THE INTERSECTION OF TECH & NUTRITION:
A Cross-Sectional Analysis of Uber Eats
Auckland, New Zealand

Jessica A Malloy
Faculty of Medical & Health Sciences
Department of Nutrition & Dietetics
University of Auckland

A thesis submitted for the degree of
Master of Health Science in Nutrition & Dietetics
February, 2021

ABSTRACT

Background - The 'digital food environment' is quickly emerging and altering traditional food availability and consumption. Research into the digital food environment, including online food delivery (OFD) and digital food marketing and promotion, is limited due to its rapid evolution and proliferation. To date, little is known of its influence on dietary quality and nutrition status. This cross-sectional analysis is one arm of a multi-city study, which is the first to examine the nutrition quality of a market-leading (OFD) service (Uber Eats) in Auckland, New Zealand.

Methodology - Using publicly available population-level data, Auckland was identified as a geographical area with an above-average (>30%) population of youth (15-34-years). Sixty-one percent of Auckland council suburbs have the Uber Eats service available (n = 186). A standardised protocol was used to collect data on the most popular food outlets, and most popular menu items, for each identified suburb. Each outlet identified (n = 394) was categorised as unhealthy, less healthy or healthy using the Food Environment Scoring (FES) tool (range; -10 'unhealthiest' to 10 'healthiest'). Each menu item identified (n = 2421) was classified as either discretionary or core using the ABS Discretionary Food List of 2014. Data on geographical distances between food outlets and suburbs, and levels of deprivation was collected to ascertain associations between socio-economic status and service offerings and usage.

Results - Almost three-quarters of food outlets assessed (73.6%) were classified as unhealthy, with less than 5% (4.3%) of outlets classified as healthy, using the FES. The majority of menu items (88.2%) evaluated were classed as discretionary foods. Significant associations were observed between the healthiness of food outlets (using the FES) and deprivation levels of food outlet locations (p = <0.0277). No significant differences were observed between the number of discretionary foods available and deprivation level (p = 0.0748).

Conclusion - This study found that most of the popular outlets on Uber Eats are unhealthy, with the majority of popular menu items being discretionary. More research is required to further explore the nutrition consequences of the service, including direct links to increases in discretionary food consumption and, consequentially, rates of non-communicable disease (NCD).

STATEMENTS of CONTRIBUTION & ACKNOWLODGEMENTS

ACKNOWLEDGEMENTS

I would like to express my special thanks to my supervisor, Dr Rajshri Roy, for her always punctual and helpful feedback and guidance throughout the thesis writing process, and for motivating me to produce a piece of work to the best of my abilities. Dr Roy has been a great supporter of this research and has provided me with invaluable insight; without her this would not have been possible. I'd like to thank Dr Stephanie Partridge and Sisi Jia for their collaboration with aspects of the research including data collection and data analysis (detailed within the document).

I would also like to extend grateful appreciation to the staff of the Department of Nutrition & Dietetics, for always being available for support and for presenting me with many unique opportunities to build upon my nutrition knowledge.

Lastly, I would like to acknowledge my family and friends, for their words of wisdom and encouragement over the preceding year.

STATEMENTS of CONTRIBUTION

- Review of the relevant literature (Chapter One)
- Methodology, data collection & descriptive data analysis (Chapter Two)
- Written and presented results (Chapter Three)
- Thorough discussion of the findings and their implications (Chapter Four)

TABLE OF CONTENTS

LIST of TABLES & FIGURES ……vi

GLOSSARY……vii

INTRODUCTION……1

CHAPTER ONE

Literature Review……7

1.1. Demographic Target: Auckland Millennial & Gen Z Populations……9

1.2. Consequences of Industrialisation: The State of Youth Health in New Zealand……11

1.3. Barrier Removal: Increased Accessibility……14

1.4. Shifting Nutrition Landscape: Consumer Quest for Convenience……15

1.5. Evolving Technology: Data Mines & Nutrition……19

1.5.1. Virtual Restaurants & Ghost Kitchens……20

1.5.2. Leading Marketing Strategies……23

1.6. Digital Food Environments & Food Environment Scoring……25

1.7. Food Delivery Technology: Sustainability Issues……29

CHAPTER TWO

Methodology……31

2.1. Introduction……31

2.2. Study Location/Setting……31

2.3. Methods of Data Collection……33

2.3.1. Sampling of Suburbs & Food Outlets……34

2.3.2. Level of Deprivation……34

2.3.3. Research Question (i); Top 10 Most Popular Outlets……35

2.3.4. Research Question (ii); Popular Menu Items……36

2.3.5. Research Question (iii); Outlet Characteristics ……37

2.4. Nutritional Analysis……37

2.4.1. Research Question (i); Classification & Evaluation: Food Environment Score……37

2.4.2. Research Question (ii); Defining Menu Items: Core Vs Discretionary……..…39
2.5. Research Question (iii); Geographical Distances …….……40
2.6. Variables……41
2.7. Measurement Techniques……..……42
2.8. Data Analysis……43
2.9. Ethical Considerations……...……44
2.10. Timeline……..…….45

CHAPTER THREE
Results……..……...46
3.1. Research Question One; Food Outlet Types & Classifications……...…….47
3.2. Research Question Two; Core Vs Discretionary Foods……..…..50
3.3. Research Question Three; Relationship with location, SES & Cost Discrepancies…….51
3.4. Supporting the Hypotheses……54

CHAPTER FOUR
Discussion……....55
4.1. Interpretations: What do the results mean? ……..……55
4.1.1. Key Research Objectives: Research Question (i); Food Outlet Types & Classifications……..……55
4.1.2. Key Research Objectives: Research Question (ii); Proliferation of Discretionary Foods……56
4.1.3. Key Research Objectives: Research Question (iii); SES, Cost Discrepancies & Delivery Distance…….……57
4.1.4. Food Environments: The Digital vs The Physical……...……59
4.1.5. Comparable Outcomes: Auckland vs Sydney…….60
4.2. Implications: Why do the results matter? …….……62
4.2.1. OFD Popularity & Engagement Trajectory…….……62
4.2.2. Covid-19 & OFD User Onboarding; A Growth Injection……63
4.2.3. Primary Research Concern: Health & Nutrition Consequences……..……64
4.3. Limitations: What can't the results tell us? ……..……66
4.3.1. Research Limitations……..……67
4.3.2. Uber Variables……69
4.3.3. Strengths: A Novel Study……70

4.4 Recommendations: What practical actions or scientific studies should follow? ……..…71

4.4.1. Progression Requirements: Government Attention & Intervention Planning……71

4.4.2. Interventions in the Digital Space……..… .72

4.4.3. Future Research Recommendations……74

4.4.4. Consumer Awareness: Campaigns & Positive Messaging/Marketing……...…75

4.4.5. Organisation & Foundation Involvement……76

4.4.6. Industry Collaboration: Transparency & Likelihood……...…76

4.4.7. Potential Policies for the Digital Food Environment……..…77

4.4.8. Utilising Pre-Existing Policies; Translation to a Digital Realm……...…79

4.4.9. Big Tech as Advantageous……..…80

4.5. Conclusion……..…81

BIBLIOGRAPHIES…….83

APPENDICIES

1. Index of Auckland Council Suburbs Included in Analysis……..99

2. Food outlet descriptions and healthiness scores (FES "Score Card")……100

3. Index of Outlets, Associated FES & Number of Appearances……..101

4. Associated Research Paper…….106

LIST of TABLES & FIGURES

FIGURES

Figure 1. Conceptual Framework (adapted from Gurevich-Panigrahi et al., 2009[1]) ……3

Figure 2. Pivotal Events in Foodservice……...17

Figure 3. Interventions for the Digital Space……..……28

Figure 4. Framework: Flow of Methodology……32

Figure 5. Flow Diagram of Council Areas, Deprivation Quintiles, Food Outlets & Menu Items…….……46

Figure 6. Potential Data Cycle Created by Users & Algorithms…….……55

Figure 7. Framework for the Nutrition Influence of Uber Eats in Auckland……...…65

TABLES

Table 1. Auckland Suburbs with Uber Eats Available……..……10

Table 2. Defining Deprivation: Dimensions & Variables…….……34

Table 3. Grouped Food Outlet Types & Scores……...……38

Table 4. Identified Outlets, Outlet Characteristics & Delivery Distances……...……47

Table 5. Food Outlet Grouped by FES Category (Healthiness)……...……48

Table 6. Food Outlet Classifications & Associated FES Scores……..……49

Table 7. Proportion of Discretionary & Core Menu Items Identified (ABS)……..……50

Table 8. Auckland Council Suburbs by Quintiles of Deprivation (NZDep)……51

Table 9. Characteristics by Deprivation Level…….……52

Table 10. Recommendations for Future Research & Intervention: Digital Food Marketing…….……73

GLOSSARY

OFD; Online Food Delivery

FES; Food Environment Scoring

ABS; Australian Bureau of Statistics

NZ; New Zealand

T2DM; Type Two Diabetes Mellitus

Gen-Z; Generation Z

NCD; Non-Communicable Disease

BMI; Body Mass Index

CVD; Cardiovascular Disease

FMCG; Fast-Moving Consumer Goods

NZDEP2018; New Zealand Deprivation Index of 2018

SES; Socio-economic Standing

NZD; New Zealand Dollar

SSB; Sugar-sweetened Beverage

NRF; National Retail Foundation

NSW; New South Wales

RCT; Randomised-controlled Trial

HPA; Health Promotion Agency

INFORMAS; International Network for Food & Obesity/Non-communicable Disease Research, Monitoring and Action Support

WHO; World Health Organisation

HSR; Health Star Rating

INTRODUCTION

Technology continues to evolve and weave seamlessly into our everyday lives. It is therefore increasingly likely that digital tools are impacting population-level health and nutrition. For years, the traditional or 'built' food environment has been an expansive topic of research and space of action by public health professionals aiming to stem the tide of obesity and nutrition-related disease. Presently, a new food environment is emerging at scale – the digital food environment. As our lives are enhanced by technology, and our 'convenience cravings' constantly satisfied in new, pervasive and innovative ways, the digital food environment poses a new challenge to health professionals.

The traditional food environment continues to be obesogenic, directing individuals towards an unfavourable consumption of saturated fats, refined sugars and added sodium. Many across the nation and internationally have attempted to implement nutrition interventions that reduce the amount of these unfavourable foods in the diet and increase the amount of fruit, vegetables and high-fibre foods consumed at the individual and population level. Although some have demonstrated success and achieved the intended outcome, rates of non-communicable disease as a result of the built food environment continue to climb. This makes the new, 'digital' food environment of increasing concern, as it presumptively amplifies rates of nutrition-related disease.

Yet to be comprehensively researched and therefore understood, the digital food environment is emerging at pace, facilitated by clever algorithms and fed by consumer demand for its ease and accessibility. The ominous digital food environment encompasses online grocery stores, online food delivery services (Uber Eats, Grubhub, Menulog, DoorDash), and, to a lesser

extent, wide-spread and frequently misinformed online food and health promotion across social media platforms such as Instagram and YouTube.

There is a large gap in the literature when it comes to the digital food environment, due to its novelty. Little is known of its “healthiness” and its effect on our health and nutrition status. Many questions are yet to be asked and answered of the environment, including ascertaining the types of frequently promoted foods, or foods which are popular online. Understanding the types of foods promoted will allow us to gauge how the environment may influence an individual's diet. If the environment typically promotes foods that favour adverse nutrition outcomes, this evidence may signal action in this space.

Online food delivery may be considered the most impactful aspect of the digital environment, as it involves the direct purchasing of foods and meals for consumption. Other aspects, such as food and lifestyle promotion on social media, are likely to have a downstream, long term or more subtle effect on health and nutrition status. Online food delivery (OFD) has been growing in popularity since its birth and proliferation in the 1990’s and is now an incredibly lucrative global market. It continues to evolve with evolutions in technology, allowing for startling delivery times. These days, foods can be ordered, prepared and delivered within 35 minutes (1). There are several OFD services in New Zealand, which appear to be operating in similar ways.

This research aims to pioneer an understanding of the digital food environment created by consumer favourite Uber Eats in Auckland, New Zealand. The three key primary research questions are as follows:

(i) What is the availability of types and categories of food outlets on Uber Eats, Auckland, NZ?

(ii) What proportion of items identified may be classified as core foods (part of a balanced diet) or discretionary?

(iii) How does the above relate to restaurant characteristics such as location, socio-economic demographics, cost of foods and delivery?

Fulfilling the research objectives will add to our collective understanding of the digital food environment and, more specifically, lay a foundation for our understanding of the online food delivery market in New Zealand's biggest city. The below conceptual framework demonstrates how this research fits into the wider narrative of combating nutrition-related disease.

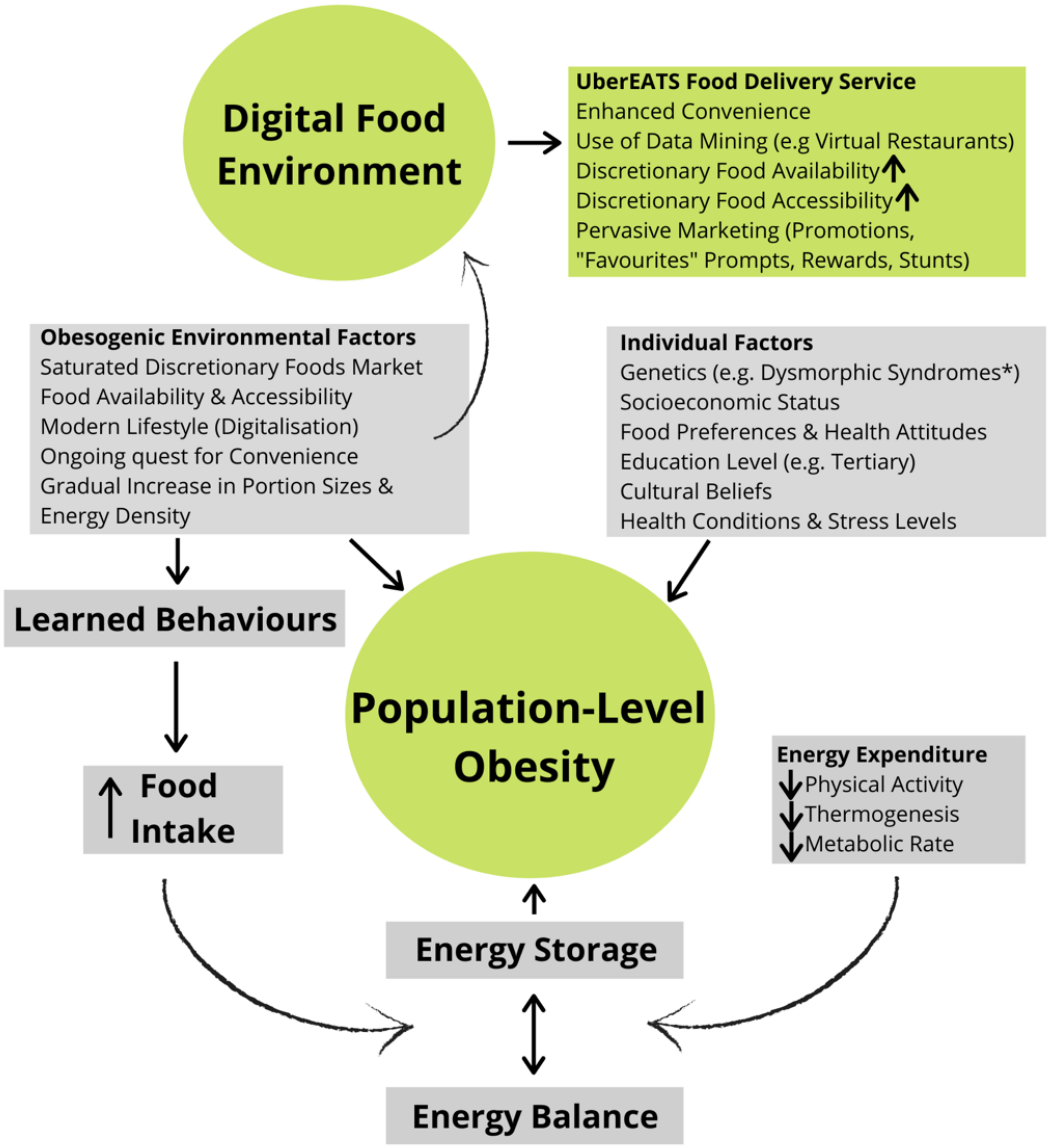

Figure 1. Conceptual Framework (adapted from Gurevich-Panigrahi et al., 2009) (2)

*Prader-Willi, Cohen's, Carpenter's, Ahlstrom's, Laurence-Moon-Biedl

As demonstrated, there are a number of factors that influence population-level obesity and its associated disease states. Individual and environmental factors are well understood due to comprehensive research efforts that offer clear links to disease progression. The digital food environment, as displayed, has emerged from modernisation. Answering research questions (i), (ii), and (iii) will allow us to better understand how OFD services such as Uber Eats may

be increasing individual consumption of discretionary foods with frequent use, affecting energy balance and storage.

In order to ensure the research is evidence-based, established public health tools are to be used, including the Food Environment Scoring tool (FES) - developed and utilised by Australian researchers to evaluate food environments – and the Australian Bureau of Statistics (ABS) Discretionary Foods List of 2014 (3, 4). This will enhance the accuracy and validity of results and allow for comparison to alternative FES assessed environments.

This document follows the expected order of a thesis, and is separated into four key chapters;

1. Chapter One is a literature review that explores our current understanding of the digital food environment and OFD services nationally and internationally. This chapter also explores the company of interest, Uber, encompassing its humble beginnings and vast growth trajectory to date.

2. Chapter Two outlines the methodology involved in the research, including methods of data analysis as well as collection. Although laborious, the relative ease of data collection (e.g., no patient or client participation) makes the methods of this research highly replicable, therefore facilitating the same research in different locations. The contactless nature of the research is particularly favourable during times of necessary "social distance".

3. Chapter Three lays out the results of the research, separated into the above research questions for ease of interpretation. You will note that the results of this research were

published in October of 2020 in the Nutrients Journal (Nutrition & Public Health). The same cross-sectional analysis was performed by researchers in Australia; Dr Stephanie Partridge (SP), Dr Alice Gibson (AG) and Si Si Jia (SJ), alongside others, in the characteristically similar city of Sydney. Aspects of data collection (delivery distances) and analysis (inferential statistics) were performed by SJ, AG and SP, as outlined below.

4. Finally, Chapter Four is an informed discussion of the research results, their implications, and recommendations for future research and intervention in the digital space. This of course includes the likely nutrition and public health consequences involved with the frequent use of OFD services, including its expected effect on population-level rates of obesity, diabetes, cardiovascular disease, and certain cancers. The notion of "big tech" is also mentioned as a topic of intrigue, whereby mammoth companies such as Google and Facebook collect and sell mass amounts of individual data to advertising and, perhaps, online food delivery companies. The extent to which this affects nutrition through the use of social media and therefore highly targeted food marketing, and tailored online food delivery, is yet to be understood. It is, however, worth considering when taking into account the resounding consequences of digitalisation or modernisation.

I hope this thesis aids in your understanding of the specific (OFD) and collective digital food environment. It should raise alarm regarding the rapidity of service adoption by consumers and expansion across population groups, and offer leverage to those willing to intervene in this space.

CHAPTER ONE

Literature Review

The purpose of this study is to gain insight into how technological advances in nutrition services such as Uber Eats serve the Auckland region. Young people in New Zealand (NZ) are spending on average 20% more than their predecessors at restaurants or ordering takeaway foods (1). Restaurant and takeaway food consumption are associated with significant increases in daily energy, sugar, saturated fat and sodium intakes, which are leading risk factors for non-communicable diseases such as obesity, type 2 diabetes (T2DM) and certain cancers (2). In recent years, restaurant and takeaway foods have expanded to online platforms, augmenting the traditional food environment and posing a new threat to public health. This research aims to evaluate food outlets on the popular online food delivery service Uber Eats to assess the healthiness of the food outlets in each suburb. This analysis will allow for a greater understanding of the digital food environment created by the service.

Uber Eats is an American online food ordering and delivery platform launched by Uber in 2015 and is based in San Francisco, California. Uber Eats grew from Uber Fresh, which had drivers circling the blocks of Santa Monica, California, with freshly made soups and sandwiches ready for swift delivery (3). The company quickly found that consumers were willing to wait up to 30 minutes when more was offered on the menu, and Uber Eats as we know it was developed and launched in Toronto in 2015 (4). Due to rapid growth, the delivery service had expanded globally by 2016, reaching Auckland, NZ, in 2017.

It was reported that last year (2019) Uber Eats grew by 230%, with the average customer spending $220 annually (5). Other than the recent Menulog report, surveys of the usage of food

delivery services have primarily been carried out on overseas populations, particularly in the United States. Research suggests that 10% of Americans use delivery services weekly, and 70% usually order food for delivery from quick-service restaurants (6,7). Figures are similar for New Zealand, where one in four people now order food online. Demand for food delivery is particularly high amongst the working population, with 52% ordering food to their place of work, typically doing so once a month (8). This demand explains the industry's worth of approximately $26.8 billion (7).

Millennials (25-34 years), and the older Generation Z (Gen-Z) population (aged 15-24), are digital natives to whom online food delivery is second nature (9). They are far more likely to order food online than their predecessors (63% vs 23% for baby boomers). Due to these statistics, Aucklanders within this age range are the principal focus of this research. It is important to note, however, that the adolescent population is of increasing concern to public health experts, as food delivery services continue to rise in popularity across school students (10, 11). This is no surprise, as those aged 10-15 years will likely be even more tech-savvy, keen to engage with digital services and be the target of food delivery marketing to ensure the growth of online food delivery in future (12). Although no research has been done on the New Zealand adolescent population, health and safety concerns in the United States have grown over the use of meal delivery services to deliver lunches to school grounds, with school districts re-evaluating their policies and banning meal delivery services as students order up to 15 meals per day (10,11). Yet to be examined is the local relationship between services such as Uber Eats and the development of obesity and metabolic risk factors for a range of non-communicable diseases (NCD's). Prior to exploring this relationship, a comprehensive understanding of how the application is used by youth in New Zealand is required.

This audit of the Uber Eats Auckland food environment can be regarded as the first step toward understanding the role that food delivery services play in the current state of youth health in NZ. A thorough analysis of food offered on the application will enable any discrepancies between different suburban areas and associated levels of deprivation to be highlighted. It is in this way that this research can begin to define the digital food environment created by the Uber Eats service and outline how it may be consequential to youth health.

1.1 Demographic Target: Auckland Millennial & Gen-Z Populations

As mentioned, Aucklanders aged 15-34 years are the demographic of interest for this research. This is due in part to extensive research that has been undertaken on the utilisation and user characteristics of multi-restaurant delivery services. The survey data (from 2,928 US consumers aged 18+) effectively outlines that the younger a person is, the more likely they are to use a food delivery service (5). This is also true for income, as the less a consumer earns, the more likely they are to use a service such as Uber Eats. For example, researchers found the lowest income bracket ($0-99,000) demonstrated the highest usage (51%), compared to 23.5% at an income level of $150,00-174,900 (5). In this instance, we can assume that income is highly correlated with age, again affirming that users are typically aged between 15-34 years.

Auckland, the largest city in New Zealand, is home to nearly 1.6 million people (33.4% of the country's population) (13). According to the latest survey data (2018 Census), 30.5% of Aucklanders are aged 15-34 years (compared with 27.25% for the New Zealand population) (14). The population of Auckland is the most diverse in the country, with over 100 ethnicities, more than 150 languages spoken, and 39.1% of the population born overseas (15). Auckland is home to the largest populations of Pacifica, Asian and Middle Eastern residents. The median personal income in Auckland is $29,600 (compared to $28,500 for all of New Zealand). There

are 302 council suburbs in Auckland, which have been categorised into the following regions: Auckland Central (64), North Shore (49), South Auckland and Eastern suburbs (93), West Auckland (35) and Rodney (61) (13). Of the 302 suburbs in Auckland, 186 (61.6%) have the Uber Eats service available. See appendices for the complete categorised list of Auckland suburbs as of 30th January 2020 sampled for this research (Appendices; Attachment 1). Table 1 demonstrates the percentage of each categorised suburban area with the service available.

Table 1. Auckland Suburbs with Uber Eats Available

Suburban Region	Suburbs with Uber Eats	Proportion of Region (%)
Auckland Central	58	91
North Shore	47	96
South Auckland & Eastern Suburbs	62	66
West Auckland	18	51
Rodney	1	1.6

As expected, the more cosmopolitan regions of the greater Auckland City area have Uber Eats available, while the majority of suburbs within rural regions such as Rodney are yet to have the service offered. Concerning Aucklanders interaction with food delivery services, global data reveals that 6 out of 10 Aucklanders have already ordered food for delivery via an app or website. During the first six months of Uber Eats' launch in 2017, the number of restaurants quadrupled, from 70 to nearly 300, reflecting the high demand for the service (16). For the Auckland Central district alone, there are currently 486 restaurants partnered with Uber Eats (17). The Uber Eats service is now operating in six cities across the nation, with plans to expand to seven more by the end of the year, bringing the total number to thirteen (18). With the rapid expansion of Uber Eats comes an increasing need to learn more of the food environment created by the service.

According to the Uber Newsroom, in 2018, the most popular item on Uber Eats in New Zealand was butter chicken, despite the most search-for item being burgers. Perhaps not surprisingly,

after midnight, the most commonly ordered item was a Big Mac® combo. Over the year, the nation ordered 505,595 burritos and over 7 million McDonald's chicken nuggets (19). These statistics provide valuable insight into the way New Zealanders are engaging with the service. The high demand for fast food is likely driving the service toward offering more of the same discretionary foods, rather than expanding its range of healthier options. As well as building upon our current understanding of Uber Eats as a digital food environment, this research aims to highlight any discrepancies in use by socio-economic demographic and outline how the service may be contributing to increasing rates of NCD's.

Due to the Covid-19 pandemic, Uber Eats has fallen to the second-most popular food delivery app in New Zealand, trailing HelloFresh (20, 21). Prior to the pandemic, Uber Eats was the most popular food delivery app on both Apple and Google Play stores. Although not a food delivery app, 'Regulr' is rising in popularity, and is more frequently downloaded than Uber Eats on all devices. Regulr uses your current location to show you popular cafes and restaurants in your area and allows you to place orders for coffees and takeaway foods in advance to skip the queue; encouraging you to become a "regular" at local eateries (20, 21). Regulr has likely risen in popularity in anticipation of the nation moving down to alert level 3, which allows for click and collect café orders.

1.2 Consequences of Industrialisation: The State of Youth Health in New Zealand

The prevalence of NCD's amongst the demographic of interest continues to rise (22). The development of an NCD is multifactorial, with common causative factors being tobacco use, physical inactivity, unhealthy diets, and harmful use of alcohol (23). When considering the development of an NCD, it is essential to outline the effect of the surrounding 'built' environment – controlled and shaped by governmental decision making and capitalistic

ventures. Such ventures have resulted in unfavourable or obesogenic environments with unprecedented access to food. In recent years, changes in food environments have led to a shift in the types of diseases developed globally, and a significant decrease in age at which such conditions are developed (24). For instance, the prevalence of global childhood overweight and obesity has dramatically risen in less than one generation (25).

Likewise, global reporting of youth-onset T2DM has risen significantly since the start of the 21st century (26). Estimates of current prevalence suggest a 31% increase in the disease among those aged 10-18 years in the United States between 2001-2009. Concerning older age groups, the International Diabetes Federation estimates that roughly 23 million young adults aged 20-39 years had T2DM worldwide in the year 2000. By 2003, this estimate had risen to 63 million (27).

Obesity, a disorder involving excessive body fat that increases the risk of health problems, has traditionally been viewed as the fault of an individual. In contrast, recent literature suggests that obesity is an inevitable consequence of complex, adaptive systems which favour the disorder (28). Although the responsibility to combat obesity continues to fall on affected individuals, the development of the disease is primarily viewed as the result of an individual's environment. This notion is reflected by current literature which overwhelmingly supports macro-level public health interventions (government and industry involvement) to stem the tide of obesity, as well as to target individual behaviours (29).

Regarding the prevalence of the disorder within the New Zealand population, the 2018/2019 Ministry of Health survey approximates that a third of those aged 15 years and over are classified as obese (30.9%) (30). It is important to note that those of a low socio-economic

demographic, and those belonging to ethnic minority groups, face inequitable rates of obesity and nutrition-related disease (31). NZ is no exception, with 66.5% of Pacific and 48.2% of Māori adults being clinically obese (32). As with overseas, T2DM - a disease traditionally burdening older adults - is increasing in prevalence amongst a far younger demographic in NZ. In the years 1997-1999, T2DM accounted for 12.5% of new cases of adolescent diabetes. By 2001, the percentage of new cases of T2DM rose to 35.7%, with the upward trend continuing to date. The mean age at diagnosis is 15 years, and the mean BMI is 36.4kg/m^2 (obese classification) (26). As the access to food shifts from local vendors to home delivery, adverse nutrition and health outcomes are to be expected. NCD's, including cardiovascular disease (CVD), have been steadily increasing in prevalence over the past decade (33). Due to their prolonged nature, NCD's pose a significant burden to diagnosed individuals and the health care sector. It is reported that in New Zealand, 89% of all deaths can be attributed to NCD's, primarily CVD, cancer and diabetes (Type 2) (33).

The modern food environment is a significant contributor to poor youth health and disease in NZ, with convenience services such as Uber Eats likely compounding its effect. Research demonstrates that youth compliance with dietary guidelines in NZ is poor. Only 40% of youth (aged 5-24 years) meet the recommended intakes of vegetables, and greater than half (51%) opt for refined bread over wholegrain, brown and wholemeal varieties (32). Furthermore, in 2011, researchers at the University of Otago and the Ministry of Health found that 53% of males and 40% of females aged 15-18 years consume soft drinks at least three times a week (32).

In NZ, sedentary behaviour amongst youth is inversely correlated with age, with physical activity declining from the ages of 5 to 24 years old. Reflected by recent statistics, almost all

NZ children aged 5-9 years meet the national physical activity guidelines (60 minutes per day). However, only 15% of those aged 20-24 years meet the adult guidelines of 30 minutes per day (32, 34). This is matched by a concurrent increase in screen time (34). An increase in the time youth spend behind screens is good news for app services. For public health, however, changes to the physical and social environment which encourage sedentariness, such as the Uber Eats service, drive adverse health outcomes, including increased adiposity and metabolic risk (35, 36, 37).

1.3 Barrier Removal: Increased Accessibility

Technological advances in nutrition services such as Uber Eats further demote physical activity and increase youth access to unhealthy food. Barriers such as time and accessibility (location and transport) associated with the purchase of fast food are eliminated by food delivery services. Presently, the only barriers youth face when accessing fast food are internet and smart-device access and financial constraints. It is for this reason that discrepancies in the cost of delivery between food outlets and suburban areas will be explored. It is important to reiterate, however, recent research demonstrating that, in general, the less income a consumer earns, the more likely they are to take advantage of restaurant delivery services (5-3). This indicates that finances are of little concern to users of the service. In addition, the student population of New Zealand are eligible for a weekly government loan of $239.76 (38). Although no prior research has been undertaken to assess how this loan is spent, the likelihood that this income is spent on services such as Uber Eats is worth noting. Regarding internet and app access, 80% of New Zealand households have Wi-Fi access, and 81% of New Zealanders own a smartphone (39, 40).

With increased accessibility to food comes health consequences, particularly if the food on offer is highly processed and unhealthy. It is well established across the literature that areas of low socio-economic standing are often "food deserts", or "food swamps" (41). A food swamp is defined as an area with a high-density of establishments selling high-calorie fast and junk food, relative to healthier food options (42). Similarly, food deserts describe an area deprived of healthy or fresh food (43). Research has shown that there are no food deserts in New Zealand. There are, however, several food swamps associated with our more deprived areas (41). Environments such as these are in stark contrast to their wealthier counterparts, which typically have very few fast-food establishments and more cafeteria and restaurant-style dining, making unhealthy food selections less likely. For instance, in the affluent Auckland suburb of Remuera, the only fast-food outlets are Hells Pizza and Pita Pit, a successful Canadian food chain which serves wraps, and is significantly healthier than traditional fast-food outlets. Comparatively, in the South Auckland suburb of Manukau, there are greater than ten fast-food retailers within a small radius, including Burger King, McDonald's, Carl's Junior, KFC and Wendy's Hamburgers (44). Whether this inequity extends to the Uber Eats service is another area of exploration that this audit will undertake. Posed as a question, does the Uber Eats service result in the extension of healthier options to less affluent suburbs, or solely act to increase the accessibility of local fast food on offer?

1.4 Shifting Nutrition Landscape: Consumer Quest for Convenience

The food environment a few decades ago is incomparable to that of today. There have been a few pivotal moments in food and foodservice history that have changed the food environment as we know it (Figure 2). While those in the past used to hunt and fight for their daily meals, these days, we are faced with perpetual, round-the-clock access to food. Alongside the

relentless conscious and subconscious food marketing and promotion we are subject to, increases in food availability have made the desire to consume almost inescapable.

Post-war, during the 1950s, consumption after rationing increased rapidly. Supermarkets were franchised with the rise of suburbia, shortly followed by the swift introduction of fast-food chains and drive-through restaurants (45). Prepared foods began to proliferate, and more convenient packaging made food preparation less time-consuming. This era was that of firsts; the first microwave oven was developed, instant oatmeal hit the shelves, and the first Burger King opened in 1954 (46).

In the 1960s, aluminium cans were first used commercially, with the 12-oz Coca-Cola can introduced at the start of the decade. Known as the age of advertising, those in the industry got creative as they mastered television marketing. By the 1970s, concerns had grown regarding increases in screen time and subsequently, less physical activity (47). As a result, the first “lite" products were released, and the first standard nutrition labels were produced. Due to increases in data collation, the tracking of consumer purchase behaviour became commonplace. A decade later, microwave ovens were in almost every home, and the industry responded with a tremendous variety of frozen meals in plastic containers. Health and obesity concerns were highlighted, and lower-calorie products were produced in response. Government health officials began to develop and initiate front-of-pack and point-of-purchase nutrition labels to help consumers make healthy choices. In New Zealand, the Heart Foundation Tick was introduced in 1991, which was supposedly indicative of options that were lower in sodium and fat (47). Before being phased out in 2016, the Tick assisted in informed decision making and encouraged favourable modification of the New Zealand food supply (48).

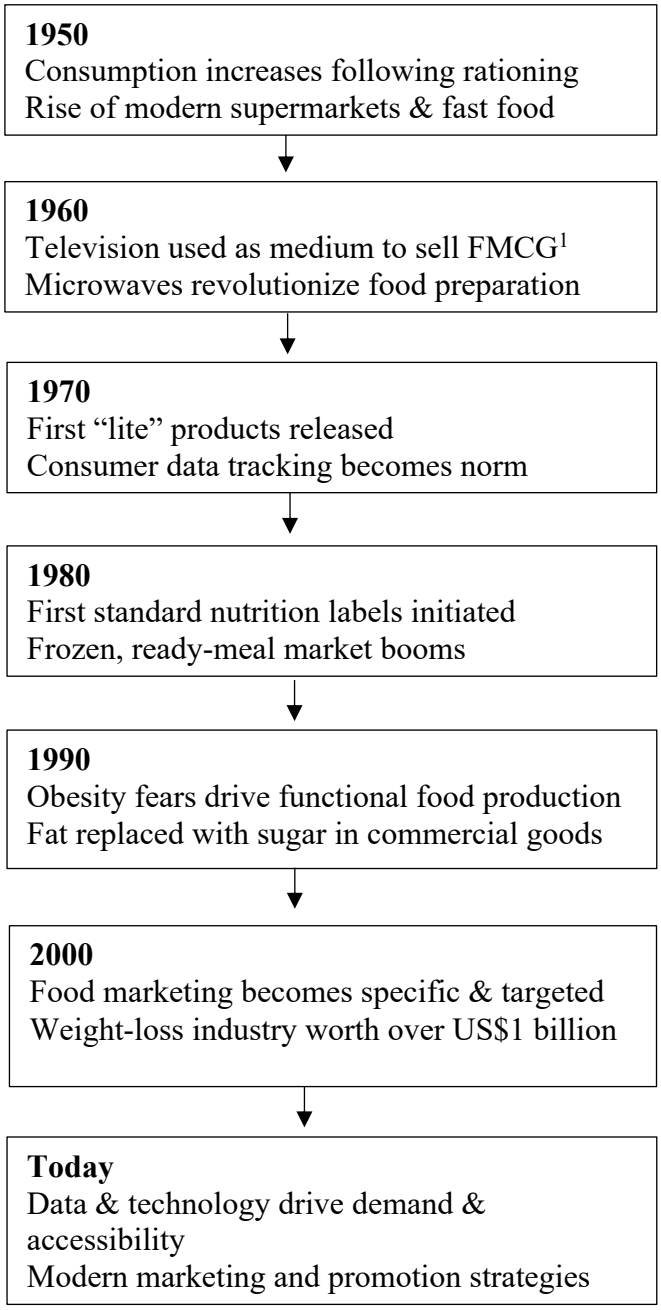

Figure 2. Pivotal Events in Foodservice
[1]*Fast moving consumer goods.*

By the mid-1990s, the food industry had capitalised on obesity fears by rolling out nutraceutical and functional foods, energy bars, fortified drinks and fat-free, low-fat or reduced-fat foods (45,49). The low-fat era is notorious to public health and nutrition experts as the products produced were often to the detriment of well-intended consumers. Fears over fat were founded on a weak evidence base, the consequences of which resound today. The food industry, aptly responding to consumer demand, removed the fat from their products and replaced it with sugar (50). Today, hidden added sugars remain in most supermarket products (approximately 60%), and confusion over the subsequent sugar versus fat debate persists (51).

At the turn of the 21st century began the technological era. Foods were marketed to generational niches, especially ageing baby boomers, and health solutions focused on reducing sodium and adding probiotics, fibre and omega-3. Weight Loss became a lucrative industry, with weight management programmes such as Naturally Slim and Wellbeats turning significant profits. In 2006 Jenny Craig was acquired by Nestle, with the processing giant profiting from

both sides (52). It was around this time that the rise of social media platforms such as Instagram occurred. As the application gained popularity, so too did its users. Social media influencers came to light and began profiting from health trends as their marketing power was recognised, fuelling consumer confusion.

By 2014, the weight loss industry was a market worth billions (53). That same year, amid rising rates of non-communicable disease in NZ, the Ministry of Primary Industries and the Ministry of Health decided on the Health-Star rating, and the new front-of-pack label was initiated. The label has been adopted slowly by the industry since its introduction, with an evaluation in 2018 showing that the label is only on one-fifth of packaged goods in NZ supermarkets (54). As in-store grocery shopping becomes less frequent, and café culture booms, front-of-pack nutrition labels become less effective at influencing healthy choices. The mass shift to online platforms presents new opportunities to encourage healthy choices, such as online nutrition labels, which are currently lacking in digital food environments.

These days, New Zealanders are allocating more disposable income to restaurant dining and takeaways, and less to the purchase of grocery items (55). In 2019, NZ's hospitality sector achieved record sales of over $11.7 billion, with the restaurant and cafe sector recording the highest growth at 5.2% (56). Regionally, consumer sales remain highest in Auckland, Wellington and Canterbury. As the restaurant industry booms, EFTPOS data shows that grocery sales are continuing to slow, with a decline in sales growth year-on-year over the past five years (57). According to a recent survey, only 52% of parents eat at home every night (58). This is reflected by an analysis of food budget spending by Statistics New Zealand, which demonstrates that in the year 2018, 26% of food spending was at restaurants and on ready-to-eat meals (compared with 23% in 2014) (57). The ongoing quest for convenience gave rise to

start-up companies such as My Food Bag and Hello Fresh, which are now worth over $100 million and $1 billion, respectively (59, 60). The frequency of eating food from outside the home is positively associated with a high BMI (61). From a public health perspective, a decline in home-cooking indicates a rise in the caloric density of the NZ diet, which has known links to escalations of overweight and obesity rates (62).

As the desire for café and restaurant meals increases, so too does the demand for their delivery, emphasising the significance of this research, particularly in the Auckland region. Food delivery services have expanded from traditional dinner delivery to serve both breakfast and lunch. Uber Eats is no exception and has tapped into the Auckland 'brunching' market by partnering with cafes offering anything from bagels to eggs benedict. Global data research on the foodservice sector shows an annual growth of 6.7% for the NZ takeaway delivery market by 2021, making NZ one of the fastest-growing takeaway markets in the world (63). Likewise, the most recent Menulog Report found that 1.2 million New Zealanders (25% of the population) already order takeaway food for delivery (8). Despite significant growth to date, the report highlighted future growth and the untapped potential of the sector. It is reported that this potential stems from digital advances which continually drive ordering habits, and the evolving consumer demand for convenience and choice.

1.5 Evolving Technology: Data Mines & Nutrition

The digitalisation of food services has been referred to as the "digital turn" and poses data as the most recent threat to public health. Today, the modern food industry - the result of technology, corporate ingenuity, and countless resources - is exceedingly lucrative. The face-paced sector is often at the forefront of technological advances in consumer marketing and accessibility. Take, for example, a new marketing strategy adopted by Tesco (a UK-based

grocery food chain), who have created interactive posters for the walls of tube stations that look like a shopping aisle. Consumers can use their phone to scan the code on any product into their virtual Tesco basket and have the products delivered later that day (64). These ingenious, forward-thinking strategies are too often adopted for the sale of fast-moving consumer goods (FMCG), and not for healthier food options, maintaining the perception that such items are a necessity. The future food environment centres itself around problem-solving, including self-ordering smart fridges and soilless, climate-controlled greenhouses (65, 66). As food-related problems are solved, health-related issues typically result. An Otago University report showed that the average BMI of New Zealanders increased from 26.4 in 1997 to 28.3 in 2015. If the trend continues, which appears likely, the average BMI of NZ would exceed 30 (the obesity threshold) by 2030, with half of the population considered clinically obese by 2038 (67).

1.5.1 Virtual Restaurants & Ghost Kitchens

An important consideration for this research is the recent rise in virtual restaurants and ghost kitchens. A virtual restaurant is a food service business that serves customers exclusively by delivery, based on phone orders or online delivery ordering (68). Virtual restaurants are attached to pre-existing restaurants and operate out of the same premise. Though similar, ghost kitchens have no retail presence and serve as a meal preparation hub for delivery orders (69). Ghost kitchens, which have adapted to and capitalised on the rise in food delivery services, economise by occupying more affordable real estate. With significantly lower overheads, such restaurants can efficiently serve to turn a profit (70). The typical considerations for a full-service restaurant premise such as foot traffic, curb appeal, and accessibility are not of concern to a ghost service. Furthermore, as front-of-house staff and paper menu reprint are not required, a ghost kitchen or virtual restaurant can afford to be more dynamic and responsive to demand; experimenting with offered food or offering more than one type of cuisine. Some examples of

successful virtual restaurants include the Brooklyn Burger Factory, MIA Wings, and French Takos, all of which are partnered with Uber Eats. Without a store-front, these food services utilise leading marketing techniques in order to promote their business. By partnering with Uber Eats, they can benefit from the company's successful marketing strategies.

Uber Eats recognised the viability of virtual restaurants and has developed a virtual restaurants programme, whereby the company analyses neighbourhood sales data to identify unmet demand for cuisines (71). The company then approaches restaurants that use the app and encourages them to create a virtual restaurant to meet that demand.

The Brooklyn Burger Factory, a virtual restaurant which sells a variety of burgers to the recently gentrified Crown Heights suburb of Brooklyn, is a compelling if not concerning example of the programme's work. The Brooklyn Burger Factory operates out of local cafe Gerizim and arose after being approached by Uber Eats; patrons would be surprised to discover that the restaurant is entirely virtual, and does not exist. The tech giant determined there was local demand for burgers based on its abundance of consumer data and approached the cafe to expand its service (71). The vendors, who originally sold a burger a day, now sell 75 a day, with the expansion now 28 times more profitable than the original cafe (71). Auckland's first virtual restaurant, Hot Lips, operates from the affluent suburb of Ponsonby, out of the 'Ha Poke!' restaurant kitchen, and was founded in 2018 (72). Uber Eats has reportedly aided the creation of over 4,000 virtual restaurants worldwide since 2017, extending its influence from how people get their food to what should go on the menu (69). Research on the consumer effect of these recent evolutions is yet to be undertaken. However, additions to an already saturated food environment which are explicitly designed to fill gaps in the marketplace will likely contribute to the prevalence of non-communicable diseases.

As well as virtual restaurants and ghost kitchens, the application poses an additional concern to public health with the recent launch of Couchfood™. Couchfood™ is a collaboration between Uber Eats and BP petrol services (73). The Couchfood™ range, which is delivered on-demand, includes a host of FMCG such as chips, chocolates and ice creams (74). Not bothering with subtlety, the service extension is targeted at those unwilling to walk any distance to a local dairy or corner store. Although not labelled as Couchfood™ in NZ, the Uber Eats service does deliver the majority of items from local petrol stations (Wild Bean Cafe) and is a call for concern.

As food services evolve quickly to address shortcomings - lead primarily by data analysis - adverse effects on consumer health are likely. Changes to the food environment such as these, which arise as a result of convenience cravings, should be a consideration for those working in the field of public health. Although alone these advances may not have a significant impact on the health of consumers, in conjunction with the current state of health and nutrition, these services will undoubtedly amplify the challenges health professionals face. As aforementioned, the role that food delivery services play in the development of non-communicable disease remains unclear, highlighting the importance of research efforts in this space (75).

In terms of where Uber is heading, the company has spent the last year developing a drone for food delivery, as part of the Uber Elevate branch of the business (76). The drone is being developed to recognise QR-codes on the roof of delivery cars and transport meals from restaurants to the driver directly (77). This is proposed to hasten delivery time and enhance efficiency. In addition, Uber Grocery is set to launch in New Zealand in the upcoming months

(78). This will allow consumers to complete their grocery shopping entirely online through the user-friendly app.

Research to determine the current state of online grocery shopping and its nutrition consequences was undertaken in 2018. It is of no surprise that millennials (21-34 years) and Gen-Z (15-20 years) were the most frequent users of online food shopping platforms, and the primary motive for online grocery shopping was convenience. However, demand for online services was high irrespective of age; of the 300,000 consumers surveyed from over sixty countries, more than half were willing to use online delivery in the future (79). In terms of health consequences, researchers found that shopping for groceries online is a "double-edged sword"; online platforms have the tendency to make unhealthy impulse buying less likely and lessen the persuasive influence of in-store promotions. On the other hand, consumers demonstrate hesitancy when shopping for fresh produce online, therefore decreasing the likelihood of fruits and vegetables being purchased (79). Consumer data is also a concern on these platforms, as purchasing patterns allow for more targeted marketing. Once an item is purchased, it will typically remain on an individual's past purchasing 'list', regularly viewed by the consumer. This tool has the potential to turn an occasional treat into a pervasive prompt for more frequent purchases. These implications translate to the Uber Eats app, where the "Your Favourites" tool exists.

1.5.2. Leading Marketing Strategies

The company's adopted marketing strategies played a significant role in its initial success and growth, thereafter, translating basic human experiences and enhancing them using technology. Authenticity, convenience and trust have been established as the most important attributes to millennials when engaging with products and services, and therefore comprise the cornerstone

of Uber's marketing efforts. The strategies used by Uber and Uber Eats are now utilised by start-up companies and entrepreneurs in the hope of expansion of the same gravity. Uber uses a combination of strategies, including partnership marketing, referrals, the utilisation of consumer data and purchasing patterns, and stunt techniques targeted at the youth market. The development of meaningful commercial relationships is fundamental to Uber Eats' success, whereby interfacing with restaurants, eateries and top chefs was prioritised to gain market share (80). The company has partnered not only with food services but with companies such as Spotify, popular with the youth demographic (81). These partnerships have facilitated the growth of the company and allowed for the exponential onboarding of new restaurants.

Stunt marketing (or UberStunts) are campaigns used to intrigue and surprise consumers, primarily aimed at gaining and maintaining youth interest. For instance, the service has been known to deliver kittens to offices, include free holiday cookies with meals and deliver thousands of tacos to University campuses to satisfy midnight cravings. By engaging with consumers and trends, Uber has maintained its relevance. Targeting the next generation of consumers future-proofs the business yet presents challenges to those in public and primary health care.

The role that food marketing and advertising plays in childhood and adolescent obesity is well-defined across nutrition literature (82). The role that Uber plays in these developments, however, is yet to be investigated. The company, as mentioned, primarily targets millennials, and uses tactics that differ to those used by traditional FMCG companies such as Coca-Cola. Uber's marketing ploys are subtle, explore and create culture, and target the social and tech-savvy traits of its consumers. A recent report of marketing engagement found that 80-90% of millennials do not trust traditional advertising (83). Instead, the generation wants to connect

with brands through content, be able to view online reviews of products and services and have services be social and tech-based (84). Without significant research on the health effects of the service, it appears the most detrimental effect of Uber on millennials may be financial, rather than physical. The additive consequences of convenient nutrition services require exploration.

1.6 Digital Food Environments & Food Environment Scoring

Swinburn et al. defined the food environment as the "collective physical, economic, policy and socio-cultural surroundings, opportunities and conditions that influence people's food choices and nutritional status" (85). As insinuated prior, technological evolutions have resulted in a digital realm being introduced as part of the food environment. A digital food environment now exists, which changes the complexity and intensity of the effects of food environments on the health and nutrition status of individuals and populations (86). Uber Eats is an example of a digital food environment, alongside online grocery stores, social media platforms, and recently introduced online school cafeterias which allow parents to select lunch options for children in advance (86). Digital food environments are rapidly emerging and will require a new wave of research and policy action to mitigate the influence of these evolutions on health and nutritional status.

In NZ, the digital food environment arguably began in 1996, when Countdown started a trial of online food shopping with 100 Auckland customers. By 2016, it had 80,000 regular buyers and filled more than 20,000 online orders a week. Today, all leading supermarkets run popular online delivery platforms and have recently introduced food boxes and meal kits, in a bid to compete with the likes of MyFoodBag, Woop and Hello Fresh (87). Currently, leading “actors” in the digital space are influencers who use social media platforms (YouTube, Instagram) to promote diets or lifestyles which influence nutritional status, and the food industry who utilise

technology and leading marketing techniques to engage with and persuade consumers. Both appear to have opposed effects on health, with social media influence resulting primarily in disordered eating or eating disorders, and the food industry contributing to overweight and obesity (86). Lacking in this space are academic and government “actors” who can promote healthful lifestyles and begin to offset the negative influence of other powers in the digital space.

As a digital food environment, Uber Eats is highly accessible and has an opportunity to greatly influence the health of its consumers. Under extreme circumstances, such as at the beginning of the coronavirus pandemic, the digital food environment is heavily relied upon (87). Before Uber Eats was considered a "non-essential service" during lockdown periods, utilisation of the app increased exponentially when fears grew, and population groups were advised to be socially distant and stay at home. To keep its clients viable, Uber Eats announced $5 million in funding for independent restaurants in New Zealand and Australia during the pandemic (88). The company also waived service fees on pick up orders from March to June 2020 and provided 25,000 free meals to support health workers and other frontline staff (88).

Other food delivery services saw a surge in popularity during the pandemic, with Deliveroo in Australia reporting increases in orders of up to 597% (89). The company also reported changes in ordering patterns, with consumers ordering 43 minutes earlier on average, hinting at the possibility that, when in lockdown, our focus on food is enhanced. Another likely residual effect of the pandemic is the increased and continued use of online grocery shopping and food delivery services in the future, as consumers adapt to using the services out of necessity. In addition, online services will likely see the onboarding of new consumers who would have otherwise not engaged. Once an individual has used an online convenience service, continued

use is likely as ease and convenience are realised, and the usual technological barrier is overcome (90).

The exponential popularity of digital services within the millennial and Gen-Z population is an increasing health concern. To improve population health, the best evidence is that interventions must target multiple levels; supporting individuals with their behaviour change is required for effectiveness; however, we must be mindful that alone this is insufficient. Therefore, interventions need to be designed and implemented at the environmental level as well as the individual level to address health issues effectively.

Current approaches to improving food environments tend to overlook the increasing role of technology and daily use of the internet, both of which have increasingly influential roles in population health and nutrition. There are ways of intervening in the digital space that have been previously identified. A leading Australian online supermarket trialled a traffic-light system for ten weeks, the results of which were insignificant (91). However, other exemplar interventions have been outlined by Granheim in 2019 (Figure 3).

To assess the digital food environment created by Uber Eats in Auckland, the food environment score (FES), used to attribute a healthiness score to food outlets, will be used. The FES is a healthiness rating system developed specifically for Australian food outlet types in Australian residential communities (92). Due to similarities between Australasian food environments, the tool is considered the most appropriate for research concerning the NZ population. It uses a 20-point scoring system ranging between -10 (least healthy) and +10 (healthiest). The tool has reported significant results in earlier studies examining the relationship between the healthiness

⇒ Implementing guidelines/codes of conduct for digital influencers sharing nutrition-related information on social media and participating in digital food marketing

⇒ Regulating the digital marketing of unhealthy foods and beverages to children (particularly on applications)

⇒ Promotion of health and nutrition literacy to enable critical assessment of the information to which people are exposed through digital technology

⇒ Increasing overall digital literacy

⇒ Government consideration of digital technology as platforms for health-promotion, in their policies and strategies to combat national and global non-communicable disease

Figure 3. Interventions for the Digital Space (86)

of the food environment in Australia and dietary behaviours (92). With the FES system, the collective digital food environment created by Uber Eats can be assessed, and comparisons of the healthiness of community food environments and the exploration of their associations with area characteristics, population's diet and health outcomes can be achieved.

To further analyse the digital food environment created by Uber Eats, popular menu items on the app will be categorised as either core foods or discretionary foods. This will allow for assessment of nutritional quality, based on the level of food processing and nutrient composition. It is expected that the vast majority of food outlets on the app will be offering discretionary, rather than core foods. If found to be true, this allows for the categorisation of the digital food environment created by Uber Eats as unhealthy and, if engaged with frequently, disease-promoting.

The geographic distance between food outlets and their delivery locations will also be explored. If it is found that delivery distances are significant, additional consequences associated with the food delivery service arise. Research has shown that the average consumer will drive a maximum of 17 minutes to a restaurant or café, with the traditional 'food radius' of an individual being 1km (31, 93). If consumers opt for the delivery of food from a greater distance

than they would usually purchase from, this extends their food environment significantly and removes accessibility barriers that would otherwise prevent them from making a food purchase.

1.7 Food Delivery Technology: Sustainability Issues

Finally, the rise in food delivery services presents challenges to planetary health as well as our own. When developed, it appears leading food delivery services did not consider the product life cycle. As the proportion of restaurant stock allocated to food delivery increases, so too does the production of delivery packaging. Food delivery services, for health and safety reasons, require all delivered food to be packaged, often including extras such as plastic cutlery, straws and napkins. A single meal kit box from Blue Apron (a market-leading American meal kit service) can have up to 110 grams of plastic, including tubes, tubs and packets for individual ingredients. Based on the assumption that a kit is sent three times a week to their 786,000 subscribers, Blue Apron alone produces 84 tonnes of plastic in a week, and 4,368 tonnes in a year (94). Despite companies trying to deliver only recyclable plastics and cardboard, recent disconcerting figures show that 91% of recyclable material does not make it into a recycling bin (95).

There is also a behavioural aspect to consider; if these consumers do not have time to prepare and cook a meal, are they likely to sort, clean and categorise their rubbish? Packaging waste, combined with the required transport of goods, undoubtedly contributes significantly to the global carbon footprint. In China, food delivery services were reportedly responsible for a nine-fold increase in packaging waste in 2017 (96). Researchers are yet to tabulate the specific effect that companies such as Uber Eats have on the environment. Even so, Uber is often painted in an unsustainable light. In response, the company has put measures in place to reduce its carbon

footprint. As of October 2019, plastic “extras” are only delivered upon request within the app (97).

Furthermore, Uber Eats often encourages those delivering food to cycle, particularly in cities, where getting around on a bicycle is often more efficient than sitting in traffic. Additionally, Uber acquired Jump, a Brooklyn bike-sharing start-up, in 2018 (98). The service was recently launched in Auckland, in February 2020. Dara Khosrowshahi, the company’s CEO, hopes that the service will encourage consumers to cycle rather than order an Uber when travelling short distances. Uber has also invested in motorised scooter company Lime, offering its service on its app. It is via these investments that the company can enhance its sustainability whilst retaining profits.

To conclude, enhancements in data usage, marketing ingenuity and limitless resources enable the foodservice industry to continually evolve to meet consumer demand for both food and convenience. These evolutions continue to pose threats to public health and make the challenge of nutrition intervention significant. It appears there are several potential consequences associated with food delivery services that require analysis. This audit of Uber Eats will allow for categorisation of the service as either healthy or unhealthy based on the most engaged with offerings on the app. From here, further research may investigate the extent of the contribution of OFD services to the current state of youth health and disease in New Zealand, including direct links to the consumption of energy-dense foods.

CHAPTER TWO

Methodology

2.1. Introduction

This cross-sectional observational study aims to accurately examine the digital food environment created by Uber Eats in Auckland, New Zealand. The cross-sectional study design enables a "screenshot" analysis to provide valuable insight into the types of foods both offered and ordered from the website and application. It allows for swift and inexpensive analysis of the digital food environment of interest, providing meaningful conclusions to form the basis of our nutrition knowledge of these services. This research is one arm of a multi-city study, involving collaboration with researchers from the University of Sydney (SJ, AG & SP). The same methodology was used to define the digital food environment created by Uber Eats in the Australian city of Sydney (99). As a result of this collaboration, some aspects of data collection and analysis were performed by SJ, AG and SP (e.g., geographical distances, inferential statistical analysis). My role in the context of the greater research project was to explore the environment created by the company in New Zealand; enabling 'multi-national' knowledge of said environment. This chapter will outline the methods of data collection used, the involved variables, proceeding data analysis, ethical considerations and a timeline of research events. Refer to Figure 4 for a summary framework demonstrating the flow of methodology for this study.

2.2. Study Location/Setting

This observational study focuses on the Auckland population. Auckland City was selected as the area of interest for several reasons. Principally, it is the largest city in New Zealand, with an above-average population of young people, identified using data from the 2018 Census (100). The country is divided into sixteen regions, with Auckland being the only council area

to have met specified criteria, as 30.5% of the population can be classified as youth (aged 15-34 years). As stated, cities such as Auckland with high populations of youth are of interest due to their high engagement with food delivery services (101). Furthermore, as Auckland City was the first to establish the Uber Eats service in New Zealand, it has partnered with the greatest number of restaurants and cafes, making it the most appropriate for analysis. A list of Auckland council suburbs was compiled in January 2020 and divided into five key regions; Auckland Central, West Auckland, North Shore, South Auckland & Eastern suburbs, and Rodney. In total, 302 Auckland council suburbs were identified.

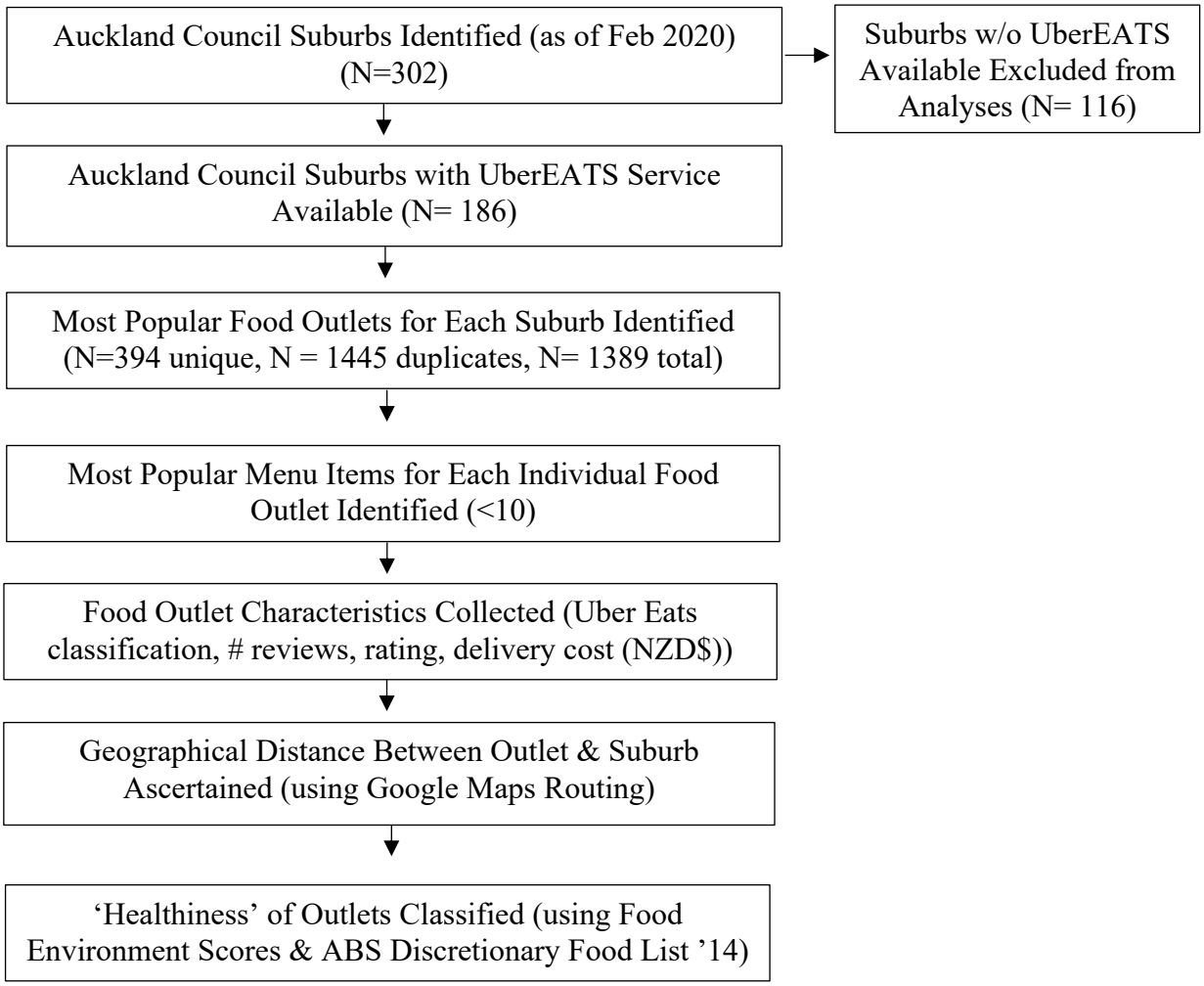

Figure 4. Framework: Flow of Methodology

The Search

2.3. Methods of Data Collection

All Uber Eats data was collected from the Uber Eats New Zealand website (102). The website page was located by searching for Uber Eats in the google toolbar. All searches were done on a personal computer. In order to avoid algorithm interference, no personal Uber accounts were used. Furthermore, Safari was used as the web browser, as Chrome is said to collect web user information which may lead to background differences in Uber website promotions and prompts. When data was collected, the 'time of delivery' was scheduled for 6-6:30pm by means of standardisation.

All suburbs with the Uber Eats service available were entered into an online database using Google Sheets; a primary research tool. This database was developed in order to simplify the process of data extraction. An 'online' database was considered preferable to Microsoft Excel in order to enable access and sharing capabilities with overseas collaborators (SP and SJ) at the University of Sydney. The online 'live' database could be examined and edited in real time by JM and those with access (SJ, RR, SP) from any location.

The website searches (data collection) were carried out from the 23rd of June to the 31st of July 2020. Auckland data, excluding geographical distances, was collected by JM. Data collection began with the sampling of food outlets, and was followed by identifying outlet characteristics and popular menu items. Later, tools and databases (defined below) were used to classify and define outlet types and the nutrition quality of menu items promoted. To summarise, the first half of the data collection process was spent collecting "real time" data, whilst the second half was spent evaluating and defining the data using a nutrition tool and database.

2.3.1. Sampling of Suburbs & Food Outlets

In order to identify which suburbs have the service available, each identified Auckland council suburb was entered into the Uber Eats search toolbar. Only the name of the suburb and postcode was searched; no specific residential or commercial addresses were used (e.g., Epsom 1023). If a suburb did not have the service available, a "sorry we are not there yet" message was displayed. These suburbs were excluded from further analyses. Following exclusions, 186 suburbs had the service available and comprised the research sample. For the full list of included Auckland council suburbs, refer to Appendices; Attachment 1. For each suburb identified, up to ten "popular" outlets were recorded, detailed below (see 2.3.3).

2.3.2. Level of Deprivation

The New Zealand Deprivation Index 2018 (NZDep2018) of socioeconomic deprivation was used to provide a comparable level of deprivation for each suburb with the service available. The NZDep2018 combines nine variables from the 2013 census which reflect eight dimensions of deprivation (103). Such variables include:

Table 2: Defining Deprivation; Dimensions & Variables (103)

Dimension of Deprivation	Description of Variable (In order of decreasing weight in the index)
Communication	People with no access to the internet at home
Income	People aged 18-64 receiving a means tested benefit
Income	People living in equivalised households with income below an income threshold
Employment	People aged 18-64 unemployed
Qualifications	People aged 18-64 without any qualifications
Owned Home	People not living in own home
Support	People aged <65 living in a single parent family
Living Space	People living in equivalised households below a bedroom occupancy threshold
Living Condition	People living in dwellings that are always damp and/or always have mould greater than A4 size.

NZDep2018 data is compiled in two publicly available Excel spreadsheets, which can be accessed from the University of Otago website (104). The NZDep2018 Statistical Area 2 (SA2) database was used to search for each suburb involved in the analysis in order to ascertain scores. The NZDep2018 Index of Deprivation User's Manual was used for reference (103). The index scale, which ranges from 1 to 10, represents the areas with the least deprived scores (1) and the areas with the most deprived scores (10).

The greater Auckland City area is divided into mesh blocks (the smallest geographical units defined by Statistics New Zealand), with larger suburban areas containing multiple mesh blocks. A single mesh block typically contains between 100 and 200 people. The SA2 database was used as it provides average deprivation scores for large suburban areas. For suburbs containing two or more deprivation scores (e.g., Epsom South & Epsom North), an average score for the area was calculated. Each suburb involved in the analysis has a prescribed deprivation score, excluding ten suburban areas (10/186, 5.4%), for which no data could be found (including Herald Island and Greenwoods Corner).

2.3.3. Research Question (i); Top 10 Most Popular Outlets

For each Auckland suburb with the Uber Eats service available, the "popular near you" tab was used to ascertain the top ten most popular outlets for later analyses. Once a suburb is entered into the Uber Eats website, the "popular near you" outlets are displayed at the top of the page, prompting user entry. The "view all" button was selected in order to see the full list of popular outlets for the suburb of interest. The first ten outlets in the list were identified, and recorded in the collective online database. Outlets that appear as "popular near you" are within a geographical radius set by individual outlets.

Due to the scheduled time for delivery, popular cafes and outlets (e.g., Best Ugly Bagels) which exclusively deliver during the day were excluded from the analysis. Franchise stores at different locations (e.g., Burger King Greenlane & Burger King Swanson) were considered "unique" or individual outlets, and not duplicates. The most popular - or perhaps "promoted" - outlets were recorded in order to generate an understanding of the types of restaurants that are dominant on the website. It is in this way that we can see, as a "first-time" user of Uber Eats, what types of foods the service may direct a user to consume – deepening our understanding of the digital food environment created by the company.

2.3.4. Research Question (ii); Popular Menu Items

As well as popular outlets, data on popular menu items was collected for analysis. Each "popular" outlet recorded for each suburb was further examined on the Uber Eats website. Once an outlet is selected on Uber Eats, the most popular menu items from the outlet are displayed at the top of the page. Again, up to ten of these menu items were recorded (E.g., BK Chicken Burger for Burger King (Apollo Dr)). As well as "popular" menu items, those what were promoted as "Recommended" or "Favourite" items were recorded. Again, this data is imperative to understanding the types of foods that are commonly offered and ordered from the website. It provides insight into both how consumers use the service, and how they are *prompted* to use the service.

Furthermore, it allows us to examine whether a "healthy" outlet which offers some "healthy" menu items is indeed contributing to a healthy online food environment, or instead is principally promoting or delivering its less healthy items. For instance, an Asian-fusion outlet such as Kokoro Kitchen, which offers an array of balanced meals, may be promoting its less healthy menu items (e.g., katsu or karrage chicken) as these are the most frequently purchased

options. This then makes it more difficult for a consumer to "find" healthier options provided by the outlet, and more likely to select a less healthy menu item.

2.3.5. Research Question (iii); Outlet Characteristics

For each food outlet identified, the following data was collected:

- Cost of delivery (in NZD)
- Uber Eats food outlet categories (e.g., Healthy, Fast Food, Salads, Mexican)
- Rating (out of 5)
- Number of outlet reviews by service users. If an outlet had greater than 500 reviews, it was listed as 500+.

This data can be found on the Uber Eats website when an outlet is selected. Characteristics of each outlet were compiled in order to make intra and inter-suburb comparisons (E.g., discrepancies between costs of delivery and service prescribed outlet categories).

2.4. Nutritional Analysis

2.4.1. Research Question (i); Classification & Evaluation: Food Environment Score

To place a public health nutrition lens on the data collected, each outlet identified was assessed using the Food Environment Scoring (FES) tool (92, 105). Food outlet classifications are based on a recent Australian study, which used adapted FES classifications and health scores (92). The FES tool was developed, and later adapted, as a system to rate the healthiness of Australian suburbs' food outlet types. As there are little known discrepancies between Australian and New Zealand foodservice and outlet types, the tool is considered appropriate for use in this study. Furthermore, the same tool was used to analyse the environment created by Uber Eats in Sydney, allowing for inter-country comparisons.

The adapted FES tool used for this research has eighteen food outlet types (see Appendices; Attachment 2). As per the tool, all outlet types are classed by healthiness into three groups; unhealthy (FES range -10 to -5), less healthy (FES range -4 to +4), and healthy (FES range +5 to +10). The below table demonstrates each food outlet "type" grouped with corresponding 'healthiness' scores.

Table 3. Grouped Food Outlet Types & Scores (104)

Food Outlets Grouped by 'Type'	Food Outlets Grouped by 'Healthiness' Score
1. Supermarkets: Minor and Major 2. Fresh Produce: Fruit & greengrocer, Butcher, Fish, Poultry shop	→ **Healthy** (FES range: +5 to +10): Supermarkets, Fruit and Greengrocer, Butcher, Fish, Poultry shop, Salads/sandwiches/sushi bar
3. Dining Out: Cafes and Restaurants (Independent & Franchised), and Pubs 4. Small Goods: Bakers, Delis, Sandwiches and Salads	→ **Less Healthy** (FES range: -4 to +4): Cafes and restaurants (independent and franchised), bakers, delis
5. Fast-food: Takeaway Franchise 6. Takeaways: Takeaway Independent 7. Discretionary Foods: General Stores and Specialty Extras	→ **Unhealthy** (FES range: -10 to -5): Fast-food, Takeaway Independent, Pubs, General Stores and Specialty stores

For each outlet that was recorded for analysis, the FES tool was used to characterize the outlet type, and prescribe a score of "healthiness". For instance, 'McDonalds Greenlane' was classified as a 'Takeaway Franchise' store, and was provided with a corresponding health score of -10.

For outlets that were less obvious than others, the outlet was googled to ascertain whether there are one (local independent) or multiple (franchise) physical outlets. Furthermore, outlet websites and Google Maps 'street view' was used to determine whether an outlet was a takeaway store (little to no seating, small space) or restaurant (spacious, multiple seating options, printed menus). For outlets which may fall into multiple categories, the menu items that were offered on Uber Eats were taken into account. For instance, Subway may be classified as a sandwich shop or a takeaway franchise; however, due to the nutritional quality of the sandwiches provided and those promoted by the service, Subway was classified as a 'Takeaway Franchise'.

By identifying each outlet type, and providing each outlet with an environment score, we can apply a standardized means of assessing each outlet. This acts to enhance our ability to definitively determine whether the collective environment created by Uber Eats is healthy, less healthy or unhealthy. Following analysis, if the environment is classified using an evidence-based tool as unhealthy, leverage is provided to nutrition researchers and organizations to enable or hasten action in the digital space.

2.4.2. Research Question (ii); Defining Menu Items: Core Vs Discretionary

To allow for further evidence-based classifications of the environment created by each outlet, and by the service in general, each popular menu item underwent a brief nutritional assessment. The identified popular menu items for each outlet were classified as either "core" or "discretionary" using the Australian Bureau of Statistics (ABS) Discretionary Foods List 2014, informed by the Australian Dietary Guidelines (2013) (106).

Menu items classified as discretionary may be thought of as foods or drinks which are not necessary to provide the nutrients the human body needs, but that may add variety to a person's diet. These foods or drinks are traditionally high in sodium, added sugars, saturated fat and/or alcohol and are low in fibre. As a result, discretionary items are often high in energy, and low in 'essential nutrients', allowing them to be described as "energy-dense" but "nutrient-poor" (107). Using the Uber Eats website, nutrient profiles for menu items were not available. Where not enough information was provided on a specific menu item (e.g., Pad Thai, which is classified as discretionary if it contains >5g/100g saturated fat), the menu item was classified as a core food. A menu item was classified as discretionary if it contained a discretionary item (e.g., battered fish or hot chips as part of a meal deal). Specialty sweetened drinks (such as bubble tea) and traditional sugar-sweetened beverages (SSB) were classified as discretionary.

The classification of identified menu items as core or discretionary deepens our understanding of the nutrition environment that has been created. Defining the vast majority of menu items offered on the website as discretionary would act to provide evidence of its "unhealthiness". The contrary would be true if the majority of menu items are found to be "core" foods. This evaluation of the collected data, in conjunction with the FES score, is intended to result in a more comprehensive assessment of the Uber Eats digital food environment, and offer insight into how youth may be using the service.

2.5 Research Question (iii); Geographical Distances

As aforementioned, delivery distances were collected in order to ascertain whether or not online food delivery services expand the radius from which individuals consume food and/or drinks. Traditional food environments are said to have a radius of 1km (108,109). Expansion of an individual food environment may be beneficial if said environment is collectively

"healthy". However, the growth of a food environment radius which provides a greater array of discretionary foods may be favourable of adverse health outcomes. It is for this reason that the geographical distances between outlets and suburbs was explored.

In order to determine this, each outlet location was entered into Google Maps as well as each identified suburb that the outlet delivers to (e.g., From: McDonalds Greenlane, To: Epsom 1023). When a suburb is entered into Google Maps, a pin is dropped in its centre. This location was used to measure the average distance (in kilometres) between outlets and suburbs. If several routes were recommended by Google Maps, the shortest was selected. No specific residential addresses were used, only suburb names and postcodes. This data was collected by SP and SJ from the University of Sydney, and was entered into the collective online database for analysis. Any routes greater than 10km were cross-checked by SP.

2.6 Variables

Scheduling a time for delivery (6-6:30pm) was performed to standardise results. However, the "most popular" outlets that are shown on the website at any given time or day are subject to change based on popularity and additional unknown algorithm data points. It is therefore possible that the 'popular" outlets are distinct from when data was collected earlier in the year. The extent of algorithm interference is unknown and may be far-reaching regardless of the steps taken to avoid this occurrence (e.g., signing out of Uber accounts). It is well established that data is collected from all devices by big tech companies (e.g., Google, Facebook) (110). Uber has paid Google for use of its mapping services (e.g., Google Maps), however it remains unclear as to whether the company has purchased individual user data to tailor its offerings.

Uber is known to temporarily remove popular restaurants from the website during periods of high demand. The outlet will reappear once demand has subsided and the service regains the ability to deliver within the expected timeframe. This may have confounded results, with popular outlets not being displayed during data collection (6-6:30pm) and subsequently missed from analysis. Furthermore, it is unclear whether the "popular near you" spots are available for purchase by food outlets. It was noted during data collection that "McDonalds" was the only outlet to be in the number one spot, or not appear in the top ten at all. All other outlets would change positioning within the top ten. This may suggest that McDonald's has paid to appear at the top for a vast majority of suburbs, confounding results and skewing the "healthiness" of the environment.

2.7 Measurement Techniques

There was a great amount of data collected throughout the methodology process. This required the grouping and colour-coding of data within the online database in order to ensure a logical layout and simple navigation. Multiple tabs or spreadsheets were created within the database, including a "complete raw data" tab, used primarily for data entry. Other tabs within the database included a list of identified outlets with corresponding FES scores and "number of appearances", geographical distances, and a list of suburbs with associated levels of deprivation.

Within the complete raw data set, suburbs were grouped by area, with every area prescribed a distinct colour (e.g., West Auckland = purple). Data would move from left to right with the name of the suburb to the far left, and the top ten outlets for each suburb to the right. For each outlet, there was data on the characteristics and most popular menu items, including whether they were core or discretionary. For instance, once a suburb was identified from the left-hand

column, a user can scroll to the right to reveal a list of outlets from one to ten and their data points of interest. No emphasis was placed on the position of each outlet within the top ten, as these are subject to change. Instead, interest in the top ten was collective, with the aim of creating a large sample of outlets on which to place a public health nutrition lens.

The "number of appearances" was collected in order to see if any particular outlet appeared for a number of different suburbs, and therefore a vast number of consumers. This data was collected by "finding" an outlet within the raw data set. By using the "Command F" function, the name of the outlet could be entered. The number of times that the outlet can be found within the document was then displayed and recorded.

2.8 Data Analysis

In order to evaluate the food outlet characteristics, the healthiness of food outlets and the nutrition quality of the most popular menu items, descriptive statistics were used, enabling simplistic summaries regarding the data collected. The descriptive statistical analysis of the collected data was replicated by JM, whereas inferential statistical analysis was solely performed by SJ & SP (University of Sydney).

To ascertain the percentage of "heathy", "unhealthy" and "less healthy" food items promoted, a new database tab was created with a list of all identified food outlets. Each outlet was then prescribed an FES score taken from the complete raw data set. Following this, the "Command F" function was used to search for the numbers of interest (e.g., 0, 5 & 10). The function would then display the number of times the number "5", "9" or "10" appears in the list, corresponding to the number of "healthy" outlet appearances collected. This number was collected and later converted into a percentage to demonstrate overall healthiness of the data collected (e.g., 17

outlets out of 394 were classified as “healthy”, or 4.3%). This database has been converted to a list, attached in the appendices for reference (Appendices; Attachment 3).

The same methods were used to ascertain the number of discretionary and core food items identified. Data on physical outlet locations and associated deprivation levels were analysed and separated into quintiles, with quintile 1 (Q1) representing the 20% least deprived areas (decile 1-2), and quintile 5 (Q5) representing the 20% most deprived areas (decile 9-10) (see Appendices; Attachment 1). This was performed in order to assess any significant associations between deprivation levels and Uber Eats offerings.

A series of tests were performed by researcher’s SP, AG and SJ by way of inferential statistical analysis. All tests were performed using SAS version 9.4. The Kolmogorov-Smirnov test was used to test the normality of continuous variables. Kruskal-Wallis tests were used for continuous variables, and Chi^2-tests were used for categorical variables to examine differences between food outlet characteristics, healthiness of food outlets and the nutrition quality of the menu items identified as most popular with the socioeconomic disadvantage level within each suburb (99). Data with skewed distribution were summarized as medians and interquartile intervals. Finally, the Dunn test was used for post-hoc multiple comparisons of significant differences (99).

2.9 Ethical Considerations

Ethical considerations were limited for this study, as there are no participants. All data collected is publicly available on the Uber Eats website; no sensitive company data was requested or collected for inclusion in this study.

2.10 Timeline

All data was collected over a two-month period from June to July 2020. Data on geographical distances collected by SJ and SP was collected at the end of this period. Data for Auckland and Sydney was analysed immediately following data collection, throughout the month of August, by SJ and SP. Following analysis by SJ and SP, the research was finalised and published in the Nutrients Journal in October (99). Working retrospectively, Auckland data was analysed by JM in November 2020 with the intent of performing the same analysis (descriptive statistical analysis). As aforementioned, inferential statistical tests were performed by SP, AG and SJ using SAS software, version 9.4.

CHAPTER THREE

Results

The Auckland regional council area covers a geographical distance of approximately 4940km^2 and has a population of nearly 1.6 million (100). Uber Eats does not have full coverage across the said area; 186 of 302 council suburbs were identified for analysis across the five districts in the Auckland metropolitan region (Central, North Shore, Southern & Eastern suburbs, Western suburbs & Rodney). The results of this research have been separated into each of the three key research questions, for ease of interpretation. Figure 5 provides an overview of the study sample, the SES characteristics of the suburbs included in the analysis, and the number of outlets and menu items identified and evaluated.

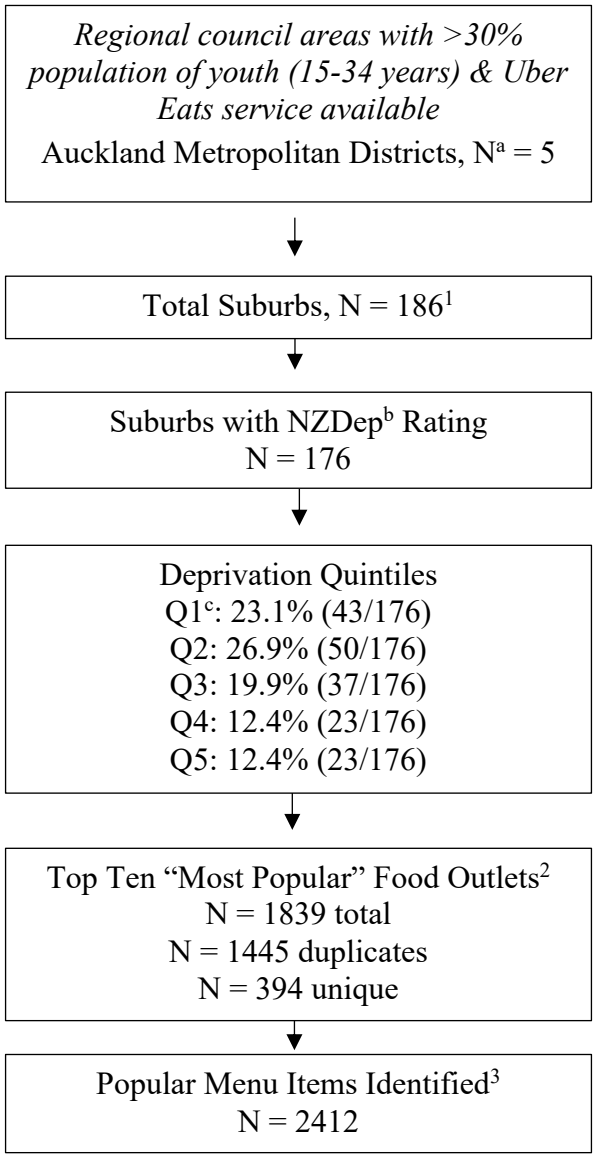

Figure 5. Flow Diagram of Council Areas, Deprivation Quintiles, Identified Food Outlets & Menu Items

[a]N, number; [b]NZDEP, New Zealand Deprivation Index of 2018; [c]Q, quintile. [1]Auckland Council suburbs with Uber Eats service coverage. [2]Most popular outlets identified for 186 suburbs. [3]Popular menu items identified for 394 unique food outlets.

3.1 Research Question One:

What is the availability of types and categories of food outlets on Uber Eats, Auckland?

The primary objective of the research was to classify the types and categories of food outlets that are popular or promoted on the Uber Eats website in the location of interest. This was performed using an evidence-based tool (FES) developed specifically for evaluating food

environments. Descriptive statistics were used to analyse and describe the data collected on food outlet types and health classifications. Answering the primary research question acts to lay the foundation of our knowledge of this emerging digital environment, which in the short-term allows for assumptions to be made regarding its impact, and, optimistically, will enact future action in this space.

Table 4. Identified Outlets, Outlet Characteristics & Delivery Distances

Characteristics	Outcome Identified
Outlets identified (total)	1839
Outlets identified (duplicates)	1445
Outlets identified (unique)	394
Outlets identified as unhealthy, n[a] (%)	290 (73.6)
Outlets identified as less healthy, n (%)	87 (22.1)
Outlets identified as healthy, n (%)	17 (4.3)
Rating/5[1], median (IQR[b])	4.5 (4.3-4.6)
Reviews[2], median (IQR)	245 (122-431)
Cost of delivery (NZD[c]), median (IQR)	7.99 (5.99-7.99)
Delivery Distance (km[d]), median (IQR)	3.20 (2.00-4.40)
Unique Delivery Routes[3]	1839
Unique Delivery Routes >1km, n (%)	1648 (89.7)

[a]n, number; [b] IQR, interquartile range; [c]NZD, New Zealand Dollar; [d]km, kilometer. [1]Rating is calculated based on the average ratings a food outlet received for their last 500 rated orders, or all orders they have completed if they haven't yet reached 500. [2]Food outlets with over 500 reviews were listed as 500+. [3]Unique delivery routes = unique food outlets x n delivery suburbs.

As per Table 4, almost three-quarters of food outlets assessed were classified as unhealthy (73.6%). Less than 5% (4.3%) of food outlets are eligible for description as "healthy" using the FES scoring tool. Once all data for the "top ten" most popular food outlets was collected, there was 1839 food outlets in total. This number includes 'duplicates' that occurred when a food outlet appeared in many suburbs as the most popular. Taking this into account, only "unique" outlets (those with a distinct physical location) were assessed, lessening the total to 394.

An aspect of this research was to ascertain whether or not the digital food environment acts to expand the traditional "food environment" radius of an individual, which is said to be ~1km (99). Delivery distances obtained were the shortest distance between the food outlet and the delivery suburb, which was ascertained using Google Maps. A unique delivery route was calculated by multiplying the food outlet by the number of delivery suburbs. Almost all identified unique delivery routes were greater than 1km (96.7%). With an average delivery distance of 3.20km, Uber Eats acts to triple the food environments of youth in Auckland. A considerable proportion (15.4%) of delivery routes were between 5.1-10.0km, with only 0.4% being >10km (Table 4).

Table 5. Food Outlets Grouped by FES Category (Healthiness)

FES[a] Category	N[b] (%)
Healthy (5 to 10)	17 (4.3)
Less healthy (-4 to 4)	87 (22.1)
Unhealthy (-10 to -5)	290 (73.6)

[a]FES, Food Environment Score; [b]n, number.

Grouping each outlet into its FES classification facilitates interpretation of the presented results (Table 5). As demonstrated, most unique outlets assessed are classified less healthy or unhealthy (377/394, 95.7%).

Table 6. Food Outlet Classifications & Associated FES Scores

Food Outlet Classification	FES[a] (n[b], %)
Bakery (0)	0 (0)
Major Supermarket (5)	0 (0)
Sandwich shop (5)	2 (0.5)
Salad/sushi bar (5)	15 (3.8)
Specialty food store – extra foods (-8)	19 (4.8)
Restaurant/café franchise (0)	27 (6.9)
Take-away local independent (-8)	57 (14.5)
Restaurant/café local independent (0)	60 (15.2)
Take-away franchise store (-10)	214 (54.3)

[a]FES, Food Environment Score; [b]n, number.

Over half of all food outlets evaluated (54.3%) are classified as “take-away franchise stores” using the FES scoring tool (Table 6). The second most popular classification in Auckland was restaurant/café local independents (15.2%), followed by take-away local independents, which accounted for 14.5%. There were no “major supermarkets” or “bakeries” identified, with healthier food outlet classifications (e.g., salad/sushi bar) making up only 3.8% of outlets assessed for the Auckland council region.

The majority of take-away franchise stores (214) were from 11 fast-food chains. The most popular chains overall, however, were Subway with 46 unique outlets (11.7%), McDonald's with 40 unique outlets (10.2%) & Burger King with 24 (6.1%) (see Appendices; Attachment 3). Boss Don was the “most popular” food outlet identified in terms of suburb appearance, appearing for 21 different suburbs. This was followed by Kokoro Kitchen (20) and Fuzion Kebab (19). It should be noted that McDonald’s appeared either in the top (#1) position of the “most popular” outlets, or did not appear at all. This was unique for the restaurant and was also observed in Sydney (99).

In summary, the results demonstrate that the types of food outlets widely available on the Uber Eats service in Auckland are unhealthy, with the majority of “outlet types” being fast-food or takeaway stores and franchises. Here, the digital food environment created by the OFD of interest may be likened to a “fast-food strip” which showcases popular ‘junk food’ franchises, and exists ‘physically’ in several suburbs around the greater Auckland region.

3.2 Research Question Two:

What proportion of foods may be classified as core foods or discretionary?

The research's secondary aim was to ascertain which, of the menu items identified, may be classified as core – part of a balanced diet – or discretionary. As with research question (i), descriptive statistical analysis was performed to make sense of the data collected and answer the presented research objective. The total number of popular menu items identified, for the "unique" outlets assessed, was 2,412.

Table 7. Proportion of Discretionary & Core Menu Items Identified (ABS[a])

Popular Menu Item Classifications	N[b] (%)
Total number of popular menu items[1]	2412
Foods classified as discretionary, n (%)	2128 (88.2)
Foods classified as core, n (%)	284 (11.8)

[a]ABS, Australian Bureau of Statistics Discretionary Foods List 2014; [b]n, number. [1]Menu items that are listed under the heading 'most popular' e.g., the first section of a food outlets complete menu.

Of the popular menu items identified, the vast majority (88.2%) may be described as discretionary, following analysis using the ABS Discretionary Foods List of 2014. Nearly a third (700/2128, 29.0%) of all discretionary items identified were "meal deals," which included a sugar-sweetened beverage (SSB) or hot chips. Core foods, foods considered "healthy" or part of a balanced diet, comprised only 11.8% (284/2412) of menu items evaluated for the Auckland council region. Nine of the suburbs assessed (9/186) had less than ten "most popular" food outlets. These suburbs were located rurally or in new development areas, a significant distance from common food outlets and cafes.

Answering this research question paints a more comprehensive picture of the Uber Eats digital food environment. The data demonstrate that the vast majority of the menu items analysed are discretionary, and are therefore not considered part of a balanced or 'healthy' diet.

Discretionary foods - described as energy-dense and nutrient poor - contribute to nutrition-related disease and are to be consumed in moderation.

3.3 Research Question Three:

How does the above relate to restaurant characteristics such as locations, socio-economic demographics of the location, cost of foods, and delivery?

The final research question aims to explore how the outlets and menu items identified by research questions (i) and (ii) relate to alternate aspects of "unique" outlets, including location, delivery distance, and cost. Descriptive and inferential statical analysis was performed in order to make comparisons and accurately assess the data collected.

Table 8. Auckland Council Suburbs by Quintiles of Deprivation (NZDep[a])

Quintiles of Deprivation	N[b] (%)
Q1[c] 20% Least Deprived (1-2)	43 (23.1)
Q2 (3-4)	50 (26.9)
Q3 (5-6)	37 (19.9)
Q4 (7-8)	23 (12.4)
Q5 20% Most Deprived (9-10)	23 (12.4)

[a]NZDEP2018, New Zealand Deprivation Index; [b]n, number; [c]Q, quintile. Ten suburbs had no NZDEP available (5.4%).

As per Table 8, of the 186 council suburbs with the service available, 50% (93/176) are located in the "least deprived" areas of the Auckland metropolitan region (See Appendices; Attachment 1). Ten suburbs did not have a deprivation index rating available during analysis (10/186, n= 176).

Table 9. Characteristics by Deprivation Level (99)

	Q1[a]	Q2	Q3	Q4	Q5	*p*-Value$_{diff}$
Delivery Details						
NZDep2018[b]	1 (1-2)	2 (1-2)	3 (2-3)	3 (2-4)	4 (3-5)	<0.0001
Delivery Cost ($NZD[c]), Median (IQR[d])	7.99 (4.99-7.99)	7.99 (5.99-7.99)	6.99 (5.99-7.99)	7.99 (6.99-7.99)	7.99 (5.99-7.99)	<0.0001
Delivery Distance (km[e]), median (IQR)	3.00 (1.8-4.2)	3.20 (2.0-4.5)	2.80 (1.9-4.4)	3.60 (2.4-4.7)	2.8 (2.1-4.1)	0.0004
Food outlet healthiness score						
Healthiness score, median (IQR)	-8 (-10-0)	-10 (-10-0)	-10 (-10—8)	-10 (-10—8)	-10 (-10—8)	0.0277
Unhealthy (score <-4), n (%)	27 (56)	75 (69)	55 (77)	75 (79)	42 (86)	0.0537
Less Healthy (score -4 to 4), n (%)	18 (38)	29 (27)	14 (20)	16 (17)	5 (10)	
Healthy (score >4), n (%)	3 (6)	5 (5)	2 (3)	4 (4)	2 (4)	
Most popular menu items						
Proportion (%) of discretionary menu items, median (IQR)	95.0 (80-100)	85.7 (70-100)	100 (80-100)	100 (80-100)	100 (85.7-100)	0.0748

[a]Q, quintile; [b]NZDep2018, New Zealand Socio-economic Deprivation Index Rating 2018; [c]NZD, New Zealand Dollar; [d]IQR, interquartile range; [e]km, kilometer.

22 unique food outlets had missing data for deprivation quintile of physical food outlet location (5.6% of total unique food outlet locations) and ten delivery suburbs had no NZDep 2018 data available; 100 unique delivery routes had missing data for deprivation quintile of delivery suburbs (5.4% of unique delivery routes).

Table 9 displays the results of inferential statistical analysis performed by researchers from the University of Sydney (SP, AG & SJ). The analysis found that the deprivation quintiles of the physical food outlet locations were similar to the deprivation quintiles in the suburb of delivery (p <0.0001). This suggests that food outlets are delivering within the suburb they are located in or to similar geographical areas (99). The researchers also found significant differences between costs of delivery across quintiles (p <0.0001), with Q3 having the lowest median delivery costs at $6.99 (NZD). Further differences were observed for delivery distances and quintiles of deprivation of physical food outlet locations in Auckland (Table 9), with increases in delivery costs and distance observed with increasing quintiles of deprivation (p <0.0004).

There were significant differences between the healthiness of food outlets (using the FES) and the deprivation quintiles of physical food outlet locations (p = 0.0277). Post-hoc comparisons demonstrated that food outlets with healthier FES scores were located significantly more in the least disadvantaged suburbs (Q1) than the most disadvantaged suburbs (Q5).

No differences in the proportion of discretionary menu items across the physical location deprivation quintiles in Auckland were found; there is no significant discrepancy between offerings & deprivation level (p = 0.0748). The majority of suburbs have a similar "top ten" regardless of their NZDep score. Key differences appear to arise from urbanization e.g., suburbs with a "healthy" top ten (Redvale) are located in rural or "new development" areas with lesser proximity to popular and common fast-food outlets.

It appears that the characteristics of identified "unique" outlets relate to socio-economic status, delivery cost and delivery distance in a number of ways. This strengthens our understanding of

what variables result in service discrepancies, or how the environment may differ based on individual and/or restaurant characteristics.

3.4 Supporting the Hypotheses;

Is Uber Eats an unhealthy digital food environment which disproportionally affects economically disadvantaged members of the Auckland population?

Data collected and analysed for research questions (i) and (ii) clearly support the hypotheses that (a) Uber Eats has high proportion of unhealthy food outlets (73.6%) and (b) the majority of promoted or popular menu items may be classified as discretionary foods (88.2%), suggesting that the digital environment may be described as unhealthy. Data collected and analysed for research question (iii) may not support the hypothesis that those located in disadvantaged council suburbs are presented with less healthy food outlets and menu items, as with the physical food environment ($p = 0.0748$). Whilst less or unhealthy outlets are more likely to be located in more deprived areas within the greater Auckland Council area, this appears not to translate to significant differences in what is presented or promoted to consumers using the service from socio-economically distinct suburban areas.

The research audit results demonstrate that the majority of food outlets and menu items on the Uber Eats website are unhealthy. This may suggest that these foods are being consumed more frequently than the healthier menu options available on the service. More research is required to evaluate the purchasing habits of service users in order to definitively assess the nutrition impact of the digital food environment created by Uber Eats.

CHAPTER FOUR

Discussion

4.1 Interpretations: *What do the results mean?*

Uber Eats may be classified as an unhealthy food environment, following the utilization of evidence-based nutrition tools and databases. This research is one arm of a multi-city study, which is the first to assess popular food outlets' healthiness and the nutrition quality of menu items provided by market-leader Uber Eats. Key findings indicate that, as a first-time user of the service, one would be directed toward purchasing a range of discretionary menu items. There appears to be enhanced difficulty finding healthy or "core" menu items on the application, making healthy food purchases less opportune.

4.1.1. Key Research Objectives: Research Question (i); *Food Outlet Types & Classifications*

Regarding the primary research question, this study has found that almost three-quarters (73.6%) of popular food outlets and menu items are classified as unhealthy, with half of all food outlets being takeaway franchise stores. The most popular food outlets across all deprivation levels were international fast-food chains stores such as McDonald's®, Burger King®, and Subway®. Here, we may wish to reflect on a data cycle that may be created through the use of OFD services:

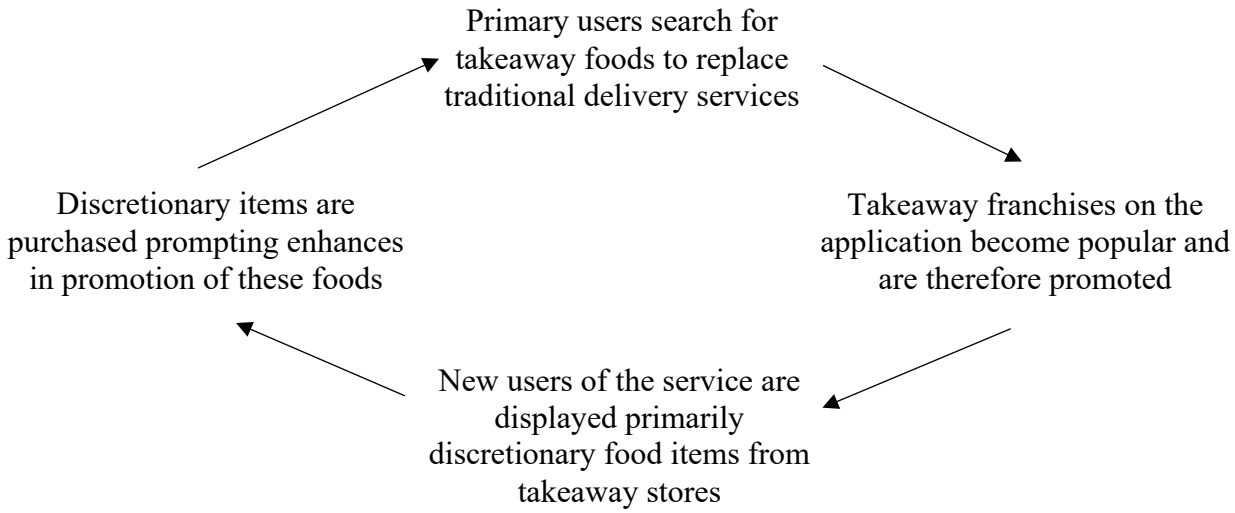

Figure 6. Potential Data Cycle Created by Users & Algorithms

It seems likely that, if healthy or "fresh" menu items are to be purchased by a user, the intention to consume healthily must be there primarily. This suggests that those who use the service to consume core foods are already health conscious, and are unlikely to require or benefit from nutrition intervention. However, of concern to nutrition professionals is those who use the service to purchase discretionary foods and, more importantly, those who use the service without preference and are therefore directed by promotions.

4.1.2. Key Research Objectives: Research Question (ii); *Proliferation of Discretionary Foods*

As per Table 7, the results of this research show that the majority of menu items (88.2%) that are popular on Uber Eats are discretionary foods. This finding validates that of the FES, which classified most popular outlets as unhealthy. The saturation of Uber Eats with discretionary foods is concerning, yet the service comprises only a small fraction of the wider digital food environment.

As discussed, the digital food environment includes online food delivery services (for meals and groceries) and social media websites and applications where food is increasingly promoted

and marketed. Digital food marketing takes place across all mediums, and is particularly significant on content-sharing platforms such as Instagram and YouTube. Here, food is not only promoted by retailers but by friends and acquaintances too, with discretionary foods being promoted in "trendy" ways. The reversal is also true of the content-sharing influence of the environment, where healthy foods and "fitspo" lifestyles are promoted by digital influencers, fuelling consumer confusion over health and nutrition. This effect on nutrition status and body image is noteworthy and should be considered when considering the "digital food environment" in a collective or general sense.

Although influencers in the digital space play a pertinent role, food companies that dominate the physical food environment are also heavily influencing the digital realm, as demonstrated by the results of this research. Concern is growing over the effect of persistent exposure to digital food marketing and promotion on social media platforms as mentioned earlier (111). Digital marketing is delivered "programmatically" whereby automated buying and selling of targeted advertising impressions occur (112). It has been estimated that by the time a child reaches the age of 13, adtech companies have collected over 72 million data points on said child, which is equivalent to 12,000 pieces of data collected for each hour spent online (113). The impact of this data collection and its use in targeted food advertising on children and adolescents' health and nutrition is likely significant and compounding the effect of OFD services when considering the greater digital food environment (112).

4.1.3. Key Research Objectives: Research Question (iii); *SES, Cost Discrepancies & Delivery Distance*

An association of interest for this research was between socioeconomic status and popular menu items of different suburbs across the Auckland region. As expected, there was a

significant difference between food outlet locations and deprivation levels (Table 9). Outlets with lower (and therefore healthier) FES scores were more frequently located in the least deprived suburbs. There was also a significant difference between cost of delivery and deprivation level, whereby slight increases in delivery costs were observed with increasing levels of deprivation (p <0.0004). This finding was surprising, as most popular takeaway outlets offering discretionary foods are located in the most deprived areas, allowing for assumptions that delivery costs would be lesser for local suburbs.

Interestingly, there were no significant differences between the number of discretionary food items promoted by the service and socioeconomic status (p = 0.0748). Due to associations between lower socioeconomic status and poor health outcomes, one may expect suburbs with higher levels of deprivation to have popular food outlets that differ to those with little to no recorded deprivation (e.g., deprivation level 10 vs 1). For instance, suburbs with a deprivation index ranging from 7-10 may be expected to primarily have takeaway outlets as the "most popular" when researched, whilst areas with scores between 1-3 may have more "heathy" options (e.g., sushi) promoted as popular. However, no such associations were found.

This differs from physical food environments, which repeatedly demonstrate significant associations between deprivation level and nutrition quality of local foods (e.g., "food swamps") (41). It appears that a digital food environment removes accessibility barriers to food provided; however, in this case, a less favourable result has come of this removal. Instead of providing healthier alternatives to lower socioeconomic areas, it appears the service may solely act to enhance the accessibility of takeaway foods to those facing less deprivation in areas where unhealthy foods are scarcer. The lack of association between deprivation level and

number of discretionary items observed may suggest that modernisation is a more significant factor for the digital food environment than deprivation.

Another key finding of this study was the significant delivery distances observed, with most delivery distances (~90%) being greater than 1km, as demonstrated in Table 4. This expands the traditional "food radius" of an individual. Due to the discretionary nature of foods promoted and provided by the service, this expansion may be considered negative. If an individual's food environment were to expand to incorporate a greater variety of core foods, such a finding may be positive. With the opposite being true of this research, we may conclude that Uber Eats expands the traditional food environment of an individual to include more discretionary foods. In future, researchers in this space may wish to investigate whether a link exists between this expansion and the nutrition quality of the youth diet in NZ.

4.1.4. Food Environments: The Digital vs The Physical

We now have a greater understanding of the digital food environment, allowing for comparisons to the physical or "built" environment. The results of this research highlight how the digital environment may differ from the physical in two key ways; the reverse effect of urbanisation – with urban areas facing less opportunity to be healthy than rural areas - and a lack of observed association between socioeconomic status and foods promoted by the service (Table 9).

Online, socioeconomic status appears not to play as large a role as in the physical realm. Instead, modernisation of lifestyles and the merging of technology with everyday life is a more pertinent factor to consider and address. Technological devices are widely available and

emerging tech services such as Uber Eats are utilised by individuals from all socioeconomic backgrounds, despite the cost of the service (114).

It is important to further recall the influence of convenience and its ability to overcome financial barriers faced by youth. The digital food environment created by the Uber Eats presents a financial barrier with regard to the additional cost of the service. However, it has been demonstrated that convenience is a significant factor in the consumer experience of a millennial, which is prioritised over price in some instances. A report prepared and released by the National Retail Federation (NRF) found that two-thirds (66%) of those surveyed stated they are willing to pay more for convenience when shopping for groceries, particularly online. This may include paying for third-party services or subscriptions in order to ease the burden of the weekly shop (115). Although they differ slightly, this behaviour when shopping for "groceries" may extend to the use of online food services such as Uber Eats.

For the physical food environment, rural areas tend to have high NCD rates due to risk factors such as lesser fruit and vegetable intake and higher alcohol consumption (116). However, for the digital food environment, it appears that urbanisation results in a less healthy environment, where rural or 'new development' areas have healthier options due to limited proximity to common fast-food outlets. The results of this research support this finding, with areas such as Redvale, located rurally, having a "healthier" top ten on Uber Eats. The rural vs urban variable would be interesting to assess further in a digital sense, exploring the influence of "urbanisation" on the digital food environment.

4.1.5. Comparable Outcomes: Auckland vs Sydney

As this is one arm of a multi-city study, comparisons can be made between Auckland and Sydney regarding research outcomes. Across all measured outcomes, the two cities are very similar, with few reported discrepancies. The average cost of delivery was similar between both cities; however, Sydney had a greater range due to free delivery promotions by takeaway franchise Domino's Pizza (99). The mean delivery distances were similar for both Auckland and Sydney; 3.00km for Sydney and 3.2km for Auckland. Also similar was the number of unique routes greater and less than 1km (traditional food environment radius); in Auckland, 10.3% of unique delivery routes were <1km, with 11.9% for Sydney (99).

The majority of food outlets for both cities were scored as unhealthy using the FES tool, with the most popular food outlet classification for both areas being "takeaway franchise stores". The most common food outlets were similar for Auckland and Sydney, including McDonald's® and Subway®, with the majority of identified "popular menu items" being classified as discretionary.

Although Auckland and Sydney are highly comparable, there is a significant discrepancy in government policy that is worth noting. New South Wales (NSW) has mandatory kilojoule (kJ) labelling for fast food chain outlets, instated in 2011 following concerns regarding increasingly poor diets and high body mass indexes contributing to the burden of disease in Australia. Such mandatory labelling now extends to apps such as Uber Eats, and has proved effective at reducing the energy content of products purchased (117).

As well as providing information regarding the energy content of menu items at the point of sale, fast food outlets are required to display information about average daily adult energy requirements (currently estimated around 8,700kJ). Alongside the introduction of the scheme,

the NSW government launched its "8700" website, which informs consumers about their daily requirements, the energy content of a variety of foods (including core foods), and outlines the new legislation (117). A 2013 evaluation of the scheme showed that the combination of energy information display and public education resulted in a significant decrease in median kJ purchased over the period evaluated, citing an overall reduction of 519kJ, or a decrease of 15% (117).

In New Zealand, no such legislature has been proposed or passed. Presently, we are unaware of the influence of said labelling on consumers when using OFD's. However, we may assume that efficacy extends to web-based services. In this instance, New Zealand consumers, particularly youth, may be disadvantaged compared to Australian youth in terms of information and education regarding energy content and requirements. Education is a key tool in combatting nutrition-related disease. Empowering youth with energy content information enables more informed and healthy decision making, which may act to reduce the overall influence of OFD's on the nutrition status of the population group of interest.

4.2 Implications: *Why do the results matter?*

The results of this research indicate several important considerations for health professionals and users of OFD's. It is primarily important to appreciate the growth and popularity of these services, which will continue to expand into the foreseeable future. Furthermore, grave consideration must be given to the nutrition consequences which are likely associated with these new digital technologies.

4.2.1. OFD Popularity & Engagement Trajectory

The popularity of OFD services is predicted to continue to increase over time, with predictions estimating a compound annual growth rate (CAGR) of 6.4% from 2021-2024 (118). Therefore, the digital food environment will only expand and utilize more consumer data to its advantage as time goes on. These advancements will continue under the guise of convenience, whereby energy expenditure will likely continue to dissipate whilst energy intakes increase. The growth of OFD services will be safeguarded by tech-raised Gen-Z, who already engage with such services frequently (119). Unsurprisingly, the youngest members of the population have the highest engagement levels, and this age-association is likely to continue, resulting in exponential growth for the industry. A "Digital Convenience Report" released by the NPD group in 2018 found that foodservice delivery orders by members of Gen-Z in the United States amounted to 552 million, which was just shy of Millennials orders for the year ending in December of 2018. This finding was significant considering the percentage of the Gen-Z population that was old enough to order their own food delivery (119).

4.2.2. Covid-19 & OFD User Onboarding; A Growth Injection

The global pandemic that began impacting the global economy and everyday life in early 2020 has significantly impacted online food delivery, injecting momentous growth into the market. The vast majority of research into the effects of the pandemic and its restrictions on food delivery conclude significant increases in the use of online food delivery services, with most users stating they will continue to use the services after restrictions have lifted. According to Google, searches for "online food delivery" increased by 300% since 2019 (120). An online food delivery survey conducted among 3,606 consumers across the UK, Italy, Brazil and South Korea, found a "net positive" impact on frequency and spending on OFD's, with 57% of new users claiming they will use the services in future (121). Once the lockdown restrictions ended

across the United States, Uber Eats witnessed a 30% increase in signups for its food delivery service (121). Other food delivery apps, including Deliveroo, saw a 20% increase in daily food deliveries from May 2020 onwards.

In New Zealand, Uber made an effort to ensure the prevalence of its use throughout the lockdown period and during the economic turbulence that followed for many New Zealanders in the foodservice industry. From the 18th of May 2020, Uber allowed food outlets to use their own staff to deliver Uber Eats orders received via the app. Restaurant owners were able to choose delivery fees and coverage areas, and pay less than half (8%) of current commission to Uber until the 31st of July, before returning to a rate of 16% (122). Furthermore, they facilitated the option to "pick-up" food via the app for no fee to consumers or commission payments to the company. Uber hoped this would help outlets to save costs and place employees in delivery work to keep jobs viable.

The pandemic has forced consumers into the digital realm due to movement restrictions and fear of infection. Furthermore, restaurants which have resumed their services following lockdowns have typically reduced their in-house seating capacity due to social distancing measures, giving more preference to takeaway and online food delivery. OFD's are likely to benefit from these outcomes into the future as "new" users are onboarded who otherwise would not have engaged with such services.

4.2.3. Primary Research Concern: Health & Nutrition Consequences

The primary concern for this research is the nutrition consequences involved in these developing technologies. The results of research questions (i), (ii), and (iii) demonstrate that the majority of food outlets and menu items available and 'popular' on Uber Eats are unhealthy,

leaving questions unanswered regarding the direct effect of the service on discretionary food consumption.

The link between the consumption of discretionary foods and adverse health outcomes is well defined by current literature (123, 124). This cross-sectional analysis suggests that youth in Auckland may be using the service to order and consume discretionary food items. It further indicates that first-time users of the service are likely directed to consume nutrient-poor, energy-dense foods while navigating the website or application. When combined with knowledge of the associations between the consistent consumption of foods high in saturated fats, refined sugars and sodium, and the development of obesity, diabetes and cardiovascular disease, this outcome suggests that the digital Uber Eats environment may be favourable of nutrition-related disease.

Repeated use of the service is likely to increase the amount of saturated fat, sugar and sodium in an individual's diet, which will likely contribute to an energy imbalance over time. Such imbalances in energy consumption increase the likelihood of weight gain, which, if sustained, involves increasingly severe health consequences; including metabolic disturbances which develop into prevalent disease states. Below is a depiction of the likely nutrition influence of Uber Eats for youth in Auckland, New Zealand. More research is required to definitively assess this association.

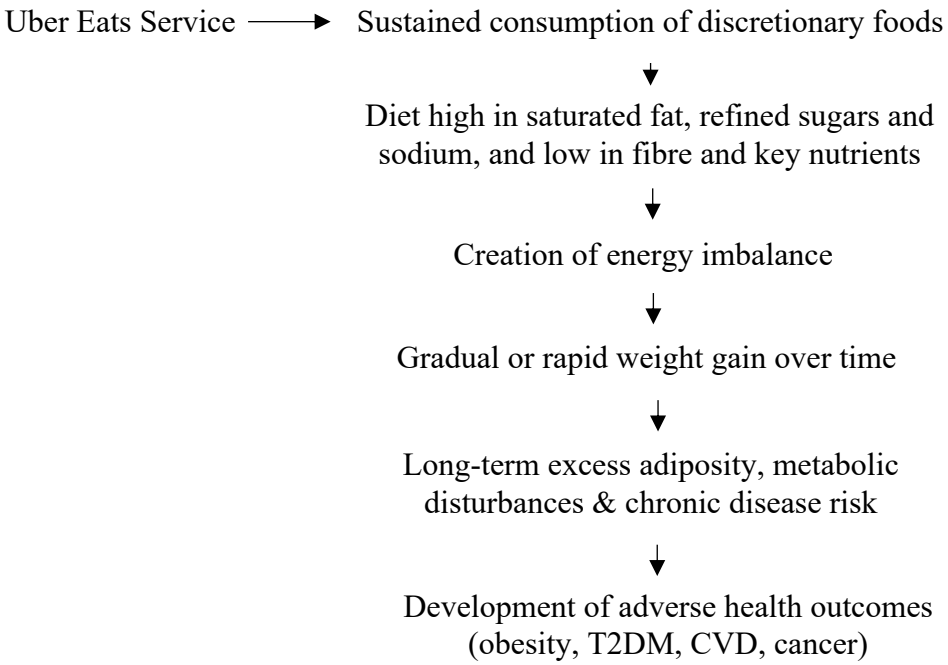

Figure 7. Framework for the Nutrition Influence of Uber Eats in Auckland

Figure 7 demonstrates the contribution of the Uber Eats service to the consumption of discretionary foods by youth in Auckland that the results of this research suggest. As is well established, the consumption of such foods has been steadily increasing across all demographics. Instead of offering and delivering a range of healthier alternatives to combat this issue, it appears that the digital food environment may contribute to such increases and, ultimately, to the consequences of their consumption. New Zealand is a nation already plagued with increasing rates of T2DM, cardiovascular diseases, cancer and obesity. There now appears to be a new variable which may be augmenting nutrition-related disease rates and amplifying the burden on our healthcare system. More research in this space is required to ascertain whether a link exists between this new environment and the development of youth NCD's.

In contrast to the conclusions of this research, the Uber "wrap up" report for 2020 sheds a positive light on how kiwis are using the service. The report states that healthy food "continued to breakthrough in popularity" with searches for kale, quinoa, poke bowls, tahini, charcoal and

acai all dramatically increasing in popularity over the course of the year (125). These searches reflect the "health food trends" of the preceding year and may indicate the previously identified "health-conscious" users of the service, who are 'health literate' and can navigate the application to select and consume healthier options. On the other hand, this statement may highlight potential limitations of the current study, including its partial, rather than full, analysis of the website, detailed below. A complete analysis of all foods available on the Uber Eats service may have concluded "healthier" results.

4.3 Limitations: *What the results can't tell us?*

There are a number of limitations to the undergone research. Some limitations have arisen from data collection methods and the study design, whilst others have arisen from fixed variables (e.g., Uber variables).

4.3.1. Research Limitations

There are known limitations to a cross-sectional study design, to which no research is exempt. The key predictive limitation of a cross-sectional study design involves the "screenshot" nature of the study. As all data was collected at a singular point in time, changes or variations in results if the same study were to be repeated are likely. Whether or not these changes would be significant, however, is unknown. New food outlets and eateries are added to Uber Eats Auckland with frequency, constantly changing the website and application landscape. It would be interesting to perform the same research in the near future (1-5 years) in order to assess how the OFD service is evolving based on consumer demand or relationships with "popular" food outlets. As technology becomes more intertwined in daily life, it would be of interest to assess whether Uber Eats becomes less of a "takeaway" service and more of an everyday application used to consume "core" foods or meals.

A further limitation is that this research only explored 'popular' food outlets and menu items; questions are left unanswered regarding the rest of the service. What percentage of *all* restaurants or outlets on Uber Eats are classified as healthy? We do not know how many outlets on the website are healthy or unhealthy, as we only sampled from the most popular. The website may have a considerable amount of healthy or core food options available. Despite this, the current research has demonstrated that these offerings may be difficult to find and may require a certain level of health literacy or "healthy intentions" in order to identify and select such foods for consumption. Exploring the proportion of healthy outlets across the entire application would be incredibly laborious; however, it would serve to deepen our understanding of the Uber Eats environment.

The generalisability of results is an important consideration. It appears that the findings of this research may be generalisable to other OFD services. Based on previous reports from other OFD's, we may assume that most food delivery services promote similar food outlets and therefore deliver similar menu items. For instance, the Menulog 2018 report states the top three dishes of that year (ordered and delivered) in New Zealand were a butter chicken, a Hawaiian pizza, and a Pad Thai (8). As of yet, there are no OFD companies that specialize in delivering healthy food items. The knowledge acquired by this research adds to our collective understanding of the emerging digital food environment and allows us to make assumptions regarding the impact of these services on our health.

However, this research only took place in the city of Auckland, the largest and most densely populated region in the country. Results may be different for other regions in New Zealand, where there is a lesser density of niche eateries and traditional fast-food outlets. It would be of

interest to explore how the service differs across the nation in terms of promoted foods. The results of this research indicate that individuals located in more rural areas may have a 'healthier' Uber Eats experience than those in densely populated cities.

Individual variations in results would also be a research area of interest following on from the current study. No login or Uber accounts were used whilst data was collected, in order to avoid confounding results. We therefore do not know how the website may change based on background data collection or food purchasing habits if an Uber account is used. For instance, the website landscape may "worsen" from a health perspective if an individual uses the service to purchase fast foods, as a key promotion on the main page is the "your favourites" toggle. However, if an individual consumes mainly core foods, such as sushi, these foods would be repeatedly promoted, with their repurchase facilitated.

A final limitation to consider is the lack of participants in the current study. We aimed to evaluate the food environment in order to describe it's 'healthiness' and subsequently raise awareness and alarm. However, we did not examine the direct effect of the service on the diet and therefore health of individuals or population groups. Describing the environment is a pertinent first step within a novel research space, which allows for assumptions to be made of its influence. Future research efforts may encompass exploring the direct impact of Uber Eats on energy and nutrient consumption using a study sample of willing and appropriate participants to definitively outline its impact.

4.3.2 Uber Variables

It remains difficult to decipher whether the "popular" food outlets are promoted by the service and paid for by food companies, or are generated by popularity and engagement algorithms. This research assumes that the "most popular" food outlets and menu items are generated due

to consumer demand and popularity. However, it is unknown whether Uber allows for food outlets, particularly those with deep pockets, to purchase a "most popular" spot to gain click traffic. As mentioned, this research found that the McDonald's fast-food outlet is either in the Number #1 spot, or does not appear in the top ten at all. Researchers in Sydney observed the same. This may suggest that the company has paid for its position as a promoted outlet, potentially confounding results.

The extent of background data utilization is also unclear. The extent to which the company utilizes "big data" to enhance the service and, therefore, confound results cannot be ascertained. Like many other websites and applications, background data from other services in use (e.g., Facebook and Gmail) may be utilized to enhance the suitability of offerings. In this instance, the website would appear different to every user despite "signing" or logging out of accounts. It is said that Uber Eats food categories (e.g., "Healthy" or "Mexican") are prescribed by those who work for the service. Often, outlets can request that Uber Eats places them in the healthy category, and this request is frequently granted; there is no established requirement for calling yourself a "healthy" outlet on Uber Eats. Furthermore, as previously mentioned, when an outlet is busy, it is temporarily removed from the website to avoid delivery delays. It will reappear once demand has died down and Uber regains the ability to deliver within the expected timeframe. This enables the application to hold a standard of efficiency, but may have confounded results by removing the most popular food outlets at the time of data collection (6-6:30pm).

4.3.3. Strengths: A Novel Study

As well as limitations, the current study has a number of strengths worth highlighting. The primary strength of this research is that it is novel; there is yet to be research into the nutrition

impacts of online food delivery services in New Zealand. Placing a public health nutrition lens on food delivery applications enables the identification of intervention requirements regarding the extent of estimated or suggested adverse nutrition impacts that arise from these services. Health professionals who specialise in nutrition and utilise evidence-based material for their practices (e.g., dietitians working in public and private sectors) may wish to use the results of this research to explore with patients the consequences associated with the consistent use of Uber Eats and similar applications.

Due to the nature of the cross-sectional study design and the ease of data access, the current study may be considered highly replicable. This study may be performed in any city where Uber Eats is a prevalent food delivery service, enabling multi-city and international comparisons. This is useful to support current findings and build upon a relatively limited evidence-base.

4.4 Recommendations: *What practical actions or scientific studies should follow?*

The implications of this research are far reaching, suggesting a pressing need to action changes within the emerging digital food environment. Furthermore, this research has highlighted spaces for intervention by health professionals in order to stem the tide of energy imbalance and nutrient-poor food consumption which may be associated with these services. Our knowledge of the nutrition effects of OFD services and the wider digital food environment is limited to date; it appears imperative that health and nutrition professionals begin to take heed of this space regarding both research endeavours and intervention.

4.4.1. Progression Requirements: Government Attention & Intervention Planning

This research into the digital nutrition space, and other research of relevance, has highlighted the growth of the digital realm and its likely effect on nutrition and health. Collectively, the research has demonstrated a significant need for Government attention and intervention. This research has achieved the preliminary step of identifying statistically significant nutrition concerns. Following this, nutrition interventions must be developed and implemented to prevent the likely consequences associated with the proliferation of the digital food environment. Due to the novelty of the environment, a certain creativity is required with interventions in order to effectively dampen the anticipated rise in a range of adverse health and nutrition outcomes.

4.4.2. Interventions in the Digital Space

How may we intervene in this space? Research regarding appropriate digital intervention is limited due to the nature of these services' development and growth, and the rapid creation of the new digital food environment. However, a handful of researchers have attempted nutrition or public health interventions in this space that are worthy of discussion. Online grocery shopping has been growing in popularity since the 1990's. Research funded by the National Institute for Health Research explored the effect of different interventions in lessening the saturated fat content of a "digital basket" whilst shopping for groceries online (126). The interventions trialled were as follows; (i) consumers were shown a list of products ranked according to their saturated fat content, (ii) consumers were offered the option to swap a product high in saturated fat for a similar one with a lower saturated fat content, and (iii) consumers were shown a combination of both the ranked list and the option to swap products (126).

They found that each intervention was successful at reducing the amount of saturated fat purchased by consumers, demonstrating that the implementation of either or both strategies are potentially effective at shaping healthier food choices (126). This may be a course of action that Uber could take to improve the healthiness of its website; offering "swaps" and ranking the "popular" menu items by content of energy, refined sugar and saturated fat. This may have a downstream effect, with food outlets tweaking menu items to qualify them as swaps in order to reach more consumers.

Furthermore, intervention may involve making the company change its algorithm to show healthy options first, with less healthy options being harder to find on the app. It appears unlikely, however, that co-operation would be gained from Uber in endeavours such as these. Here, it is important to recall the requirement of mutual benefit when attempting to change the behaviour of corporations or industries. The tide of sustainability efforts saw Uber change a number of its practices to appeal to consumers (97,98). If enough emphasis is placed on nutrition and the promotion of healthier outlet options by health professionals and consumers, future changes may be implemented by the company. This calls to attention the notion of consumer awareness and its pertinent long-term influence.

In their research into the consequences of digital food marketing to children and youth, Boyland et al outlined recommendations for future action and intervention to dampen the effect of such pervasive and targeted marketing on a child's health and nutrition. The identified recommendations, outlined in Table 10, may be translated to combat OFD's. We may also wish to recall similar interventions outlined in Figure 3 of Chapter One, by Granheim et al.

Table 10. Recommendations for Future Research & Intervention: Digital Food Marketing (111)

Recommendation 1: *Relevant Research*	Research to explore the impact of digital food and beverage marketing on normalisation of eating behaviours and longer-term effects on health outcomes in children (across childhood, from pre-schoolers to adolescents)
Recommendation 2: *Consumer Awareness*	Efforts to raise awareness of this issue among stakeholders including consumers (young people, parents), health campaigners and experts, and policymakers to encourage parental intervention and political will for action
Recommendation 3: *Society Policy Action*	All relevant scientific societies dedicated to child health to work together to achieve meaningful policy progress to restrict children's exposure to marketing for unhealthy foods and beverages online
Recommendation 4: *Industry Collaboration*	Greater transparency from the food and beverage industries and the marketers with respect to the data they hold on digital food marketing prevalence and impact, and the facilitation of appropriate access for researchers to those data
Recommendation 5: *Government Policy Action*	Governments to introduce or strengthen policies to restrict the exposure of young people (including adolescents) to the digital marketing of unhealthy foods and beverages.

4.4.3. Future Research Recommendations

All five identified actionable recommendations may be utilised to form the basis of recommendations for OFD growth and utilisation. As per *recommendation 1*, more research into the effect of OFD on the health and nutrition status of individuals is required. Primary limitations of the current study are its 'screenshot' nature, lack of participants, and unanswered questions regarding *all* outlets on Uber Eats, not just the most popular.

These inherent weaknesses impact the validity of results as they leave 'gaps' to be filled, leaving room for assumptions rather than definitive evidence regarding the healthiness of the digital environment and its impact on individuals and population groups. More comprehensive research in this space is required to fill the gaps identified by the current study and build upon our knowledge of the digital environment. The current study has *described* the Uber Eats environment as unhealthy, and saturated with discretionary foods. Going forward, research regarding the direct effect of the environment on health and nutrition is imperative to round-out our understanding of its influence.

Such research may then be utilised to form the basis of relevant policies, and provide leverage to health professionals advocating for action in the digital space. Comprehensive studies are required to support findings and grow the current evidence-base; gold standard, randomised-controlled trials (RCT's) are necessary to definitively assess the impact of such services on health at the individual and population-level. An RCT assessing the impact of Uber Eats on the nutrition quality of individual diets (e.g., energy density) would strengthen the current evidence-base. Regarding nutrition interventions, the replication of interventions trialled for online grocery stores (e.g., the aforementioned research by Koutoukidis et al) including "swap suggestions" or altering the default order of outlets and menu items, would be beneficial to understand how best to intervene.

Alternatively, or in addition, long-term observational studies measuring discrepancies between members of the population who frequently engage with OFD's or the vast digital food environment, and those who do not, would be advantageous in supporting the current findings. Following this, the same study design may be used to assess the impact of education and consumer awareness campaigns on the utilisation and navigation of OFD's in future.

4.4.4. Consumer Awareness: Campaigns & Positive Messaging/Marketing

Consumer awareness should be a primary goal of public health efforts. There are many ways this can be achieved, utilising the same tech platforms that promote unhealthy options. Consumer awareness campaigns should aim to both educate individuals on the healthiness of the OFD environment, and offer practical tips and solutions to ensure a healthier experience online. This information may be incorporated into conversations between patients and health professionals or run as a public health message/promotion over time.

Such messages may be disseminated on popular social media platforms, where the attention of the target audience (tech savvy millennials and Gen-Z) is highly accessible. This is a novel area of research and intervention; any implementors of programmes or campaigns regarding the "smart and healthy" navigation of the digital food environment would be considered pioneers.

In New Zealand, the Health Promotion Agency (HPA) is tasked with promoting evidenced-based health and wellness advice to kiwis in the form of research, programmes and campaigns (127). Their marketing approaches are aimed at achieving behaviour change amongst target populations. In this case, the dissemination of an HPA campaign based around the healthiness of the digital food environment, including OFD's, using evidence-based research, would be an excellent first step in educating New Zealand youth. Previously successful campaigns (including the "Say Yeah, Nah – Department of Lost Nights campaign) which utilised research to facilitate creative and engaging content delivered through popular mediums (including Facebook) may be utilised as a blueprint for OFD campaigns in future, whereby clever messaging is used to capture the attention of younger generations.

4.4.5. Organisation & Foundation Involvement

Recommendation 3 calls for the collaboration of organisations and societies that are dedicated to improving the health of distinct population groups. In this instance, organisations that are focused on reducing the incidence of nutrition-related disease amongst youth are called on to incorporate OFD into their current policies and programmes. Such organisations in the area of interest include but are by no means limited to; the HPA, Sport Auckland, Fuelled4Life, the Heart Foundation, and Te Awakairangi Health.

4.4.6. Industry Collaboration: Transparency & Likelihood

Traditionally, industry collaboration has been hard to achieve. This is usually due to what was above-mentioned as "mutual benefit" whereby the corporation must be able to identify a favourable outcome (be it profit or public relations). An example of this is the recent launch of "meat-free" options at fast-food outlets to appeal to environmentally conscious consumers (e.g., Burger King's Rebel Whopper). There is little need for the food industry to collaborate if demand and engagement remains high. However, if demand for healthier options and the opportunity to *select* healthier options arises from consumer awareness, we may see the companies change in the long-term.

Interestingly, the outlined recommendation by Boyland et al mentions the transparency of data collected and used to market to children online. Here, we may request a similar transparency with regard to the potential tailoring of individual results and in-app promotions, if it is the case that background data is used. We are becoming aware that mobile applications should not be thought as "tools" but agenda-based technologies which actively engage us. The same is true for Uber Eats, which will send through "push notifications" to consumers when the app has not been opened for a pre-determined time period, prompting consumer entry. Advising

consumers to turn off their notifications may be an easy first step in limiting the consistent use of the service.

4.4.7. Potential Policies for the Digital Food Environment

Finally, government policy action is required to ensure nationwide efforts to protect NZ youth against the potential long-term adverse effects of OFD services. According to INFORMAS - an international network founded to monitor and benchmark food environments, relevant government policies and private sector actions globally – six policy and four infrastructure support actions were identified as the top priorities for the New Zealand government combat non-communicable disease. These were summarised as seven recommendations (128):

i. Implementing a comprehensive national action plan for obesity and NCD prevention
ii. Setting priorities in statements of intent and setting targets for reducing childhood and adolescent obesity, reducing salt, sugar and saturated fat intake and food composition
iii. Increasing the funding for population nutrition promotion; doubling it to at least 70 million NZD per year
iv. Reducing the marketing of unhealthy foods to children and adolescents through broadcast and non-broadcast media and in settings such as schools
v. Ensuring that foods provided in, or sold by, schools and early childhood education services meet dietary guidelines
vi. Implementing the Health Star Rating food labelling system
vii. Introducing an excise tax of at least 20% on SSB

For some of the indicators, the New Zealand government's level of implementation meets international best practice, including food labelling and monitoring of NCD risk factors and prevalence. However, for over half of the "good practice" indicators, the level of implementation was rated as very little, or "low" (128). According to the World Health Organisation, a "comprehensive national action plan, including targets to reduce childhood obesity, diet-related NCDs and population intakes of nutrients of concern" is needed (128). Interventions to improve health education and engagement with the digital food environment may fall under (i), (ii), (iii) and (iv).

4.4.8 Utilising Pre-Existing Policies; Translation to a Digital Realm

Can traditional "healthy food environment" policies and actions be translated to a digital realm? An informative example of a New Zealand initiative to improve the healthiness of built food environments is the "National Healthy Food and Drinks Policy". The policy involves the colour coding of foods for sale across all district health boards to inform consumers of healthier choices (129). Healthy options are provided with a green label, whilst less healthy options are amber, and unhealthy are red. Foods or menu items achieve a green label when sugar, sodium and fat content is under a standardised threshold (these foods are also considered part of a healthy diet, containing plenty of vegetables or fruit, wholegrains, low fat or reduced milk, and/or legumes, nuts, seeds and lean meats).

This policy may be translated to the online realm, whereby menu items are displayed on the application with a green, amber or red "emoji" or ideogram. Following the outline of the policy, "green" menu items should be promoted on the website and application to encourage their consumption (similar to shelf placement and promotion). This policy may be considered for future intervention in the digital realm; however, such a scheme would require intensive labour

from a team of health professionals to ascertain ingredients of menu items on the application, company collaboration and supporting informative campaigns.

The "Health Star Rating" (HSR) is another health promoting initiative used in New Zealand to inform consumers and alter dietary behaviour (130). This is a further example of a built environment scheme that may be translated to an online realm. To enact this for online grocery stores would be easily facilitated, as many in-store products already have the rating. However, as with the above policy, implementing this intervention on an OFD service would be labour intensive, as each menu item would require evaluation to determine a star-rating. Furthermore, the HSR is currently voluntary in New Zealand, making the likelihood of food outlet collaboration slim.

Implementing mandatory kilojoule labelling as seen in the majority of Australian states should be a consideration for the New Zealand government. As aforementioned, such an initiative has proved effective at informing consumers and reducing overall energy intake. New Zealand should consider mandatory kJ labelling not just for the benefit of OFD's and digital food environment engagement but also for the built food environment. The scheme applies to fast food outlets, who have standardised meals and menu items across nations. Therefore, implementation may happen with ease, as energy content information is readily available for outlets such as McDonalds® and Burger King®.

4.4.9. Big Tech as Advantageous

A final aspect of the digital environment to highlight is the notion of 'big tech'. Big tech utilises data from a range of different sources (Gmail, Facebook, Google search) in order to tailor search results and advertising to individuals (131). It is unclear whether Uber uses such data to

tailor in-app promotions in order to enhance the likelihood of purchase. However, the question remains as to whether it is possible to utilise mass data consumption from big tech to our advantage. Can we alter our Uber Eats offerings for the better?

It is likely that if an individual appears healthy from a data perspective (e.g., has a "health-conscious" search history) they will be presented with "healthy" advertisements (gym membership deals, supplements, local "healthy" eateries). If Uber does purchase background data for its own use, perhaps if one were to appear "health conscious" online, the likelihood of being presented with a "healthier" most popular tab or in-app promotions would increase. If true, this would present an opportunity for consumers to alter the "healthiness" of not only the Uber app and webpage they are presented with, but their internet experience in general.

4.5. Conclusion

The results of this research describe the digital food environment created by Uber Eats in Auckland as unhealthy using evidence-based tools. Answering research questions (i), (ii), and (iii) is beneficial to our understanding of the concerns that this thesis is examining, including how the digital food environment may be disrupting traditional environments and altering consumption.

Strong research results (e.g., high proportions of fast-food outlets and discretionary menu items) have demonstrated that the Uber Eats service is likely saturated with energy-dense, nutrient poor food items which are promoted to consumers, particularly those first using the app. These unfavourable foods are already highly accessible within the physical food environment, are constantly promoted and marketed through different mediums around us, and are now carried with us on a mobile device.

The high prevalence of discretionary foods in both the digital and physical food environment increases the likelihood of population-level energy imbalance and, consequently, the development of nutrition-related diseases. Weaker research results, including associations between popular food outlets and socio-economic status, highlight areas for future research in the digital space to further understand its gravity and social impact.

To conclude, this study points out, through its audit and categorisation, what is available within the Uber Eats digital food environment. Whilst the high prevalence of discretionary foods correlates to the potential ordering and consumption of these foods from the service, future research is requited to measure what people are buying on the platform before definitive conclusions can be made. It appears that the simplest "first step" in lessening the likely impact of the digital food environment is to enhance research efforts, grow the evidence-base and disseminate findings to target population groups – including awareness campaigns and tips for "healthy navigation".

BIBLIOGRAPHIES

INTRODUCTION

1. Pomraz M. This Delivery App Has the Fastest Delivery Times [Internet]. Food & Wine. 2017 [cited 23 January 2021]. Available from: https://www.foodandwine.com/news/delivery-app-fastest-delivery-times
2. Gurevich-Panigrahi, T., Panigrahi, S., Wiechec, E. and Los, M., 2009. Obesity: Pathophysiology and Clinical Management. Current Medicinal Chemistry, [online] 16(4), pp.506-521. Available at: <http://liu.diva-portal.org/smash/get/diva2:583167/FULLTEXT01.pdf> [Accessed 24 August 2020].
3. Needham C, Orellana L, Allender S, Sacks G, Blake M, Strugnell C. Food Retail Environments in Greater Melbourne 2008–2016: Longitudinal Analysis of Intra-City Variation in Density and Healthiness of Food Outlets. Int. J. Environ. Research and Public Health [Internet]. 2020 [cited 20 March 2020];17(4):1321. Available from: https://www.mdpi.com/1660-4601/17/4/1321/htm
4. Australian dietary guidelines. Canberra, A.C.T.: National Health and Medical Research Council; 2013.

MAIN THESIS TEXT

1. Edmunds S. What young Kiwis are really spending more on, compared to their parents' generation [internet]. Stuff. 2019 [cited 30 May 2020]. Available from: https://www.stuff.co.nz/business/117501962/heres-what-young-people-are-really-spending-more-on-compared-to-their-parents-generation
2. Nguyen B, Powell L. The impact of restaurant consumption among US adults: effects on energy and nutrient intakes. Public Health Nutr [Internet]. 2014 [cited 30 May 2020];17(11):2445-2452. Available from: https://www.sciencedaily.com/releases/2014/08/140807105211.htm
3. Carson B. Uber's Secret Gold Mine: How Uber Eats Is Turning Into A Billion-Dollar Business To Rival Grubhub [Internet]. Forbes. 2019 [cited 13 March 2020]. Available from: 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/#2b2112a01fa9
4. Elliot F. UberFRESH Rebrands to UberEATS Just in Time to Expand Like Crazy [Internet]. Eater LA. 2015 [cited 15 March 2020]. Available from:

https://la.eater.com/2015/5/4/8545731/uberfresh-rebrand-ubereats-expansion-deliverywire-uber

5. Zion A, Spangler J, Hollmann T. Food Delivery Apps: Usage and Demographics — Winners, Losers and Laggards [Internet]. 2020 [cited 7 March 2020]. Available from: https://www.zionandzion.com/research/food-delivery-apps-usage-and-demographics-winners-losers-and-laggards/
6. Lock S. Food Delivery in the US - Statistics & Facts [Internet]. Statista; 2019 [cited April 2020]. Available from: https://www.statista.com/topics/1986/food-delivery-industry-in-the-us/
7. The NPD Group/Delivering Digital Convenience Report [Internet]. NPD Group; 2018 [cited 1 April 2020]. Available from: https://www.npd.com/perspectives/foodsvc-delivering-digital-convenience/
8. Menulog Report New Zealand [Internet]. 2018 [cited 7 March 2020]. Available from: https://www.dropbox.com/s/zfwgqytmnx9l3x2/Menulog%202018%20Report%20NZ%20.pdf?dl=0
9. Malmberg L. Gen Z's Influence on the Food and Beverage Industry – Anderson Partners Food Ingredient Marketing [Internet]. Apfoodingredients.com. 2019 [cited 30 May 2020]. Available from: https://apfoodingredients.com/2019/09/09/gen-zs-influence-on-the-food-and-beverage-industry/
10. Povich E. Students, bored by cafeteria fare, love food delivery services; schools don't. [Internet]. The Washington Post. 2019 [cited 1 April 2020]. Available from: https://www.washingtonpost.com/health/students-bored-by-cafeteria-fare-love-food-delivery-services-schools-dont/2019/06/07/2568d12c-8617-11e9-98c1-e945ae5db8fb_story.html
11. Wisely J. Michigan schools ban Grubhub and other food deliveries during school day [internet]. Detroit Free Press. 2019 [cited 1 April 2020]. Available from: https://www.freep.com/story/news/education/2019/04/10/schools-ban-food-deliveries-grubhub-doordash-ubereats/3400131002/
12. Koulopoulos T, Keldsen D. The Gen Z Effect. [Place of publication not identified]: Skillsoft; 2017.
13. 2018 Census | Stats NZ [Internet]. Stats.govt.nz. 2021 [cited 24 February 2021]. Available from: https://www.stats.govt.nz/2018-census/

14. Resident population count for Auckland, New Zealand [Internet]. Figure.nz. 2020 [cited 20 March 2020]. Available from: https://figure.nz/chart/QkzOTXV0E3pnkmM9
15. Ethnic diversity in New Zealand state schools [internet]. Education Review Office. 2016 [cited 18 March 2020]. Available from: https://www.ero.govt.nz/footer-upper/news/ero-insights-term-1/ethnic-diversity-in-new-zealand-state-schools/
16. Nichol T. More Kiwis ordering in as apps like Uber Eats' popularity soars [internet]. NZ Herald. 2017 [cited 3 April 2020]. Available from: https://www.nzherald.co.nz/business/news/article.cfm?c_id=3&objectid=11937393
17. Liu S. List of Auckland restaurants on Uber Eats | Finder New Zealand [Internet]. finder NZ. 2020 [cited 8 March 2020]. Available from: https://www.finder.com/nz/auckland-ubereats-restaurants
18. Harris C. Uber Eats to open in seven more NZ cities [internet]. Stuff. 2020 [cited 3 April 2020]. Available from: https://www.stuff.co.nz/business/119663860/uber-eats-to-open-in-seven-more-nz-cities
19. Uber in New Zealand by the numbers: 2018 in Review | Uber Newsroom New Zealand [Internet]. Uber Newsroom. 2020 [cited 8 March 2020]. Available from: https://www.uber.com/en-NZ/newsroom/nz2018review/
20. Best Food and Drink Apps in New Zealand of Google Play Store [Internet]. Mobile Action - App Store Optimization and App Analytics. 2020 [cited 7 March 2020]. Available from: https://www.mobileaction.co/top-apps/food-and-drink-56/android/nz
21. Follow the leaders: highest ranking Apps in Apple App Store, New Zealand [Internet]. SimilarWeb. 2020 [cited 8 March 2020]. Available from: https://www.similarweb.com/apps/top/apple/store-rank/nz/food-and-drink/top-free/iphone
22. Habib S, Saha S. Burden of non-communicable disease: Global overview. Diabetes & Metabolic Syndrome: Clinical Research & Reviews [Internet]. 2010 [cited 30 May 2020];4(1):41-47. Available from: https://www.sciencedirect.com/science/article/abs/pii/S1871402108000489
23. Kataria I. Health literacy for NCD prevention, management and promoting equality. Presentation presented at; Young professionals chronic disease network (WHO); 2011; North Carolina, USA. Available from: https://www.who.int/global-coordination-mechanism/working-groups/hl_youth.pdf?ua=1

24. Koopman R. Changes in Age at Diagnosis of Type 2 Diabetes Mellitus in the United States, 1988 to 2000. Ann. Fam. Med [Internet]. 2005 [cited 4 March 2020];3(1):60-63. Available from: http://www.annfammed.org/content/3/1/60.short
25. Lobstein T, Jackson-Leach R, Moodie M, Hall K, Gortmaker S, Swinburn B et al. Child and adolescent obesity: part of a bigger picture. Lancet [Internet]. 2015 [cited 4 March 2020];385(9986):2510-2520. Available from: https://www-clinicalkey-com-au.ezproxy.auckland.ac.nz/#!/content/journal/1-s2.0-S0140673614617463
26. Pinhas-Hamiel O, Zeitler P. The global spread of type 2 diabetes mellitus in children and adolescents. Int. J. Pediatr. [Internet]. 2005 [cited 4 March 2020];146(5):693-700. Available from: https://www.jpeds.com/article/S0022-3476(04)01217-X/fulltext#sec3.1.8
27. Lascar N, Brown J, Pattison H, Barnett A, Bailey C, Bellary S. Type 2 diabetes in adolescents and young adults. Yearbook of Paediatric Endocrinology [Internet]. 2018 [cited 4 March 2020];6(1):69-80. Available from: https://www-clinicalkey-com-au.ezproxy.auckland.ac.nz/#!/content/journal/1-s2.0-S2213858717301869
28. Vandenbroeck P, Goossens J, Clemens M. Tackling Obesities: Future choices - Obesity system atlas [internet]. 1st ed. Government Office for Science (Foresight Programme); 2007 [cited 26 March 2020]. Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/295153/07-1177-obesity-system-atlas.pdf
29. Institute of Medicine (US) Committee on Health and Behavior: Research, Practice, and Policy. Health and Behavior: The Interplay of Biological, Behavioral, and Societal Influences. Washington, D.C.: National Academy of Sciences; 2001 [cited 20 April 2020]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK43749/
30. Obesity statistics [Internet]. Ministry of Health NZ. 2020 [cited 4 March 2020]. Available from: https://www.health.govt.nz/nz-health-statistics/health-statistics-and-data-sets/obesity-statistics
31. Caspi C, Sorensen G, Subramanian S, Kawachi I. The local food environment and diet: A systematic review. Health Place [Internet]. 2012 [cited 4 March 2020];18(5):1172-1187. Available from: https://www.ncbi.nlm.nih.gov/pubmed/22717379/'
32. Ministry of Health. Food and Nutrition Guidelines for Healthy Children and Young People (Aged 2-18 years): A background paper [Internet]. Wellington: Ministry of Health; 2012. Partially revised Feb 2015. [cited 18 March 2020]. Available from:

https://www.health.govt.nz/system/files/documents/publications/food-nutrition-guidelines-healthy-children-young-people-background-paper-feb15-v2.pdf

33. Bullen C, Beaglehole R, Duabe M, Devlin G, Hughes S, Swinburn B. Targets and actions for non-communicable disease prevention and control in New Zealand. N Z Med J [Internet]. 2016 [cited 4 March 2020];128(1427):55-60. Available from: https://espace.curtin.edu.au/handle/20.500.11937/5274
34. A National Survey of Children and Young People's Physical Activity and Dietary Behaviours in New Zealand: 2008/09: Key Findings [Internet]. Ministry of Health NZ. 2020 [cited 6 March 2020]. Available from: https://www.health.govt.nz/publication/national-survey-children-and-young-peoples-physical-activity-and-dietary-behaviours-new-zealand-2008
35. Sardinha L, Andersen L, Anderssen S, Quiterio A, Ornelas R, Froberg K et al. Objectively Measured Time Spent Sedentary Is Associated With Insulin Resistance Independent of Overall and Central Body Fat in 9- to 10-Year-Old Portuguese Children. Diabetes Care [Internet]. 2007 [cited 6 March 2020];31(3):569-575. Available from: https://care.diabetesjournals.org/content/31/3/569
36. Steele R, van Sluijs E, Cassidy A, Griffin S, Ekelund U. Targeting sedentary time or moderate- and vigorous-intensity activity: independent relations with adiposity in a population-based sample of 10-y-old British children. Am. J. Clin. Nutr. [Internet]. 2009 [cited 5 March 2020];90(5):1185-1192. Available from: https://academic.oup.com/ajcn/article/90/5/1185/4598092
37. Chastin S, Granat M. Methods for objective measure, quantification and analysis of sedentary behaviour and inactivity. Gait Posture [Internet]. 2010 [cited 7 March 2020];31(1):82-86. Available from: https://www.sciencedirect.com/science/article/abs/pii/S096663620900602X?via%3Dihub
38. Student Loan living costs - StudyLink [Internet]. Studylink.govt.nz. 2020 [cited 30 May 2020]. Available from: https://www.studylink.govt.nz/products/a-z-products/student-loan/living-costs.html#null
39. State of the Internet 2017 [Internet]. Wellington: Internet NZ; 2020 [cited 7 March 2020]. Available from: https://internetnz.nz/sites/default/files/SOTI%20FINAL.pdf
40. Yeh A. New Zealand Mobile Trends in a Multiscreen World | NZDMI [Internet]. NZDMI. 2020 [cited 7 March 2020]. Available from: https://nzdmi.co.nz/blog/new-zealand-mobile-trends/

41. Sushil Z, Vandevijvere S, Exeter D, Swinburn B. Food swamps by area socio-economic deprivation in New Zealand: a national study. Int. J. Public Health [Internet]. 2017 [cited 15 April 2020];62(8):869-877. Available from: https://www.ncbi.nlm.nih.gov/pubmed/28534060
42. Cooksey-Stowers K, Schwartz M, Brownell K. Food Swamps Predict Obesity Rates Better Than Food Deserts in the United States. Int. J. Environ. Res. Public. Health. [Internet]. 2017 [cited 6 March 2020];14(11):1366. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5708005/
43. Dutko P, Ver Ploeg M, Farrighan T. Characteristics and Influential Factors of Food Deserts [Internet]. United States Department of Agriculture (USDA) (Economic Research Service); 2012 [cited 16 March 2020]. Available from: https://www.ers.usda.gov/webdocs/publications/45014/30940_err140.pdf
44. Harrowell C. Candidates have no appetite to curb fast food spread [internet]. Stuff. 2016 [cited 30 May 2020]. Available from: https://www.stuff.co.nz/auckland/local-news/manukau-courier/83326100/candidates-have-no-appetite-to-curb-fast-food-spread
45. Toops D. Food Processing: A History [Internet]. Foodprocessing.com. 2010 [cited 7 March 2020]. Available from: https://www.foodprocessing.com/articles/2010/anniversary/
46. Lewis R. Burger King Corporation | History & Facts [Internet]. Encyclopedia Britannica. [cited 23 March 2020]. Available from: https://www.britannica.com/topic/Burger-King-Corporation
47. Heart Foundation Tick [Internet]. Heart Foundation NZ. 2020 [cited 8 March 2020]. Available from: https://www.heartfoundation.org.nz/wellbeing/heart-foundation-tick
48. Pettigrew S, Talati Z, Neal B. Tick tock: time for a change?. health. Promot. J. Austr. [Internet]. 2016 [cited 7 March 2020];27(2):102-104. Available from: https://www.ncbi.nlm.nih.gov/pubmed/27029557
49. Hasler C. Functional Foods: Benefits, Concerns and Challenges—A Position Paper from the American Council on Science and Health. J Nutr [Internet]. 2002 [cited 1 March 2020];132(12):3772-3781. Available from: https://academic.oup.com/jn/article/132/12/3772/4712139
50. Nguyen P, Lin S, Heidenreich P. A systematic comparison of sugar content in low-fat vs regular versions of food. Nutrition & Diabetes [Internet]. 2016 [cited 25 March

2020];6(1):e193-e193. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4742721/

51. Popkin B, Hawkes C. Sweetening of the global diet, particularly beverages: patterns, trends, and policy responses. Lancet Diabetes Endocrinol. [Internet]. 2016 [cited 7 March 2020];4(2):174-186. Available from: https://www.thelancet.com/journals/landia/article/PIIS2213-8587(15)00419-2/fulltext
52. Sorkin A. Nestlé to Buy Jenny Craig, Betting Diets Are on Rise [Internet]. Nytimes.com. 2006 [cited 21 March 2020]. Available from: https://www.nytimes.com/2006/06/19/business/worldbusiness/19deal.html?auth=login-email&login=email
53. Global Market for Weight Loss Worth US$586.3 Billion by 2014 [Internet]. Marketsandmarkets.com. 2013 [cited 24 June 2020]. Available from: https://www.marketsandmarkets.com/PressReleases/
54. Brunton C. 2018 Health Star Rating monitoring and evaluation: Year 2 Follow-up research report [internet]. Wellington: Health Promotion Agency; 2018. Available from: https://www.hpa.org.nz/research-library/research-publications/2018-health-star-rating-hsr-monitoring-and-evaluation
55. Kiwis eating more food on the go [Internet]. Archive.stats.govt.nz. 2020 [cited 7 March 2020]. Available from: http://archive.stats.govt.nz/browse_for_stats/economic_indicators/prices_indexes/fpi-review-2017-ns-kiwis-eating-on-go.aspx
56. The rise and rise of dining out in New Zealand 2019 - Restaurant Association of New Zealand [Internet]. Restaurant Association of New Zealand. 2020 [cited 7 March 2020]. Available from: https://www.restaurantnz.co.nz/2019/10/18/hospitality-report-2019
57. Bidois M. The rise and rise of dining out in New Zealand. Hosp. Insights [Internet]. 2018 [cited 7 March 2020];2(2):1-2. Available from: https://ojs.aut.ac.nz/hospitality-insights/index.php/HI/article/view/44
58. The rise of Kiwi dining out - Hospitality Business [Internet]. Hospitality Business. 2018 [cited 25 March 2020]. Available from: https://www.hospitalitybusiness.co.nz/the-rise-of-kiwi-dining-out/
59. Ryan H. My Food Bag's phenomenal rise: from zero to $100m revenue in three years [internet]. NZ Herald. 2015 [cited 25 March 2020]. Available from: https://www.nzherald.co.nz/business/news/article.cfm?c_id=3&objectid=11558913

60. Helm B. The World's Most Ruthless Food Start-up: The Inside Story of How HelloFresh Clawed Its Way to the Top [Internet]. Inc.com. [cited 25 March 2020]. Available from: https://www.inc.com/magazine/201808/burt-helm/hellofresh.html
61. McCrory M, Harbaugh A, Appeadu S, Roberts S. 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. J. Acad. Nutr. [Internet]. 2019 [cited 24 March 2020];119(6):923-933. Available from: https://www.ncbi.nlm.nih.gov/pubmed?Db=pubmed&Cmd=ShowDetailView&TermToSearch=30826304
62. Mohammadbeigi A, Asgarian A, Moshir E, Heidari H, Afrashteh S, Khazaei S et al. Fast Food Consumption and Overweight/Obesity Prevalence in Students and Its Association With General and Abdominal Obesity. J Prev Med Hyg [Internet]. 2018 [cited 30 May 2020];59(3):E236-E240. Available from: https://pubmed.ncbi.nlm.nih.gov/30397681/
63. An insatiable App-etite: Online food delivery report | Scoop News [Internet]. Scoop.co.nz. 2020 [cited 7 March 2020]. Available from: https://www.scoop.co.nz/stories/BU1806/S00511/an-insatiable-app-etite-online-food-delivery-report.htm
64. Solomon M, Russell-Bennett R, Previte J. Consumer Behaviour eBook. Melbourne: P. Ed Australia; 2012.
65. Prospero M. What Is a Smart Refrigerator, and Is It Worth It? [Internet]. Tom's Guide. 2019 [cited 24 March 2020]. Available from: https://www.tomsguide.com/us/what-is-a-smart-refrigerator,review-6307.html
66. Savvas D, Gruda N. Application of soilless culture technologies in the modern greenhouse industry – A review. Eur. J. Hortic. Sci. [Internet]. 2018 [cited 21 March 2020];83(5):280-293. Available from: https://www.researchgate.net/publication/328888013_Application_of_soilless_culture_technologies_in_the_modern_greenhouse_industry_-_A_review
67. Wilson R, Abbott J. Age, period and cohort effects on body mass index in New Zealand, 1997-2038. Aust. NZ J. Publ. Heal. [Internet]. 2018 [cited 18 March 2020];42(4):396-402. Available from: https://onlinelibrary.wiley.com/doi/full/10.1111/1753-6405.12804
68. Shieber J. The next big restaurant chain may not own any kitchens [internet]. Techcrunch.com. 2018 [cited 13 March 2020]. Available from:

https://techcrunch.com/2018/10/07/the-next-big-restaurant-chain-may-not-own-any-kitchens/

69. Isaac M. The Rise of the Virtual Restaurant [Internet]. Nytimes.com. 2019 [cited 23 March 2020]. Available from: https://www.nytimes.com/2019/08/14/technology/uber-eats-ghost-kitchens.html
70. Turow-Paul E. That Restaurant On Seamless Might Not Actually Exist [Internet]. Forbes. 2017 [cited 12 March 2020]. Available from: https://www.forbes.com/sites/eveturowpaul/2017/03/24/that-restaurant-on-seamless-might-not-actually-exist/#6e0b29f617a2
71. Krader K. Uber's Secret Restaurant Empire of virtual restaurants [internet]. Bloomberg.com. 2018 [cited 13 March 2020]. Available from: https://www.bloomberg.com/news/articles/2018-10-24/uber-s-secret-empire-of-virtual-restaurants?cmpid=BBD103118_PUR&utm_medium=email&utm_source=newsletter&utm_term=181031&utm_campaign=pursuits
72. Peacock A. Auckland's first 'ghost restaurant' capitalising on food delivery trend [internet]. New Zealand Herald. 2018 [cited 13 March 2020]. Available from: https://www.nzherald.co.nz/business/news/article.cfm?c_id=3&objectid=12094428
73. Dye J. Junk on demand: Food delivery giants bring salt and sugar within arms' reach [internet]. Good Food. 2020 [cited 20 March 2020]. Available from: https://www.goodfood.com.au/eat-out/news/junk-on-demand-food-delivery-giants-bring-salt-and-sugar-within-arms-reach-20200228-h1m5no
74. BP Australia. Couchfood™ [Internet]. 2020 [cited 13 March 2020]. Available from: https://www.bp.com/en_au/australia/home/products-services/food-drink/couchfood.html
75. Stephens J, Miller H, Militello L. Food Delivery Apps and the Negative Health Impacts for Americans. Front. Nutr. [Internet]. 2020 [cited 17 March 2020];7. Available from: https://www.frontiersin.org/articles/10.3389/fnut.2020.00014/full
76. Uber Elevate [Internet]. Uber. 2020 [cited 24 March 2020]. Available from: https://www.uber.com/us/en/elevate/
77. Vincent J. Uber says it will start delivering fast food by drone in San Diego this summer [internet]. The Verge. 2019 [cited 22 March 2020]. Available from: https://www.theverge.com/2019/6/12/18662524/uber-drone-delivery-fast-food-san-diego-summer-2019-trial

78. Shaw A. Uber Grocery - US ridesharing giant's next business move in New Zealand [Internet]. NZ Herald. 2020 [cited 22 March 2020]. Available from: https://www.nzherald.co.nz/business/news/article.cfm?c_id=3&objectid=12309188
79. Jilcott Pitts S, Ng S, Blitstein J, Gustafson A, Niculescu M. Online grocery shopping: promise and pitfalls for healthier food and beverage purchases. Public Health Nutr. [Internet]. 2018 [cited 16 March 2020];21(18):3360-3376. Available from: https://www.cambridge.org/core/services/aop-cambridge-core/content/view/00D984E81BCD38FD733A35147078BC58/S1368980018002409a.pdf/div-class-title-online-grocery-shopping-promise-and-pitfalls-for-healthier-food-and-beverage-purchases-div.pdf
80. McClelland L. 5 Marketing Lessons Learned From UberEATS [Internet]. Mediapost.com. 2016 [cited 17 March 2020]. Available from: https://www.mediapost.com/publications/article/272424/5-marketing-lessons-learned-from-ubereats.html
81. Miller G. Uber's Marketing Strategy in 7 Steps, Revisited [Internet]. Annexcloud.com. 2020 [cited 19 March 2020]. Available from: https://www.annexcloud.com/blog/ubers-marketing-strategy-in-7-steps-revisited/
82. Harris J, Pomeranz J, Lobstein T, Brownell K. A Crisis in the Marketplace: How Food Marketing Contributes to Childhood Obesity and What Can Be Done. Annual Review of Public Health [Internet]. 2009 [cited 22 March 2020];30(1):211-225. Available from: https://www.annualreviews.org/doi/abs/10.1146/annurev.publhealth.031308.100304
83. Millennials: Trust and Attention Survey (Google Consumer) [Internet]. New York City: The McCarthy Group; 2014 [cited 25 March 2020]. Available from: https://static1.squarespace.com/static/5c61c52811f78475c8a8a6c5/t/5c6c23f16e9a7f0b4e4ad353/1550590961706/millenial+survey.pdf
84. Standberry S. 5 Proven Strategies for Marketing to Millennials Straight From the Experts [Internet]. Digital Marketing Blog. 2019 [cited 23 March 2020]. Available from: https://www.lyfemarketing.com/blog/marketing-to-millennials/
85. Swinburn B, Sacks G, Vandevijvere S, Kumanyika S, Lobstein T, Neal B et al. INFORMAS (International Network for Food and Obesity/non-communicable diseases Research, Monitoring and Action Support): overview and key principles. Obesity Reviews [Internet]. 2013 [cited 16 March 2020];14:1-12. Available from:

https://www.scopus.com/record/display.uri?eid=2-s2.0-84885162727&origin=inward&txGid=e0018c32224f506b4799179a7de64ca1

86. Granheim S. The digital food environment. UNSCN [Internet]. 2019 [cited 29 March 2020];(44):115-121. Available from: https://www.cabdirect.org/globalhealth/abstract/20193459852
87. Ryan H. The goods: Food to your door trend growing [internet]. NZ Herald. 2016 [cited 3 April 2020]. Available from: https://www.nzherald.co.nz/business/news/article.cfm?c_id=3&objectid=11710435
88. Clent D. Coronavirus: Uber Eats announces $5m funding for restaurants across NZ and Australia [Internet]. Stuff. 2020 [cited 3 April 2020]. Available from: https://www.stuff.co.nz/national/health/coronavirus/120392931/coronavirus-uber-eats-announces-5m-funding-for-restaurants-across-nz-and-australia
89. Scanlan R. Australia's eating habits have completely changed during lockdown [internet]. NewsComAu. 2020 [cited 30 May 2020]. Available from: https://www.news.com.au/lifestyle/food/deliveroo-reveals-australias-eating-habits-have-changed-because-of-lockdown/news-story/1e94a4da7f232118cbe849be2eb391a5
90. Lee S, Sung H, Jeon H. Determinants of Continuous Intention on Food Delivery Apps: Extending UTAUT2 with Information Quality. Sustainability [Internet]. 2019 [cited 15 April 2020];11(11):3141. Available from: https://www.researchgate.net/publication/333613010_Determinants_of_Continuous_Intention_on_Food_Delivery_Apps_Extending_UTAUT2_with_Information_Quality
91. Sacks G, Tikellis K, Millar L, Swinburn B. Impact of 'traffic-light' nutrition information on online food purchases in Australia. Aust. NZ. J. Public Health [Internet]. 2011 [cited 3 April 2020];35(2):122-126. Available from: https://www.ncbi.nlm.nih.gov/pubmed/21463406
92. Needham C, Orellana L, Allender S, Sacks G, Blake M, Strugnell C. Food Retail Environments in Greater Melbourne 2008–2016: Longitudinal Analysis of Intra-City Variation in Density and Healthiness of Food Outlets. Int. J. Environ. Research and Public Health [Internet]. 2020 [cited 20 March 2020];17(4):1321. Available from: https://www.mdpi.com/1660-4601/17/4/1321/htm
93. Marchant R. Consumers will travel 17 mins to reach a local business [internet]. BrightLocal. 2017 [cited 15 April 2020]. Available from: https://www.brightlocal.com/research/local-business-travel-times/

94. McCool B. Just How Much Of A Packaging Waste Problem Do Meal Kit Companies Have Anyway? [Internet]. Thedieline.com. 2018 [cited 3 April 2020]. Available from: https://thedieline.com/blog/2018/7/11/umpvn50ap9qkuqjy3r4n8wq2xdq6w4
95. Geyer R, Jambeck J, Law K. Production, use, and fate of all plastics ever made. Science Advances [Internet]. 2017 [cited 3 April 2020];3(7):e1700782. Available from: https://advances.sciencemag.org/content/3/7/e1700782
96. Song G, Zhang H, Duan H, Xu M. Packaging waste from food delivery in China's mega cities. Resources, Conservation and Recycling [Internet]. 2018 [cited 20 March 2020];130:226-227. Available from: http://css.umich.edu/publication/packaging-waste-food-delivery-china's-mega-cities
97. Boman E. Making Food Delivery More Accessible & Sustainable | Uber Newsroom US [Internet]. Uber Newsroom. 2019 [cited 3 April 2020]. Available from: https://www.uber.com/newsroom/making-food-delivery-more-accessible-sustainable/
98. Murphy M. The future of Uber is … bikes? [Internet]. Quartz. 2018 [cited 15 April 2020]. Available from: https://qz.com/1371145/uber-is-shifting-towards-bike-rides-for-short-city-trips/
99. Partridge S, Gibson A, Roy R, Malloy J, Raeside R, Jia S 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 [Internet]. 2020 [cited 5 January 2021];12(10):3107. Available from: https://www.mdpi.com/2072-6643/12/10/3107
100. 2018 Census place summaries | Stats NZ [Internet]. Stats.govt.nz. 2020 [cited 31 August 2020]. Available from: https://www.stats.govt.nz/tools/2018-census-place-summaries/auckland-region
101. Online Food Delivery - New Zealand | Statista Market Forecast [Internet]. Statista. 2020 [cited 31 August 2020]. Available from: https://www.statista.com/outlook/374/161/online-food-delivery/new-zealand
102. Order food online | Food delivery app | Uber Eats [Internet]. Ubereats.com. 2020 [cited 31 August 2020]. Available from: https://www.ubereats.com/nz
103. Atkinson J, Salmond C, Crampton P. NZDep2018 Index of Deprivation User's Manual [Internet]. Wellington: University of Otago; 2018 [cited 31 August 2020]. Available from: https://www.otago.ac.nz/wellington/otago730391.pdf
104. Socioeconomic Deprivation Indexes: NZDep and NZiDep, Health Inequalities Research Programme (HIRP), University of Otago, Wellington, University of Otago,

New Zealand [Internet]. Otago.ac.nz. 2020 [cited 8 December 2020]. Available from: https://www.otago.ac.nz/wellington/departments/publichealth/research/hirp/otago020194.html

105. Moayyed H, Kelly B, Feng X, Flood V. Evaluation of a 'healthiness' rating system for food outlet types in Australian residential communities. Nutr. Diet. [Internet]. 2016;74(1):29-35. Available from: https://onlinelibrary.wiley.com/doi/abs/10.1111/1747-0080.12286
106. Australian dietary guidelines. Canberra, A.C.T.: National Health and Medical Research Council; 2013.
107. Discretionary food and drink choices [Internet]. https://www.eatforhealth.gov.au/. 2017 [cited 31 August 2020]. Available from: https://www.eatforhealth.gov.au/food-essentials/discretionary-food-and-drink-choices
108. Cobb L, Appel L, Franco M, Jones-Smith J, Nur A, Anderson C. The relationship of the local food environment with obesity: A systematic review of methods, study quality, and results. Obesity [Internet]. 2015 [cited 8 December 2020];23(7):1331-1344. Available from: https://pubmed.ncbi.nlm.nih.gov/26096983/
109. Bivoltsis A, Cervigni E, Trapp G, Knuiman M, Hooper P, Ambrosini G. Food environments and dietary intakes among adults: does the type of spatial exposure measurement matter? A systematic review. Int. J. Hlth Geographics. 2018;17(1).
110. Schmidt D. Google Data Collection [Internet]. Nashville, Tennessee: digitalcontentnext.org; 2018. Available from: https://digitalcontentnext.org/wp-content/uploads/2018/08/DCN-Google-Data-Collection-Paper.pdf
111. Boyland, E., Thivel, D., Mazur, A., Ring-Dimitriou, S., Frelut, M. and Weghuber, D., 2020. Digital Food Marketing to Young People: A Substantial Public Health Challenge. Ann. Nutr. Metab. [online] 76(1), pp.6-9. Available at: <https://www.karger.com/Article/FullText/506413>.
112. WHO European Office for the Prevention and Control of Noncommunicable Diseases (NCD Office). Monitoring and Restricting Digital Marketing of Unhealthy Products to Children and Adolescents [Internet]. Moscow, Russia: World Health Organisation; 2018. Available from: https://www.euro.who.int/__data/assets/pdf_file/0008/396764/Online-version_Digital-Mktg_March2019.pdf
113. Collins, D. Blog: How much data do adtech companies collect on kids before they turn 13 [Internet]. Superawesome. 2017 [cited 24 January 2021]. Available from:

https://blog.superawesome.tv/2017/12/13/how-much-data-do-adtech-companies-collect-on-kids-before-they-turn-13/.

114. Rahmati A, Tossell C, Shepard C, Kortum P, Zhong L. Exploring iPhone usage. Proceedings of the 14th international conference on Human-computer interaction with mobile devices and services - MobileHCI '12 [Internet]. 2012 [cited 24 January 2021];. Available from: https://www.researchgate.net/publication/261858477_Exploring_iPhone_usage_the_influence_of_socioeconomic_differences_on_smartphone_adoption_usage_and_usability
115. National Retail Federation. Convenience and the Consumer [Internet]. Washington DC; 2020. Available from: https://nrf.com/research/consumer-view-winter-2020
116. Htet A, Bjertness M, Sherpa L, Kjøllesdal M, Oo W, Meyer H et al. Urban-rural differences in the prevalence of non-communicable diseases risk factors among 25–74 years old citizens in Yangon Region, Myanmar: a cross sectional study. BMC Public Health [Internet]. 2016 [cited 25 January 2021];16(1). Available from: https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-016-3882-3#:~:text=Several%20of%20the%20NCDs%20risk,factors%20such%20as%20smoking%2C%20alcohol
117. Obesity Policy Coalition. Policy Brief: Menu Kilojoule Labelling in Chain Food Outlets in Australia [Internet]. Melbourne, Victoria; 2018. Available from: https://www.opc.org.au/downloads/policy-briefs/menu-kj-labelling-in-chain-food-outlets-in-australia.pdf
118. Statista. eServices Report 2020: Online Food Delivery [Internet]. 2020. Available from: https://www.statista.com/study/40457/food-delivery/
119. Generation Z Consumer Behavior [Internet]. The NPD Group. 2021 [cited 24 January 2021]. Available from: https://www.npd.com/wps/portal/npd/us/news/thought-leadership/2019/3-ways-to-win-over-the-thrifty-gen-z-consumer/
120. Pollard M, O'Neill C. How COVID-19 Is Impacting Online Food Delivery Platforms - CitiGPS [Internet]. CitiGPS. 2021 [cited 25 January 2021]. Available from: https://www.citivelocity.com/citigps/how-covid-19-is-impacting-online-food-delivery-platforms/
121. Chauhan P. Impact Of COVID-19 On Online On-Demand Food Delivery Services [Internet]. Medium. 2021 [cited 25 January 2021]. Available from:

https://medium.com/yo-yumm/impact-of-covid-19-on-online-on-demand-food-delivery-services-9a5bf3f910e9

122. Auster J. Delivering more choice for local restaurants - now and into the future | Uber Newsroom [Internet]. Uber Newsroom. 2021 [cited 25 January 2021]. Available from: https://www.uber.com/en-NZ/newsroom/mpfnz/

123. Lal A, Peeters A, Brown V, Nguyen P, Tran H, Nguyen T et al. The Modelled Population Obesity-Related Health Benefits of Reducing Consumption of Discretionary Foods in Australia. Nutrients [Internet]. 2020 [cited 25 January 2021];12(3):649. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7146305/

124. Johnson B, Bell L, Zarnowiecki D, Rangan A, Golley R. Contribution of Discretionary Foods and Drinks to Australian Children's Intake of Energy, Saturated Fat, Added Sugars and Salt. Children [Internet]. 2017 [cited 25 January 2021];4(12):104. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5742749/

125. Aotearoa's Top 10 for 2020 | Uber Newsroom [Internet]. Uber Newsroom. 2021 [cited 25 January 2021]. Available from: https://www.uber.com/en-NZ/newsroom/nz2020/

126. Koutoukidis D, Jebb S, Ordóñez-Mena J, Noreik M, Tsiountsioura M, Kennedy S et al. Prominent positioning and food swaps are effective interventions to reduce the saturated fat content of the shopping basket in an experimental online supermarket: a randomized controlled trial. IJBNPA [Internet]. 2019 [cited 25 January 2021];16(1). Available from: https://ijbnpa.biomedcentral.com/articles/10.1186/s12966-019-0810-9

127. Campaigns [Internet]. Te Hiringa Hauora/Health Promotion Agency. 2018 [cited 25 January 2021]. Available from: https://www.hpa.org.nz/our-work/campaigns

128. Vandevijvere S, Dominick C, Devi A, Swinburn B. The healthy food environment policy index: findings of an expert panel in New Zealand [Internet]. World Health Organisation. 2015 [cited 25 January 2021]. Available from: https://www.who.int/bulletin/volumes/93/5/14-145540/en/

129. National District Health Board Food and Drink Environments Network. National Healthy Food and Drink Policy [Internet]. 2nd ed. Wellington: Ministry of Health; 2019 [cited 25 January 2021]. Available from:

https://www.health.govt.nz/system/files/documents/publications/national-healthy-food-and-drink-policy-2nd-edition.pdf

130. Health Star Ratings | Nutrition and Activity Hub [Internet]. Nutritionandactivity.govt.nz. 2021 [cited 25 January 2021]. Available from: https://www.nutritionandactivity.govt.nz/health-star-ratings
131. Zuboff S. Big other: Surveillance Capitalism and the Prospects of an Information Civilization. J. Inf. Technol. [Internet]. 2015 [cited 25 January 2021];30(1):75-89. Available from: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2594754

WIDER READING

Note: This list includes sources of information that indirectly helped with the formulation of ideas for this thesis and enhanced my understanding of the issues at hand.

i. McQueen D. Global handbook on noncommunicable diseases and health promotion. 2013.
ii. Sitwell W. The Restaurant: A History of Eating Out. New York: Simon & Schuster UK; 2020.
iii. Zuboff S. The age of surveillance capitalism. Profile Books; 2019.
iv. Berkowski G. How to build a billion-dollar app. Hachette UK; 2014.
v. Perera B, Albinsson P. Uber (Corporations That Changed the World). Greenwood; 2020.
vi. McCorquodale S. Influence: How social media influencers are shaping our digital future. Bloomsbury Publishing; 2019.
vii. Galloway S. The Four: The Hidden DNA of Amazon, Apple, Facebook and Google. Random House; 2017.

APPENDICES

1.Index of Auckland Council suburbs with Uber Eats available (January 30th 2020)

Suburb	NZDep (Q)	Suburb	NZDep (Q)	Suburb	NZDep (Q)	Suburb	NZDep (Q)
Central Auckland (58)		Te Papapa	8 (Q4)	Wairau Valley	6 (Q3)	Wiri	10 (Q5)
Arch Hill	4 (Q2)	Three Kings	6.5 (Q3)	Westlake	5 (Q3)	*Papakura*	
Auckland CBD	8.3 (Q4)	Waikowhai	6.5 (Q3)	Windsor Park	4 (Q2)	Alfriston	5 (Q3)
Avondale	6.6 (Q3)	Waterview	8 (Q4)	South & Eastern Suburbs (62)		Ardmore	5 (Q3)
Balmoral	4 (Q2)	Western Springs	3 (Q2)	Airport Oaks	10 (Q5)	Conifer Grove	5.5 (Q3)
Blockhouse Bay	5.25 (Q3)	Westfield	?	Botany Downs	3 (Q2)	Drury	6 (Q3)
Eden Terrace	?	Westmere	2.5 (Q1)	Bucklands Beach	4 (Q2)	Longford Park	4 (Q2)
Eden Valley	4 (Q2)	North Shore (47)		Burswood	4 (Q2)	Manurewa East	10 (Q5)
Ellerslie	3.25 (Q2)	Albany	4.25 (Q2)	Chapel Downs	9 (Q5)	Opaheke	6 (Q3)
Epsom	3.8 (Q2)	Bayswater	4 (Q2)	Clendon Park	10 (Q5)	Pahurehure	4 (Q2)
Freemans Bay	4 (Q2)	Bayview	4.3 (Q2)	Clover Park	9.5 (Q5)	Papakura	9.1 (Q5)
Glendowie	2.5 (Q1)	Beach Haven	4.3 (Q2)	Cockle Bay	1 (Q1)	Red Hill	10 (Q5)
Glen Innes	9.3 (Q5)	Belmont	4 (Q2)	Dannemora	2.5 (Q1)	Rosehill	9 (Q5)
Grafton	5 (Q3)	Birkdale	4.5 (Q2)	East Tamaki	5 (Q3)	Takanini	7.2 (Q4)
Greenlane	4.5 (Q2)	Birkenhead	2.3 (Q1)	East Tamaki Heights	2 (Q1)	*Pukekohe*	
Greenwoods Corner	?	Browns Bay	2.3 (Q1)	Eastern Beach	3 (Q2)	Karaka Harbour	3 (Q2)
Grey Lynn	3.75 (Q2)	Campbells Bay	1 (Q1)	Farm Cove	2 (Q1)	West Auckland (18)	
Herne Bay	1 (Q1)	Castor Bay	1 (Q1)	Favona	10 (Q5)	Glen Eden	7.4 (Q4)
Hillsborough	4.5 (Q2)	Chatswood	2 (Q1)	Flat Bush	?	Glendene	8 (Q4)
Kingsland	5 (Q3)	Cheltenham	1 (Q1)	Golflands	3 (Q5)	Green Bay	4 (Q2)
Kohimarama	1 (Q1)	Crown Hill	5 (Q3)	Goodwood heights	6 (Q3)	Henderson	7.9 (Q4)
Lynnfield	5 (Q3)	Devonport	2 (Q1)	Greenmeadow	4 (Q2)	Henderson Valley	2 (Q1)
Meadowbank	2.5 (Q1)	Fairview heights	?	Half Moon Bay	4 (Q2)	Herald Island	?
Mission Bay	2 (Q1)	Forrest Hill	4.3 (Q2)	Highland Park	5 (Q3)	Hobsonville	3 (Q2)
Morningside	4 (Q2)	Glenfield	5.6 (Q3)	Hillpark	?	Kelston	8.5 (Q4)
Mount Albert	4.75 (Q2)	Greenhithe	1.3 (Q1)	Howick	4 (Q2)	Lincoln	8.3 (Q4)
Mount Eden	4.4 (Q2)	Hauraki	2 (Q1)	Huntington Park	5 (Q3)	McLauren Park	?
Mount Roskill	7.2 (Q4)	Highbury	10 (Q5)	Mangere	8.7 (Q4)	Massey	8.3 (Q4)
Mount Wellington	7 (Q4)	Hillcrest	4 (Q2)	Mangere Bridge	7 (Q4)	New Lynn	7.8 (Q4)
Newmarket	5 (Q3)	Long Bay	1 (Q1)	Mangere East	8 (Q4)	Oratia	2 (Q1)

Newton	?	Mairangi Bay	2 (Q1)	Manukau	9 (Q5)	Ranui	5 (Q3)
New Windsor	7 (Q4)	Marlborough	4.9 (Q2)	Manukau Heights	6 (Q3)	Royal Heights	7 (Q4)
Onehunga	6.5 (Q3)	Milford	3.5 (Q2)	Manurewa	9.6 (Q5)	Sunnyvale	8 (Q4)
One Tree Hill	5 (Q3)	Murrays Bay	1.5 (Q1)	Meadowlands	3 (Q2)	Swanson	3.5 (Q2)
Orakei	5.5 (Q3)	Narrow Neck	2 (Q1)	Mellons Bay	2 (Q1)	Te Atatu	6.1 (Q3)
Oranga	10 (Q5)	Northcote	4.5 (Q2)	Middlemore	?	Rodney (1)	
Otahuhu	10 (Q5)	Northcote Point	2 (Q1)	Northpark	2.5 (Q1)	Red Vale	2 (Q1)
Owairaka	8 (Q4)	North Harbour	6 (Q3)	Ormiston	3 (Q2)		
Panmure	8 (Q4)	Northcross	3 (Q2)	Otara	10 (Q5)		
Parnell	3 (Q2)	Okura	1 (Q1)	Pakuranga	5.6 (Q3)		
Penrose	8 (Q4)	Oteha	4.5 (Q2)	Pakuranga Heights	6 (Q3)		
Point England	10 (Q5)	Pinehill	4 (Q2)	Papatoetoe	8.5 (Q4)		
Point Chevalier	3 (Q2)	Rosedale	1 (Q1)	Randwick Park	9 (Q5)		
Ponsonby	3.5 (Q2)	Rothesay Bay	2 (Q1)	Settlers Cove	9 (Q5)		
Remuera	1.8 (Q1)	Schnapper Rock	2 (Q1)	Shelly Park	1 (Q1)		
Royal Oak	5 (Q3)	Stanely Point	1 (Q1)	Somerville	2 (Q1)		
Saint Heliers	1.3 (Q1)	Sunnynook	5 (Q3)	Sunnyhills	4 (Q2)		
Saint Johns	4 (Q2)	Takapuna	3.3 (Q2)	The Gardens	2 (Q1)		
Saint Marys Bay	2 (Q1)	Torbay	2 (Q1)	Totara Heights	5 (Q3)		
Sandringham	5.75 (Q3)	Totara Vale	5.5 (Q3)	Tuscany Estate	5 (Q3)		
Stonefields	1 (Q1)	Unsworth heights	3 (Q2)	Wattle Downs	5.6 (Q3)		
Tamaki	10 (Q5)	Waiake	2 (Q1)	Weymouth	9.3 (Q5)		

2.Food outlet descriptions and healthiness scores (FES “Score Card”) (92)

Food Outlet Type	Description	Health Score
Fruiterer & greengrocer	Mainly engaged in the sale of fresh fruit and vegetables, including whole sale stores with direct to public sales.	10
Fish Shop	Mainly engaged in the sale of fresh seafood; including wholesale stores with direct to public sales and takeaway stores also providing a range of fresh seafood.	9
Poultry Shop	Mainly engaged in the sale of fresh poultry; including wholesale stores with direct to public sales.	9
Butchery	Mainly engaged in the sale of fresh meat; including wholesale stores with direct to public sales	9
Major Supermarket	Mainly engaged in the sale of groceries (fresh foods, canned and packaged foods, dry foods) of non-specialised (conventional) food lines. May contain a butcher or baker. Usually have 5 or more checkouts and a floor area over 1000 square meters. I.e., Woolworths, Coles, BI-LO, Franklins (no frills), ALDI.	5
Minor Supermarket	Mainly engaged in the sale of groceries (fresh foods, canned and packaged food, dry foods) of non-specialised (conventional) food lines. Usually have 4 or fewer checkouts and a floor area under 1000 square meters. E.g., Independent grocer or supermarket.	5

Specialty food stores – core foods	Mainly engaged in the sale of a limited line of specialised food such as a particular gourmet food that can be defined under core food.	5
Restaurant/café – franchise	E.g., franchise restaurants and cafes, mainly engages in the preparation and sale of meals/snacks for consumption on the premises; table service provided; may sell alcohol with food; may provide takeaway services.	0
Restaurant/café – local independent	E.g., restaurant in a golf club, culture-based restaurant/café which is not a take-away such as Mexican, Thai, Chinese etc.; mainly engaged in the preparation and sale of meals/snacks for consumption on the premises; table service provided; may also sell alcohol with food, may provide takeaway services.	0
Sandwich Shop	Mainly engaged in the preparation of filled bread products like sandwiches or rolls.	5
Salad/Sushi Bar	Mainly engaged in the preparation of salads and sushi.	5
Delicatessen	Mainly engaged in the sale of specialty packaged or fresh products such as cured meats and sausage, pickled vegetables, dips, bread and olives; may also provide dine in meals.	0
Bakery	Mainly oriented towards bread, biscuits, pastries or other flour products with or without packaging.	0
General Store	Mainly engaged in the sale of a limited line of groceries generally includes milk, bread and canned and packaged foods.	-5
Specialty Food Store – Extra Foods	Mainly engaged in the sale of foods such as ice-creams, donuts, waffles, cakes etc. than can be defined under extra food.	-8
Pub	E.g., pub within a bowing park, pub inside a private gambling club; food primarily engaged in selling alcoholic beverages where consumers can order and consume the alcoholic drinks in premises; can also be part of park or private club.	-5
Take-away Local Independent	E.g., kebab, fish & chips, burger, chicken shops, local pizza, mainly engaged in the preparation and sale of meals/snacks that are ready for immediate consumption; table service not provided; meals can be eaten on site; taken away or delivered; shop is not a franchise.	-8
Take-away Franchise Store	E.g., McDonalds, KFC, Subway; mainly engaged in the preparation and sale of meals (excludes donuts, drinks, ice-cream etc.)/snacks that area ready for immediate consumption; table service not provided; meal can be eaten on site, taken away or delivered; the food shop is a franchise/chain store with food being sold in specialised packaging.	-10

3.Index of Outlets, Associated FES & Number of Appearances

Outlet	FES	Appearances	Outlet	FES	Appearances	Outlet	FES	Appearances
McDonalds (Grey Lynn)	-10	10	Kebab King (Symonds St)	-10	17	Burger Wisconsin (Mt Eden)	-10	2
McDonalds (New Lynn)	-10	1	Kebab King (St Lukes)	-10	1	DumpleWing	-8	4
McDonalds (Balmoral)	-10	4	Dunkin' Donuts (Airport Business Park)	-8	1	E-Sarn WOK	-8	4
McDonalds (Greenlane)	-10	4	Dunkin Donuts (Takanini)	-8	11	Jewel of India	0	5
McDonalds (Glen Innes)	-10	3	Lil Abners	-8	10	Sushi Spring	5	11
McDonalds (Royal Oak)	-10	6	The Food Hut	-8	8	Cafe Anatolia (Te Atatu)	0	1

McDonalds (Pt Chev)	-10	4	Wild Bean Cafe (BP Mangere)	-8	4	Cafe Anatolia (Browns Bay)	0	6
McDonalds (Stoddard Rd)	-10	3	Wild Bean Cafe (BP Swanson)	-8	2	The Flaming Onion	0	17
McDonalds (Mt Wellington)	-10	2	Wild Bean Cafe (BP Weymouth)	-8	2	Busy Horse Take-aways	-8	1
McDonalds (Penrose)	-10	2	Wild Bean Cafe (BP Ormiston)	-8	1	Momotea (Howick)	-8	3
McDonalds (Otahuhu)	-10	1	144.Wild Bean Cafe (BP Hauraki)	-8	1	Shaolin Kung Fu Noodle	-8	1
McDonalds (Quay St)	-10	1	Wild Bean Cafe (BP Birkenhead)	-8	2	Thai Thai Takeaway	-8	8
McDonalds (Lunn Ave)	-10	2	Wild Bean Cafe (BP Whenuapai)	-8	1	Torbay Bar and Restaurant	0	2
McDonalds (Britomart)	-10	1	Choice Food Bar	5	10	Lovers Corner	-8	2
McDonalds (Albany)	-10	6	Katsuman Burger	0	1	Thai Isaan	0	7
McDonalds (Belmont)	-10	4	Soy & Ginger	5	3	Pizza Club Howick	-8	9
McDonalds (Glenfield)	-10	1	Oporto (Botany Downs)	-10	2	Thai Lemon	0	6
18.McDonalds (Wairau Road)	-10	6	Oporto (Botany)	-10	1	Sushi Time (Mangere)	5	1
McDonalds (Akoranga Dr)	-10	4	Mangere Bridge Takeaways	-8	4	Country Fried Chicken (Mangere)	-10	2
McDonalds (Constellation Dr)	-10	3	Mini Siam	-8	1	Country Fried Chicken (Roscommon)	-10	10
McDonalds (Mangere)	-10	3	Krispy Kreme (Manukau)	-8	5	Chicking (Takanini)	-10	15
McDonalds (Pakuranga)	-10	6	The Flaming Tandoor	0	2	Chicking (Manukau)	-10	11
McDonalds (Ti Rakau Dr)	-10	9	Rack n Roll Ribs (Browns Bay)	-8	7	Chicking (Mangere)	-10	5
McDonalds (Manukau)	-10	2	Rack n Roll Ribs	-8	8	Fuzion Kebab	-8	19
McDonalds (Clendon Park)	-10	3	King of India (Windsor Park)	-8	12	Daruma Ramen	0	11
McDonalds (Ormiston)	-10	2	Pho Bien	0	1	Kebabs on Maskell	-8	1
McDonalds (Massey Road)	-10	2	St Pierre’s (Oteha)	5	2	East India Auckland	-8	2
McDonalds (Otara)	-10	2	Bruce Lee (Manukau)	5	3	Aunt Lees Sushi (Howick)	5	1
McDonalds (Papatoetoe)	-10	1	Bruce Lee (Highbrook)	5	1	Kebabiya (Howick)	-8	15
McDonalds (Manurewa)	-10	6	Dodo Sushi	5	1	Chinese BBQ & Vietnamese	-8	6
McDonalds (Cavendish Dr)	-10	1	The Burger Bach	0	15	Indian Kitchen (Howick)	0	15
McDonalds (Takanini)	-10	3	Kai Eatery Takapuna	-8	7	Katsubi Rosedale	0	15
McDonalds (Papakura)	-10	4	Bar & Baa	0	1	Phuket Thai Takeaway	0	10
McDonalds (Kelston)	-10	2	Haru Japanese	0	1	Cuisine India Belmont	-8	2

McDonalds (Westgate)	-10	2	GG Roast	-8	5	Cuisine India Northcross	-8	1
McDonalds (Lincoln Road)	-10	2	The Best Sushi Factory	5	6	Buona Sera	0	1
McDonalds (Te Atatu)	-10	1	Hulu Cat (Rosedale)	-8	3	Nicolino Restaurant	0	3
McDonalds (Ash St)	-10	1	Pita Pit (Otahuhu)	5	2	Curry of India	0	3
McDonald's (West City)	-10	1	Pita Pit (Kelston)	5	1	Flying Rickshaw	0	7
McDonald's (Airport)	-10	1	Glen Eden Kebab	-8	1	Olivas Kitchen	-8	3
Burger King (Swanson St)	-10	5	Siam Thai	0	2	A'ruma Malaysian Long Bay	0	1
Burger King (New Lynn)	-10	4	Bountiful Earth	0	1	Indian Valley Restaurant	-8	1
Burger King (Dominion Road)	-10	7	Tanpopo Ramen	0	1	The Taste Thai	0	8
Burger King (Epsom)	-10	6	Uncle Man at The Eatery	0	6	Little & Kitchen	-8	9
Burger King (Newmarket)	-10	3	Dominos (Avondale)	-10	2	9 Bowls Café	0	2
Burger King (Panmure)	-10	5	Dominos (Papakura)	-10	1	Punjabi Kitchen	0	4
Burger King (Albany)	-10	3	Dominos (Clendon Park)	-10	3	Sushi San	5	2
Burger King (Highpoint)	-10	4	Dominos (Pakuranga)	-10	1	The Milk Shake Bar	-8	1
Burger King (Wairau Park)	-10	6	Dominos (Mangere)	-10	1	LJ's Waitakere	-10	1
Burger King (Sunnybrae)	-10	7	Dominos (Highland Park)	-10	2	LJ's Takanini	-10	9
Burger King (Apollo Dr)	-10	6	Mexicali Fresh (Botany Junction)	0	3	LJ's Manukau	-10	1
Burger King (Sylvia Park)	-10	1	Mexicali Fresh (Constellation Dr)	0	1	Thai Family Restaurant	0	1
Burger King (Bader Dr)	-10	3	Mt Albert BBQ Noodle House	0	9	Ribs and Wings Manurewa	-8	1
Burger King (Botany Downs)	-10	10	Three Kings Takeaway	-8	2	Select Pizza (Mangere)	-10	1
Burger King (Papatoetoe)	-10	7	Thai Sizzlers	-8	2	Heaven Indian Kitchen	-8	3
Burger King (Highland Park)	-10	6	Heritage Cuisine of India	0	1	Mayas South Indian Bistro	0	1
Burger King (Takanini)	-10	5	Noodle Canteen	-10	1	The Coffee Club (Takanini)	0	3
Burger King (Mangere)	-10	3	Mr Zhou's Dumplings	0	1	The Coffee Club (Hobson Centre)	0	2
Burger King (Glendene)	-10	4	Way Home (Albany)	0	3	Kebabs Aladdin	-8	1
Burger King (Henderson)	-10	3	Five Eighty Burgers	-8	3	Yellow Chili	0	1
Burger King (Westgate)	-10	2	Kokoro Kitchen	0	20	Flame Pizza Karaka	-8	1
Burger King (Otahuhu)	-10	1	Kokoro Kitchen (Symonds Street)	0	1	Flame Pizza and Gourmet Burgers	-8	1

Burger King (Constellation Dr)	-10	1	Pizza Express	-8	2	Thai Kitchen Takeaways	-8	1
Burger King (Dairy Flat)	-10	1	Murder Burger (Ponsonby)	-10	5	Nirvana Indian Restaurant	0	6
Subway (Eden Quarter)	-10	2	Murder Burger (Mt Eden)	-10	1	Lone Star (Manukau)	0	6
Subway (Lynnfield)	-10	2	Better Burger (Ponsonby)	-10	2	Lone Star (Westgate)	0	2
Subway (Pitt St)	-10	1	Better Burger (Sylvia Park)	-10	1	Lone Star (Albany)	0	1
Subway (Mt Eden)	-10	1	Gong Cha (Takapuna)	-8	18	The Chef of India	0	3
Subway (Onehunga)	-10	1	Gong Cha (Newmarket)	-8	1	The Sugarloaf Takanini	0	1
Subway (Royal Oak)	-10	5	Gong Cha (Botany)	-8	7	Tipparost Thai Restaurant	0	3
Subway (Kelston)	-10	7	Kebab Sensation	-8	2	Punjab Palace	0	9
Subway (Ellerslie)	-10	11	NZ Kebabs/sensational chicken	-10	12	Wild Orchid Thai Restaurant	0	10
Subway (New Lyn)	-10	1	NZ Kebab/sensational Chicken (Mt Roskill)	-10	2	Galaxy Pizza	-8	2
Subway (Sylvia Park)	-10	4	Hell (Symonds St)	-10	5	The Good Home	0	1
Subway (Mobil K Rd)	-10	1	Hell (Royal Oak)	-10	6	Thai Chefs Titirangi	0	1
Subway (Otahuhu)	-10	6	Hell (Ellerslie)	-10	3	The Fish and Chippery Glen Eden	-8	8
Subway (Mt Roskill)	-10	5	Hell (Grey Lynn)	-10	4	Fish Stop Glen Eden	-8	3
Subway (Parnell)	-10	2	Hell (Mt Albert)	-10	4	Fried Chicken Headquarters	-8	3
Subway (Avondale)	-10	2	Hell (Balmoral)	-10	6	Sushi & More	5	4
Subway (Ponsonby)	-10	8	Hell (Remuera)	-10	4	Ruang Thong Thai 4 Restaurant	0	5
Subway (Kingsland)	-10	4	Hell (Kohi)	-10	6	Shanghai Street Dumplings and Noodles	0	6
Subway (Mercari Way)	-10	10	Hell (Victoria St)	-10	5	Ten on Ten Indian Take-aways	-8	9
Subway (Anzac St)	-10	3	Hell (Belmont)	-10	4	Yuxiang Chinese Restaurant	0	1
Subway (Glenfield Mall)	-10	8	Hell (Northcross)	-10	7	Thai Kitchen Restaurant	0	1
Subway (Browns Bay)	-10	5	Hell (Glenfield)	-10	11	Chapati Indian Restaurant	0	2
Subway (Devonport)	-10	2	Hell (Albany)	-10	2	Seasonings	0	2
Subway (Rosedale)	-10	1	Hell (Botany Downs)	-10	5	Bombay Kitchen	0	1
Subway (Northcross)	-10	4	Hell (Papakura)	-10	5	Sushi Tomi Japanese	5	2

Subway (Wairau Park)	-10	5	Hell (Titirangi)	-10	1	Goode Brothers Northwest	0	3
Subway (Sunnybrae)	-10	2	Hell (Henderson)	-10	2	The Red Fort	0	4
Subway (Mobil Hillside)	-10	1	Hell (New Lynn)	-10	3	Goldensilk Thai Restaurant	0	4
Subway (Mairangi Bay)	-10	1	Hell (Westgate)	-10	3	Kangnaru Korean Restaurant	0	2
Subway (Auckland Airport)	-10	1	Hell (Highland Park)	-10	7	Royal Takeaway	-8	5
Subway (Botany)	-10	15	Big J's Take-aways	-8	1	Maki Sushi	5	2
Subway (Howick)	-10	5	Hansan (Newmarket)	0	1	Chinoiserie	0	2
Subway (East Tamaki)	-10	2	The Pavilion, Indian Cuisine	-8	14	Sages Indian Restaurant	0	1
Subway (Highland Park)	-10	6	Queens Kebab	-8	3	Glenmall Roast	-8	1
Subway (Manurewa)	-10	5	Nando’s (Albany)	-10	11	Butter Chicken Place	-8	1
Subway (Papatoetoe Caltex)	-10	2	Nando’s (Wairau)	-10	12	Kebabistan (Glen Eden)	0	2
Subway (Middlemore)	-10	1	Nando’s (Botany)	-10	11	Daruma Sushi Go Round Albany	5	1
Subway (Takanini)	-10	7	Nando’s (Manukau)	-10	11	Kohinoor Indian Cuisine	0	1
Subway (Manukau)	-10	1	Nando’s (Takanini)	-10	11	Abruzzo Restaurante Italian	0	5
Subway (Mobil Clendon)	-10	5	Nando’s (Otahuhu)	-10	4	Delissimos Pizza	-8	7
Subway (Papakura)	-10	3	Nando’s (New Lynn)	-10	10	PrimeRose Thai	0	4
Subway (Lincoln North)	-10	6	Nando’s (Lincoln Rd)	-10	6	Happy Boy	0	16
Subway (Mission Bay)	-10	5	Nando’s (Mt Eden)	-10	3	Chaat Indian Cuisine	0	6
Subway (Wiri)	-10	1	Nando’s (Lunn Ave)	-10	11	Airport Kebabs & Pizza	-8	3
Subway (Botany Junction)	-10	1	Nando’s (Onehunga)	-10	8	Mozaic Kebab	-8	5
Subway (Grafton)	-10	1	Nando’s (Queen St)	-10	3	Night n Day (Takanini)	-8	5
Subway (Beach Rd)	-10	1	Nando’s (St Lukes)	-10	1	Night n Day (Henderson)	-8	2
Carls Jr (Queen St)	-10	17	Sal’s (Mission Bay)	-10	5	Umiya Sushi	0	1
Carls Jr (Avondale)	-10	12	Sal’s (New Lynn)	-10	5	Broadway Diner	-8	2
Carls Jr (St Johns)	-10	10	Sal’s (Mt Eden)	-10	12	Bamboo Kitchen	0	1
Carls Jr (Pakuranga)	-10	1	Sal’s (Parnell)	-10	10	Xtreme Pizza	-8	2
Carls Jr (Albany)	-10	12	Sal’s (Mt Wellington)	-10	9	Kebab Grillers n Fried Chicken	-8	3
Carls Jr (Airport)	-10	1	Sal’s (Wynyard Quarter)	-10	2	Kabana Takapuna	0	6
Carls Jr (Manukau)	-10	11	Sal’s (Brown Bay)	-10	12	Black Box Pizza	-8	1

Carls Jr (Mangere)	-10	5	Sal's (Takapuna)	-10	13	Thai Rain Forest	0	1
Carls Jr (Takanini)	-10	11	Sal's (Birkenhead)	-10	6	Zambrero	0	1
Carls Jr (Henderson)	-10	5	Sal's (Highland Park)	-10	8	KS Curry Place	-8	1
Wendy's (Dominion Rd)	-10	13	Sal's (Takanini)	-10	4	Otto Woo Noodle Bar (Taka)	0	2
Wendy's (Lynnfield)	-10	8	Sal's (Westgate)	-10	3	Chand Indian Restaurant	0	4
Wendy's (Panmure)	-10	10	Sal's (Henderson)	-10	2	Dante's Pizzeria	0	2
Wendy's (Greenlane)	-10	10	Sal's (K Road)	-10	2	Monsoon Indian Cuisine	0	1
Wendy's (Royal Oak)	-10	7	Sal's (Remuera)	-10	1	Thai Passion	0	1
Wendy's (Mt Wellington)	-10	3	Boss Don	0	21	Karachi Kebabs	-8	1
Wendy's (Queen St)	-10	10	Raviz	0	1	Aroy Thai Eatery	0	1
Wendy's (Otara)	-10	6	Burger Wisconsin (Howick)	-10	13	Thai Heart Restaurant	0	1
Wendy's (Constellation Dr)	-10	8	Burger Wisconsin (Mairangi Bay)	-10	13			
Wendy's (The Hub)	-10	17	Burger Wisconsin (Wairau)	-10	5			
Wendy's (Manukau)	-10	2	Burger Wisconsin (Mt Albert)	-10	4			
Wendy's (Papakura)	-10	7	Burger Wisconsin (Onehunga)	-10	6			
Wendy's (Te Atatu)	-10	6	Burger Wisconsin (Remuera)	-10	2			

4.Associated Research Paper

Partridge S, Gibson A, Roy R, Malloy J, Raeside R, Jia S 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 [Internet]. 2020 [cited 5 January 2021];12(10):3107. Available from: https://www.mdpi.com/2072-6643/12/10/3107