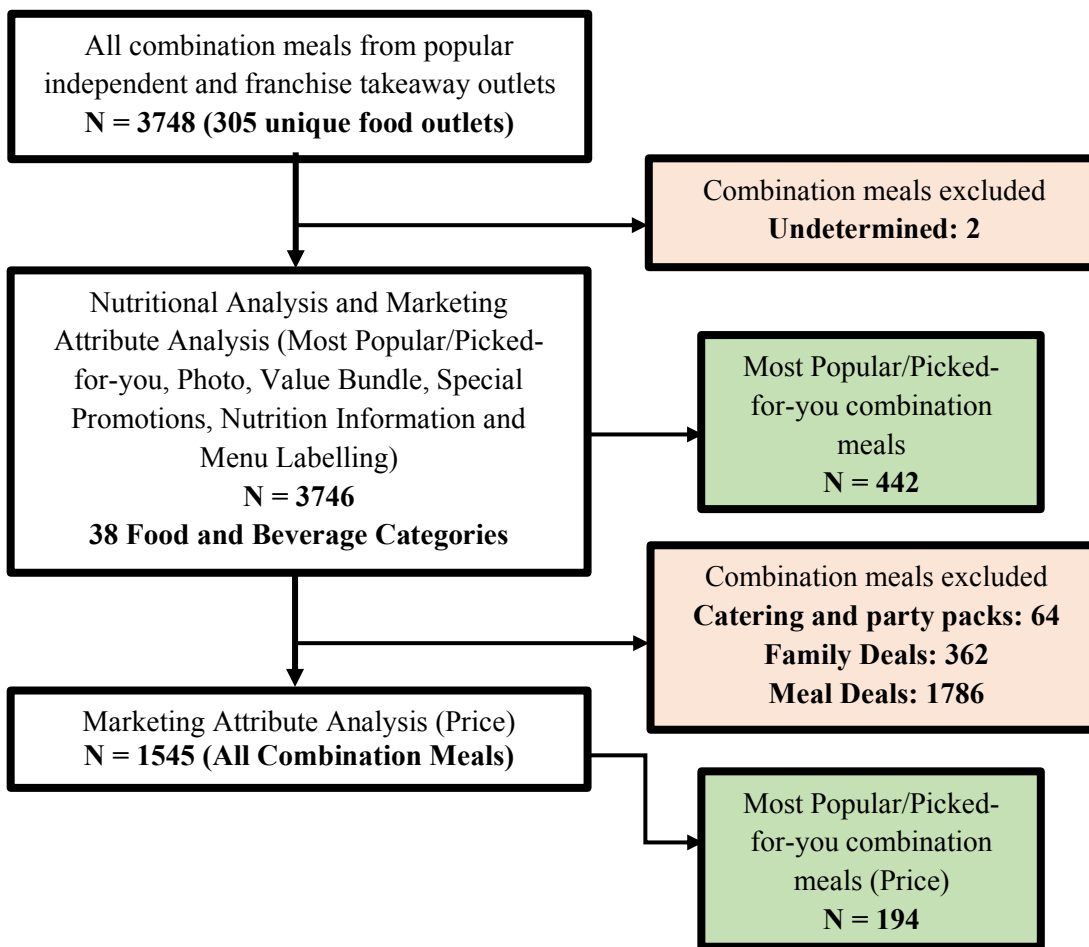
Figure 4. Inclusion of Combination Meals. Flow diagram outlining the inclusion of combination meal menu items in each analysis.

3.2. Nutritional Quality of Menu Items

Research Question (i): *What proportion of menu items are classified as FFG or discretionary?*

The primary outcome of this study was to evaluate the nutritional quality of menu items of popular takeaway outlets on Uber Eats in New Zealand. Table 2A shows the proportions of each food and beverage category for all menu items and Table 2B shows the proportion of each food and beverage category for most popular/picked-for-you menu items, both excluding combination meals. A majority (73.3%, 18,955 / 25,877) of all menu items and 83.8% (1317 / 1571) of most popular/picked-for-you menu items were discretionary. The discretionary cereal-based mixed meal category was the largest category within both complete menus (36.4%, 9419 / 25,877) and the most popular/picked-for-you menus (48.9%, 768 / 1571) (Table 2A and 2B). This category included burgers, pizzas, sandwiches, wraps, pasta, entrées and sides. The second-largest category was discretionary meat or alternative-based mixed meals for both complete menus (8.9%, 2308 / 25,877) and most popular menus (19.7%, 310 / 1571). This category included menu items such as deep-fried meat and seafood meals, processed meats, ribs, meat or seafood meals with an excessive amount of sauce added as seen in the photo (if available) or meat/seafood curries including discretionary ingredients such as butter and cream (e.g., butter chicken) or other coconut-based or cream-based curries, including paneer or tofu (see Appendices: Table A1 for criteria of nutritional analysis).

Table 2A. & 2B. Proportion of Discretionary and FFG for Menu Items on Uber Eats. The proportion of food and beverage categories in (2A) all menu items ($N =$ 25,877) and (2B) most popular/picked-for-you menu items (n = 1571) from 354 local independent and franchise takeaway outlets in descending order. Both Tables (2A) and (2B) exclude combination meal menu items. All menu items are inclusive of the most popular menu items and the remaining menu items.

	2A				2B		
Type of Category	**Food Categories**	**n**	**%**	**Type of Category**	**Food Categories**	**n**	**%**
Discretionary	Cereal-based mixed meal	9419	36.4	Discretionary	Cereal-based mixed meal	768	48.9
	Meat or alternative based mixed meal	2308	8.9		Meat or alternative based mixed meal	310	19.7
	Sugar-Sweetened Beverages	1673	6.5		Baked goods/Desserts (homemade or similar)	50	3.2
	Baked goods/Desserts (homemade or similar)	1001	3.9		Fried potato (or similar)	46	2.9
	Other Beverage[b]	979	3.8		Vegetable-based mixed meal	45	2.9
	Vegetable-based mixed meal	763	2.9		Discretionary Milk Based Beverages	43	2.7
	Discretionary Milk Based Beverages	698	2.7		Iced confectionary and dairy-based desserts	24	1.5
	Savoury Sauces, Condiments and Spreads	670	2.6		Other Beverage[b]	11	0.7
	Iced confectionary and dairy-based desserts	617	2.4		Sugar Sweetened Beverages	11	0.7
	Fried Potato (or similar)	445	1.7		Other Food[a]	5	0.3
	Other Food[a]	382	1.5		Savoury Sauces, Condiments and Spreads	4	0.3
	Total Discretionary	**18,955**	**73.3**		**Total Discretionary**	**1317**	**83.8**
Five Food Groups	Cereal-based mixed meal	2366	9.1	Five Food Groups	Cereal-based mixed meal	136	8.7
	Meat or alternative based mixed meal	1459	5.6		Meat or alternative based mixed meal	86	5.5
	Vegetable-based mixed meal	889	3.4		Vegetable-based mixed meal	21	1.3
	Other Beverage[d]	811	3.1		Other Food[c]	9	0.6
	Other Food[c]	533	2.1		Other Beverage[d]	2	0.1
	Juice	482	1.9		Juice	0	-
	Water	382	1.5		Water	0	-
	Total FFG	**6922**	**26.7**		**Total FFG**	**254**	**16.2**
	Total	**25,877**			**Total**	**1571**	

[a]Confectionery, Discretionary snack food (Savoury) – Packaged, Discretionary snack food (Sweet) – Packaged, Other snack food (other), Processed Meats, [b]Alcohol, Energy Drinks, Non-Sugar Sweetened Beverages, Rehydration Beverages (Electrolytes), Water Based Flavoured Beverage – sugar not determined, [c]Breads and Cereals, Dairy and alternatives, Fats/Oils, Fruit, Legumes, Meat and Alternatives, Soup, Vegetables, Vegetables (Other), [d]Body Building and Performance Beverages, Coffee, Milk/Milk Alternatives, Milk/Milk Alternative Based Beverages, Tea

3.2.1. Nutritional Quality: Combination Meals

Table 2C shows the proportions of each food and beverage category for most popular/picked-for-you and not most popular/picked-for-you within combination meal menu items. Since combination meals contain more than one food/beverage item, analysis of the nutritional quality and marketing attributes included all menu items which contained the food/beverage category of interest. A majority (90.0%, 1176 / 1306) of most popular/picked-for-you combination meal menu items and 81.1% (6941 / 8562) of remaining combination meal menu items contained at least one discretionary food/beverage category (Table 2C). Fried potato (or similar) was the largest category for both most popular/picked-for-you unique combination meals (65.4%, 289 / 442) and for the remaining combination meal menu items (53.0%, 1752 / 3304) (Table 2C). This category mainly included potato/kumara fries or wedges that were one of the food items in the meal deal or combination meal. Discretionary cereal-based mixed meals was the second largest food category for both most popular/picked-for-you unique combination meals (51.1%, 226 / 442) and the remaining combination meal menu items (47.7%, 1577 / 3304) (Table 2C). This included combo meals (i.e., meal deals) or combination meals that contained discretionary cereal-based mixed meal items such as burgers, wraps, discretionary breads (i.e., butter naan, garlic bread, etc.), and pizzas.

Table 2C. Proportion of Discretionary and FFG for Combination Meals on Uber Eats. The proportion of food and beverage categories as part of combination meals in most popular ($N = 442$ unique combination meals) and not most popular ($n = 3304$ unique combination meals) menu items from 305 unique local independent and franchise takeaway outlets. Not most popular/picked-for-you menu items exclude the most popular/picked-for-you menu items and include the remaining menu items. Combination meal menu items contain more than one food/beverage item.

Type of Category	Food Categories	Most Popular/Picked-for-you		Not Most Popular/Picked-for-you	
		n	%	n	%
Discretionary	Fried Potato (or similar)	289	65.4	1752	53.0
	Cereal-based mixed meal	226	51.1	1577	47.7
	Meat or alternative based mixed meal	151	34.2	1298	39.3
	Sugar Sweetened Beverages	79	17.9	543	16.4
	Baked goods/Desserts (homemade or similar)	87	19.7	159	4.8
	Other Beverage[b]	110	24.9	170	5.1
	Vegetable-based mixed meal	39	8.8	347	10.5
	Discretionary Milk Based Beverages	0	0	0	0
	Savoury Sauces, Condiments and Spreads	117	26.5	893	27.0
	Iced confectionary and dairy-based desserts	76	17.2	157	4.8
	Other Food[a]	2	0.5	45	1.4
	Total Discretionary (n)	**1176**	**90.0**	**6941**	**81.1**
Five Food Groups	Cereal-based mixed meal	9	2.0	202	6.1
	Meat or alternative based mixed meal	24	5.4	131	4.0
	Other Beverage[d]	0	0	18	0.5
	Vegetable-based mixed meal	34	7.7	130	3.9
	Other Food[c]	61	13.8	609	18.4
	Water	2	0.5	429	13.0
	Juice	0	0	102	3.1
	Total FFG (n)	**130**	**10.0**	**1621**	**18.9**
	Total (n)	**1306**		**8562**	
	Total Unique Combination Meals	**442**		**3304**	

[a]Confectionery, Discretionary snack food (Savoury) – Packaged, Discretionary snack food (Sweet) – Packaged, Other snack food (other), Processed Meats, [b]Alcohol, Energy Drinks, Non-Sugar Sweetened Beverages, Rehydration Beverages (Electrolytes), Water Based Flavoured Beverage – sugar not determined, [c]Breads and Cereals, Dairy and alternatives, Fats/Oils, Fruit, Legumes, Meat and Alternatives, Soup, Vegetables, Vegetables (Other), [d]Body Building and Performance Beverages, Coffee, Milk/Milk Alternatives, Milk/Milk Alternative Based Beverages, Tea

3.3. Nutritional Quality and Marketing Attributes

<u>Research Question (ii):</u> *What is the association between the nutritional quality of menu items and marketing attributes?*

The secondary outcome of this study was to evaluate the associations between nutritional quality and marketing attributes used to promote the menu items. The three marketing attributes investigated on Uber Eats in this study were (i) availability of a photo of the menu items, (ii) value bundle, and (iii) special promotions. Value Bundle has been defined in this study as menu items that either include a meal deal or a family deal. Special promotions is an addition to this study as a marketing attribute as it was not included in the Australian study. Some examples of special promotions observed were: *'Buy 1, get 1 free', 'one free drink', '$0 delivery fee (spend $20)', 'free with $30 purchase',* etc. Popularity (Most Popular/Picked-for-you) of the menu items was also analysed in this study.

3.3.1. Research Question (iia): *What proportion of menu items promoted using marketing strategies are classified as 'Discretionary' or 'FFG'?*

<u>Table 3A</u> shows the proportion of discretionary and FFG menu items within complete menus and each marketing characteristic. Most popular/picked-for-you menu items comprised 6.1% (1571 / 25,877) of complete menus and a majority of the most popular/picked-for-you menu items (83.8%, 1317 / 1571) were significantly discretionary ($p < 0.001$) <u>(Table 3A).</u> Furthermore, a discretionary menu item was more likely (OR: 2.0, 95% CO 1.7-2.2) to be most popular/picked-for-you compared to a FFG menu item. The discretionary cereal-based mixed meal category was the largest category from the most popular/picked-for-you menu items (48.9%, 768 / 1571) <u>(Table 2B).</u> The second-largest category for most popular/picked-for-you menu items was discretionary meat or alternative-based mixed meals (19.7%, 310 / 1571) <u>(Table 2B).</u>

Table 3B shows the proportion of discretionary and FFG menu items for combination meal menu items and each marketing characteristic. Most popular/picked-for-you unique combination meal menu items comprised 11.8% (442 / 3746) of total unique combination meal menu items and a majority of the most popular/picked-for-you menu items were discretionary (90.0%, 1176 / 1306) (Table 3B). The frequency of photos, value bundles and special promotions associated with (i) complete menus ($N = 25,877$) and (ii) the most popular/picked-for-you menu items ($n = 1571$) is shown in Table 4.

Table 3A. Marketing Characteristics & Discretionary or FFG (All Menu Items). The proportion of discretionary categories compared against Five Food Group (FFG) categories for marketing attributes.[1] Excludes combination meals.

Characteristic	Discretionary (%)	Five Food Group (%)	Total	Odds Ratio (95% CI)
Most Popular/Picked-for-you	1317 (83.8)	254 (16.2)	1571	2.0 (1.7-2.2)
Photo	13,591 (76.7)	4132 (23.3)	17,723	1.7 (1.6-1.8)
Value Bundle	363 (92.6)	29 (7.4)	392	4.6 (3.2-6.8)
Special Promotions	265 (74.4)	91 (25.6)	356	1.1 (0.8-1.4)
Total Menu Items	18,955 (73.3)	6922 (26.7)	25,877	

[1]The odds ratio was calculated for discretionary categories compared against FFG categories. The percentages are within each marketing attribute.

Table 3B. Marketing Characteristics & Discretionary or FFG (Combination Meals). The proportion of discretionary categories compared against Five Food Group (FFG) categories for marketing attributes for combination meals.

Characteristic	Discretionary items in Combination Meals (%)	Five Food Group items in Combination Meals (%)	Total (n)	Total Unique Combination Meals
Most Popular/Picked-for-you	1176 (90.0)	130 (10.0)	1306	442
Photo	6371 (73.2)	2334 (26.8)	8705	2786
Value Bundle	4984 (81.9)	1099 (18.1)	6083	2148
Special Promotions	249 (65.7)	130 (34.3)	379	117
Total Menu Items	6941 (81.1)	1621 (18.9)	8562	3746

Within complete menus, 1.5% (392 / 25,877) were a value bundle. A higher proportion of discretionary menu items (1.9%, 363 / 18,955) were offered as a value bundle compared to FFG menu items (0.4%, 29 / 6922) (p < 0.001) (Table 4). A discretionary menu item was 4.6 times more likely (OR: 4.6, 95% CI 3.2-6.8) to include a value bundle (meal deal or family deal) compared to a FFG menu item (Table 3A). Among the most popular/picked-for-you menus, 3.4% (53 / 1571) were a value bundle. There was a significant difference in the number of value bundles within the most popular/picked-for-you menu items compared to regular menu items (p < 0.001). Like complete menus, a higher proportion of discretionary most popular/picked-for-you menu items (3.6%, 47 / 1317) were offered as a value bundle compared to FFG most popular/picked-for-you menu items (2.4%, 6 / 254) (p < 0.001) (Table 4).

Within all unique combination meal menu items, 57.3% (2148 / 3746) were a value bundle (Table 3B). A higher proportion of combination meal menu items which included at least one discretionary food/beverage category (63.4%, 5144 / 8117) were offered as a value bundle compared to combination meal menu items which included at least one FFG food/beverage category (62.8%, 1099 / 1751) (Table 3B). Among the most popular/picked-for-you combination meal menu items, 64.5% (842 / 1306) were offered as a value bundle.

Table 4. Proportion of Marketing Attributes & Food Categories. Prevalence of photos, value bundles and special promotions for all menu items (*N* = 25,877) and most popular/picked-for-you menu items (*n* = 1571) of 354 independent and franchise takeaway outlets, excluding combination meals[1].

Food & Beverage Group	Food & Beverage Category	Marketing Attributes	All Menu Items		Most Popular/Picked-for-you Menu Items	
			n	%	n	%
Food (Discretionary)	Cereal-based mixed meal	Photo	7193	76.4	671	87.4 **
		Value Bundle	105	1.1	3	0.4 *
		Special Promotions	151	1.6	10	1.3
	Meat or alternative based mixed meal	Photo	993	43.0	236	76.1 **
		Value Bundle	69	3.0	37	11.9 **
		Special Promotions	13	0.6	1	0.3
	Savoury Sauces, Condiments and Spreads	Photo	260	38.8	2	50.0
		Value Bundle	0	0	0	0
		Special Promotions	0	0	0	0
	Fried Potato (or similar)	Photo	316	71.0	30	65.2
		Value Bundle	1	0.2	1	2.2 *
		Special Promotions	3	0.7	0	0
	Baked goods/desserts (homemade or similar)	Photo	894	89.3	49	98.0 *
		Value Bundle	181	18.1	6	12.0
		Special Promotions	30	3.0	0	0
	Iced confectionary and dairy-based desserts	Photo	565	91.6	21	87.5
		Value Bundle	2	0.3	0	0
		Special Promotions	2	0.3	0	0
	Vegetable-based mixed meal	Photo	386	50.6	14	31.1 *
		Value Bundle	5	0.7	0	0
		Special Promotions	13	1.7	1	2.2
	Other Food[a]	Photo	331	86.6	5	100.0
		Value Bundle	0	0	0	0
		Special Promotions	1	0.3	0	0
Beverage (Discretionary)	Sugar Sweetened Beverages	Photo	1208	72.2	8	72.7
		Value Bundle	0	0	0	0
		Special Promotions	22	1.3	0	0
	Other Beverage[b]	Photo	843	86.1	10	90.9
		Value Bundle	0	0	0	0
		Special Promotions	8	0.8	0	0

Table 4. *Cont.*

Food & Beverage Group	Food & Beverage Category	Marketing Attributes	All Menu Items		Most Popular/Picked-for-you Menu Items	
	Milk Based Beverages	Photo	602	86.2	43	100.0 *
		Value Bundle	0	0	0	0
		Special Promotions	22	3.2	2	4.7
Total Discretionary		**Photo**	**13,591**	**71.7 #**	**1089**	**82.7**
		Value Bundle	**363**	**1.9 #**	**47**	**3.6**
		Special Promotions	**265**	**1.4**	**14**	**1.1**
Food (FFG)	**Cereal-based mixed meal**	Photo	1618	68.4	82	60.3
		Value Bundle	21	0.9	4	2.9
		Special Promotions	28	1.2	1	0.7
	Vegetable-based mixed meal	Photo	427	48.0	9	42.9
		Value Bundle	0	0	0	0
		Special Promotions	8	0.9	0	0
	Meat or alternative based mixed meal	Photo	422	28.9	50	58.1 **
		Value Bundle	8	0.5	2	2.3 *
		Special Promotions	1	0.1	0	0
	Other Food[c]	Photo	173	32.5	2	22.2
		Value Bundle	0	0	0	0
		Special Promotions	2	0.4	0	0
Beverage (FFG)	**Water**	Photo	329	86.1	0	0
		Value Bundle	0	0	0	0
		Special Promotions	8	2.1	0	0
	Other Beverage[d]	Photo	763	94.1	2	100.0
		Value Bundle	0	0	0	0
		Special Promotions	32	3.9	0	0
	Juice	Photo	400	83.0	0	0
		Value Bundle	0	0	0	0
		Special Promotions	12	2.5	0	0
Total FFG		**Photo**	**4132**	**59.7**	**145**	**57.1**
		Value Bundle	**29**	**0.4**	**6**	**2.4**
		Special Promotions	**91**	**0.5**	**1**	**0.4**
Total		**Photo**	**17,723**	**68.5**	**1234**	**78.5 ****
		Value Bundle	**392**	**1.5**	**53**	**3.4 ****
		Special Promotions	**356**	**1.4**	**15**	**1.0**

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Table 4. *Cont.*

3.3.1.2. Photos

Within complete menus, 68.5% (17,723 / 25,877) of the menu items were accompanied by a photo. A higher proportion of discretionary menu items (71.7%, 13,591 / 18,955) had photos compared to FFG menu items (59.7%, 4132 / 6922) ($p < 0.001$) (Table 4). A discretionary menu item was 1.7 times more likely (OR: 1.7, 95% CI 1.6-1.8) to include a photo as compared to the FFG menu items (Table 3A). Among the most popular/picked-for-you menus, 78.5% (1234 / 1571) were accompanied by a photo. Most popular/picked-for-you menu items were also more likely to have a photo compared to all menu items ($p < 0.001$). A higher proportion of discretionary most popular/picked-for-you menu items (82.7%, 1089 / 1317) had photos compared to FFG most popular/picked-for-you menu items (57.1%, 145 / 254) (Table 4).

Among all combination meal menu items, 74.4% (2786 / 3746) were accompanied by a photo. A slightly higher proportion of combination meal menu items which included at least one FFG food/beverage category (81.8%, 1433 / 1751) had photos compared to combination meal menu items which included at least one discretionary food/beverage category (78.5%, 6371 / 8117). Among the most popular/picked-for-you combination meal menu items, 88.0% (1149 / 1306) were accompanied by a photo.

3.3.1.3. Special Promotions

Within complete menus, 1.4% (356 / 25,877) included special promotions. A higher proportion of discretionary menu items (74.4%, 265 / 356) had special promotions compared to FFG menu items (25.6%, 91 / 356) (Table 4). However, there was no significant difference in the number of special promotions within the discretionary menu items compared to FFG menu items (p = 0.610). Within most popular/picked-for-you menus, 1.0% (15 / 1571) included special promotions. A higher proportion of discretionary most popular/picked-for-you menu items (1.1%, 14 / 1317) had special promotions compared to FFG most popular/picked-for-you menu items (0.4%, 1 / 254) (Table 4). There was no significant difference in the number of special promotions within the most popular/picked-for-you menu items compared to all menu items (p = 0.139).

Among all combination meal menu items, 3.1% (117 / 3746) included special promotions. A higher proportion combination meal menu items which included at least one FFG food/beverage category (7.4%, 130 / 1751) had special promotions compared to combination meal menu items which included at least one discretionary food/beverage category (3.1%, 250 / 8117). Among the most popular/picked-for-you combination meal menu items, (1.5%, 19 / 1306) had special promotions.

3.3.2. Research Question (iib): *What food/beverage categories are commonly promoted using marketing attributes?*

Baked goods/desserts (homemade or similar) made up 46.2% (181 / 392) and discretionary cereal-based mixed meals made up 26.8% (105 / 392) of all value bundles (Table 4). Discretionary meat or alternative-based mixed meals made up the highest proportion (69.8%, 37 / 53) of all value bundles offered within most popular/picked-for-you menu items (Table 4). Furthermore, discretionary cereal-based mixed meals made up 24.3% (1519 / 6243) and fried potato (or similar) made up 23.8% (1485 / 6243) of all value bundles included in combination meals. Additionally, discretionary cereal-based

mixed meals made up the highest proportion (24.6%, 207 / 842) of all value bundles included in the most popular/picked-for-you combination meal menu items.

Discretionary cereal-based mixed meals made up the highest proportion of all menu items (40.6%, 7193 / 17,723) and most popular/picked-for-you menu items (54.4%, 671 / 1234) which consisted of a photo compared to all other food/beverage categories (Table 4). Fried potato (or similar) made up the highest proportion of all combination meal menu items (21.1%, 1646 / 7804) and most popular/picked-for-you combination meal menu items (23.3%, 268 / 1149) which consisted of a photo.

Discretionary cereal-based mixed meals made up the highest proportion of all menu items (42.4%, 151 / 356) and most popular/picked-for-you menu items (66.7%, 10 / 15) which included special promotions (Table 4). On the other hand, fried potato (or similar) made up the highest proportion of all combination meal menu items (22.4%, 85 / 380) which included special promotions. Discretionary cereal-based mixed meals and fried potato (or similar) both made up the highest proportion of most popular/picked-for-you combination meal menu items (21.1% each, 4 / 19) which included special promotions compared to all other food/beverage categories.

3.4. Price

Table 5 shows the median prices (in NZD) of the (i) most popular/picked-for-you and (ii) not most popular/picked-for-you menu items, excluding catering and party packs, value bundles and combination meals. The median price for the most popular/picked-for-you menu items was significantly higher than not most popular/picked-for-you menu items for savoury sauces, condiments and spreads ($p = 0.019$), fried potato (or similar) ($p = 0.000$), baked goods/desserts (homemade or similar) ($p = 0.000$), discretionary vegetable-based mixed meals ($p = 0.001$), iced confectionary and dairy-based desserts ($p = 0.000$), FFG cereal-based mixed meals ($p = 0.000$), FFG vegetable-based mixed meals ($p = 0.000$) and discretionary other beverages ($p = 0.003$). However, the median price of the most popular/picked-for-you menu items for FFG meat or alternative based mixed meals, was

significantly less than the not most popular/picked-for-you menu items (p = 0.004). Additionally, the median price of the most popular/picked-for-you menu items for discretionary cereal-based mixed meals was the same as not most popular/picked-for-you menu items, hence no significant difference was found (p = 0.128).

Figure 5A compares the median price between categories with discretionary and FFG counterparts for not most popular/picked-for-you menu items. The median price for discretionary cereal-based mixed meals ($12.60) was higher than its FFG counterpart ($11.60). However, this price difference between discretionary and FFG cereal-based mixed meals was not significant (p = 0.607). On the other hand, the median price of both discretionary meat or alternative-based mixed meals ($16.00) and discretionary vegetable-based mixed meals ($12.20) was lower than their FFG counterpart ($19.00, p < 0.001 and $14.00, p < 0.001 respectively).

Table 5. Median Price of Food Categories. Median price (in NZD) of most popular/picked-for-you and not most popular/picked-for-you menu items for each food or beverage category. Not most popular/picked-for-you exclude most popular/picked-for-you menu items and include all other menu items. Catering and party packs, value bundles, combination meals and menu items with price unavailable were excluded (*N* = 25,364).

Food or Beverage Group	Food or Beverage Category	Most Popular/Picked-for-you			Not Most Popular/Picked-for-you			P-value
		Median price ($)	Q1	Q3	Median Price ($)	Q1	Q3	
Food (Discretionary)	Cereal-based mixed meal	12.60	10.20	16.00	12.60	8.95	15.90	0.128
	Meat or alternative based mixed meal	15.98	8.20	18.97	16.00	10.00	19.90	0.865
	Savoury Sauces, Condiments and Spreads	5.00	3.13	8.00	1.50	0.50	4.00	0.019 *
	Fried Potato (or similar)	6.99	5.25	9.90	4.99	3.83	7.43	0.000 **
	Baked goods/Desserts (homemade or similar)	9.95	5.75	17.40	5.20	2.20	7.90	0.000 **
	Vegetable-based mixed meal	16.00	13.80	19.50	12.20	8.40	17.00	0.001 *
	Iced confectionary and dairy-based desserts	12.99	6.90	15.24	6.10	4.90	12.99	0.000 **
	Other Food[a]	6.45	6.05	7.23	6.75	4.45	8.10	0.909
Food (FFG)	Cereal-based mixed meal	16.99	13.00	18.50	11.60	9.80	16.99	0.000 **
	Vegetable-based mixed meal	19.00	15.00	18.50	14.00	10.40	18.00	0.000 **
	Meat or alternative based mixed meal	17.95	15.99	21.25	19.00	16.90	21.90	0.004 *
	Other Food[c]	5.90	2.75	7.45	4.00	2.59	8.00	0.639
Beverage (Discretionary)	Sugar Sweetened Beverages	5.65	3.00	6.45	4.60	4.00	5.40	0.103
	Other Beverage[b]	6.35	5.70	6.90	5.40	4.40	5.80	0.003 *
	Discretionary Milk Based Beverages	6.50	4.30	8.00	5.76	5.10	7.25	0.265
Beverage (FFG)	Water	-	-	-	4.15	3.60	5.00	-
	Other Beverage[d]	7.33	5.65	-	5.00	4.50	6.00	0.075
	Juice	-	-	-	4.80	4.10	5.00	-

[a]Confectionery, Discretionary snack food (Savoury) – Packaged, Discretionary snack food (Sweet) Packaged, Other snack food (other), Processed Meats

[b]Alcohol, Energy Drinks, Non-Sugar Sweetened Beverages, Rehydration Beverages (Electrolytes), Water Based Flavoured Beverage – sugar not determined

[c]Breads and Cereals, Dairy and alternatives, Fats/Oils, Fruit, Legumes, Meat and Alternatives, Soup, Vegetables, Vegetables (Other)

[d]Body Building and Performance Beverages, Coffee, Milk/Milk Alternatives, Milk/Milk Alternative Based Beverages, Tea

Q = Quartile. * $p < 0.05$. ** $p < 0.001$
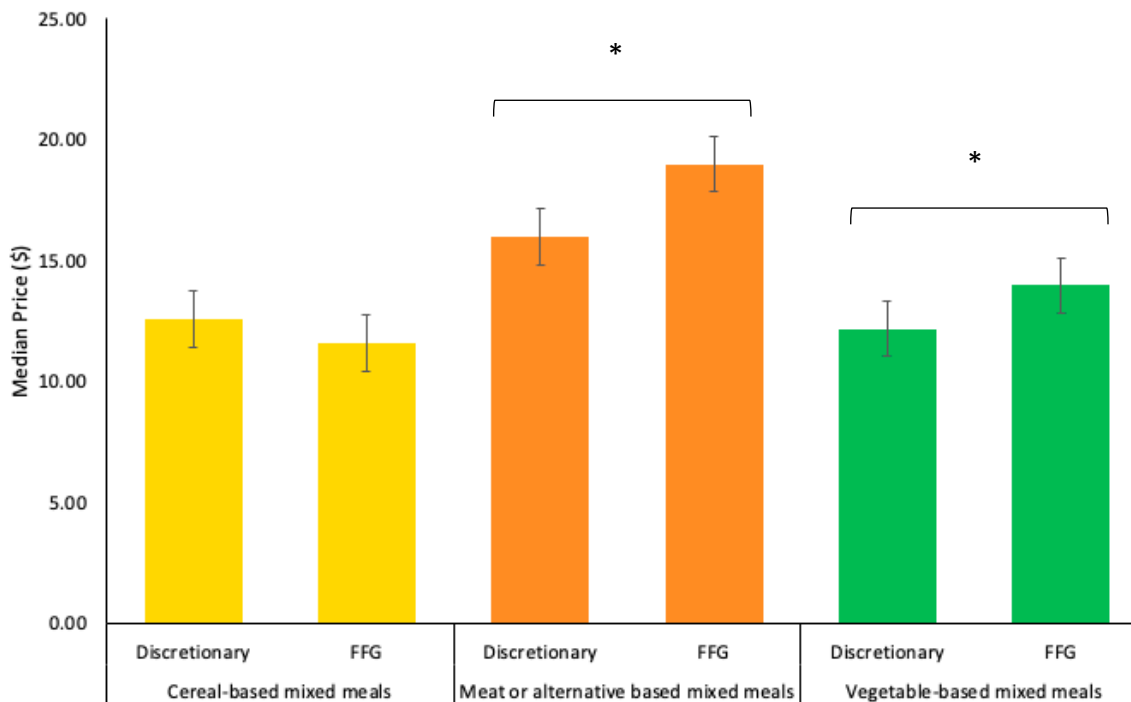
Figure 5A. Price Comparison of Menu Items. Median price (in NZD) of not most popular/picked-for-you discretionary and Five Food Group (FFG) mixed meal menu items excluding catering and party packs, value bundles, combination meals and menu items with price unavailable. Error bars display interquartile interval, * $p < 0.001$.

Figure 5B compares the median price between categories with discretionary and FFG counterparts for not most popular/picked-for-you combination meal menu items. The median price for discretionary cereal-based mixed meals ($14.00), discretionary meat or alternative-based mixed meals ($13.50) and vegetable-based mixed meals ($15.25) which were included as a part of the combination meals were all lower than its FFG counterparts ($18.70, $19.99, $19.50 respectively). Since inferential statistics was not conducted for combination meal menu items, test for significant differences between discretionary and FFG pricing has not been explored.
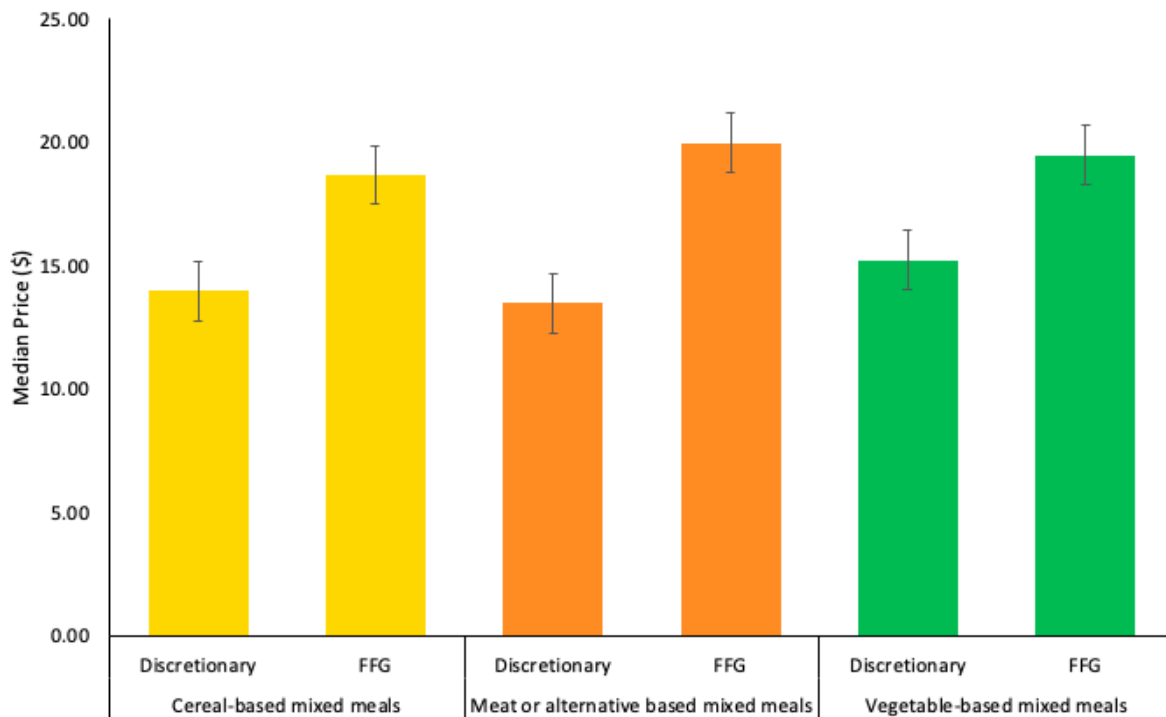
Figure 5B. Price Comparison of Combination Meals. Median price (in NZD) of not most popular/picked-for-you discretionary and Five Food Group (FFG) mixed meal menu items for combination meals excluding catering and party packs and value bundles. Error bars display interquartile interval.

3.5. Nutrition Information and Dietary Labelling

Nutritional information was available for 19.7% (5095 / 25,877) of all menu items and only energy (kJ/kcal) values were provided for most of these menu items. Out of 5095 menu items with nutritional information available, 99% (5061 / 5095) were provided for Subway takeaway outlet menu items which included a link to their website for all nutritional information, including nutrition information panel, ingredients and allergens for all their menu items. Dietary labelling was found for 714 menu items which comprised mostly of gluten-free, vegan and vegetarian labels.

3.6. Summary of the Results: *What are the key findings from this research?*

The findings from this study help answer our two main research questions. As per the results of the data analysis for nutritional quality and marketing attributes, this suggests that Uber Eats predominately consists of unhealthy choices, within both complete menus (73.3%) and most popular menus (83.8%). Furthermore, a majority of the menu items promoted via photos (76.7%), value bundles (92.6%), special promotions (74.4%) or popularity (83.8%) may be classified as discretionary foods. Discretionary cereal-based mixed meals was the largest food category within complete menus (36.4%), as well as most popular menus (48.9%). Results show that two of the three discretionary mixed meal menu items are significantly less expensive than the FFG menu items. Moreover, nutrition information is not available for a majority of the menu items on Uber Eats.

CHAPTER FOUR

Discussion

4.1. Interpretations of the Results: *What do the results tell us?*

Following the results obtained from previous research studies and this current study, Uber Eats may be classified as an unhealthy digital food environment. This research is one arm of the multi-national study and the first to assess the nutritional quality and marketing attributes of menu items of popular independent and franchise takeaway outlets on the leading OFD platform, Uber Eats, in New Zealand. As per the results of this study, the main findings suggest that young adults, who are more likely to use Uber Eats (34), may be exposed to discretionary menu items more than healthy or Five Food Group (FFG) menu items, hence, influencing their purchasing and consumption behaviours. Although purchasing and consumption behaviours of the service users were not directly measured in this study, the findings of this study however indicate that OFD platforms may increase appetite for unhealthy food and beverages as that is what is largely available and exposed to the users.

4.1.1. Research Question (i): *Prevalence of Discretionary Menu Items*

Regarding the primary objective of this study, which was to analyze the nutritional quality of the menu items, one of the important findings of this study is that discretionary food and beverages made up almost three-quarters (73.3%) of all menu items from popular takeaway outlets. Additionally, discretionary menu items were two times more likely to be categorized by Uber Eats as most popular or picked-for-you (83.8%), which means unhealthy food and beverages are more visible to consumers on the website when a food outlet is selected, compared to the healthier menu items. Likewise, 9 out of 10 of the most popular combination meal menu items included discretionary food/beverage items, hence classified as unhealthy.

Since discretionary menu items significantly dominated the sample of menu items in this study, this suggests that in New Zealand, predominantly the young, working population (15-34 years) who are the primary users of OFD platforms (34), are more likely to purchase and hence consume an unhealthy menu item as compared to a healthy menu item from the popular takeaway outlets. Even when the consumers select a combination meal, the meal is highly likely to contain at least one or more of an unhealthy food/beverage item such as discretionary cereal or meat-based mixed meals, sugar-sweetened beverages (SSB), baked items/desserts or other discretionary beverages such as energy drinks. Recently, Wang et al. also analyzed the nutritional quality and marketing attributes of complete menus from 196 unique independent takeaway outlets on Uber Eats in Sydney, Australia (58). Identical to the findings of our study, this study also found that a majority (81%) of the complete menus were discretionary foods and beverages. They also found that discretionary menu items were more likely to be categorized as most popular, hence more visible to the consumers on the website or app. Similarly, another study conducted by Partridge et al. in Sydney and in Auckland also found that almost 9 out of 10 of the popular menu items were discretionary and were more likely to be popularized on Uber Eats (51). Findings of other studies such as Poelman et al. (78) and Jaworowska et al. (16,141), also align with the results of our study, that a large proportion of menu items from takeaway outlets are energy-dense with poor nutritional value, hence unhealthy.

In addition to the similarities between findings of studies conducted on Uber Eats, the results regarding the healthiness of the most popular menu items on OFD platforms also align with the yearly reports provided for other OFD platforms (65,113,156). For example, a 2021 report from the leading OFD app in the UK, 'Grubhub' revealed the most popular orders of the year, which were mostly discretionary. This included cheeseburger, shredded pork taco, pizza, and mac and cheese (113). Food items high in added sugars, sodium and saturated fats such as sides and dips & desserts were also some of the most popular orders of the year. Moreover, the top convenience orders from the app were also discretionary (i.e., candies) and their prediction for popular order for the year 2022 included discretionary items like

pizza, burger, and desserts. Similarly, the report from 'DoorDash', another leading OFD app in the USA, also revealed that their most popular orders for 2019 were mostly discretionary and that food delivery was the preferred way to eat dinner for 66% of the Americans (65). Speaking locally, the 2021 Uber Eats report for Australia and New Zealand shows that savoury sauces, condiments, and spreads was the most requested item in both countries (156). Furthermore, chips were the most popular side and items like ice-cream and chocolate were the most ordered convenience items over the past year when consumers were seeking comfort at home during lockdowns (105,157).

There is a possibility that the COVID-19 pandemic accelerated the use of OFD platforms (107,158,159). Since all food outlets were forced to shut during the initial Alert Level 4 lockdown in New Zealand, including OFD services, consumers craved their favourite fast-foods during those seven weeks (105). Once these restrictions were slightly eased under Level 3, which permitted takeaway outlets and OFD platforms to resume, there was a significant increase in the takeaway sales, including online, hence a predicted increase in consumption of unhealthy food and beverages (160,161). These reports align with the yearly report by Uber which disclosed that their delivery bookings grew 113% in the second quarter of 2020 and revenue increased by 103% in August 2020 as compared to the previous year (109). In addition, Uber also reported seeing a 30% increase in customers signing up for the service in the same year (110). Furthermore, a study conducted in New Zealand during Alert Level 4 lockdown found a shift in dietary patterns towards more discretionary food and beverage items, such as salty and sweet snacks, alcohol, and SSB (105). Another observational study conducted in 38 countries including New Zealand, found that stay-at-home policies and anxiety caused by the pandemic led to the selection of unhealthier food options (112).

Approximately half of the most popular or picked-for-you menu items on Uber Eats in New Zealand were discretionary cereal-based mixed meal dishes such as burgers and pizzas. This finding aligns with the Australian study which reported discretionary cereal-based mixed meals made up more than half of the most popular menu items (58). Another cross-sectional study conducted across three international

cities that reviewed the food outlets on OFD platforms also found that pizzas and burgers were the most common food options to be promoted and marketed on the platform (78). Therefore, since discretionary cereal-based mixed meals are more popular on the OFD platform, menu items containing this food category are also more likely to be visible, hence purchased and consumed by the users. Similarly for combination meals, discretionary cereal-based mixed meals were included in more than half of the most popular or picked-for-you combination meal menu items, however fried potato (or similar) was the most dominant food category and was included in approximately 7 out of 10 of the most popular combination meals. Another key finding from our study is that discretionary menu items are twice as likely to be most popular/picked-for-you. This finding suggests that consumers are more likely to pick a discretionary menu item from the most popular/picked-for-you sections which are more likely to be visible on the top of the food outlet page. Consequently, discretionary menu items are more likely to be frequently purchased and remain under the most popular/picked-for-you category for individual food outlets, creating a viscous cycle (Figure 6), if the Uber Eats algorithm for popularized menu items is based on sales (156).

In addition to the popularity cue offered by the food outlets on Uber Eats, discretionary menu items are being promoted in other ways such as photos, value bundles (combination of food and beverages offered at a discount), and special promotions, making them more noticeable by the users. Therefore, this suggests that Uber Eats in New Zealand is possibly promoting more unhealthier options, making it difficult for the consumers to "find" healthier options provided by the food outlets.
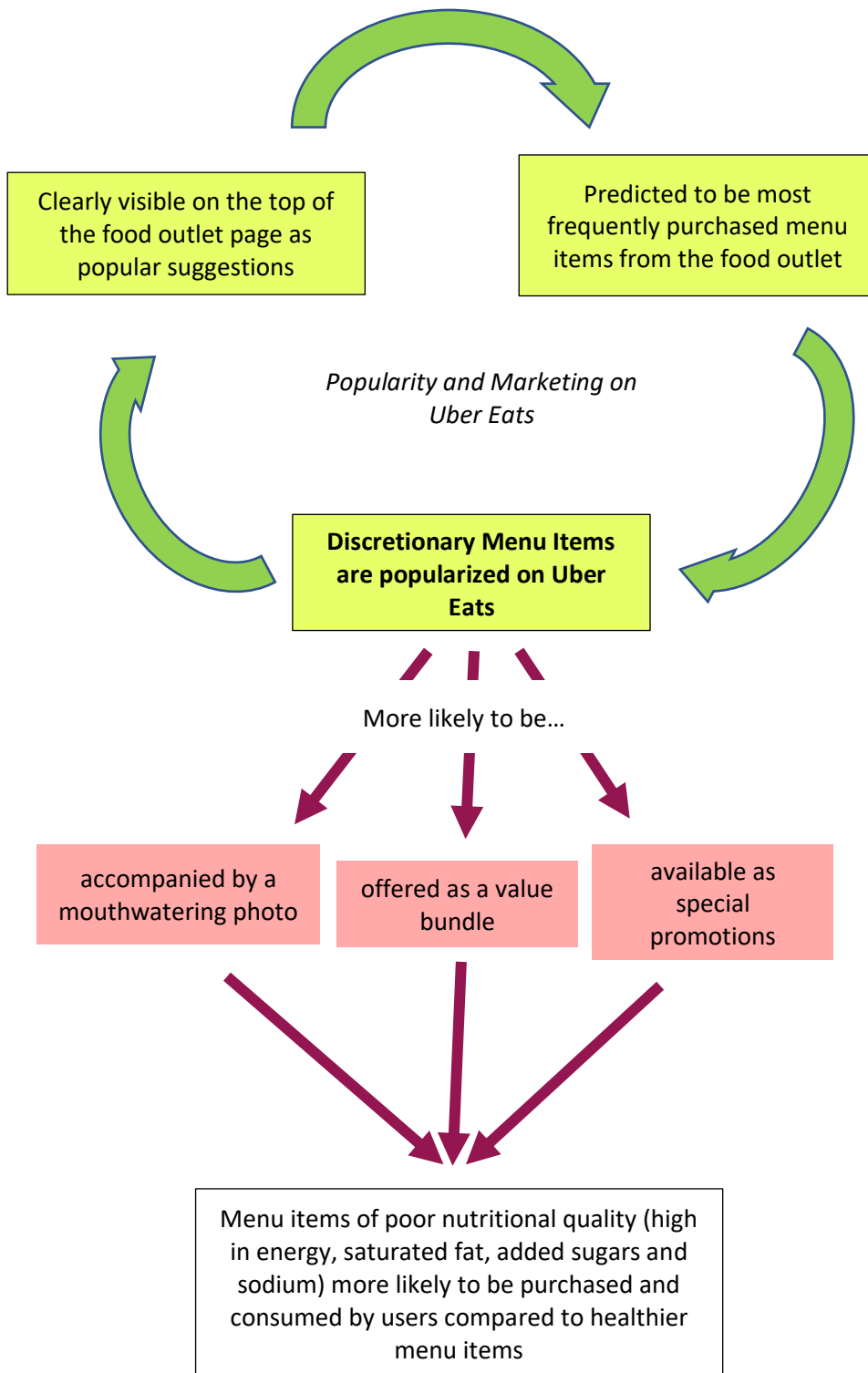
Figure 6. Flow Diagram for the Marketing Influence of Uber Eats. Vicious cycle and flow diagram showing the influence of Uber Eats' marketing attributes on the consumer's choice of menu items in New Zealand

With these results and findings, discretionary food and beverages that are energy-dense and nutrient-poor are more popular and dominant on such OFD platforms. Conversely, Uber Eats' homepage also includes a 'Healthy Eating' section providing options of food outlets that are within the delivery range of the consumer's address (162). However, based on the observations from this study, this option is not one of the top options on the page and requires scrolling down past more convenient food options such as "National brands", "Popular near you" and "Today's offers" which mainly offer discretionary food and beverages. There is not enough information available regarding the algorithm that is used by Uber Eats to categorize food outlets under such sections. However, based on the "Healthy Eating" food outlet suggestions observed during this research, a majority of the photos associated with the food outlets under this category displayed discretionary menu items such as cookies, burgers, fries, etc. Additionally, even though the food outlets were categorized as a "healthy" outlet, there was no sub-category available within the food outlet's menu page to choose healthy menu items from. This indicates that health claims and categories created by Uber Eats may be misleading consumers regarding what is considered "healthy" and "unhealthy". Besides, nutritional labelling is not available for a majority of these food outlets for consumers to be able to make informed decisions regarding the nutritional quality of menu items, with Subway being an exception. This further implies that Uber Eats is a platform where discretionary menu items are more visible and easily available to choose from as compared to the healthier menu items. Additionally, what is more concerning is that discretionary menu items are also highly promoted to consumers via various methods, hence influencing consumers' dietary behaviours, especially of those who have limited nutritional knowledge and are therefore more vulnerable to such promotions (163,164).

Although a majority of the popular food outlets have shown to be offering unhealthy menu items, there were some food outlets that offered customization options for consumers to tailor their meals. For example, Subway is one such food outlet where the consumers get to build their sandwiches, wraps or salad by choosing their breads, fillings, sauces and condiments, sides and drinks (165). Therefore, the

healthiness of the meal created solely depends on the consumers likes and preferences. Additionally, other strategies such as photos of the menu item provided on Uber Eats, as well as offers and promotions are likely to influence the preferences and choices of the consumers as they may prefer making their meal just the way it 'looks' in the photo, save money on delivery or get an additional side for a lesser price.

4.1.2. Research Question (ii): *Marketing of Discretionary Menu Items*

As per Tables 3A and 4, discretionary food and beverages were more likely to be popular, accompanied by a photo, offered as a value bundle, and have special promotions as compared to FFG menu items on Uber Eats. This finding suggests that not only Uber Eats is dominated by discretionary food and beverages, however, these discretionary menu items are also largely subjected to the use of marketing attributes. In other words, unhealthy food and beverages are accompanied by mouth-watering photos and striking deals and offers to satisfy the cravings of the users. This finding also aligns with the Australian study as they also reported that discretionary menu items were more likely to be offered as value bundles and accompanied by an image (58). Additionally, Uber Eats also reported a massive surge in "family meals" with bundles in 2021 for Australia and New Zealand, as more people were spending time at home (156). One of the most significant findings from this study was that discretionary menu items were approximately five times more likely to be offered as a value bundle as compared to an FFG menu item. This finding raises public health concerns as value bundles increase the energy content of the meal without adding any beneficial nutrients (166). Similarly, a 2020 study in Brazil reported that unhealthier foods were advertised more frequently and were marketed more predominately using discounts, free deliveries, and combos, compared to healthier foods (115). Furthermore, another recent Australian study reported that marketing attributes such as price, appealing food images, and value for money food items (i.e., meal deals) significantly influence the dietary preferences of young people (35).

This Australian study also reported that images are strong influencers of dietary choice (35). Popular OFD platforms such as 'Deliveroo' have also reported that appealing photography of the menu items in an online world is a key factor in increasing consumer's appetite and boosting sales (167). Likewise, Uber Eats also recommends their restaurant partners to include photos and offer photography guidelines to get the perfect light, angles, and colour of their menu items. Furthermore, Uber Eats offers professional photoshoots for high quality photos of the restaurants' most popular menu items to boost their appeal (168,169). This shows just how important good quality photos are for OFD platforms in attracting consumers, increasing appetite and influencing food choices. As per the findings of our study, a large proportion of all menu items included photos. Additionally, the most popular menu items had significantly more photos as compared to all menu items. However, our results also showed that a slightly higher proportion of combination meals with at least one FFG menu item had photos compared to combination meals with at least one discretionary menu item. However, because there was an overlap in the analysis of combination meals, there is a possibility that only one of the food/beverage items in the meal was healthier than the other, which is likely to mask the occurrence of unhealthier items.

Based on an observation from this study, some photos also showed food/beverage items that were not mentioned in the name or description of the menu item, such as SSB. Additionally, photos can also mislead consumers regarding "healthy" menu items. For example, photos of menu items making health claims from takeaway outlets that allow consumers to tailor their own meal, show discretionary ingredients such as processed meats, excess amount of sauce, deep-fried ingredients, etc., which can misinform consumers into believing that it is healthy. Even though these menu items could be made healthy, they had to be marked as discretionary based on the photos during the analysis, as photos are likely to have a greater influence on consumers' dietary preferences (115,170).

High calorie or junk foods such as baked goods and desserts, sugary beverages and salty foods have shown to stimulate appetite and promote hunger, especially of young adults who are more likely to be manipulated and get trapped in the marketing and digital world (171,172). A 2017 study in the US also reported that presenting attractive pictures of menu items increases consumers' attitudes, purchasing intentions, and willingness to pay, therefore increasing sales and profit (170). However, in contrast, another study in the US conducted in 2020 found no associations between pictures and consumer purchasing intentions using a simulation of an OFD platform (173). However, the results of this study cannot be generalizable as it was limited to a single menu item (i.e., chicken sandwich) which is not at all representative of the discretionary menu items commonly found on OFD platforms. Despite multiple studies reporting that food and beverages with poor nutritional quality are more likely to have images, further research is required regarding how these images influence consumers' purchasing and dietary behaviours on OFD platforms.

In addition to value bundles and photos, Uber Eats also provides special promotions and offers which is another marketing characteristic analyzed in this study. As per the findings of our study, discretionary menu items were more likely to have special promotions than FFG menu items. This finding was also true for most popular menu items and combination meals. Special promotions are price-based promotions which provide consumers with discounts if they purchased food of up to a certain amount. For example, 'free delivery' if cart total is up to $30 or 'free food item' if purchased food of $20 or more. This is a similar concept used in supermarkets to promote food and beverages with poor nutritional quality to children and young adults using strategies such as shelf placements and in-store promotions (174). More recently, Uber has also introduced another feature for all its' services called 'Uber Pass', a monthly subscription providing discounts and offers. More specifically, this service also provides free delivery on food and groceries (175,176). Since young adults are the largest and more frequent users of Uber Eats (53), they are also highly likely to have subscribed to this service

considering expensive delivery charges on some food delivery. However, this data is not made publicly available.

In addition to the excessive marketing of nutritionally poor foods on OFD platforms, food is also increasingly promoted and marketed on social media platforms such as Instagram and Facebook, which is a part of the digital environment (57,177). In 2018, approximately a third of New Zealand teens reported spending four or more hours online on an average day (178). According to a 2019 research, 3.6 million Kiwis are active social media users with Facebook and Instagram being the top platforms used amongst young adults and the working population (179). Since so many young people are active social media users, they are highly likely to encounter special promotions, offers, and appealing images used by OFD platforms as well as food companies themselves to promote EDNP food and beverages (180). The onset of COVID-19 pandemic has shown to have further escalated the promotion of unhealthy foods and beverages on OFD platforms (115). Similarly, COVID-washing was widely used by unhealthy food and beverage brands on social media platforms during initial lockdowns in New Zealand (57). By showing empathy through emotional and caring messages and phrases, the food brands and companies were promoting unhealthy food and beverages, increasing brand loyalty and encouraging consumption of such products.

Young people are also likely to get inspired by social media influencers who regularly post images and videos of food. This is likely to stimulate hunger, make young adults tempted to use OFD platforms, and purchase new and exciting food and beverages (125-127). Furthermore, since OFD platforms make the consumption of your favourite food and beverages just a click away, this may influence dietary behaviours of the young population and create a habit of consuming foods away from home and disrupt the traditional practices of preparing food from scratch (71). Another observed marketing strategy used by some food outlets in this study was offering free toys for children on selected menu items. This practice is similar to using familiar cartoon characters on TV commercials and front-of-pack product advertising, targeting children mostly to promote food and beverages of poor nutritional quality

(181,182). This also indicates the freedom that food companies have with advertising nutritionally poor food and beverages to the most vulnerable population, without any restrictions in place. Based on the findings of our research and previous studies, as discretionary food items are more likely to include such special promotions (Figure 6), this adds to the public health concern as young adults, who are more likely to be drawn to such offers and promotions, are therefore highly likely to purchase and consume unhealthy food and beverages (115).

4.1.3. Price or Taste?: *What is more important to consumers?*

In addition to the effect of marketing attributes, the price of the menu items was also analyzed in this study to investigate the influence on consumers' purchasing and dietary choice behaviours on OFD platforms. According to previous research, consumers' choice of food outlets on OFD platforms have shown to be influenced by the average price when comparing within the same cuisine (183). Similarly, another study conducted amongst university students reported that although taste was an important factor when ordering food from an OFD platform, price was also a dominant factor which influenced the participants' purchasing behaviours (75). OFD platforms also provide the convenience of comparing prices and offers from different outlets from the same app. Considering that young individuals are the largest users of OFD platforms like Uber Eats, they are more likely to be price-sensitive given the limited budgets of full or part-time students (35). As per the findings of our study, menu items from two of the three discretionary mixed-meal categories were significantly less expensive than their comparable FFG category. Although FFG cereal-based mixed meal was $1 less expensive than the discretionary counterpart, the difference wasn't significant. Likewise, our study also found that combination meals with discretionary items were priced lower than the FFG counterparts. These findings align with the belief that healthy food is more expensive than unhealthy food (184,185). Hence, a majority of the young population choose the cheapest options when eating away from home, that are therefore highly likely to be discretionary (35).

Young people are also more likely to be attracted to combo meals or combination meals that are usually cheaper than purchasing the individual menu items (35). As per the findings of this study, out of every 10 food outlets investigated, approximately 9 included at least one combination meal (i.e., menu consisting of more than one food/beverage item), which includes combo meals (e.g., burger, fries, and drink). As mentioned earlier, combo meals or meal deals increase the energy content of the meals without adding any nutritional benefits, hence, likely to be a public health concern (166). Contrary to the findings of our study, a 2011 study conducted in New Zealand reported that healthier menu items were less expensive than the regular menu items (140). Similarly, the Australian study found that two out of three FFG mixed-meal categories were significantly less expensive than their discretionary counterparts (58). However, this study also reported that despite the significant difference between the prices of healthy and unhealthy mixed meals, it is undetermined whether a difference of $1-$2 would make any difference in purchasing (58). Similarly, in our study discretionary cereal-based mixed meals were on average only $1 more expensive than the FFG counterpart, and no significant difference was found in price between most popular and not most popular menu items under this category. Therefore, it is unknown whether this difference was enough for consumers to choose healthier meals based on the price point of view. Moreover, as taste has also been shown to be an important characteristic in influencing dietary behaviours, there are high chances that the palatability of the food is more important to the consumers, especially when the price differences are not very significant (35). Interestingly, the findings of our study also show that most of the discretionary food/beverage categories that were categorized as most popular/picked-for-you on Uber Eats, were significantly more expensive than the same food/beverage categories not popularized. This further indicates that palatability of the food and beverages sold on OFD platforms appear to be more significant than the price, as popular menu items are likely to be the ones that are regularly sold by food outlets, hence purchased by consumers (Figure 6). However, further investigation is required regarding the associations between price, nutritional quality and purchasing behaviours of menu items on OFD platforms.

The discretionary meat or alternative-based mixed meals category, which was also the second largest category amongst all discretionary menu items and most popular menu items, was less expensive than the FFG counterpart. Similarly, the same pattern followed for vegetable-based mixed meals. However, the meat or alternative-based mixed meals were overall highly-priced than both the cereal and vegetable-based mixed meals. This result is expected as meat tends to be more expensive than vegetables on average (186). Although the prevalence of meat-based meals is higher than the vegetable-based meals on Uber Eats for both discretionary and FFG, we have not investigated the actual consumption of these meals. Therefore, further research is required to investigate whether differences in price between different food categories of opposing nutritional quality on OFD platforms, have any effect on the consumers' choices of menu items, in addition to the effects of other marketing attributes.

4.1.4. Nutritional Labelling

Based on the findings of our study, nutritional information was only provided for 19.7% of all menu items, including both local independent and franchise food outlets. However, 99% of the nutritional labelling was provided for Subway, a franchise food outlet which offers similar menu items across all their unique stores. Unlike other food outlets which provide menu kilojoule labelling on Uber Eats itself, Subway outlets provide a link under each of their menu items, which takes the users to a webpage with nutritional information for all individual menu items and ingredients (187). Although they provide thorough nutritional information, since it is not available on the Uber Eats app itself, there is a possibility that unless consumers have any dietary restrictions, they are unlikely to click on the link to investigate which menu item is lower in calories. Additionally, as discussed earlier, menu items are also highly likely to have photos and promotions which is expected to have a greater influence on consumers regarding purchasing choice, compared to nutritional information, especially for the younger adults (35).

Despite menu labelling being reported as an effective method of allowing consumers to make more informed choices when selecting food prepared away from home (134), not many food outlets have shown to offer nutritional information on OFD platforms. Similar to the findings of our study, the Australian study also reported only 0.2% of all menu items offering menu kilojoule labelling on local independent takeaway outlets on Uber Eats (58). However, only the local independent outlets were investigated in Sydney and franchise outlets were excluded, as franchise outlets in most Australian states have implemented the mandatory menu kilojoule labelling policy. Exclusion of nutritional labelling from a large proportion of menu items from popular takeaway outlets therefore tell us how challenging it is for consumers to choose healthier menu items on Uber Eats.

4.1.5. The Digital Food Environment: *What does this tell us about the healthiness of New Zealand's digital food environment?*

Based on all our findings from this study, we now have better knowledge of the healthiness of the digital food environment created by OFD platforms such as Uber Eats in New Zealand. The key results of this study highlight the significant presence of discretionary menu items on Uber Eats which are largely promoted using marketing attributes, as well as an absence of nutritional labelling and public health interventions, therefore making unhealthy menu items more noticeable than others.

It is important to recall that consumers, especially young adults, seek convenience. Despite the financial barriers of the young population, prior research has shown that convenience is a key driver for consumers to use online services, including OFD platforms (45,61). Additionally, a 2020 report by the National Retail Federation (NRF) also reported that consumers today increasingly prioritize convenience and expect retailers to offer services which save them time and effort. Furthermore, they also reported that convenience is important to 83% of the consumers while shopping and offers a competitive advantage over quality and price (188).

The digital food environment created by OFD platforms is making accessibility to food easier and expanding consumer's reach, beyond the neighbourhood food environment (51). With a large majority of the menu items on Uber Eats being categorized as discretionary, this finding suggests that young people have a greater reach and accessibility to unhealthier food choices, particularly the ones that are lower priced and with multiple promotions and offers. This demonstrates that OFD platforms disrupt the traditional food culture and the neighbourhood food environment, as more people choose to purchase food and get them delivered right at their door, as per their convenience (71). This practice has been further accelerated by the effects of COVID-19 on the food environment as physical distancing rules and gathering limits have limited the ability to dine-in, especially in confined spaces (107). Moreover, in today's context, it is more convenient to get the food delivered than standing in queues outside the takeaway outlets, which also increases the risk of transmitting the virus due to increased physical contact and the risk of being in close proximity of a positive case.

Regardless of whether consumers choose to use OFD services for convenience, lack of time and cooking skills, attracted by marketing and promotions, or due to the fear of COVID-19 and physical contact, OFD platforms have been promoting a sedentary lifestyle behaviour. Furthermore, a sedentary lifestyle and overall reduced physical movement has also become more common due to remote working and 'work-from-home' practices since the onset of the pandemic (43). A 2020 report showed that more than 40% of the employed Kiwis worked from home during Level 4 and Level 3 lockdown (189). There is likely to be a further increase as more and more businesses may be encouraging work-from-home practices over time. Furthermore, considering the younger population, schools and universities globally had to move to online learning since the beginning of the pandemic (190,191). This behaviour has reduced physical movement significantly due to sitting in front of screens for long periods to attend online meetings/classes, further promoting a sedentary lifestyle (192). Therefore, an online world created due to the pandemic, further increasing the popularity of the digital food

environment, is thereby increasing the risk of chronic diseases, such as obesity amongst young consumers.

4.2. Implications: *Why are the results worrisome?*

The results of this study highlight the critical implications of OFD platforms on its users and indicate important considerations for government and public health professionals. The primary concern of this research was the health consequences associated with the digital food environment, specifically for the young population. Secondarily, given the convenience and accessibility OFD platforms provide consumers with, especially during a global pandemic, the popularity of such services is likely to continue to grow in the future.
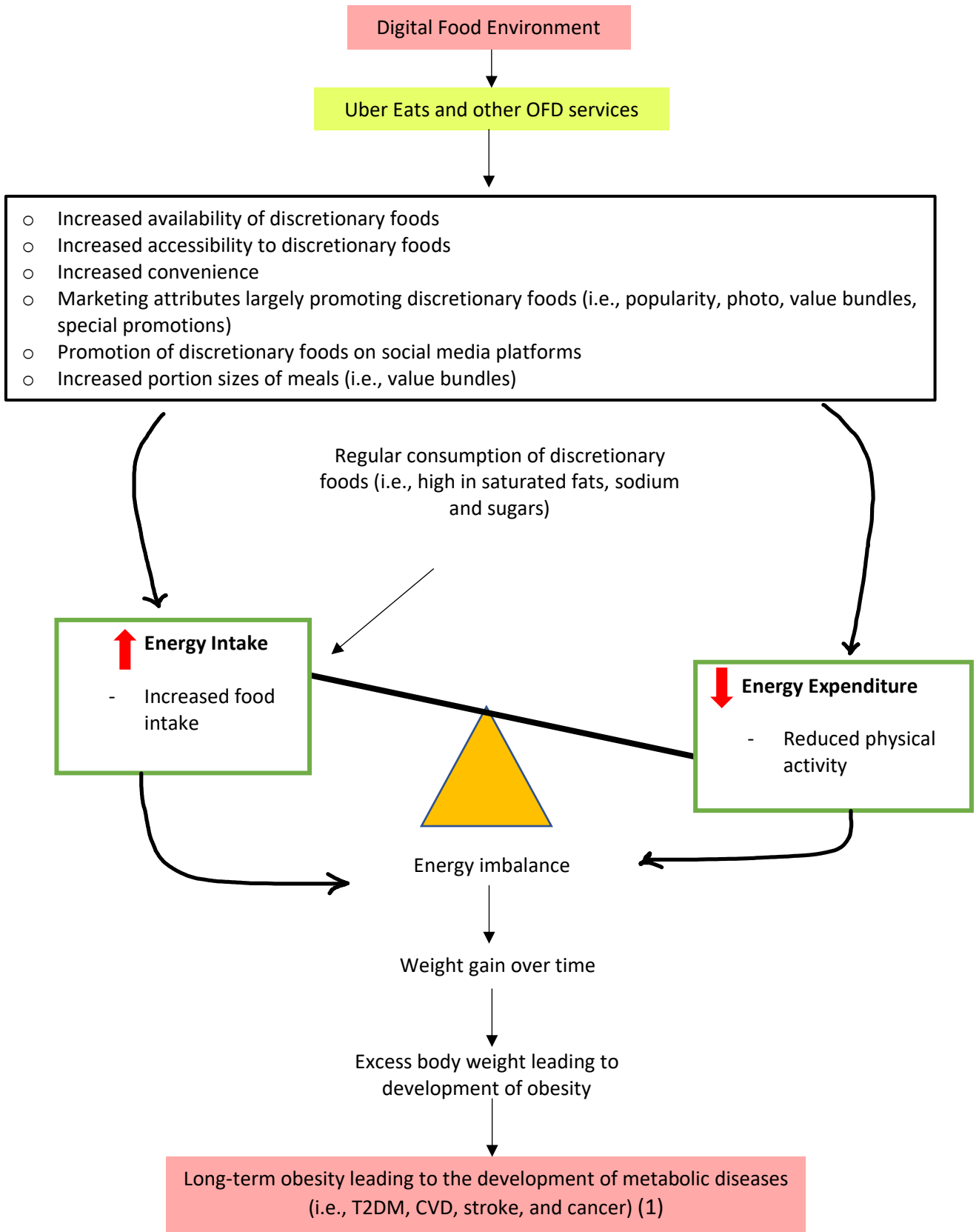
4.2.1. Health Consequences

Public health consequences of the digital food environment is the primary concern of this study. Increasing popularity of the 'western' diet, or a diet high in discretionary foods has been associated with poor health outcomes, such as obesity and related comorbidities (1,25,27,193). Based on the findings of this research, a majority of the young adults in New Zealand are likely to consume a diet high in energy and poor nutritional quality (34). Although we haven't investigated the frequency of consumption of takeaway foods from OFD platforms, increased availability of energy-dense and nutrient-poor foods on Uber Eats still suggests that the digital food environment created by Uber Eats is overall unhealthy, hence playing a key role in the escalating prevalence of obesity and nutrition-related diseases amongst the youth in New Zealand.

Almost half of the most popular menu items on Uber Eats in New Zealand were discretionary cereal-based mixed meals which included menu items such as burgers and pizzas with discretionary ingredients. Cereal foods include menu items made with breads, rice, pasta, noodles, etc. Although these ingredients can be used to make healthy meals, menu items such as pizzas, burgers, pies, sandwiches, etc. with processed meats, excess amount of sauce and cheese, or deep-fried foods such as

spring rolls or samosas (see Appendices: Table A1), increase the energy, saturated fats, sodium and sugar content of the meals, hence making them unhealthy for frequent consumption (11,22,23). Almost 8 out of 10 of the most popular menu items were accompanied by mouth-watering photos which is highly likely to be successful in influencing the food choices of young people (35). Furthermore, discretionary cereal-based mixed meals were the least expensive out of all the mixed meals and highly promoted which was apparent considering the popularity of those meals. Although the large sales of such menu items are a positive outcome for the food outlets available on Uber Eats, it is however a health concern for the consumers of those meals. Since discretionary cereal-based mixed meals was also highly available as value bundles, the other food/beverages included as part of the bundle were also likely to be discretionary, such as SSB, fried potato or savoury sauces, condiments and spreads, further increasing the energy content of the meal with poor nutritional value.

An average Kiwi household has shown to spend 27% of their food budget on takeaways and restaurant meals in 2020 (37). Furthermore, the largest consumers of takeaways in New Zealand are young adults (34). Consistent consumption of such food and beverages outside of home is likely to increase an individual's intake of saturated fats, sodium and sugars (16,22,23). Furthermore, an increased consumption of foods high in poor nutritional quality is therefore believed to create an imbalance in energy intake and energy expenditure, hence contributing to weight gain (1). Over time, consistent consumption of such foods, is likely to develop into severe health consequences such as obesity. Excess body weight is associated with the onset of other obesity-related metabolic conditions such as type-2 diabetes mellitus (T2DM), cardiovascular diseases (CVD), cancers and strokes (Figure 7) (1,4,5). As shown in Figure 7, based on the results of this study as well as previous studies, it appears that Uber Eats and OFD platforms have contributed to the creation of a digital food environment that promote unhealthier food options which is likely to be increased in consumption. Although there are healthier food choices available on such platforms, they are hidden from view as very few menu items have nutritional information provided. While the digital food environment is not the only contributor to

today's escalating prevalence of obesity and nutrition-related diseases, it certainly is a key contributor

as the digital food environment reflects the actual food environment (193,194).

Figure 7. Framework for the Nutritional Influence of Uber Eats. Showing the characteristics of the digital food environment and its health consequences

4.2.2. Predicted Popularity & Growth of OFD Services

Since OFD platforms provide consumers with convenience and increased accessibility and availability to foods, which is one of the main reasons why people use OFD services, the popularity of such services is likely to increase in the future (195). Additionally, since the young population is more tech-friendly and are more likely to engage with new digital platforms, these services are expected to continue to target those groups in the population (35). Hence, over time, energy intake is expected to continue to increase (196) and due to increased convenience, sedentary lifestyle behaviour is also likely to become more and more common amongst the users of OFD platforms.

The lifestyle behaviour changes brought upon recently since the global pandemic has further accelerated this growth in the digital food environment. More and more people globally have been using online services, including OFD platforms to prevent stepping out of the house and contracting the virus (107). In New Zealand, this growth was shown by an increase in demand from the consumers during lockdowns on Uber Eats with a 30% increase in customers signing up for the service who would have possibly not engaged otherwise (109,110). In addition to more consumers joining these services, more food outlets have also become involved to find alternative ways to provide their services to consumers during lockdown. Uber Eats has been providing users with essential services since the beginning of the pandemic. Additionally, they have also been providing employment opportunities to many who have lost their jobs due to the impact of COVID-19. In New Zealand, from mid 2020, Uber announced new options for restaurants to engage with Uber Eats and the fees charged (197). Firstly, they allowed restaurants to choose to use their own staff to deliver orders and only pay less than half the commission to Uber Eats. Secondly, they also introduced the "pick up" option for consumers who wished to save on the delivery charges. These approaches further indicate that OFD platforms are likely to grow in the future as providing an option of saving money is an added benefit for the consumers. Furthermore, the impact of the pandemic is likely to remain for the next few years, which means consumers are likely to be enforced to stick to the digital environment as physical distancing

regulations restrict restaurants and takeaway outlets from opening to full capacity (198). Hence, this indicates that the OFD platforms are probably going to remain as the most popular way of ordering consumers' favourite food options and "eating in" is going to continue to be the new trend.

4.3. Compare and Contrast: *New Zealand vs Sydney, Australia*

As stated earlier, this study is one arm of a multi-national study and a similar study has been conducted in Sydney, Australia (58). Thus, comparisons can be made between Sydney, Australia and New Zealand, predominantly Auckland, regarding research outcomes as the food environment and the proportion of young people is similar across both cities and countries.

Both studies identified that a majority of the menu items on popular takeaway outlets on Uber Eats is discretionary. Discretionary menu items in both studies were also shown to be significantly promoted using images, value bundles and popularity cues. Although a majority of the food outlets in New Zealand showed 'picked-for-you' sections instead of 'most popular', they were presumed to be of the same category with the intention of making those menu items easily noticeable to the consumers. Furthermore, discretionary cereal-based mixed meals were found to be the most common food category on Uber Eats in both studies. The median price was higher for meat or alternative-based mixed meals in both studies, including both discretionary and FFG counterparts. However, the Australian study showed that the FFG cereal-based mixed meals and vegetable-based mixed meals were both significantly lower in price compared to their discretionary counterparts (58). In contrast, this New Zealand study showed that FFG mixed meals were significantly more expensive than the discretionary mixed meals, with no significant difference observed for the cereal-based mixed meals.

Although there were many similarities in both studies regarding the nutritional quality and prevalence of marketing attributes, there were also some differences. Firstly, the Australian study only evaluated the local independent takeaway outlets whereas this study in New Zealand investigated the nutritional

quality and marketing attributes of both independent and franchise takeaway outlets. This addition of franchise outlets increased the number of takeaway outlets investigated in New Zealand by almost twice as much as Sydney. Furthermore, combination meals were also investigated in this study which was not explored in Sydney. Although combination meals were separately analyzed for nutritional quality and marketing attributes for consistency with the results and to enable comparisons with the Australian study, it provided us with a greater understanding of the availability of combination meals on OFD platforms. Additionally, special promotions were also a marketing attribute investigated in this study which was not explored in Sydney. As this marketing attribute provides price-reducing offers and promotions, they are more likely to appeal to the young consumers (115).

Although both studies found that very few menu items display nutritional labelling, there is still a significant disparity in public health policies between both countries. In Australia, due to the increasing burden of disease due to poor diets and increasing BMI, New South Wales, Victoria, Queensland, South Australia, and the Australian Capital Territory have implemented a policy that all fast-food chain outlets must display nutritional (kilojoule) labelling for consumers to be able to make informed choices at point-of-sale (199). Mandatory kilojoule labelling has also shown to be an effective way of encouraging consumers to choose menu items which were lower in energy content (199). Despite discretionary menu items being significantly available and promoted on Uber Eats in New Zealand, with very few food outlets displaying nutritional labelling on the platform, no such regulations or policies have been proposed. This suggests that in terms of education and knowledge regarding food and nutrition, users of Uber Eats and similar OFD platforms in New Zealand, may be disadvantaged compared to the users in Australia.

4.4. Limitations

There are various limitations to this research which should be acknowledged. Most of these limitations have arisen due to the nature and process of the research. However, there were also limitations

associated with the OFD platform of interest (i.e., Uber Eats) as it hasn't been researched enough to understand its intentions.

4.4.1. Research Limitations

Firstly, there are limitations associated with the cross-sectional study design. The nature of a cross-sectional study is for the data to be collected at a single point in time (200). Although it is a useful design to form conclusions, the digital environment is likely to evolve rapidly and frequently which can mean changes in results are highly likely if the same research were to be conducted again. However, as any other study design to conduct this type of research would be very time consuming and labour-intensive, conducting similar research frequently would provide an updated landscape of the digital food environment. This would also indicate whether the digital food environment is getting healthier or unhealthier over time.

Although this research included one food outlet each from Wellington and Christchurch, a majority of the food outlets were established in Auckland. Even though Auckland is the largest city of New Zealand with the largest number of users of Uber Eats (34), our findings cannot be generalizable to understanding the digital food environment of *New Zealand*, as we haven't analyzed food outlets from other cities of the country. It would therefore be interesting to explore whether there are any differences in the Uber Eats service, especially with regards to promotion and marketing of foods across the country.

A further limitation to this research is that we only assessed the 10 most popular food outlets identified in each suburb. However, we do not know the healthiness of the menu items from the remaining food outlets that weren't categorized as 'most popular' by Uber Eats. There is a possibility that Uber Eats has a significant amount of healthy food available, however, it is likely they have been buried under unhealthy foods and outlets. As discussed earlier, there is also a possibility of the website misleading consumers regarding what is considered "healthy", which demonstrates the importance of OFD users to

have some nutritional knowledge to be able to identify healthy food from the overwhelming quantity of unhealthy foods available. Investigating *all* food outlets on Uber Eats therefore would have provided us with a better understanding of the digital food environment created by Uber Eats.

Since this research only examined the market-leading OFD platform in New Zealand, which is Uber Eats, there are however other OFD platforms with widespread usage such as 'Delivereasy' and 'Menulog'. Hence, we may have excluded food outlets exclusive to these OFD platforms. More importantly, 'Delivereasy' has gained popularity since the beginning of the pandemic as it is likely consumers have been supporting local companies (114). Therefore, there may be certain marketing attributes unique to their services which we may have excluded.

Even though the researcher was not logged in to her Uber Eats account during this research to avoid confounding results, this also may have resulted in a limitation. It is highly likely that Uber Eats users get promoted foods and beverages based on their purchasing history and the types of websites visited by the users in background. For example, if a user has purchased a certain type of food, they are likely to see similar food outlets and menu items based on their previous purchases on their homepage, hence likely to influence their dietary choices. Similarly, if a user has purchased healthier food items, they are also likely to see and be promoted similar items in the future. However, further research is required to investigate this association.

Although analysis of nutritional quality and marketing attributes was not affected due to lockdowns, there is still a possibility that food outlets may have introduced changes in their menu items and promotions. All analysis was done between 14 April and 1 December 2021, which also included the period of nationwide Level 4 lockdown between 18 August and 21 September 2021, which is when all OFD platforms came to a halt. Although this period didn't affect analysis of the menus, we did not explore whether there were any changes in the menu items before and after lockdown in terms of nutritional quality, marketing or price. Furthermore, research has shown that COVID-19 lockdowns

have resulted in changes in consumers' dietary preferences and intake (105). However, through this research we have not investigated consumers' purchasing or consumption behaviours. Although we have identified that Uber Eats includes an overwhelming amount of unhealthy food items which are also largely promoted, we are unable to make associations between the availability of menu items with actual purchasing and consumption.

A final limitation to consider is the researcher's personal bias and food knowledge. Although the researcher is a student dietitian with adequate nutritional knowledge, there is still opportunity for biasness in nutritional analysis based on the pre-existing knowledge about certain cuisines more than others. The nutritional analysis was based on the information provided on Uber Eats as much as possible. However, there is a possibility that the pre-existing knowledge about certain foods may have influenced the nutritional analysis of menu items. Furthermore, Google search for the common ingredients and cooking methods for certain menu items, may have led to an over or underestimation of discretionary items than what was described and available on Uber Eats for consumers.

4.4.2. Limitations with Uber Eats

In this research, we assumed that 'most popular' or 'picked-for-you' referred to menu items with the greatest sales compared to all other menu items in each food outlet. However, the algorithm used by Uber Eats to determine this characteristic is not made publicly available. Moreover, there is no prior research done to determine how most popular menu items are chosen. It is possible that food outlets pay Uber Eats to hold the 'most popular' spot on the website as one of the observations from this study was that a majority of the food outlets popularized on Uber Eats are franchise restaurants such as McDonald's and Pizza Hut. It is not surprising for these fast-food giants to pay to appear in the top, most visible spots of the website, compared to local independent takeaway outlets. However, no further information is available to guarantee the existence of this action.

The algorithm used by Uber Eats to categorize food outlets into different categories such as "Healthy Eating" is also unclear. Based on the observation from this study, a majority of the food outlets under this category were not identified as "healthy" based on the photos and categories available. Furthermore, it is also unclear the way Uber Eats uses its user's personal data and usage of other apps and websites in the background to tailor the app by offering them takeaway outlets and foods based on their likes and preferences. Therefore, it is unlikely two different users are going to be shown the exact same food outlets on their Uber Eats account, even if they are in the same geographical location. Finally, during the nutritional analysis process, there were multiple food outlets that were no longer available on Uber Eats, hence, they were excluded from the analysis. However, there is a possibility that they were only temporarily unavailable and would reappear later which could have led to underestimation of the nutritional quality and marketing attribute analysis as all food outlet pages were only visited once for analysis.

4.5. Strengths

A key strength of this research is that this is the first study investigating the complete menus from popular takeaway outlets in New Zealand. To our knowledge, no known studies have been conducted in New Zealand investigating the nutritional quality and marketing attributes of menu items on Uber Eats. Similar study has been conducted recently by Wang et al. in Sydney, Australia, however they did not investigate menus from franchise takeaway outlets (58). Similarly, Partridge et al. (51) and Jaworowska et al. (16,141) have evaluated the nutritional quality of menu items however only from independent takeaway outlets and were only limited to popular menu items. Therefore, this current study in New Zealand provides us with a better understanding of the digital food environment created by the leading OFD platform. The comprehensive classification system of 38 food and beverage categories used for nutritional analysis also enabled deeper understanding of the nutritional quality of menu items available on the digital platform. Additionally, apart from the Australian study, there is no

known study carried out in New Zealand linking the nutritional quality and marketing attributes for food prepared outside of the home and available on the digital food platforms such as Uber Eats.

Another key strength of this study is that it can be replicated anywhere where Uber Eats is a leading OFD platform, or for any other OFD platforms, assuming data is publicly available. As this study is one arm of a multi-national study, allowing comparisons of digital food environments between different countries and cities, this study can therefore also be replicated to evaluate the food environment of many other countries. This can be a useful tool to implement public health policies in countries where health consequences are already severe or to prevent it from reaching to the worst stages.

4.6. Recommendations: *What do we do with all this information?*

The findings of this research suggest the need for practical actions to take place within the evolving digital food environment to lessen its burden on the health of the young population. From the learnings of this research and considering the gaps which remain in our understanding of the associations between digital food environment and nutrition consequences, various recommendations follow regarding public health interventions and research studies for the future to further gain understanding and develop our knowledge in this space.

The primary concern of this research has been the negative health consequences due to the evolving digital food environment. The findings of this research have highlighted the significant concerns regarding the role played by OFD platforms in influencing the dietary choices of today's youth. Consequently, this research indicates a substantial need and involvement of the Government and other public health professionals to implement interventions to reduce the ongoing health effects of the growing digital platforms.

4.6.1. Mandatory Nutritional Labelling Policy: *An Essential Tool*

First and foremost, in addition to the overwhelming amount of unhealthy food available on Uber Eats, in this research we also discovered that nutritional labelling is rarely available for consumers to be able to make informed choices when using the services. As discussed earlier, mandatory kilojoule labelling has been implemented in a majority of the Australian states and should also be considered by the New Zealand government to be implemented not only in the traditional food environment (i.e., the physical food outlets), but also on the digital OFD platforms. Nutritional labelling has also shown to be an effective strategy in informing consumers about the nutritional quality of the food and enabling choosing healthier options at point-of-sale (199,201). Based on the observation from this research, so far only Subway outlet has shown to be providing a thorough nutritional information through their own website (187). Since a majority of the food outlets have also been shown to providing photos, dietary labelling, and information regarding offers and promotions, it should not be difficult for them to also include nutritional labelling as a characteristic. This intervention should be easily implemented for franchise food outlets at least to begin with, as they have standardized meals and consistent menus across all their outlets. Furthermore, they are also likely to have enough resources to be able to get their menu items analyzed for nutritional information as compared to the local independent outlets. Since franchise outlets are also more predominantly available on Uber Eats and are possibly also paying the platform to be popularized, providing nutritional information should not be challenging for them (202).

4.6.2. Applying Pre-Existing Policies to the Digital Food Environment

There are various public health policies which have been implemented in other areas of the food environment which can also be applied to the digital food environment. For example, the Health Star Rating (HSR), a voluntary front-of-pack food labelling policy targeted to packaged food products manufactured and sold in Australia and New Zealand (136), can also be applied to the menu items on OFD platforms. Although labour-intensive, this tool could be provided to the food outlets themselves to be able to create their HSR for menu items as an added advantage to the consumers. Since HSR is a

voluntary policy for food products in New Zealand, it is shown that many of the manufacturers of unhealthy food products opt out of this policy to prevent displaying products with very low star rating (203). Likewise, this policy has also prompted food manufacturers to reformulate their products to increase their star rating (204). If such policy is provided for food outlets on OFD platforms, similar actions can be expected. Additionally, HSR may also help consumers gain more knowledge about the nutritional quality of menu items based on the absence or presence of the star rating, which may encourage selection of healthier menu items. Similar to how Uber Eats offers photography guidelines and photo shoots for restaurants, they should also be able to provide the option of enabling HSR to their menu items as a healthy initiative.

An app-based intervention, called 'FoodSwitch', has been designed to help people make healthier food choices (205). This has been a partnership between the National Institute for Health Innovation (NIHI), George Institute for Global Health and Bupa New Zealand. This app contains a database of a majority of the packaged food products available in Australian and New Zealand supermarkets and provides easy-to-interpret nutritional information by using the app to scan the barcode of the products (205). Upon scanning the barcode, the app provides traffic light-style colour coded ratings for key nutritional characteristics such as total energy, saturated fats, sodium and added sugars. 'Red' suggests the food item is higher than the "healthy" threshold for consumption and regular consumption of that food product may increase the risk of nutrition-related diseases. Healthy range of the nutrients is therefore indicated with a green label. Furthermore, this app also suggests alternative healthier options available in supermarkets compared to the product scanned, hence the name "FoodSwitch". Similar traffic light-style policies may be translated to the OFD platforms to indicate the healthiness of the menu items. Just like how currently more popular menu items or food outlets are being promoted on the platforms, menu items could then be popularized based on the colour of the menu items to encourage healthier consumption and choices. However, since this policy would require the creation of a database and standardized criteria for nutritional quality to be able to categorize them based on colours, a lot of effort

would be required from public health professionals and cooperation would be required from the food outlets.

Considering that the young population are amongst the largest users of the OFD platforms, in addition to these pre-existing policies, other creative interventions could be developed by public health professionals, specifically designed and user-friendly to the young adults. This would require some research for ideas regarding what this intervention could be and how it could show effectiveness in providing nutritional education to the population of interest and enable users to making informed choices on the OFD platforms.

4.6.3. Recommendations for Uber Eats

Based on the observations from this research, most popular food outlets which appeared on the website's homepage were most likely to be franchise fast-food outlets, predominantly selling unhealthy food items. Furthermore, most popular and picked-for-you menu items were shown to be significantly unhealthier however were displayed on the top of the food outlet's page. An intervention could be developed where Uber Eats would be required to make the "healthy" food options more visible to the consumers than the unhealthier ones. This would require cooperation from Uber Eats themselves to shift the digital food environment towards healthier choices. Furthermore, similar interventions could also be developed on Uber Eats to only allow healthier menu items to be offered for special promotions for price-sensitive users. Similarly, policies could be developed to only offer healthier food items as part of value bundles. For example, not including SSB as part of meal deals and providing healthier food items such as fruits, vegetables, wholegrain carbohydrates or water instead of sugary and salty food and beverages. This would again require cooperation from individual food outlets, especially fast-food chains as they would have to recreate their menus which can be labour-intensive.

In addition to the menu kilojoule labelling policy suggested to be included on OFD platforms, an overall energy content of the menu items added in the cart could also be beneficial. A similar

intervention has been implemented by Subway app which displays the overall kilojoule of the menu item selected in cart (206). This could be beneficial for individuals who wish to learn about the calories they are consuming daily or for those who are conscious about what they are consuming. Additionally, OFD platforms could also display individual nutritional content (i.e., saturated fats, sodium, sugars, etc.) with 'red', 'amber' and 'green' colour coding which could help educate consumers regarding healthy range of nutrients. However, this would require a lot of work and effort from health professionals and cooperation from OFD platforms.

Both OFD platforms and social media platforms remain highly unregulated and invisible from advertising and marketing controllers such as the Advertising Standards Authority (ASA) in New Zealand (130). This research indicates that menu items with discretionary food and beverages have been promoted to children which goes against the ASA code for children and young adults if it were to be advertised through other media. This code specifically suggests that food and beverages only meant for occasional consumption (i.e., discretionary), should not be targeted to children and young adults (130). Furthermore, OFD platforms and social media platforms have also shown to be targeting children by offering kids' toys on value bundles which contain discretionary items. This suggests that need of a regulation system monitoring digital platforms since it is getting more popular amongst youth, however, remains highly unregulated.

4.6.4. Recommendations for Future Research

As mentioned earlier, the cross-sectional study design comes with various limitations. However, it is also easy to carry out and efficient in demonstrating associations between certain variables. It would therefore be recommended to carry out a similar study frequently (i.e., at least every 2-4 years) considering how fast the digital environment evolves. Consequently, there is a possibility that in the next few years, there will be new characteristics introduced to OFD platforms which would be worth exploring and linking it to the health of the population. Conducting this research every few years would therefore keep us updated about the landscape of the digital food environment, with the ability to show

trends over time and make comparisons between other cities and countries. Similarly, it would also enable public health professionals to identify gaps in the current system and opportunities to develop new interventions to improve the health of the population of interest. Furthermore, evaluating the nutritional quality and marketing attributes of other OFD platforms is also needed to help deepen our understanding of the digital food environment, as currently, we have only investigated Uber Eats. Although it is a market-leader OFD platform in New Zealand, there may be food outlets or marketing attributes unique to other platforms which were not investigated in this study.

This research was the first to evaluate the nutritional quality of combination meals (i.e., menu items including more than one food or beverage category). Although each food or beverage category was analyzed separately for nutritional quality, due to the complexity of these menu items, we were unable to determine the overall nutritional quality of unique combination meals. Since combination meals are likely to increase the overall energy content of the meals (166), it is recommended for future research to develop a criterion to be able to analyze the overall nutritional quality of combination meals. For example, if more than a certain percentage of the individual food items within the combination meals is discretionary, then the overall meal would be categorized as discretionary. A similar categorizing approach has been incorporated in the "National Healthy Food and Drink Policy" which involves colour coding of food outlets and vending machines based on the percentage of availability of foods categorized into 'red', 'amber', or 'green', indicating the healthiness of the foods (207). A thorough analysis of the combination meals would therefore provide a better understanding of the healthiness of these combination menu items.

From this research, we were able to find out what is predominantly available on Uber Eats and possibly the digital food environment in general. But how do we know whether users of OFD apps are actually *consuming* unhealthy foods? This addresses a gap of this research which was the inability to form associations between the availability of unhealthy menu items with consumer purchasing behaviours. Further research is required in this area with participants willing to share their purchasing data from

OFD platforms, over a period of time. This would then enable us to form definitive conclusions and to investigate whether the users are actually consuming unhealthy food and beverages and what influences their dietary choices and behaviours on OFD platforms.

4.7. Conclusion

In this current digitally-led world, it is no surprise that online food delivery services are growing popularity, with a further acceleration since the start of the global pandemic. These services are providing consumers with convenience, increasing accessibility and availability to their favourite cuisines which is what people crave for in today's busy lifestyle, hence these characteristics are contributing to their growth.

Through the nature of this research, we have investigated what is currently available on the market leading platform in New Zealand, Uber Eats digital food environment. The results indicate that a large proportion of the menu items on Uber Eats are predominantly unhealthy, with higher energy content and poor nutritional quality. Although only one OFD platform has been investigated, the results are expected to be similar across all other popular OFD platforms in New Zealand. Additionally, the results of this study have shown similarities with the other arm of this study conducted in Sydney, Australia as part of the multi-national analysis, with regards to the unhealthiness of the digital food environment. Furthermore, this research also suggests that OFD platforms are promoting unhealthier menu items significantly more than the healthier ones through various marketing attributes. The overwhelming availability and promotion of discretionary menu items on Uber Eats are therefore likely to influence the nutritional quality of the food choices users make. However, we did not examine the consumption nor the sales of the menu items on Uber Eats, therefore, these associations of unhealthiness of the digital food environment with the health consequences remain hypothetical. Hence, further research is strongly advocated as well as the need for menu kilojoule labelling policies or similar public health interventions to enable consumers to use convenience for healthier options.

BIBLIOGRAPHIES

INTRODUCTION

(1) Meal delivery services double usage in only 18 months. Roy Morgan. Available at: https://www.roymorgan.com/findings/8270-food-delivery-services-september-2019-202002030451. Accessed 18 March, 2021.

(2) Yeo VCS, Goh S, Rezaei S. Consumer experiences, attitude and behavioral intention toward online food delivery (OFD) services. Journal of Retailing and Consumer Services 2017;35:150-162.

(3) Allman-Farinelli M, Rahman H, Nour M, Wellard-Cole L, Watson WL. The role of supportive food environments to enable healthier choices when eating meals prepared outside the home: Findings from focus groups of 18 to 30-year-olds. Nutrients 2019;11(9):2217.

(4) Horta PM, de Paula Matos J, Mendes LL. Digital food environment during the coronavirus disease 2019 (COVID-19) pandemic in Brazil: an analysis of food advertising in an online food delivery platform. Br J Nutr 2020:1-6.

(5) Overweight and Obesity. World Health Organization. Available at: https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight. Accessed 7 Feb, 2021.

(6) Jaworowska A, Blackham TM, Long R, Taylor C, Ashton M, Stevenson L, et al. Nutritional composition of takeaway food in the UK. Nutr Food Sci 2014;44:414-430.

(7) Wellard-Cole L, Davies A, Allman-Farinelli M. Contribution of foods prepared away from home to intakes of energy and nutrients of public health concern in adults: A systematic review. Crit Rev Food Sci Nutr 2021:1-12.

(8) Butland B, Jebb S, Kopelman P, McPherson K, Thomas S, Mardell J, et al. Tackling obesities: future choices-project report. : Citeseer; 2007.

(9) Li C, Mirosa M, Bremer P. Review of Online Food Delivery Platforms and their Impacts on Sustainability. Sustainability 2020;12(14):5528.

(10) How the pandemic put food delivery firms in the limelight in 2020. Forbes. Available at: https://www.forbes.com/sites/jonathankeane/2020/12/15/how-the-pandemic-put-food-delivery-firms-in-the-limelight-in-2020/?sh=4207f7cc5eeb. Accessed 26 March, 2021.

(11) Wang C, Korai A, Jia SS, Allman-Farinelli M, Chan V, Roy R, et al. Hunger for Home Delivery: Cross-Sectional Analysis of the Nutritional Quality of Complete Menus on an Online Food Delivery Platform in Australia. Nutrients 2021;13(3):905.

MAIN THESIS TEXT

(1) Overweight and Obesity. Available at: https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight. Accessed 7 Feb, 2021.

(2) Obesity. Available at: https://ourworldindata.org/obesity#childhood-obesity. Accessed 7 Feb, 2021.

(3) Ministry of Health. Annual Update of Key Results 2019/20: New Zealand Health Survey. Obesity Statistics. 2020; Available at: https://www.health.govt.nz/nz-health-statistics/health-statistics-and-data-sets/obesity-statistics. Accessed 11 March, 2021.

(4) The State of the World's Children 2019: Growing well in a challenging world. UNICEF 2019:8-15,49.

(5) Lim S, Vos T, Flaxman A, Danaei G, Shibuya K, Adair-Rohani H, et al. A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010. The Lancet 2012;380(9859):2224-60.

(6) National Research Council. Diet and Health: Implications for Reducing Chronic Disease Risk. 1989.

(7) Saturated Fat. 2021; Available at: https://www.heart.org/en/healthy-living/healthy-eating/eat-smart/fats/saturated-fats. Accessed 20 Feb, 2022.

(8) Sodium. Available at: https://www.heart.org/en/healthy-living/healthy-eating/eat-smart/sodium. Accessed 20 Feb, 2022.

(9) Added Sugars. 2021; Available at: https://www.heart.org/en/healthy-living/healthy-eating/eat-smart/sugar/added-sugars. Accessed 20 Feb, 2022.

(10) Bates S, Reeve B, Trevena H. A narrative review of online food delivery in Australia: challenges and opportunities for public health nutrition policy. Public Health Nutrition 2020 Jun 9,:1-11.

(11) Janssen HG, Davies IG, Richardson LD, Stevenson L. Determinants of takeaway and fast food consumption: a narrative review. Nutrition Research Reviews 2018 Jun;31(1):16-34.

(12) TABATA T. The High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security, Investing in Smallholder Agriculture for Food Security. The Agricultural Marketing Journal of Japan 2015 Dec 31,:24(3):62-63.

(13) Butland B, Jebb S, Kopelman P, McPherson K, Thomas S, Mardell J, et al. Tackling obesities: future choices-project report. : Citeseer; 2007.

(14) Marteau TM, Hollands GJ, Shemilt I, Jebb SA. Downsizing: policy options to reduce portion sizes to help tackle obesity. BMJ 2015;351.

(15) Miura K, Giskes K, Turrell G. Socio-economic differences in takeaway food consumption among adults. Public Health Nutr 2012;15(2):218-226.

(16) Jaworowska A, Blackham TM, Long R, Taylor C, Ashton M, Stevenson L, et al. Nutritional composition of takeaway food in the UK. Nutr Food Sci 2014;44:414-430.

(17) Richardson AS, Boone-Heinonen J, Popkin BM, Gordon-Larsen P. Neighborhood fast food restaurants and fast food consumption: a national study. BMC Public Health 2011;11(1):1-8.

(18) Nago ES, Lachat CK, Dossa RA, Kolsteren PW. Association of out-of-home eating with anthropometric changes: a systematic review of prospective studies. Crit Rev Food Sci Nutr 2014;54(9):1103-1116.

(19) Malik VS, Willett WC, Hu FB. Global obesity: trends, risk factors and policy implications. Nature Reviews Endocrinology 2013;9(1):13-27.

(20) Botonaki A, Mattas K. Revealing the values behind convenience food consumption. Appetite 2010;55(3):629-638.

(21) Nguyen BT, Powell LM. The impact of restaurant consumption among US adults: effects on energy and nutrient intakes. Public Health Nutr 2014;17(11):2445-2452.

(22) Davies IG, Blackham T, Abayomi JC, Long R, Taylor C, Ashton M, et al. Saturated fatty acid content of popular takeaway food in the UK. Proc Nutr Soc 2013;72(OCE4).

(23) Davies IG, Blackham T, Abayomi JC, Taylor C, Ashton M, Long R, et al. Total sugar content of takeaway food in Merseyside, UK. Proc Nutr Soc 2012;71(OCE3).

(24) Gopinath B, Flood VM, Burlutsky G, Louie JC, Baur LA, Mitchell P. Frequency of takeaway food consumption and its association with major food group consumption, anthropometric measures and blood pressure during adolescence. Br J Nutr 2016;115(11):2025-2030.

(25) Donin AS, Nightingale CM, Owen CG, Rudnicka AR, Cook DG, Whincup PH. Takeaway meal consumption and risk markers for coronary heart disease, type 2 diabetes and obesity in children aged 9–10 years: a cross-sectional study. Arch Dis Child 2018;103(5):431-436.

(26) Taher AK, Evans N, Evans CE. The cross-sectional relationships between consumption of takeaway food, eating meals outside the home and diet quality in British adolescents. Public Health Nutr 2019;22(1):63-73.

(27) Smith KJ, McNaughton SA, Gall SL, Blizzard L, Dwyer T, Venn AJ. Takeaway food consumption and its associations with diet quality and abdominal obesity: a cross-sectional study of young adults. International Journal of Behavioral Nutrition and Physical Activity 2009;6(1):1-13.

(28) Wellard-Cole L, Davies A, Allman-Farinelli M. Contribution of foods prepared away from home to intakes of energy and nutrients of public health concern in adults: A systematic review. Crit Rev Food Sci Nutr 2021:1-12.

(29) McCrory MA, Harbaugh AG, Appeadu S, Roberts SB. Fast-food offerings in the United States in 1986, 1991, and 2016 show large increases in food variety, portion size, dietary energy, and selected micronutrients. Journal of the Academy of Nutrition and Dietetics 2019;119(6):923-933.

(30) Stephens J, Miller H, Militello L. Food delivery apps and the negative health impacts for Americans. Frontiers in Nutrition 2020;7:14.

(31) Total sales of takeaway food in New Zealand between 2014 and 2018. Available at: https://www.statista.com/statistics/982670/total-sales-takeaway-food-new-zealand/. Accessed 12 March, 2021.

(32) Two-year growth of fast food in New Zealand in 2016, by type. Available at: https://www.statista.com/statistics/792740/new-zealand-fast-food-growth/. Accessed 12 March, 2021.

(33) Share of children who ate fast food at least once in the past week in New Zealand as of June 2018, by age. Available at: https://www.statista.com/statistics/763739/new-zealand-children-eating-fast-food-past-week-by-age/. Accessed 12 March, 2021.

(34) Smith C, Gray AR, Fleming EA, Parnell WR. Characteristics of fast-food/takeaway-food and restaurant/café-food consumers among New Zealand adults. Public Health Nutr 2014;17(10):2368-2377.

(35) Allman-Farinelli M, Rahman H, Nour M, Wellard-Cole L, Watson WL. The role of supportive food environments to enable healthier choices when eating meals prepared outside the home: Findings from focus groups of 18 to 30-year-olds. Nutrients 2019;11(9):2217.

(36) Kiwis eating more food on the go. . Available at: https://www.stats.govt.nz/news/kiwis-eating-more-food-on-the-go. Accessed 12 March, 2021.

(37) Kiwis growing taste for takeaways and eating out. . Available at: https://www.stats.govt.nz/news/kiwis-growing-taste-for-takeaways-and-eating-out. Accessed 18 March, 2021.

(38) Food price index review: 2020. . Available at: https://www.stats.govt.nz/methods/food-price-index-review-2020. Accessed 18 March, 2021.

(39) Ministry of Health. Annual Update of Key Results 2019/20: New Zealand Health Survey. Meets Vegetable and Fruit Intake Guidelines. Available at: https://minhealthnz.shinyapps.io/nz-health-survey-2019-20-annual-data-explorer/_w_f06a2369/#!/explore-indicators. Accessed 8 September, 2021.

(40) Food and Nutrition Guidelines for Healthy Children and Young People (Aged 2-18 years): A background paper. 2015; Available at: https://www.health.govt.nz/system/files/documents/publications/food-nutrition- guidelines-healthy-children-young-people-background-paper-feb15-v2.pdf. Accessed 8 September, 2021.

(41) Ministry of Health. Annual Update of Key Results 2019/20: New Zealand Health Survey. Physically active (did at least 2.5 hours of activity in the past week, spread out over the week). 2020; Available at: https://minhealthnz.shinyapps.io/nz-health-survey-2019-20-annual-data-explorer/_w_f06a2369/#!/explore-indicators. Accessed 8 September, 2021.

(42) Gerritsen J. New Zealand teens among world's biggest internet users. 2021; Available at: https://www.stuff.co.nz/national/education/300303738/new-zealand-teens-among-worlds-biggest-internet-users. Accessed 8 September, 2021.

(43) Meiring RM, Gusso S, McCullough E, Bradnam L. The effect of the COVID-19 pandemic movement restrictions on self-reported physical activity and health in New Zealand: A cross-sectional survey. International Journal of Environmental Research and Public Health 2021;18(4):1719.

(44) Kapoor AP, Vij M. Technology at the dinner table: Ordering food online through mobile apps. Journal of Retailing and Consumer Services 2018;43:342-351.

(45) Yeo VCS, Goh S, Rezaei S. Consumer experiences, attitude and behavioral intention toward online food delivery (OFD) services. Journal of Retailing and Consumer Services 2017;35:150-162.

(46) Uber Eats. Uber Eats New Zealand. Available at: https://www.ubereats.co.nz. Accessed 6 August, 2020.

(47) Menulog. Available at: https://www.menulog.co.nz. Accessed 23 Feb, 2022.

(48) Deilvereasy. Available at: https://www.delivereasy.co.nz/restaurants. Accessed 8 September, 2021.

(49) Top Food and Drinks App in New Zealand . Available at: https://www.mobileaction.co/top-apps/food-and-drink-56/android/nz. Accessed 8 September, 2021.

(50) Li C, Mirosa M, Bremer P. Review of Online Food Delivery Platforms and their Impacts on Sustainability. Sustainability 2020;12(14):5528.

(51) Partridge SR, Gibson AA, Roy R, Malloy JA, Raeside R, Jia SS, et al. Junk Food on Demand: A Cross-Sectional Analysis of the Nutritional Quality of Popular Online Food Delivery Outlets in Australia and New Zealand. Nutrients 2020;12(10):3107.

(52) Online Food Delivery: New Zealand. Available at: https://www.statista.com/outlook/dmo/eservices/online-food-delivery/new-zealand. Accessed 18 March, 2021.

(53) Meal delivery services double usage in only 18 months . Available at: https://www.roymorgan.com/findings/8270-food-delivery-services-september-2019-202002030451. Accessed 18 March, 2021.

(54) Uber Eats Revenue and Usage Statistics (2021). Available at: https://www.businessofapps.com/data/uber-eats-statistics/. Accessed 18 March, 2021.

(55) Elliott, Farley. UberFRESH Rebrands to UberEATS Just in Time to Expand Like Crazy. 2015; Available at: https://la.eater.com/2015/5/4/8545731/uberfresh-rebrand-ubereats-expansion-deliverywire-uber. Accessed 8 September, 2021.

(56) Carson B. Uber's Secret Gold Mine: How Uber Eats Is Turning Into A Billion-Dollar Business To Rival Grubhub. 2019; Available at: https://www.forbes.com/sites/bizcarson/2019/02/06/ubers-secret-gold-mine-how-uber-eats-is-turning-into-a-billion-dollar-business-to-rival-grubhub/?sh=14cf5231fa9c. Accessed 8 September, 2021.

(57) Gerritsen S, Sing F, Lin K, Martino F, Backholer K, Culpin A, et al. The timing, nature and extent of social media marketing by unhealthy food and drinks brands during the COVID-19 pandemic in New Zealand. Frontiers in Nutrition 2021;8:65.

(58) Wang C, Korai A, Jia SS, Allman-Farinelli M, Chan V, Roy R, et al. Hunger for Home Delivery: Cross-Sectional Analysis of the Nutritional Quality of Complete Menus on an Online Food Delivery Platform in Australia. Nutrients 2021;13(3):905.

(59) Technology fires up the online takeaway industry. . Available at: https://www.scoop.co.nz/stories/BU1710/S00832/technology-fires-up-the-online-takeaway-industry.htm. Accessed 19 March, 2021.

(60) An insatiable App-etite: Online food delivery report. . Available at:
https://www.scoop.co.nz/stories/BU1806/S00511/an-insatiable-app-etite-online-food-delivery-report.htm. Accessed 19 March, 2021.

(61) Kimes SE. The current state of online food ordering in the US restaurant industry. Cornell Hosp. Rep. 2011;11(17):6-18.

(62) Jiang LA, Yang Z, Jun M. Measuring consumer perceptions of online shopping convenience. Journal of Service Management 2013;24(2):191-214.

(63) Childers TL, Carr CL, Peck J, Carson S. Hedonic and utilitarian motivations for online retail shopping behavior. J Retail 2002;77(4):511-535.

(64) Eriksson K, Nilsson D. Determinants of the continued use of self-service technology: The case of Internet banking. Technovation 2007;27(4):159-167.

(65) The Dish: Our End Of Year Trend Report. 2019; Available at:
https://doordash.news/2019/11/14/the-dish-our-end-of-year-trend-report/. Accessed 4 Feb, 2022.

(66) Keeble M, Adams J, Sacks G, Vanderlee L, White CM, Hammond D, et al. Use of online food delivery services to order food prepared away-from-home and associated sociodemographic characteristics: a cross-sectional, multi-country analysis. International Journal of Environmental Research and Public Health 2020;17(14):5190.

(67) Yin Y, Hu J. The analysis of the advantages and disadvantages of the online food delivery phenomenon in universities and the research on the countermeasures—Based on the empirical study of Jiangpu campus of Nanjing university of technology and its surroundings. Pop.Stand 2019;16:46-48.

(68) Li F, Zhang J. Current consumption and problems of online food delivery of university students-A case study on students of Jiujiang college. J.Hubei Univ.Econ.(Humanit.Soc.Sci.) 2018;12:40-42.

(69) Han M, Zhang N, Meng X. Survey on consumption of online delivered food of college students. Co-Oper.Econ.Sci 2017;2:92-93.

(70) Kamenidou IC, Mamalis SA, Pavlidis S, Bara EG. Segmenting the generation Z cohort university students based on sustainable food consumption behavior: A preliminary study. Sustainability 2019;11(3):837.

(71) Maimaiti M, Zhao X, Jia M, Ru Y, Zhu S. How we eat determines what we become: opportunities and challenges brought by food delivery industry in a changing world in China. Eur J Clin Nutr 2018;72(9):1282-1286.

(72) Smith G, Gidlow C, Davey R, Foster C. What is my walking neighbourhood? A pilot study of English adults' definitions of their local walking neighbourhoods. International Journal of Behavioral Nutrition and Physical Activity 2010;7(1):1-8.

(73) Davis FD. A technology acceptance model for empirically testing new end-user information systems: Theory and results (Doctoral dissertation, Massachusetts Institute of Technology). 1985.

(74) Elvandari CDR, Sukartiko AC, Nugrahini AD. Identification of technical requirement for improving quality of local online food delivery service in Yogyakarta. Journal of Industrial and Information Technology in Agriculture 2018;1(2):1-7.

(75) Chandrasekhar N, Gupta S, Nanda N. Food delivery services and customer preference: a comparative analysis. Journal of Foodservice Business Research 2019;22(4):375-386.

(76) Kulviwat S, Bruner II GC, Neelankavil JP. Self-efficacy as an antecedent of cognition and affect in technology acceptance. Journal of Consumer Marketing 2014;31(3):190-199.

(77) Wolfson JA, Bleich SN. Is cooking at home associated with better diet quality or weight-loss intention? Public Health Nutr 2015;18(8):1397-1406.

(78) Poelman MP, Thornton L, Zenk SN. A cross-sectional comparison of meal delivery options in three international cities. Eur J Clin Nutr 2020;74(10):1465-1473.

(79) Sallenave, Janelle. The 2020 Uber Eats Cravings Report. 2020; Available at: https://www.uber.com/en-NZ/newsroom/2020-uber-eats-cravings-report/. Accessed 4 Feb, 2022.

(80) Uber in New Zealand by the numbers: 2018 in Review. Available at: https://www.uber.com/en-NZ/newsroom/nz2018review/. Accessed 19 March, 2021.

(81) Eating and Activity Guidelines for NZ Adults.
. Available at: https://www.health.govt.nz/our-work/eating-and-activity-guidelines. Accessed 19 March, 2021.

(82) Zhou B, Lu Y, Hajifathalian K, Bentham J, Di Cesare M, Danaei G, et al. Worldwide trends in diabetes since 1980: a pooled analysis of 751 population-based studies with 4· 4 million participants. The Lancet 2016;387(10027):1513-1530.

(83) Allman-Farinelli MA, Chey T, Bauman AE, Gill T, James WPT. Age, period and birth cohort effects on prevalence of overweight and obesity in Australian adults from 1990 to 2000. Eur J Clin Nutr 2008;62(7):898-907.

(84) Hayes A, Gearon E, Backholer K, Bauman A, Peeters A. Age-specific changes in BMI and BMI distribution among Australian adults using cross-sectional surveys from 1980 to 2008. Int J Obes 2015;39(8):1209-1216.

(85) Fryar CD, Kruszan-Moran D, Gu Q, Ogden CL. Mean body weight, weight, waist circumference, and body mass index among adults: United States, 1999–2000 through 2015–2016. 2018.

(86) Gould LH, Rosenblum I, Nicholas D, Phan Q, Jones TF. Contributing factors in restaurant-associated foodborne disease outbreaks, FoodNet sites, 2006 and 2007. J Food Prot 2013;76(11):1824-1828.

(87) Cunningham A. Toxic leftovers: Microbes convert flame retardant. Sci News 2006;169(25):389-390.

(88) Varshavsky JR, Morello-Frosch R, Woodruff TJ, Zota AR. Dietary sources of cumulative phthalates exposure among the US general population in NHANES 2005–2014. Environ Int 2018;115:417-429.

(89) García-Arias MT, Pontes EÁ, García-Linares MC, García-Fernandez MC, Sánchez-Muniz FJ. Cooking–freezing–reheating (CFR) of sardine (Sardina pilchardus) fillets. Effect of different cooking and reheating procedures on the proximate and fatty acid compositions. Food Chem 2003;83(3):349-356.

(90) Grubhub Releases Annual "Year In Food" Report Detailing Most Popular Dining Trends Of 2018. 2018; Available at: https://www.prnewswire.com/news-releases/grubhub-releases-annual-year-in-food-report-detailing-most-popular-dining-trends-of-2018-300761123.html. Accessed 4 Feb, 2022.

(91) Paredes A, Persaud E, Shelnutt A. Raising healthy children: the importance of family meals. Plant Physiol. 2014;129:1695-9.

(92) Uber Eats's Competitors, Revenue, Number of Employees, Funding and Acquisitions. Available at: https://archive.is/iP8Ss. Accessed 7 April, 2021.

(93) Annual Comprehensive Analysis of the Internet Catering Takeaway Market in China. 2019; Available at: https://archive.is/VKpJR. Accessed 7 April, 2021.

(94) Ma Y. Current situation and solution of online food delivery in campus—A case study on students of Anhui Economic University. Mod. Bus. Trade Ind. 2019;7:50-51.

(95) Food Delivery People Wish "Reducing Pressure", Hope Establishment of Association. . Available at: https://archive.is/ylOfx. Accessed 7 April, 2021.

(96) How Food Delivery Apps Have Changed the Game for Restaurants. . Available at: https://archive.is/nzjpJ. Accessed 7 April, 2021.

(97) Choudhary N. Strategic Analysis of Cloud Kitchen–A Case Study. Strategic Analysis 2019;9(3):184-190.

(98) Uber Founder Buys More than 100 "Dark Kitchens" across London in New Venture that Allows Takeaway-Only Businesses to Rent Them for £2,500 a Month to Sell Food on Apps Such as Deliveroo. Available at: https://archive.is/jvJfl. Accessed 7 April, 2021.

(99) Belleri C. Deliveroo: improving a service making IT 24 hours. 2020.

(100) Roh M, Park K. Adoption of O2O food delivery services in South Korea: The moderating role of moral obligation in meal preparation. Int J Inf Manage 2019;47:262-273.

(101) Liu C, Chen J. Consuming takeaway food: Convenience, waste and Chinese young people's urban lifestyle. Journal of Consumer Culture 2019.

(102) Meah A, Jackson P. Convenience as care: Culinary antinomies in practice. Environ Plann A 2017;49(9):2065-2081.

(103) Qiu Z, Meng B, Lin Y, Chen S. Research on the status quo of sorting and disposing of food waste from takeout of college students. Mod. Food 2019;5:187-191.

(104) Coronavirus. Available at: https://www.who.int/health-topics/coronavirus#tab=tab_1. Accessed 26 March, 2021.

(105) Gerritsen S, Egli V, Roy R, Haszard J, Backer CD, Teunissen L, et al. Seven weeks of home-cooked meals: changes to New Zealanders' grocery shopping, cooking and eating during the COVID-19 lockdown. J R Soc N Z 2021;51(sup1):S4-S22.

(106) Mackay S, Ni Mhurchu C, Swinburn B, Eyles H, Young L, Gontijo de Castro T. State of the food supply: New Zealand 2019. 2019.

(107) How the pandemic put food delivery firms in the limelight in 2020. . Available at: https://www.forbes.com/sites/jonathankeane/2020/12/15/how-the-pandemic-put-food-delivery-firms-in-the-limelight-in-2020/?sh=4207f7cc5eeb. Accessed 26 March, 2021.

(108) How food delivery apps are responding to the coronavirus. . Available at: https://www.forbes.com/sites/lanabandoim/2020/03/20/how-food-delivery-apps-are-responding-to-the-coronavirus/?sh=5810e2ca55dc. Accessed 26 March, 2021.

(109) Uber announces results for second quarter 2020. Available at: https://investor.uber.com/news-events/news/press-release-details/2020/Uber-Announces-Results-for-Second-Quarter-2020/default.aspx. Accessed 26 March, 2021.

(110) Uber Eats demand soars due to COVID-19 crisis. Available at: ttps://www.forbes.com/sites/marcochiappetta/2020/03/25/uber-eats-demand-soars-due-to-covid-19-crisis/?sh=1947ccf1580c. Accessed 26 March, 2021.

(111) Uber Eats' U.S. sales surged 10% last week thanks to quarantines. . Available at: The Information. Accessed 26 March, 2021.

(112) De Backer C, Teunissen L, Cuykx I, Decorte P, Pabian S, Gerritsen S, et al. An evaluation of the COVID-19 pandemic and perceived social distancing policies in relation to planning, selecting, and preparing healthy meals: an observational study in 38 countries worldwide. Frontiers in Nutrition 2020;7.

(113) Year in Review: Taste of 2021. 2021; Available at: https://blog.grubhub.com/taste-of-2021/. Accessed 4 Feb, 2022.

(114) Foxcroft D. Local food delivery company swamped on the first night of level three. 2020; Available at: https://www.stuff.co.nz/business/prosper/your-stories/121328115/local-food-delivery-company-swamped-on-the-first-night-of-level-three. Accessed September 8, 2021.

(115) Horta PM, de Paula Matos J, Mendes LL. Digital food environment during the coronavirus disease 2019 (COVID-19) pandemic in Brazil: an analysis of food advertising in an online food delivery platform. Br J Nutr 2020:1-6.

(116) Horta PM, Souza, Juliana de Paula Matos, Rocha LL, Mendes LL. Digital food environment of a Brazilian metropolis: food availability and marketing strategies used by delivery apps. Public Health Nutr 2021;24(3):544-548.

(117) Collin J, Ralston R, Hill S, Westerman L. Signalling virtue, promoting harm: unhealthy commodity industries and COVID-19 (2020). . Available at: https://ncdalliance.org/resources/signalling- virtue- promoting- harm. Accessed 29 March, 2021.

(118) Mondalek A. When pandemic marketing goes too far: How to avoid #COVIDwashing. Business of Fashion (2020). . . Accessed 29 March, 2021.

(119) Breugelmans E, Campo K, Gijsbrechts E. Shelf sequence and proximity effects on online grocery choices. Mark Lett 2007;18(1):117-133.

(120) Campbell S, James EL, Stacey FG, Bowman J, Chapman K, Kelly B. A mixed-method examination of food marketing directed towards children in Australian supermarkets. Health Promot Internation 2012;29(2):267-277.

(121) Watch: Foodpanda's Crave Party is Set to Be Its Biggest Food Experience Campaign. . . Accessed 7 April, 2021.

(122) Alibaba's Ele.me Goes on 3 Billion Yuan Summer Spending Spree to Fight Competition. . . Accessed 7 April, 2021.

(123) Gunden N, Morosan C, DeFranco A. Consumers' intentions to use online food delivery systems in the USA. International Journal of Contemporary Hospitality Management 2020;32(3):1325-1345.

(124) Sadeghirad B, Duhaney T, Motaghipisheh S, Campbell N, Johnston BC. Influence of unhealthy food and beverage marketing on children's dietary intake and preference: a systematic review and meta-analysis of randomized trials. Obesity Reviews 2016;17(10):945-959.

(125) Smith R, Kelly B, Yeatman H, Boyland E. Food marketing influences children's attitudes, preferences and consumption: A systematic critical review. Nutrients 2019;11(4):875.

(126) Murphy G, Corcoran C, Tatlow-Golden M, Boyland E, Rooney B. See, like, share, remember: Adolescents' responses to unhealthy-, healthy-and non-food advertising in social media. International Journal of Environmental Research and Public Health 2020;17(7):2181.

(127) Mills S, Tanner LM, Adams J. Systematic literature review of the effects of food and drink advertising on food and drink-related behaviour, attitudes and beliefs in adult populations. Obesity Reviews 2013;14(4):303-314.

(128) Koordeman R, Anschutz DJ, van Baaren RB, Engels RC. Exposure to soda commercials affects sugar-sweetened soda consumption in young women. An observational experimental study. Appetite 2010;54(3):619-622.

(129) Set of Recommendations on the Marketing of Food and Beverages to Children. Available at: https://www.who.int/dietphysicalactivity/publications/recsmarketing/en/. Accessed 29 March, 2021.

(130) ASA – Advertising Standards Authority. Available at: https://www.asa.co.nz.codes/codes/advertising-standards-code/. Accessed 29 March, 2021.

(131) Dietz W, Santos-Burgoa C. Obesity and its implications for COVID-19 mortality. Obesity (Silver Spring) 2020;28(6):1005.

(132) Kassir R. Risk of COVID-19 for patients with obesity. Obesity Reviews 2020;21(6).

(133) Australia and New Zealand Ministerial Forum on Food Regulation (2018), Consultation Paper: Review of Fast Food Menu Labelling Schemes. . Available at: https://foodregulation.gov.au/internet/fr/publishing.nsf/Content/review-fast-food-menu-labelling-schemes. Accessed 6 April, 2021.

(134) Littlewood JA, Lourenço S, Iversen CL, Hansen GL. Menu labelling is effective in reducing energy ordered and consumed: a systematic review and meta-analysis of recent studies. Public Health Nutr 2016;19(12):2106-2121.

(135) Crockett RA, King SE, Marteau TM, Prevost AT, Bignardi G, Roberts NW, et al. Nutritional labelling for healthier food or non-alcoholic drink purchasing and consumption. Cochrane Database of Systematic Reviews 2018(2).

(136) How Health Star Ratings work. 2021; Available at: https://www.mpi.govt.nz/food-safety-home/how-health-star-ratings-work/. Accessed 19 Feb, 2022.

(137) Ni Mhurchu C, Volkova E, Jiang Y, Eyles H, Michie J, Neal B, et al. Effects of interpretive nutrition labels on consumer food purchases: the Starlight randomized controlled trial. Am J Clin Nutr 2017;105(3):695-704.

(138) Dunford EK, Wu JH, Wellard-Cole L, Watson W, Crino M, Petersen K, et al. A comparison of the Health Star Rating system when used for restaurant fast foods and packaged foods. Appetite 2017;117:1-8.

(139) Moodie R, Stuckler D, Monteiro C, Sheron N, Neal B, Thamarangsi T, et al. Profits and pandemics: prevention of harmful effects of tobacco, alcohol, and ultra-processed food and drink industries. The Lancet 2013;381(9867):670-679.

(140) Chand A, Eyles H, Mhurchu CN. Availability and accessibility of healthier options and nutrition information at New Zealand fast food restaurants. Appetite 2012;58(1):227-233.

(141) Jaworowska A, Blackham T, Davies IG, Stevenson L. Nutritional challenges and health implications of takeaway and fast food. Nutr Rev 2013;71(5):310-318.

(142) New Zealand Government. Census Summary: Auckland Region. . Available at: https://www.stats.govt.nz/tools/2018-census-place-summaries/auckland-region. Accessed 30 July, 2021.

(143) The 5 biggest cities in New Zealand and what to do there
. 2017; Available at: https://www.gorentals.co.nz/explore/blog/5-biggest-cities-new-zealand/. Accessed 11 August, 2021.

(144) Ōtautahi Christchurch
. Available at: https://www.christchurchnz.com. Accessed 11 August, 2021.

(145) Wellington City. Available at: https://wellington.govt.nz/wellington-city/about-wellington-city/profile-of-wellington. Accessed 11 August, 2021.

(146) Population of Cities in New Zealand (2021)
. Available at: https://worldpopulationreview.com/countries/cities/new-zealand. Accessed 11 August, 2021.

(147) Sabrina Collier. Top Universities in New Zealand 2020. 2021; Available at: https://www.topuniversities.com/where-to-study/oceania/new-zealand/top-universities-new-zealand-2020. Accessed 11 August, 2021.

(148) Moayyed H, Kelly B, Feng X, Flood V. Evaluation of a 'healthiness' rating system for food outlet types in Australian residential communities. Nutrition & Dietetics 2017;74(1):29-35.

(149) Needham C, Orellana L, Allender S, Sacks G, Blake MR, Strugnell C. Food retail environments in Greater Melbourne 2008–2016: Longitudinal analysis of intra-city variation in density and healthiness of food outlets. International Journal of Environmental Research and Public Health 2020;17(4):1321.

(150) Thornton LE, Kavanagh AM. Association between fast food purchasing and the local food environment. Nutrition & diabetes 2012;2(12):e53.

(151) Franchise Restaurants v/s Independent Restaurants: Which Route To Take. Available at: https://www.posist.com/restaurant-times/resources/franchise-outlet-vs-independent-restaurants-which-is-the-better-route.html. Accessed 17 August, 2021.

(152) Michael Kay. The Definition of a Franchise Restaurant. 2017; Available at:
https://bizfluent.com/list-5950936-benefits-international-franchising.html. Accessed 17 August, 2021.

(153) National Health and Medical Research Council (NHMRC). Australian Dietary Guidelines.
National Health and Medical Research Council 2013.

(154) Wellard-Cole L, Jung J, Kay J, Rangan A, Chapman K, Watson WL, et al. Examining the
Frequency and Contribution of Foods Eaten Away From Home in the Diets of 18-to 30-Year-Old
Australians Using Smartphone Dietary Assessment (MYMeals): Protocol for a Cross-Sectional Study.
JMIR research protocols 2018;7(1):e24.

(155) Goal Cottage Cheese Fresh Paneer. Available at:
https://shop.countdown.co.nz/shop/productdetails?stockcode=726429&name=gopala-cottage-cheese-
fresh-paneer. Accessed 22 Feb, 2022.

(156) The 2021 Uber Eats Cravings Report. 2022; Available at: https://www.uber.com/en-AU/blog/the-
2021-uber-eats-cravings-report/. Accessed 4 Feb, 2022.

(157) Roy R, de Castro TG, Haszard J, Egli V, Te Morenga L, Teunissen L, et al. Who We Seek and
What We Eat? Sources of Food Choice Inspirations and Their Associations with Adult Dietary Patterns
before and during the COVID-19 Lockdown in New Zealand. Nutrients 2021;13(11):3917.

(158) Agarwal S, Huang P, Luo C, Qin Y, Zhan C. Assessment of Online Food Ordering and Delivery
in Singapore During the COVID-19 Pandemic. JAMA network open 2021;4(9):e2126466.

(159) Let Thy Food Be Thy Medicine: Exploring the Impact of Covid-19 Pandemic on the Online Food
Delivery Industry. The International Research & Innovation Forum: Springer; 2021.

(160) Sommerville T, Kerr-Lazenby M. Covid-19: Long queues for fast food as Auckland moves to
alert level 3 . 2021; Available at: https://www.stuff.co.nz/auckland/local-news/126453468/covid19-
long-queues-for-fast-food-as-auckland-moves-to-alert-level-3. Accessed Feb 4, 2022.

(161) Lock H. Customers flocking for fast food takeaways 'out of the ordinary'. 2020; Available at:
https://www.rnz.co.nz/news/business/415353/customers-flocking-for-fast-food-takeaways-out-of-the-
ordinary. Accessed Feb 4, 2022.

(162) Healthy Eating
. Available at:
https://www.ubereats.com/nz/search?carid=eyJwbHVnaW4iOiJyZWNvbW1lbmRhdGlvbkZlZWRQb
HVnaW4iLCJyZWNvbW1leXBlIjoidGFnX2Jhc2VkX2Nhcm91c2VsIiwidGFnIjoiaGVhbHRoeSJ9&
pl=JTdCJTIyYWRkcmVzcyUyMiUzQSUyMkJsb2NraG91c2UlMjBCYXklMjIlMkMlMjJyZWZlcmV
uY2UlMjIlM0ElMjJDaElKcGd0VLZEdEVzBSUUxlaVEySHZBQVUlMjIlMkMlMjJyZWZlcmVu
Y2VUeXBlJTIyJTNBJTIyZ29vZ2xlX3BsYWNlcyUyMiUyQyUyMmxhdGl0dWRlJTIyJTNBLTM2Lj
kyMjcxMTYlMkMlMjJsb25naXR1ZGUlMjIlM0ExNzQuNzAxNTIyMiU3RA%3D%3D. Accessed 18
Feb, 2022.

(163) Freeman B, Kelly B, Vandevijvere S, Baur L. Young adults: beloved by food and drink
marketers and forgotten by public health? Health Promot Internation 2016;31(4):954-961.

(164) Pechmann C, Levine L, Loughlin S, Leslie F. Impulsive and self-conscious: Adolescents'
vulnerability to advertising and promotion. Journal of Public Policy & Marketing 2005;24(2):202-221.

(165) How To Order. Available at: https://www.subway.com/en-
NZ/MenuNutrition/Menu/HowToOrder. Accessed 20 Feb, 2022.

(166) Mackay S, Gontijo de Castro T, Young L, Shaw G, Ni Mhurchu C, Eyles H. Energy, Sodium, Sugar and Saturated Fat Content of New Zealand Fast-Food Products and Meal Combos in 2020. Nutrients 2021;13(11):4010.

(167) Parker S. How does photography impact sales? 2018; Available at: https://foodscene.deliveroo.co.uk/restaurant-profiles/menu-photography-how-does-it-impact-sales.html. Accessed 9 Feb, 2022.

(168) Your food, in the spotlight. Available at: https://merchants.ubereats.com/us/en/menu-photos/https://merchants.ubereats.com/us/en/menu-photos/. Accessed 9 Feb, 2022.

(169) Restaurant menu photography guidelines. Available at: https://merchants.ubereats.com/us/en/restaurant-submitted-photos/. Accessed 9 Feb, 2020.

(170) Hou Y, Yang W, Sun Y. Do pictures help? The effects of pictures and food names on menu evaluations. International Journal of Hospitality Management 2017;60:94-103.

(171) Junk Food Promotes Hunger and Overeating. 2020; Available at: https://wepisces.com/2022/01/junk-food-promotes-hunger-and-overeating/. Accessed 18 Feb, 2022.

(172) Looking At Junk Food Makes You Feel Hungry, Study Confirms. 2012; Available at: https://www.huffpost.com/entry/junk-food-hungry-fattening-appetite-craving_n_1628766. Accessed 18 Feb, 2022.

(173) Gunden N, Morosan C, DeFranco A. Are online food delivery systems persuasive? The impact of pictures and calorie information on consumer behavior. Journal of Hospitality and Tourism Insights 2020.

(174) L Harris J, Webb V, J Sacco S, L Pomeranz J. Marketing to children in supermarkets: An opportunity for public policy to improve children's diets. International journal of environmental research and public health 2020;17(4):1284.

(175) Uber Pass. Available at: https://www.uber.com/nz/en/ride/how-it-works/uber-pass/?%243p=a_custom_354088&_branch_match_id=1017254540600328819&_branch_referrer=H4sI AAAAAAAAAxXKTQuDIBgA4F9Tl7CyTN8GscPYZTAYwWA3eTUt6Usy2d8fe87PdJ4%2BXIpi1 87k6H2%2BuG0uPmP%2FfnynMcA1qVjtO5Q6hnNfZd2wEiCNenF6lm7ooKx0hUoRoIITxpESMJY RQZGVVjWloEOaiLvG1aMbt%2B6tzJG9MISsN6PbN1yyW%2F%2F8lzNuRvqoFhcmc8gQFe2sAs VbQwlta0EYEy2BigsyWFpzrm3DDfwAuB2zcMQAAAA%3D&uclick_id=802c2abb-8176-46a1-8ef4-71a40fb5071d&utm_campaign=Uber%20Pass%20Regional%20CRM&utm_medium=paid%20advertis ing&utm_source=CRM&~campaign=Uber%20Pass%20Regional%20CRM&~tune_publisher_sub1=fb 8b69e1-1937-4479-8267-df1366cf56e8. Accessed 2 Feb, 2022.

(176) Kilpatrich M. Uber Pass offers kiwis savings for $14.99 monthly subscription fee. 2021; Available at: https://www.newshub.co.nz/home/technology/2021/05/uber-pass-offers-kiwis-savings-for-14-99-monthly-subscription-fee.html. Accessed 2 Feb, 2022.

(177) Jia SS, Raeside R, Redfern J, Gibson AA, Singleton A, Partridge SR. #SupportLocal: how online food delivery services leveraged the COVID-19 pandemic to promote food and beverages on Instagram. Public Health Nutr 2021;24(15):4812-4822.

(178) Pacheco, Edgar, Melhuish N. New Zealand teens' digital profile: A factsheet. 2018 February.

(179) NZ Social Media Statistics 2020. 2020; Available at: https://socialmedia.org.nz/nz-social-media-statistics-2018/. Accessed 9 Feb, 2022.

(180) Vassallo AJ, Kelly B, Zhang L, Wang Z, Young S, Freeman B. Junk food marketing on Instagram: content analysis. JMIR public health and surveillance 2018;4(2):e9594.

(181) Elliott C, Truman E. The power of packaging: A scoping review and assessment of child-targeted food packaging. Nutrients 2020;12(4):958.

(182) Castonguay J, Kunkel D, Wright P, Duff C. Healthy characters? An investigation of marketing practices in children's food advertising. Journal of Nutrition Education and Behavior 2013;45(6):571-577.

(183) Schulz E, Bhui R, Love BC, Brier B, Todd MT, Gershman SJ. Structured, uncertainty-driven exploration in real-world consumer choice. Proceedings of the National Academy of Sciences 2019;116(28):13903-13908.

(184) Jo J, Lusk JL. If it's healthy, it's tasty and expensive: Effects of nutritional labels on price and taste expectations. Food Quality and Preference 2018;68:332-341.

(185) Roser M, Ritchie H. Food Prices. 2021; Available at: https://ourworldindata.org/food-prices. Accessed 19 Feb, 2022.

(186) Food Prices in Auckland, New Zealand. Available at: https://www.numbeo.com/food-prices/in/Auckland. Accessed 19 Feb, 2022.

(187) Nutrition Facts. Available at: https://www.subway.com/en-NZ/MenuNutrition/Nutrition. Accessed 19 Feb, 2022.

(188) Inman D. Growing emphasis on convenience for today's consumers. National Retail Federation 2020 January 14,.

(189) Carroll M. Working from home here to stay after 4 in 10 Kiwis did it during Covid lockdown . 2020; Available at: https://www.stuff.co.nz/business/industries/122686786/working-from-home-here-to-stay-after-4-in-10-kiwis-did-it-during-covid-lockdown. Accessed 12 February, 2022.

(190) Hunt T, Witton B, Kenny L. Coronavirus: All New Zealand schools and universities to close. 2020; Available at: https://www.stuff.co.nz/national/health/coronavirus/120484560/coronavirus-close-schools-immediately-teaching-council-pleads. Accessed 12 Feb, 2022.

(191) The COVID-19 pandemic has changed education forever. This is how . 2020; Available at: https://www.weforum.org/agenda/2020/04/coronavirus-education-global-covid19-online-digital-learning/. Accessed 12 Feb, 2022.

(192) Stockwell S, Trott M, Tully M, Shin J, Barnett Y, Butler L, et al. Changes in physical activity and sedentary behaviours from before to during the COVID-19 pandemic lockdown: a systematic review. BMJ Open Sport & Exercise Medicine 2021;7(1):e000960.

(193) Walker BB, Shashank A, Gasevic D, Schuurman N, Poirier P, Teo K, et al. The local food environment and obesity: evidence from three cities. Obesity 2020;28(1):40-45.

(194) Pérez-Ferrer C, Auchincloss AH, de Menezes MC, Kroker-Lobos MF, de Oliveira Cardoso L, Barrientos-Gutierrez T. The food environment in Latin America: a systematic review with a focus on

environments relevant to obesity and related chronic diseases. Public Health Nutr 2019;22(18):3447-3464.

(195) Cummins P. Hot Trends That Will Change the Future of the Food Delivery Industry. 2021; Available at: https://medium.datadriveninvestor.com/hot-trends-that-will-change-the-future-of-the-food-delivery-industry-cb16fd64c71. Accessed 19 Feb, 2022.

(196) Roser M, Ritchie H. Food Supply. Available at: https://ourworldindata.org/food-supply. Accessed 19 Feb, 2022.

(197) Auster J. Delivering more choice for local restaurants – now and into the future. 2020; Available at: https://www.uber.com/en-NZ/newsroom/mpfnz/. Accessed 15 Feb, 2022.

(198) Stephens R. 21 Ways Restaurants Could Change Forever, According to Chefs. 2020; Available at: https://www.foodandwine.com/fwpro/restaurants-after-covid19-coronavirus-chef-predictions. Accessed 19 Feb, 2022.

(199) MENU KILOJOULE LABELLING IN CHAIN FOOD OUTLETS IN AUSTRALIA. 2018; Available at: https://www.opc.org.au/downloads/policy-briefs/menu-kj-labelling-in-chain-food-outlets-in-australia.pdf. Accessed 13 Feb, 2022.

(200) Wang X, Cheng Z. Cross-sectional studies: strengths, weaknesses, and recommendations. Chest 2020;158(1):S65-S71.

(201) Morley B, Scully M, Martin J, Niven P, Dixon H, Wakefield M. What types of nutrition menu labelling lead consumers to select less energy-dense fast food? An experimental study. Appetite 2013;67:8-15.

(202) Kerins C, McHugh S, McSharry J, Reardon CM, Hayes C, Perry IJ, et al. Barriers and facilitators to implementation of menu labelling interventions from a food service industry perspective: a mixed methods systematic review. International Journal of Behavioral Nutrition and Physical Activity 2020;17(1):1-15.

(203) Martin L. Unhealthy products are gaming flawed health star food rating, study finds. 2019; Available at: https://www.theguardian.com/australia-news/2019/may/30/unhealthy-products-are-gaming-flawed-health-star-food-rating-study-finds. Accessed 19 Feb, 2022.

(204) Mhurchu CN, Eyles H, Choi Y. Effects of a voluntary front-of-pack nutrition labelling system on packaged food reformulation: The health star rating system in New Zealand. Nutrients 2017;9(8):918.

(205) FoodSwitch. Available at: https://www.lenscience.auckland.ac.nz/en/about/teaching-and-learning-resources/MyFoodMyFuture/FoodSwitch.html. Accessed 16 Feb, 2022.

(206) Order From Anywhere
. Available at: https://www.subway.com/en-us/menunutrition/nutrition/downloadtheapp. Accessed 20 Feb, 2022.

(207) National Healthy Food and Drink Policy. 2019.

APPENDICES

Table A1. Food Category Classification. Food Categories and their definitions with inclusions and exclusions.

Food Type	Example
Dairy and alternatives	Definition: Dairy and alternatives food group. Includes: Milk within dishes (e.g., milk on cereal), yoghurt, cheese and/or their alternatives.
Breads and Cereals	Definition: grain (cereal) food group, mostly wholegrain and or high cereal fibre varieties. Includes: All breads and cereals (with or without fruit, nuts, and seeds), pasta, noodles, roti, bread rolls, flat breads, oatmeal (porridge), crumpets. Excludes: breakfast cereals categorised as discretionary (> 15g sugar per 100g)
Fruit	Definition: All fresh fruit, diced, canned fruit, stewed and dried. Includes: oranges, mandarins and grapefruit, apricots, cherries, peaches, nectarines, plums, bananas, paw paw, mangoes, pineapple, melons, berries, grapes, passionfruit, apples, pears, watermelon, banana, coconut, and guava Excludes: fruit juice these are coded under beverages.
Vegetables	Definition: vegetables food group – these can be fresh, frozen, and canned vegetables. Includes: Green leafy or raw salad vegetables, sweet corn, potato or starchy vegetables, tomato, celery, sprouts, zucchini, squash, capsicum, eggplant, cucumber, okra, pumpkin, green peas, green beans, potato, cassava, sweet potato, taro, carrots, beetroot, onions, shallots, garlic, bamboo shoots, swede, turnip, broccoli, brussels sprouts, bok choy, cabbages, cauliflower, kale, lettuce, silverbeet, spinach and snow peas. Excludes: legumes
Vegetables (Other)	Definition: All other food items that are consumed like vegetables however botanically not a vegetable Includes: avocados, olives (of any variety), mushrooms, tomatoes, Wakame (seaweed salad), Chilli
Meat and Alternatives	Definition: meat and alternatives food group Includes: Red meats such as beef, lamb, veal, pork, goat, or kangaroo. Poultry such as chicken or turkey. Fish and seafood such as prawns, crab, lobster, mussels, oysters, scallops, clams. Eggs, Tofu, Quorn etc. Excludes: legumes, processed meats
Nuts and Seeds (incl. pastes)	Definition: Any nuts (or not botanically nuts e.g., peanuts that are consumed like nuts) or seeds. These can be non-processed, roasted, peeled, salted, or made into pastes. Includes: Nuts such as almonds, pine nuts, walnut, macadamia, hazelnut, cashew, peanut, brazil nuts. Seeds such as pumpkin seeds, sesame seeds, sunflower seeds Nut/Seed Pastes such as almond/peanut butter or tahini Excludes: Legume based dips
Legumes	Definition: Most legumes Includes: All cooked, baked/roasted, dried or canned beans such as: red kidney beans, soybeans, lima beans, cannellini beans, chickpeas, lentils, split peas Legume based dips e.g., hummus Excludes: Soy based products e.g., tofu that are classified under meat alternatives as sometimes it is difficult to distinguish between real and imitation meat Peanuts as these are consumed more like nuts than legumes
Confectionery	Definition: Sweet discretionary products that are usually higher in sugar and/or fat. Includes: Lollies, chocolate, roll-ups, nougat, fruit leather, sesame snaps, peanut

	brittle, chocolate coated fruit/nuts/seeds, chocolate hazelnut spreads, chocolate sauces
Bars	Definition: Product usually made from grains, whey protein, nuts and/or fruit. These can be packaged, homemade or made outside the home and purchased by the consumer. Includes: Muesli bars, nut bars, protein bars/balls/biscuits/slices
Baked Goods/Desserts (homemade or similar)	Definition: These foods are usually made from flour. These may be made in an oven, microwave or on the benchtop and may have a confectionary style covering e.g., frosting or chocolate. These are usually homemade or made outside the home by a bakery, café or dessert outlet and purchased by the consumer. Includes: cookies, cakes, cake-type desserts, muffins, slices, sweet pies, scones, crumbles, iced buns, pancakes or crepes with/without toppings, waffles, soufflé, croissant, fruit crumbles, pastries Excludes: Bread Examples: Churros, Baklava, Gulab Jamun, Kanafeh, Nutella Pizzas
Discretionary snack food (Savoury) – Packaged	Definition: Packaged savoury snack foods that cannot be classified into other categories that are higher in one or more of the following: salt, sat fat, energy or added sugar. Examples: Potato chips, flavoured crisps and crackers, prawn crackers, popcorn, corn chips, pork crackling, pretzels, grain chips, cheese spread, rice crackers
Discretionary snack food (Sweet) - Packaged	Definition: Packaged sweet snack foods that cannot be classified into other categories that are higher in one or more of the following: salt, sat fat, energy or added sugar Examples: Biscuits with sweet fillings, Wagon Wheels, TimTams, TeeVee Snacks, YanYan, Pocky, Hello Panda etc.
Other snack food (other)	Other snack foods that do not belong to any other category. Includes: Pickles, chewing gum
Iced confectionary and dairy-based desserts	Definition: milk or water-based desserts that are cold and/or frozen. Includes: Ice blocks, slushies, snow cones, jelly, frozen yoghurt, patbingsoo, and icecream, gelato, sundaes, sorbet, rice pudding, fromais frais, mousse, custard Che Bau Mau and similar Vietnamese iced drink desserts, Pannacotta
Processed meats	Definition: Meat that has been cured, salted, smoked, or has had chemicals added to it. Examples: Sausage, bacon, ham, salami, luncheon meats
Cereal-based mixed meal (five food groups)	Definition: Mixed meals where cereal or cereal products are the major ingredients AND discretionary and/or processed meats are not an ingredient which is not clearly visible. Examples: Pasta, pizza, burgers, sandwiches, sushi, wraps, filled rolls, fried rice, fried noodles, ravioli, dumplings, pilaf, burrito, taco, congee (non-plain), steamed buns with fillings, nachos, risotto, gnocchi, fajitas Pasta with tomato sauce, pizzas with core ingredients (no cheese) e.g. Meat Mannoush/ lahmacun, lahmajoun, lahme Biajine (multiple spellings), noodle soups (pho, some chinese noodle soups), Burrito Bowls with moderate amount of sauce Chicken and Vegetable Sandwiches/ wraps with sauce (unless excessive amounts of sauce)
Cereal-based mixed meal (Discretionary)	Definition: Meals where cereal or cereal products are the major ingredients, however, are discretionary themselves i.e., are higher in fat and saturated fat, sodium and sugar or contain visible discretionary products e.g., bacon. Examples: Deep fried foods, take away pizza and burgers with processed meats, sushi with tempura (fried) filling, meat pies, quiche, sausage rolls Pizzas with >5g saturated fat/100snack g discretionary items, burgers with brioche bun/mayo, cream based/ rose sauce pasta, lasagne, Char Kway Teow, Japanese Ramen, other soy-sauce based noodle soups

Cereal-based mixed meal (not further defined)	Definition: Meals where cereal or cereal products are the major ingredients and the proportion of five food group and discretionary cannot be easily discerned.
Meat or alternative based mixed meal (five food groups)	Definition: meals where meat and alternatives are the major constituent AND discretionary and processed meats are not an ingredient which is clearly visible. Examples: Omelette, frittata, scrambled eggs, curry, stew, casserole, meatloaf, meat balls, rissoles, patties, crustless pies Shish Kebab/ Souvlaki (using cubes of meat) Meat + rice dishes (if not obvious what the serving is) Stirfry (if not obvious amount of sauce)
Meat or alternative based mixed meal (Discretionary)	Definition: Meat or meat-based products are the major ingredients, however, are discretionary themselves i.e., are higher in fat and saturated fat, sodium and sugar or contain visible discretionary products e.g., bacon. Examples: battered or crumbed fish and seafood, schnitzel, untrimmed meats (e.g., chicken wings) Kebabs (Minced - kofta, kafta, seekh kebabs, adana (minced lamb) /Shaved Meat - Shawarma) Coconut based sauce/soup/curry, Satay sauce, Paneer Curries (containing creamy base e.g., using buttermilk or ghee), Other cream-based curries, laksa, Seafood salad with sauce Bifteki (Greek Rissoles)
Meat or alternative based mixed meal (not further defined)	Definition: Meat or meat-based products are the major ingredients and the proportion of five food group and discretionary cannot be easily discerned.
Fats/Oils	Definition: any fat-based spreads and/or oil Examples: Olive oil, canola, coconut oil, vegetable oil, sesame oil, butter, or margarine
Fried Potato (or similar)	Definition: any fried or oil cooked potato products including sweet potato Examples: hot chips (of any thickness, cut, size e.g., French fries, wedges, thick cut), hash browns, potato gems (or tatter tots).
Vegetable-based mixed meal (five food groups)	Definition: A meal in which vegetables are the major ingredients AND discretionary and processed meats are not an ingredient which is clearly visible. Examples: salads with modest number of dressings, vegetable-based curries, stews, or casseroles, vegetable patties, stir fries with or without meat/alternatives, dhal
Vegetable-based mixed meals (Discretionary)	Definition: A meal in which vegetables are the major ingredient, however, are discretionary themselves i.e., are higher in fat and saturated fat, sodium and sugar or contain visible discretionary products e.g., bacon Examples: Tempura vegetables, deep fried vegetable patties or croquettes, Caesar salad, falafel, creamy potato bakes, coleslaw
Vegetable-based mixed meal (not further defined)	Definition: A meal in which vegetables are the major ingredients and the proportion of five food group and discretionary cannot be easily discerned.
Soups	Definition: All broths, blended and chunky soups based from meat, fish, poultry or vegetables, containing a variety of ingredients. Excludes noodle soups (e.g., ramen, pho)
Special dietary foods	Definition: All other special dietary foods Includes: Oral nutritional supplements (non-beverages only) e.g., puddings, jellies Excludes: Protein Bars and Supplemental Vitamins (e.g., multivitamins, chewable Vitamin C and Fish oil)
Prescription Medication and related	Definition: All prescription medication and tablets (e.g., multivitamins)
Sugar and Related Products	Definition: any form of sweetener which can be added to foods. Examples: honey, sugar (caster, cane, white, raw, powdered, etc.) syrups, nutritive and non-nutritive artificial sweeteners, jam
Savoury Sauces,	Definition: any savoury sauce, condiment, and non-fat spread

Condiments and Spreads	Examples: tomato sauce, chutney, salad dressings, mayonnaise, vinegar, (non-legume) dips and yeast spreads
	Defined as Discretionary by ABS, however if choice of additional sauce, assume to be core.
Undetermined	Coder is not 100% certain of the food item/product.

Table A2. Beverage Category Classification. Beverage Categories and their definitions with inclusions and exclusions.

Beverage type	Example
Tea	Includes: All tea types (black, white, green, fruit tea) with minimal or no milk/sugar/honey at any temperature (hot/iced/warm) Excludes: Chain milk tea varieties e.g., pearl milk tea as these are high in sugar due to syrup used and will be considered a discretionary milk-based beverage or sugar sweetened beverages if it is a tea-based beverage Reasoning: No desegregation based on temperature as a hot beverage may become cool over time and still consumed Cannot distinguish if sweeteners were added to the beverage Some beverage holders (e.g., mugs) are not transparent and you cannot determine what type of tea was consumed AND if any milk was added to the tea. Matcha/ Iced Matcha
Coffee	Includes: All coffee types with minimal or no milk/sugar at any temperature (hot/iced/warm) Excludes: coffee flavoured milk Reasoning: No desegregation based on temperature as a hot beverage may become cool over time and still consumed. Cannot distinguish if sweeteners were added to the beverage. Some beverage holders (e.g., mugs) are not transparent and you cannot determine what type of tea was consumed AND if any milk was added to the tea Macchiato, short black, Espresso, Greek Frappe
Water	Includes: All water types (sparkling, mineral, still, tap, filtered) and may contain added ingredients (e.g., lemon wedge, mint, dash of apple cider vinegar) that do not significantly alter the nutritional composition Excludes: Tonic Water Reasoning: Unflavoured water has minimal energy and nutritional value when compared the flavoured varieties Example: Acqua panna (Mineral Water)
Juice	Includes: All fruit and vegetable juices – may be fresh, store purchased, cartooned with added or no added sugars. Includes coconut water (or juice) Excludes: Juices with any additional components e.g., milk Reasoning: Fruits and vegetables are often blended It is difficult to distinguish between fruit and vegetable juice once juiced Difficult to distinguish if any sugars have been added to juices
Energy Drinks	Includes: All beverages containing caffeine, guarana, or any other similar stimulant compound Examples: Mother, V, Rockstar, or Red Bull Excludes: Coffee/Tea
Sugar Sweetened Beverages	Includes: All beverages containing added sugars and/or nutritive sweeteners. Examples: Soft drinks, cordial, or non-dairy chain tea varieties. Iced Tea, Chinotto (Italian soft drink), Milkis (Korean Milk soft drink), Cascade (mixer), Aloe Vera (But if name has Juice, put in Juice), Cidona (Irish Softdrink), Mineral Water with added sugar, Lucozade (Japanese softdrink), Uludag (Turkish soft drink)
Non-Sugar Sweetened Beverages	Includes: All beverages without added sugars and/or nutritive sweeteners Examples: diet soft drinks, zero sugar beverages, Nexba, Kombucha
Water Based Flavoured Beverage – sugar not determined	Includes: Any beverage whose sugar level is not determined Examples: Decanted soft drinks (coder cannot determine if it is the diet or non-diet version)

Milk/Milk Alternatives	Includes: All animal milk of all fat levels, rice milk, almond milk, macadamia milk, soy milk, drinkable yoghurts, Ayran Excludes: any milk-based beverages, yoghurt-based bubble tea (e.g., yomie's yoghurt and rice drink) Reasoning: Difficult to distinguish between different types of milk based on images NOTE – dairy/alternatives in foods section only refers to dairy products that are "ingredients" e.g., milk on cereal. This category refers to dairy that is consumed like a beverage
Milk/Milk Alternative Based Beverages	Includes: flavoured milk or milk/milk alternatives with additional core food items Examples: Fruit smoothies, oak chocolate flavoured milk, iced coffee (without icecream or syrups), hot chocolate, milo, up and go, acai smoothie, piccolo latte, dirty chai, turmeric latte, cappuccino, latte, flat white Excludes: plain milk/milk alternatives Reasoning: Difficult to distinguish between flavoured milk and finely blended fruit smoothies and/or milo Not classified as discretionary as flavoured milk are considered core foods in AGHE
Discretionary Milk Based Beverages	Includes: milk/milk alternatives with additional discretionary items Examples: Milk based drinks made with ice-cream, syrups, and any other sweeteners e.g., chocolate milk shake with ice-cream/whipped cream or syrup, commercial milk teas with toppings (e.g., pearls) Excludes: plain milk/milk alternatives or milk/milk-based beverages Frappe, Chai Latte, Mocha, flavoured lattes (Taro, Matcha)
Alcohol	Includes: all forms of alcohol Examples: Wine, whisky, beer, soju, cocktails etc.
Body Building and Performance Beverages	Includes: All sports-based beverages – these are usually protein and/or amino acid based and consumed around (before/during/after) situations where the participant undertakes physical activity Examples: protein shakes (made in water or milk) or branched chain amino acids (BCAAs) Excludes: All electrolyte drinks because these can be consumed for purposes other than physical activity
Rehydration Beverages (Electrolytes)	Includes: all electrolyte-based drinks aimed to improve the hydration status of the consumer Examples: Gatorade, Powerade, Gastrolyte, HYDRAlyte, Pedialyte and Repalyte
Undetermined	Coder is not 100% certain of the food item/product Bottles, Can without description, Kid's drink
Supplements	Includes: All other oral supplements Examples: Fibre supplements or meal replacement beverages or carbohydrate gels for endurance runners Excludes: Sports beverages and rehydration beverages, meal replacement non-beverage items e.g., bars Reasoning: Meal replacement beverages have a different nutritional composition when compared to sports protein drinks

Table A3. Inclusion of Food & Beverage Categories in Analysis. 38 Food and Beverage Categories included in the Nutritional Analysis and Marketing Attribute Analysis

Food Category
Cereal-based mixed meal (Discretionary)
Meat or alternative based mixed meal (Discretionary)
Savoury Sauces, Condiments and Spreads
Fried potato (or similar)
Baked Goods/Desserts (homemade or similar)
Vegetable-based mixed meal (Discretionary)
Iced confectionary and dairy-based desserts
Confectionery
Discretionary Snack Food (Savoury) – Packaged
Discretionary Snack Food (Sweet) – Packaged
Other snack food (other)
Processed Meats
Cereal-based mixed meal (FFG)
Vegetable-based mixed meal (FFG)
Meat or alternative based mixed meal (FFG)
Breads and Cereals
Dairy and Alternatives
Fats/Oil
Fruit
Legumes
Meat and Alternatives
Soup
Vegetables
Vegetables (Other)
Beverage Category
Sugar Sweetened Beverages
Alcohol
Energy Drinks
Non-Sugar Sweetened Beverages
Rehydration Beverages (Electrolytes)
Water-Based Flavoured Beverage – Sugar Not Determined
Discretionary Milk Based Beverages
Water
Juice
Body Building and Performance Beverages
Coffee
Milk/Milk Alternatives
Milk/Milk Alternative Based Beverages
Tea