Characteristics of Self-managed Weight Loss in Australian Adults: An Exploratory Study

Divya Ramachandran

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Candidate Statement

This is to certify that to the best of my knowledge, the content of this thesis is my own work. This thesis has not been submitted for any degree or other purposes.

I certify that the intellectual content of this thesis is the product of my own work and that all assistance received in preparing this thesis and sources have been acknowledged.

Name: Divya Ramachandran

Date: June 27, 2021

Declaration of Completion

This is to certify that this thesis entitled 'Characteristics of Self-Managed Weight Loss in Australian Adults: An Exploratory Study' submitted by Divya Ramachandran in fulfilment of the requirements for the degree of Doctor of Philosophy is in a form ready for examination.

Name: Professor Timothy Gill

Date: June 27, 2021

Abstract

The capacity of health care services to address obesity in Australia is grossly inadequate given the enormity of the issue. Over 12.5 million Australians have a weight above the healthy range and more than one out of every three Australians are living with obesity. Effective self-directed interventions that can be scaled up to population level are therefore critical to address the lack of health resources and change these trends. People who self-manage their weight loss in the general population, without accessing any level of support from the health system (or even other commercial weight loss services) have not been extensively researched. Knowing who they are, how they manage their weight, and if they are successful, can provide valuable insights for planned obesity management strategies. This thesis attempts to address some of these issues with a research focus on understanding characteristics of self-managed weight losers and their weight loss journeys and outcomes. In order to answer these questions, it was important to additionally consider methodological questions about what data should be collected and how best to reach and recruit self-managed weight losers from the general community. A range of quantitative and qualitative techniques were used to examine different aspects of self-managed weight loss and these studies form the chapters in this thesis. Majority of the participants were women, English speaking, married or with partner. A little over half had degree or higher qualifications. There was a more even representation across age ranges and relative socio-economic disadvantage. Among our participants, we found a third of self-managed weight losers were successful at achieving modest weight loss, and a tenth achieved a weight loss that was clinically significant. The majority of participants were completely unassisted in their weight loss journey, and managed to achieve these results despite the disruptions brought on by the COVID-19 pandemic. The strategies used by the self-managed weight losers, as well as the results that they achieved, were comparable with more intensive and professionally delivered behavioural interventions, and even matched some pharmacological agents. The characteristics associated with successful self-managed weight loss and weight maintenance, as well as the barriers faced by the self-managed weight losers were similar to those reported among participants in clinical settings or in research settings offering formal weight loss interventions. The strengths of this thesis were the uniqueness of the population studied and gathering a breadth of data about features of self-managed weight loss. The methodology was well informed by preliminary research and a large pilot study. The biggest limitations, which

prevents generalizability, were the limited sample size achieved and the occurrence of the Covid-19 pandemic in the midst of the longitudinal study.

Given the scale of the issue in Australia, and the limited existing resources for managing overweight and obesity for individuals, this thesis recommends that self-managed weight loss be recognised as a legitimate weight management strategy that individuals can pursue unless contraindicated. This should be considered within local and national planning. Self-managed weight loss should be encouraged and supported among those in the population with a weight problem who choose to adopt this approach.

Thesis Summary

Background: Obesity is a health condition indicated by high levels of body fat, which can increase the risk of several chronic diseases such as diabetes, heart disease, stroke and some cancers. In Australia, obesity is a public health issue, with over 67% of adults bearing excess weight, with health and economic impacts at both individual and population levels. With the scale of the issue, the capacity of health services to provide appropriate obesity management services is grossly inadequate. Obesity management interventions that do not require intensive professional contact, if found effective and scalable, can help alleviate the issue to some extent. This has led to increased research in the area of self-directed weight loss interventions. However, there are many in the population that attempt weight loss on their own, without accessing any healthcare or other professional weight management programs. These people, as a population group, have not been extensively researched before because research participants usually tend to be those recruited from health facilities or enrolled in formal intervention programs. As a result, very little is understood about the self-management process or who is likely to successfully 'self-manage' their weight loss. An understanding of their characteristics can provide valuable insights for national obesity management strategies, potentially better supporting those who do self-manage, and allow the channelling of more intensive resources to those who most need it.

Aims: Within the frame of examining self-managed weight loss, the aims for this thesis were as follows: (1) What are the characteristics of people who self-manage their own weight loss? (2) How successful are they? (3) What factors predict changes in weight, diet and physical activity among self-managed weight losers? Researching self-managed weight losers presents some methodological challenges as this is a group that has not been extensively examined before. For exploration of the aims of the study, it therefore became necessary to address the following additional research questions: (1) What data are important to collect about self-managed weight loss? (2) Are online mechanisms of recruitment—using Facebook in particular—feasible to reach and recruit those attempting self-managed weight loss in the population? (3) Among those who self-manage, are there any differences between those who are completely unassisted and do not access any professional service, and those who may still be assisted in some manner in the self-management?

Methods: A range of qualitative and quantitative methods were used to answer these research questions, and explore the issues addressed within each chapter in the thesis. As a first step, it was important to determine what patient characteristics or factors are considered by obesity experts before commencement of a weight loss intervention. This thesis found that there was no commonly agreed baseline patient data collection that obesity clinics follow in Australia. This gap was addressed by using the **Delphi technique** to build consensus among obesity experts on what baseline patient data should be collected. The next challenge was finding ways to reach self-managed weight losers in the community because usual avenues of recruitment from obesity clinics or other health services target those who participate in more intensive obesity management services, or receive some level of health professional intervention. Using Facebook for recruitment, along with online surveys for data collection, presented a possible avenue worth exploring for reaching and recruiting our population of interest. This led to a large **pilot study**, which examined the feasibility of both paid and free mechanisms of recruitment through Facebook by using an **iterative design exploration**. Online survey design elements including a simplified consent form and use of raffle incentives were examined. The data collected through the pilot study were used for preliminary analysis of this target group. This included descriptive statistics and **multiple binary logistics regression** to explore which predictors influence self-management type ('self-managed: unassisted' and 'self-managed: assisted'). The lessons learned from the pilot study were used to inform the development of a **longitudinal study**. The longitudinal study made use of paid Facebook advertisements for recruitment of appropriate participants, and data on a range of characteristics were collected at baseline and at 12-week follow-up, including outcomes for weight, diet and physical activity. **Descriptive analysis**, **before and after analysis**, and a **comparison of assisted and unassisted subgroups** were undertaken. A **two-step cluster analysis** was conducted to identify the existence of homogeneous groups or clusters among self-managed weight losers. **Univariate and multiple regressions (linear and logistic)** were performed to analyse which characteristics had most impact on **weight loss outcomes**, as well as **secondary outcomes of changes in diet and physical activity**. **Thematic analysis** of responses to open-ended questions was conducted to better understand diet and exercise strategies, barriers, and other aspects related to self-managed weight losers. With the sudden arrival of the pandemic, additional survey questions were asked of participants about the impacts on their weight loss journeys. **Content analysis** was used to summarise impacts, and the weight, diet and physical activity outcomes were compared between participants who reported their weight loss journey was affected and those who reported that they were not affected.

Results: The Delphi study conducted among obesity experts to identify data important to collect from people attempting weight loss identified a list of standardised patient data items to be collected at baseline. This informed the thesis on the range of data that needed to be collected from self-managed weight losers. In the pilot study, 233 participants were successfully recruited through Facebook to complete an online survey on their self-managed weight loss journey. Using paid Facebook advertisements was found more feasible as it yielded better results and removed any potential selection bias introduced through free mechanisms (recruitment through Facebook groups that revolved around specific characteristics or interests). The preliminary analysis of data from the pilot study on self-management type showed that 61.5% of the participants were completely 'unassisted' and the rest might have accessed some form of assistance, and this was influenced by characteristics including age, BMI category, weight gained as an adult, diet tracking and use of diet books. In the longitudinal study, the thesis was able to recruit a group of self-managed weight losers at the beginning of their weight loss attempt and follow them up at 12 weeks (n = 102). Participants were mainly female (78%), English speakers (85%), and married or with partners (70%). Most (88%) had overweight or obesity. More than half (53%) reported having at least one chronic disease. The majority (85%) were 'self-managed: unassisted'. There were no differences found between the 'self-managed: unassisted' and 'self-managed: assisted' groups. Four homogeneous groups were detected among self-managed weight losers and could be described as '*older, ill and stressed*', '*younger aged and healthy, but poor and stressed*', '*wealthy but ill and stressed*', '*wealthy, relaxed and healthy*'. Participants had a mean weight loss of 2.07 kg (95% CI = −3.06, −1.09) at 12 weeks. A third of the participants successfully lost weight (≥3% of their initial body weight), and a fifth achieved clinically significant (≥5% of their initial body weight) weight loss. Higher initial BMI, non-English speakers, mention of cancer diagnosis, and use of weight loss products were associated with higher likelihood of absolute weight loss. Increased consumption of discretionary foods was associated with weight gain. Through the thematic analysis, diet themes identified were 'Snack management tactics', 'Awareness of portion control' and 'Following specific diets and eating rules'. Exercise themes identified were 'Many ways of walking', 'Starting or increasing level of exercise' and 'Plans, routines, goals and monitoring'. Barriers to sustaining weight loss or healthy behaviours were 'Health issues and state of mind and body', 'Losing motivation' and 'Unconducive environments and unhelpful social situations'. The two additional themes identified were 'I am trying' and 'Perpetual struggle'. The majority (72%) of the self-managed weight losers reported that the lockdown and social restrictions enacted with the onset of the COVID-19 pandemic negatively affected their weight loss journeys.

Participants reported high levels of stress eating, binge eating and eating out of boredom, and detrimental impacts on exercise with the closure of gyms, swimming pools and loss of social exercise.

Conclusion: This thesis was able to reach and recruit people from the general community who were commencing a self-managed weight loss journey and capture a range of data and characteristics, including weight loss, diet and physical activity outcomes at 12 weeks, for the first time. The thesis found that people who self-manage their weight loss without accessing any professional health services can be successful at losing meaningful amounts of weight that are comparable to few of the more formal behavioural weight interventions and some pharmacological agents. The weight loss strategies that they used were similar to those generally recommended in more formal interventions. It is worthwhile recognising self-managed weight loss as a legitimate individual weight management approach in national and local policies, along with appropriate encouragement and public health supports. Self-managed weight loss can make a valuable contribution as one approach among a suite of strategies considering it is unlikely to have health service interventions for all individuals given scale of the issue of obesity in Australia.

Some characteristics of successful weight loss, as well as barriers, that have been identified in the thesis are commonly identified in the literature. However, firm conclusions on their impact on weight, diet and physical activity outcome effect sizes could not be made because of the small sample size. Further, the unique circumstances of the pandemic amid weight loss journeys further prevented the generalisability of findings. However, this thesis was successful in studying a unique population group among weight losers, gathering data on a breadth of characteristics for the first time and following journeys in a 12-week longitudinal study. The thesis addressed a gap in clinical practice and made contributions to the literature on self-directed weight loss, and laid foundations for further research on self-managed weight losers.

Acknowledgements

I would like to express my deep gratitude to my primary supervisor Professor Timothy Gill, whose knowledge and expertise were invaluable in advising and guiding me throughout every phase of the thesis. Beyond academic guidance, Professor Gill took the risk of accepting me as a candidate, despite my having a background in a different discipline and being a recent entrant to the field of health. Further, his understanding and support enabled working remotely for most of the time, travelling to the university only when necessary. This mindset was way in advance of the new norms that have been forced on all by the pandemic. Professor Gill, without your support in a myriad of ways through my different life circumstances, this thesis would not be possible.

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Abbreviations

ABS	Australian Bureau of Statistics
AIHW	Australian Institute of Health and Welfare
BIC	Bayesian information criterion
BMI	body mass index
BWMP	behavioural weight management program
CATI	computer-aided telephonic interview
DIY	do-it-yourself
GP	general practitioner
HSC	high school certificate
IPAQ	International Physical Activity Questionnaire
IRSD	Index of Relative Socio-economic Disadvantage
NHMRC	National Health and Medical Research Council
NNPAS	National Nutrition and Physical Activity Survey
NWCR	National Weight Control Registry
PWCR	Portuguese Weight Control Registry
SSBs	sugar sweetened beverages
VIF	variance inflation factor
WHO	World Health Organization

Preface

Thesis style

The University of Sydney allows published papers that arise from a higher degree by research to be included in a thesis. Therefore, this thesis is presented as a hybrid ‘thesis including publications’, with papers that are published or are under review in Chapters 3, 4 and 9. Each paper is presented in the style required by the journal. Study-specific appendixes, originally published or under review for publication as online supplementary material, are included in the thesis appendixes. For consistency and ease of reading, all other chapters, which address the research questions, are written and presented in a format that follows the structure of scientific publications, with references at the end of each chapter.

Dissemination of Work

Findings from the thesis, have been broadly communicated to the public in the following formats.

Publications in peer-reviewed journals

- Ramachandran, D., Gill, T. (2020). Impact of COVID-19 lockdown on self-managed weight loss journeys. *Obesity Research & Clinical Practice*, 14(4), 386–387.
- Ramachandran, D., Atlantis, E., Markovic, T., Hocking, S., Gill, T. (2019). Standard baseline data collections in obesity management clinics: A Delphi study with recommendations from an expert panel. *Clinical Obesity*, 9(3), 1–7.
- Ramachandran, D., Kite, J., Vassallo, A., Chau, J., Partridge, S., Freeman, B., Gill, T. (2018). Food trends and popular nutrition advice online—Implications for public health. *Online Journal of Public Health Informatics*, 10(2), 1–15.

Under review for publication

- Ramachandran, D., Li, A., Gill, T. (2021). An exploration of recruitment through Facebook to an online survey on self-managed weight loss in Australia—Lessons learned.

Oral and poster abstracts, and presentations at national and international conferences

- Ramachandran, D., Atlantis, E., Markovic, T., Hocking, S., Gill, T. (2018). Standardised baseline data collections in obesity management services in Australia: Recommendations from an expert panel. ANZOS-Breakthrough Discoveries Joint Annual Scientific Meeting 2018, 17 October 2018, Melbourne, Australia.
- Ramachandran, D., Li, A., Gill, T. (2019). 'What differentiates people who self-manage their weight-loss'. ANZOS-ASLM-ICCR 2019, 16–18 October 2019, Sydney, Australia.
- Ramachandran, D., Li, A., Gill, T. (2019). Higher processed meat consumption among self-reported low-carbohydrate and high-fat (LCHF) dieters in Australia. Nutrition Society of Australia 43rd Annual Scientific Meeting.

- Ramachandran, D., Li, A., Gill, T. (2020). Impact of COVID-19 restrictions on self-managed weight-loss journeys. The Austral-Asia Obesity Research Update 2020—Convened by ANZOS, 15–16 October 2020 (Virtual conference).
- Ramachandran, D., Li, A., Gill, T. (2021). ‘A cluster analysis of Australians who self-manage their weight loss’. ANZOS 2021, 20–22 July 2021, Brisbane, Australia.

Scholarships awarded during candidature

- The Paulette Isabel Jones PhD Completion Scholarship (SC3549) awarded on 7 December 2020.

Authorship Contributions

I, Divya Ramachandran (the candidate), declare that the research papers presented in this thesis are the original work of myself, under the guidance of primary supervisor Professor Timothy Gill and auxiliary supervisor Dr Ang Li.

I acknowledge the editing services provided by Elite Editing, which included standard copyediting for Chapters 1 to 10 and document formatting. The editor was aware of and abided by the standards set out in the Australian Standards for Editing Practice (2013) and the Institute of Professional Editors Guidelines for Editing Research Theses (2010).

Chapter 3 of this thesis is published as **Ramachandran, D.,** Atlantis, E., Markovic, T., Hocking, S., Gill, T. (2019). Standard baseline data collections in obesity management clinics: A Delphi study with recommendations from an expert panel. *Clinical Obesity*, 9(3), 1–7.

The co-authors of the paper confirm that Divya Ramachandran made the following contributions:

- made methodological decisions regarding the design of the study
- gained ethical approval
- created and tested the online surveys
- recruited participants
- analysed and interpreted the data
- wrote and critically appraised the paper
- corresponded with the journal
- approved the final publication.

Chapter 4 of this thesis titled ‘An exploration of recruitment through Facebook to an online survey on self-managed weight loss in Australia—Lessons Learned’ is under review in the *International Journal of Social Research Methodologies* The co-authors of the paper confirm that Divya Ramachandran made the following contributions:

- made methodological decisions regarding the design of the study
- created and tested the online surveys
- recruited participants

- analysed and interpreted the data
- wrote and critically appraised the paper
- corresponded with the journal.

Chapter 8 of this thesis includes the paper published as **Ramachandran, D.,** Gill, T. (2020). Impact of COVID-19 lockdown on self-managed weight loss journeys. *Obesity Research & Clinical Practice*, 14(4), 386–387.

The co-authors of the paper confirm that Divya Ramachandran made the following contributions:

- made methodological decisions regarding the design of the study
- gained ethical approval
- created and tested the online surveys
- recruited participants
- analysed and interpreted the data
- wrote and critically appraised the paper
- corresponded with the journal
- approved the final publication.

A body of work that is included in Appendix A and came about along with this thesis is published as Ramachandran, D., Kite, J., Vassallo, A., Chau, J., Partridge, S., Freeman, B., Gill, T. (2018). Food trends and popular nutrition advice online—Implications for public health. *Online Journal of Public Health Informatics*, 10(2), 1–15.

The co-authors of the paper confirm that Divya Ramachandran made the following contributions:

- made methodological decisions regarding the design of the study
- identified data sources and collected data
- analysed and interpreted the data
- wrote the paper
- corresponded with the journal
- approved the final publication.

As supervisor for the candidature upon which this thesis is based, I confirm that the authorship attribution statements above are correct and complete.

Signature: [REDACTION]

Name: Divya Ramachandran

Date: June 27, 2021

Signature: [REDACTION]

Name: Professor Timothy Gill

Date: June 27, 2021

Section 1

Chapters 1, 2 and 3

Chapter 1: Introduction

1.1 Overweight and Obesity Overview

1.1.1 Definition of overweight and obesity

Overweight and obesity refer to excess body weight. The World Health Organization (WHO) defines overweight and obesity as abnormal or excessive fat accumulation that presents a risk to health.(1) Obesity is a result of an imbalance between energy intake through the diet and energy expenditure through basal metabolism, thermic processes and physical activity. Excess energy intake, of even a small amount over a long period, causes weight gain.(2)

Many different factors influence the development of obesity, including genetics and physiology, as well as individual, environmental and societal factors.(2, 3) Physical, economic, political and sociocultural factors that are conducive to weight gain and obesity among individuals and the population are described by the term ‘obesogenic environment’.(4) The multifactorial nature of the causes of obesity presents opportunities to target interventions at multiple levels.

Obesity is measured through BMI or Body Mass Index. BMI is the internationally recognised standard of measurement of obesity. It is calculated by dividing the person’s weight in kilograms by the square of height in metres. Table 1.1 below shows weight classification of adults based on BMI. The WHO classifies BMI in adults from underweight through to obesity.(5) Obesity is further split into three classes according to severity, with more severe obesity associated with a higher risk of comorbidities.(2)

Table 1.1 Adult weight classification based on Body Mass Index (BMI)

BMI (kg/m^2)	Classification
Less than 18.5	Underweight
18.5 to less than 25	Normal weight range
25 to less than 30	Overweight but not obese
30 to less than 35	Class 1 Obesity
35 to less than 40	Class 2 Obesity
40 and above	Class 3 Obesity

Adapted from: Australian Institute of Health and Welfare 2017. A picture of overweight and obesity in Australia 2017. Cat. no.PHE 216. Canberra: AIHW

It has been suggested that these cut-off points should differ for certain population groups, such as older people; people with high muscle mass; Aboriginal and Torres Strait Islander people; and Pacific Islander, South Asian, Chinese and Japanese populations.(2) BMI may not always directly reflect adiposity or fatness in different individuals, and therefore different measures such as waist circumference and body fat composition are also considered when assessing health risks and treatment for individuals. However, BMI is a practical and useful measure for identifying overweight and obesity at a population level.(6)

1.1.2 Prevalence of overweight and obesity in Australia

The Australian Bureau of Statistics (ABS) National Health Survey of 2017–2018 indicated that 67% of Australians had a weight above the healthy range,(7) an increase of 3.6% compared with 2014–2015.(8) Slightly more than a third (35.6%) were overweight and slightly less than a third had obesity (31.3%).(7)

A higher proportion of adult males (74.5%) than females (59.7%) carried excess weight. The largest difference was seen between the genders in the overweight category, with 42.0% of males and 29.6% of females being overweight. The difference was smaller in the obesity category (32.5% males compared with 30.2% females).(7) Compared with 2014–2015, the proportion of people with obesity increased for males from 28.4% to 32.5%, and for females from 27.4% to 30.2%.(8) The proportions of both males and females in the overweight category have remained constant.

Excess body weight markedly increased with age, with 46% in the ages 18–24 years, 68.7% in the ages 35–44 years and 78.2% in the ages 65–74 years.(7) Compared with 2014–2015,(8) the largest increase was found in the ages 18–24 years, with 46% in 2017–2018 and 38.9% in 2014–2015.

Socio-economic Indexes for Areas (SEIFA) (9) is a ranking of areas in Australia by the ABS according to relative socio-economic advantage and disadvantage. The Index of Relative Socio-economic Disadvantage (IRSD) ranks areas on a continuum from the most disadvantaged to least disadvantaged on the basis of a range of information about the economic and social conditions of people and households within an area. A low score indicates greater disadvantage, for example, more households with low income, no qualifications or low-skill occupations.

The trend of increased proportions of overweight and obesity with increased relative disadvantage has remained constant since 2014–2015(7, 8). In 2017–2018, 71.8% of adults living in the areas of most disadvantage (first quintile) had overweight or obesity in comparison with 62.6% in the least disadvantaged (fifth quintile). Adults living in inner regional Australia and outer regional and remote Australia were more likely to have overweight or obesity compared with those living in major cities (72.4% and 72.2% compared with 65.0%, respectively).

1.1.3 Impact of overweight and obesity

Overweight and obesity have detrimental effects on health and emotional wellbeing, as well as economic impacts at individual and population levels.

Overweight and obesity in adults increases the likelihood of developing several chronic diseases and conditions such as cardiovascular disease, type 2 diabetes, stroke, osteoarthritis, kidney disease, NAFLD (non-alcoholic fatty liver disease), gall bladder disease, asthma, and certain types of cancer including breast, endometrial, and colon cancer.(2) There are strong bidirectional relationships between obesity and depression(10) and increase in odds of mood and anxiety disorders with increased obesity.(11)

Further, obesity is linked with more severe and adverse outcomes in case of some illnesses. For example, in recent times, 'individuals living with obesity have experienced greater morbidity and mortality from COVID-19, with concerns that future vaccines will be less effective for individuals with obesity.(12)

Health and medical conditions caused by overweight and obesity have a significant economic impact as well, placing pressure on the health system. Costs include direct health costs such as hospitalisation, ambulatory services and medication, as well as direct non-healthcare costs such as transport to hospitals, supported accommodation and purchase of special food. In addition, there are the costs of government subsidies such as various pensions, and allowances for mobility, sickness and unemployment benefits, as well as indirect costs such as loss of productivity, early retirement, premature death and carer costs. Combined costs have been estimated at $56.6 billion per year.(13) A 2015 report by PwC projected a total of $87.7 billion in additional direct and indirect costs to Australia accumulated across the 10 years to 2025 if actions were not taken to curb the growth in obesity.(14)

1.1.4 Benefits of weight loss and obesity treatment approaches

Maintaining BMI within a healthy range is ideal in terms of reducing obesity-related risks. Studies have shown that even a modest weight reduction of 5–10% from current weight yields valuable health benefits—with marked improvements in cardiovascular risk factors,(15) glycaemic control(16) and all aspects of metabolic syndrome.(17) There may be benefits in other conditions as well, such as fertility, menstrual disorders, psychological changes, immunity, asthma and sleep apnoea.(18)

Obesity treatment approaches include behavioural weight management programs (BWMPs),(19) pharmacotherapy(20) and bariatric surgery.(21). In Australia, there are only a small number of existing, and often under-resourced, specialist obesity services, which are located only in a few major cities, with the vast majority of Australians with clinically severe obesity unable to access the specialised evidence-based treatments needed.(22)

Further, Australian clinical practice guidelines for the management of obesity recommend that only patients with BMI > 35 kg/m^2, or BMI > 30 kg/m^2 with comorbidities, be provided referral to specialist healthcare professionals and obesity management clinics to support lifestyle and intensive interventions, as well as manage comorbidities.(23) This leaves the majority of the population that struggles with excess weight to their own devices.

In a bid to find cost-effective weight management approaches that can also be scaled up at population levels, there is an increased research focus to assess feasibility of low-intensity BWMPs that can be delivered with minimal healthcare professional contact, such as self-directed weight loss interventions.

1.2 Behavioural Weight Management Programs and Self-Directed Weight Loss

1.2.1 Behavioural weight management programs

BWMPs are based on promoting an energy balance through healthy eating and physical activity, and are effective at least in the short term.(24) However, these programs vary widely in duration, intensity, settings and format of delivery. A large proportion of behaviour weight management intervention research consists of comparative studies and reviews to identify those interventions that are most effective, as well as cost-effective.(25-29)

1.2.2 Self-directed weight loss

The term 'intensity' in weight management programs refers to the level of contact delivered by healthcare professionals in such interventions. A recent area of focus is low-intensity BWMPs, termed 'self-directed weight loss programs' (30). They are described in a recent systematic review as 'those programs which require minimal or no professional contact and can be used with existing infrastructure in everyday lives',(30) for example, interventions that provide no more than one face-to-face contact, or online programs or apps that require users to enter their data in response to prompts. These programs target diet, exercise behaviours or both, and enable individuals to develop knowledge and skills required to facilitate weight loss. Studies indicate that self-directed programs have small but positive results, at least in the short term. Findings from select studies in self-directed weight loss are described below.

A 2016 systematic review found that self-directed weight loss interventions can generate modest weight loss (MD = −1.56 kg, CI = −2.25, −0.86, ranging from 0.6 to 5.3 kg) at 3.1 months' follow-up, compared with those in the minimal intervention or no-treatment groups, but may need to be supplemented by further interventions to achieve sustained and clinically meaningful weight loss.(30)

Examining data from the control arm of trials in obesity intervention studies can also provide insights on self-help or self-directed interventions as the control arms are usually 'no intervention' or 'minimal intervention' groups. In a review of 29 studies representing 5,963 subjects in the control arm, it was found that people weighed about 1 kg lighter on average at the first year of follow-up.(31) However, the authors highlight that there is insufficient evidence for the effectiveness of self-help programs among the socio-economically disadvantaged.

Higher uptake of some programs in higher socio-economic groups could be due to characteristics such as cultural capital and executive functioning.(32)

A systematic review of qualitative studies examined strategies people employ as part of self-directed weight loss attempts.(33) The study suggests that a wide range of cognitive and behavioural strategies are used, and these strategies change over time, with attitudes varying with individual circumstances. A 'one-size-fits-all' approach therefore cannot be applied to cognitive and behavioural strategies in self-directed weight loss attempts. The authors concluded that current interventions targeting individuals engaged in self-management of weight do not reflect real-life experiences of self-directed weight loss and call for 'high-quality primary studies with diverse samples.

The Australian Longitudinal Study on Women's Health (ALSWH), is a retrospective cohort study on 11,589 Australian women aged 47-52 years, report dietary modification was used more frequently than exercise in an effort to actively control their weight. (34) Most common strategies were decreasing quantity of food consumed, an cutting down on fats/sugars and exercise'. While a combination of factors prevented weight gain, the mean weight of cohort increased by more than a kilogram over 2 years (mean = +1.19, s.d. = 4.78). Findings from ALSWH (35) also report that social class had an effect on weight control measures. Compared with middle/upper-class women, the working-class women gained weight (1.27 (0.07) kg (95% CI: 1.12-1.42)), compared with middle/upper-class women at (1.01 (0.07) kg (95% CI: 0.88-1.15)), more likely to engage in harmful practices (8.9%) (Chi-squared test=30.65, p<0.0001), such as vomiting, smoking and fasting. They were also less likely to meet physical activity recommendations.

1.2.3 Behaviour changes taxonomies

BWMPs encompass a broad range of programs of different approaches, design and delivery modes. (36, 37) For example, they can be face-to-face programs delivered in individual or group settings; they can be telephone coaching, web-based, or text-based or mobile apps. Studies show different effect sizes, even with BWMPs that use a similar delivery approach. The need to explain differences in effect sizes of similar interventions has led to comparing behaviour change techniques applied. The need to distinguish and compare these techniques has led to the development of several behaviour change taxonomies.

In 2012, researchers at the University of Oxford conducted a meta-regression to examine how program characteristics affect mean weight loss, using the CALORE Taxonomy.(36) However, the study was not able to identify those program components and features that contributed to success.(37) Using a different approach, rather than identifying components in current interventions, the OxFAB taxonomy was developed to capture the behaviour strategies and techniques adopted by individuals in their personal weight control efforts as a starting point. (38) The table below (Table 1.2) is reproduced from the original table by Hartmann-Boyce et al. (39), and shows the twenty-three domains of self-management strategies for weight loss or weight maintenance, encompassing 117 strategies that have been defined.

Table 1.2: Domains of self-management strategies for weight loss/maintenance

Domain	Definition	Example
Energy compensation	Conscious adjustment of behaviors to alter energy intake and/or expenditure to control weight in light of previous energy intake or expenditure	If you've eaten a lot, exercise more to make up for it
Goal setting	Setting of specific behavioral or outcome targets)	Set a goal for how much weight you want to lose by a certain time point
Imitation (modeling)	Emulating the physical activity or dieting behavior of someone who you have observed	Choose to go on a certain diet because someone you know lost weight using the same approach
Impulse management: Acceptance	Respond to unwanted impulses through awareness and acceptance of the feeling that and reacting without distress or over-analysis	When you are being physically active and it becomes uncomfortable, accept that it is part of exercising and continue on with your activity
Impulse management: Awareness of motives	Respond to unwanted impulses by evaluating personal motives behind that impulse before acting	When you find yourself wanting to eat, ask yourself if you are hungry and only eat if you are
Impulse Management: Distraction	Respond to unwanted impulses through distraction in an attempt not to act on the impulse	When you feel like eating, distract yourself by doing something else to keep you from eating
Information seeking	Seek specific information to enhance knowledge to help manage weight	Look up the calorie content of something you are considering eating using an app or website
Motivation	Strategies to increase the desire to control weight	Put a picture of yourself when you were slimmer on your fridge
Planning content	Plan types of food physical activity in advance of performing behavior	Prepare a shopping list in advance of going grocery shopping
Scheduling of diet and activity	Plan timing and context/location of food physical activity in advance of performing behavior	Schedule doing your food shopping at a time when you are unlikely to be hungry
Regulation: Allowances	Unrestricted consumption of or access to prespecified foods or behaviors	Allow yourself to eat unlimited amounts of certain foods / drinks
Regulation: Restrictions	Avoid or restrict prespecified foods, behaviors, or settings	Never go to fast food restaurants
Regulation: Rule setting	Mandate responses to specific situations	Order a small dish when eating out

Domain	Definition	Example
Restraint	Conscious restriction over the amount that is eaten	Accept some periods you will stick to your diet more than you will at other times (flexible restraint) /never allow yourself to eat more than you had planned (rigid restraint)
Reward	Reinforcement of achievement of specific behavior or outcome through reward contingent on the meeting of that target	Allowing 'cheat' or treat meals after restricting for a certain amount of time
Self-monitoring	Record specific behaviors or outcomes on regular basis	Use a pedometer to measure the amount of physical activity you do
Stimulus control	Alter personal environment such that it is more supportive of target behaviors (adapted from CALO-RE)	Do not keep plates of food on table when eating
Support: Buddying	Perform target behaviors with another person	Exercise with a friend
Support: Motivational	Discussing, pledging, or revealing weight loss goals, plans, achievements, or challenges to others to bolster motivation	Discuss your weight loss goals with friends/family
Support: Professional	Seek help to manage weight from someone with specific expertise	Get support from a dedicated weight loss service or professional
Weight management aids	Use of and/or purchase of aids to achieve weight loss in any other manner (including, but not limited to reducing energy intake and increasing energy output)	Use meal replacements to control weight

Reprinted from: Hartmann-Boyce J, Aveyard P, Koshiaris C, Jebb SA. Development of tools to study personal weight control strategies: OxFAB taxonomy: OxFAB Taxonomy and Questionnaire. *Obesity*. 2016;24(2):314-20.

1.2.4 Factors that influence successful weight management

Failure to maintain long-term weight loss for at least one year and subsequent weight regain, even among those who are successful at initial weight loss, has generated the need to identify characteristics and factors that predict weight outcomes. From an intervention research perspective, weight management has been described as ‘a dynamic process, with a pre-treatment phase, a treatment (including process) phase and post-treatment maintenance, where relapse is possible during both the treatment and maintenance’.(40) Numerous studies have examined a plethora of biological, psychosocial and environmental variables that influence weight trajectories. The complexity of the relationship among these factors, as well as the heterogeneity in populations and intervention approaches, presents challenges in dissecting predictors and correlates in obesity research.(40)

Creating a negative energy balance is the cornerstone for weight loss. (41) While lower energy intake facilitates weight loss, issues related to reduced energy intake, such as hunger, fatigue, loss of motivation, sustainability, additional planning and finances, create challenges.

An early conceptual review in 2005 described a range of factors that were associated with weight loss maintenance and weight regain. (42) According to the review, successful weight maintenance is associated with more initial weight loss, reaching a self-determined goal weight, having a physically active lifestyle, a regular meal rhythm including breakfast and healthier eating, control of overeating, and self-monitoring of behaviours. Weight maintenance was further associated with an internal motivation to lose weight, social support, better coping strategies and ability to handle life stress, self-efficacy, autonomy, assuming responsibility in life, and overall, more psychological strength and stability. Factors that created a risk for weight regain included a history of weight cycling, disinhibited eating, binge eating, more hunger, eating in response to negative emotions and stress, and more passive reactions to problems.

A 2012 paper describes an analysis of 2228 participants in the National Weight Control Registry (NWCR) to identify clusters with unique and distinct experiences, strategies and attitudes with respect to weight loss and weight loss maintenance. (43) The analysis considered weight and health history, weight control behaviours and strategies, effort and satisfaction with maintaining weight, and psychological and demographic characteristics. Four distinct clusters were identified and described. Half the participants were the weight-stable and healthy group, followed by those that had continuously struggled with weight since childhood, with higher levels of stress and depression. The third cluster were successful at weight loss on the first attempt and reported the least difficulty maintaining weight. The smallest cluster represented older participants with more health problems.

A 2012 cross-sectional study comparing participant characteristics, weight loss and weight loss maintenance strategies adopted by a cohort of the Portuguese Weight Control Registry (PWCR) with the NWCR's most common strategies adopted for weight loss identified modifying diet and physical activity—such as eating breakfast, choosing better foods, limiting fat intake, limiting quantity, and weighing in each week.(44)

A 2015 qualitative study undertaken by the Boden Collaboration interviewed adults who had lost at least 5% of their body weight to identify factors that made them successful.(45)The study found previously known behaviours such as diet and physical activity modification; self-monitoring; and tracking diet, physical activity and weight. In addition, two more themes were identified: an ability to learn from and build positively on past weight loss efforts, and embedding dietary and physical activity as a regular part of their lifestyle.

The 2016 systematic review and meta-analysis on personal weight control attempts identified correlates and personal strategies used, as well as underlying motives. (46) Doing or increasing physical activity was the most common behaviour that was assessed in the studies in the review to lose weight, as well as maintain weight, followed by dieting. Diet factors included both diet restraint and avoiding certain foods, as well as choosing specific dietary behaviours, followed by using weight management aids. Most commonly assessed motives for weight loss were ‘to improve appearance’ and ‘to improve health and prevent future diseases’, although the most commonly cited motivation for weight loss was to improve wellbeing, followed by ‘keeping fit’ and ‘improving self-esteem’.

In 2017, in a systematic review of qualitative studies found the common strategies employed by people as part of self-directed weight loss attempts were restriction, self-monitoring, scheduling, seeking professional support and using weight management aids. (47) Two additional factors found were ‘reframing’ (as an example, reframing the concept of ‘diet’ as ‘lifestyle’, or ‘food’ as ‘fuel’) and ‘self-experimentation’.

In 2018, after a systematic review of determinants of weight loss maintenance, 124 determinants were identified by the authors, of which five were demographic or personal determinants, 59 were behavioural determinants, 51 were psychological/cognitive determinants, and nine were social and physical environmental determinants. (48) The study found that demographic determinants were not predictive of weight loss maintenance. However, behavioural and cognitive determinants that promoted a reduction in energy intake, or an increase in energy expenditure and monitoring of that balance, were predictive determinants.

Personality traits seem to influence the development and persistence of obesity. High conscientiousness—reflecting high self-control, orderliness and adherence to social norms—was related to lower obesity risk across studies (pooled odds ratio [OR] = 0.84; 95% confidence interval [CI] = 0.80, 0.88 per 1 standard deviation increment in conscientiousness). (49) On follow-up at 5.5 years, conscientiousness predicted lower obesity risk in individuals who did not initially have obesity (OR = 0.88, 95% CI = 0.85, 0.92; n = 33,981). Among those who initially had obesity, conscientiousness predicted a greater likelihood of return to lower weight ranges (OR = 1.08, 95% CI = 1.01, 1.14; n = 9,657). Other personality traits were not related to obesity in the pooled analysis.

Data collected in obesity clinics can inform what factors are currently used in practice for the successful treatment of obesity. No existing recommendations were found for what data items are collected by obesity professionals. The Bariatric Surgery Registry, however, collects data to measure the outcomes of surgery.(50) The National Health and Medical Research Council (NHMRC) clinical practice guidelines(23) make recommendations that focus on clinical and physical aspects of care. Besides, using BMI and waist circumference to assess obesity; factors that increase predisposition to overweight and obesity (genetic factors, family history and life stage); factors relevant to the assessment of health risk (diet and physical activity, and factors that may influence these behaviours); comorbidities influenced by excess weight; other factors such as certain medications and stopping smoking; weight history; and the readiness to change are discussed, with a recommendation for health professionals to support individual self-management.

1.2.5 Self-managed weight loss

In recent times, in another area of public health concern—tobacco consumption—questions have been raised on the research neglect of *unassisted smoking cessation*.(51, 52) The importance of studying unassisted smoking cessation and the gaps it may address in comprehensive tobacco control strategies have been highlighted. For example, a greater understanding of successful unassisted smoking cessation can help illuminate potential lessons for policy and public health communication about cessation.(52) Applying the same to the obesity crisis—the population group that achieves success at weight loss unassisted—is an important study group. What makes people decide how to manage their weight—either on their own or by seeking professional assistance? Their experiences can offer valuable insights for obesity management policy and mass communication.

While the challenges presented by an obesogenic environment(53) make it conducive to weight gain, people are more aware about the health risks of obesity (54), and therefore, not surprisingly, a large proportion of people continually attempt to manage their weight. A systematic review investigating personal weight control worldwide found 40% of the general adult population were attempting to lose weight, and 23% were attempting to maintain weight.(55) Australian market analysis reports also confirm that those attempting to lose weight are increasing, with the commercial weight loss sector an estimated 6.6 billion dollar industry, and growing.(56)

With the limited availability of health services, or paid commercial options, it is very likely that many who attempt weight loss may try to do so on their own without accessing healthcare services or other professional weight management services. This is observed in the NWCR, which tracks over 10,000 participants in the United States who have lost and maintained their weight loss for a year or longer. Almost half (45%) of the registry participants have lost the weight on their own without any assistance.(57) Similarly, an Australian cross-sectional study in a general practitioner (GP) setting indicated that most who attempted weight loss did so unassisted, with very low rates of consultation with GPs and weight loss specialists.(58)

1.3 Online Research: Recruitment and Surveys

Researching self-managed weight loss presents some unique challenges with respect to reaching and recruiting the population of interest, as well as data collection. Traditional methods of participant recruitment reported in health research include advertising in newspapers, newsletters, posters and flyers, and information stands in individual study relevant settings.(59) In the case of obesity research, another traditional mode is by involving Medicare Locals and general practice clinics, and incentivising the practice or the GPs in identifying participants that meet eligibility criteria and enrolling them to the study.(60) Traditional recruitment processes for obesity research involve methods such as posters at locations such as gyms targeting a clientele, or through utilising the help of GPs or obesity clinics to identify participants of interest through their patient networks. Our major population of interest, however, involves those in the general population that 'self-manage' or attempt weight loss on their own, and self-determine their approach and strategies to lose weight, where contact with professionals is absent or negligible.

Recruitment of large population cohorts can be achieved by using national databases such as Medicare as a sampling frame; however, they require significant investment, and targeting only those that self-manage is difficult.(61, 62). However, with the pervasive reach of electronic media, recruitment of hard-to-reach populations through online recruitment, especially Facebook, is increasingly researched.(63)

Closely following the challenges in recruitment, is the question of data collection from recruited participants. With the advancement of technology, a large number of web-based survey software are now available. Combining online recruitment with online data collection methods presents promising possibilities for our study.

1.3.1 Online platforms for research recruitment

The reach and variety of social media platforms increase their usefulness in various aspects of health research, such as data collection and content analysis of interventions, as well as recruitment. Facebook, Twitter and Instagram are three popular platforms that can be used for recruitment(64). Facebook has consistently been the most popular social media platform in the last 3 years, with 16 million users in 2020 compared with 9 million users for Instagram and 5.3 million users for Twitter.(65) Further advantages of Facebook include (a) mechanisms to target relevant audiences through paid promotions, as well as special interest groups in the case of free promotions, unlike Twitter, where users who do not fit recruitment criteria will see the message(64), and (b) high volume of users spanning all adult age ranges, unlike Instagram, which is mainly accessed by teenagers.(65)

The feasibility and effectiveness of using Facebook for research recruitment is reported in several papers.(63, 66-69) The studies report mixed results, ranging from not successful (61) to very successful(68); however, the modalities of using Facebook widely differ. Two main formats include free recruitment posts, such as wall shares, Facebook pages and groups, and paid advertising, which allows targeting the advertisements to match broad inclusion criteria such as gender, age, city and interests.

In the area of social sciences, researchers report their success with the myPersonality project(70) using a simple snowballing technique that originated with 150 of the authors' Facebook friends and went viral and attracted over 6 million participants in 4 years.(68) The project subjects undertake a survey and are given immediate feedback on their personality. However, as the authors point out, only the most engaging studies, such as games and other novelty, can achieve virality, and these kinds of applications now compete with well-funded commercial applications.

An Australian study demonstrates that Facebook advertising can be used to recruit groups that have been difficult to reach via traditional recruitment methods through targeted social media advertising. (69) They were able to engage young females, who are usually underrepresented in health research, from both rural and urban regions, including those unlikely to travel. They also found that participants who were overweight were less likely to travel to the study site than those with normal BMI (although participants with obesity were as likely as normal weight participants to travel to the study site), making online recruitment and survey a more suitable mode of reaching these participants.

However, an American study reports poor results from their attempt to recruit women aged 35–49 years to their study. Only nine women out of the 374,225 women reached through Facebook impressions proceeded past the introductory page of their survey website. They also raise the question of optimal incentives for contemporary internet users, highlighting value for prizes range from a chance to win a $50 raffle to up to $400.(63) The myPersonality project, however, offered individual results to each participant who undertook the survey.(68)

In an analysis of the recruitment of young adults to a healthy lifestyle mHealth program for the prevention of weight gain,(60) GP letters were compared with a variety of paid and free electronic media and print media. Free electronic media (Facebook page, Gumtree, university e-newsletter, university web home page, news story and listings on university research volunteer pages) was the most cost-effective strategy. Targeted paid Facebook advertisements had the maximum reach, but attracted few enquiries, making it the most expensive strategy, with similar results for Google advertising.

Research driven by Twitter data analysis is steadily on the rise, with few studies utilising the platform for recruitment.(71) While scholarly literature is still sparse, a blog post by a research fellow at RMIT University explains the ease with which the author recruited over 400 academics to complete a survey, and discusses targeting people of interest. (72) However, the author warns of the inherent Twitter bias where the sample would be limited to Twitter users, speaking the same language, and possessing a certain level of technology competence or internet access. However, depending on the nature of the research, Twitter can be a powerful tool combined with other forms of recruitment.

The use of data mining algorithms and machine learning is seen in an innovative Twitter recruitment system for a smoking cessation study.(73) The authors describe a digital campaign solution that is both large scale, and inexpensive, and can reach out to individuals in their time of need, even as they express that need. For example, a tweet that solicits help directly or indirectly will receive an automated reply tweet from a Twitter profile that can promote recruitment.(73)

1.3.2 Online surveys for data collection

Online surveys, also called web-based surveys or e-surveys, are surveys created and delivered using the internet. The use of popular survey platforms such as Qualtrics(23) and Survey Monkey(74) is increasingly seen in health and social research. Key advantages that make them appealing to researchers is the ability to rapidly design, build and conduct administrator surveys. In addition, the turnaround for data collection is quick with low cost and there are fewer human errors associated with manual data entry from telephone or emailed questionnaires. Key concerns with online surveys include potential demographic biases and differences in digital abilities and internet access.(75)

While what is known of effective paper-based survey design can be translated to web-based surveys, there are some items distinctive to electronic surveys that need to be considered in the design, development and deployment of surveys.(76) These include (a) survey design, (b) participant privacy and confidentiality, (c) sampling and participant solicitation, and (d) distribution methods and response rates. The authors provide a list of evaluation criteria and considerations on each of these items and argue that web-based surveys are better than surveys sent through email.(76)

A number of methodological, technological and ethical issues with internet-based surveys have been highlighted, along with guidelines and scenarios that may be suitable for web-based surveys.(77) Internet-based surveys are suitable where participants cover a large geographical area, respondents are known and match non-respondents and non-internet users on key variables, intent is to document phenomena or simple occurrence is of interest, investigators are competent in web skills, and the survey has been piloted with representative participants.(77)

Design of the research questionnaires needs to be well thought out. (78) In web surveys, unlike telephonic surveys for example, the respondents perceive information visually, and therefore the visual design layout of the survey is particularly important. Further, graphics, size of text, location of instructions, overall layout of the screen and other visual design, and communication and accessibility principles are especially important in helping respondents self-administer the survey as there is no interviewer to guide them.(78)

Poor response rate to research is a challenge faced by health researchers, and there is a trend for decreasing response rates, extending to all survey models.(79) While there is no agreed standard for an acceptable minimal response rate to a survey, rates of 70% higher are considered good among GP surveys. (80) However, published response rates with medical practitioners are often lower than 30%.

Research with small sample sizes limits the conclusions drawn from the data. Several tactics are employed by researchers, such as shortened questionnaires and appealing in some manner to altruistic (contributing to health research) and egotistic (enjoying surveys, learning something new, benefit) motivations. Design of incentive systems is complex, and while it can be crucial to effectiveness, the practicalities will differ according to context.(81) Monetary research incentives are commonly used by researchers to influence response rates. Lotteries, conditional on completion, are popular and favoured because the total amount spent on the number of prizes can be limited, and the costs of distributing them are less, even if the number of respondents to a survey are very large.(82) However, while incentives increase the likelihood of response in web surveys, there is no evidence that lottery prizes are more effective in web surveys than other modes of surveys.(82)

1.4 Issues Around Studying Self-Managed Weight Loss

Obesity remains a major issue in Australia, with the need to offer effective weight management options to those with an existing weight problem. Low-intensity BWMPs are increasingly attractive, given the number of people with weight issues. While prior research has focused on self-directed interventions,(30, 83) with instruments developed to better understand intervention components,(39) people who self-manage their weight loss in the community are not well understood. Who are they? Are they successful? What motivates and what differentiates them? Researching self-managed weight losers can potentially provide insights for obesity policies and planned obesity management strategies. Engaging participants in the community who attempt weight management on their own into research poses a number of methodological challenges that will need to be addressed.

This thesis examines some of these issues with the following research questions:

1. What are the characteristics of people who self-manage their own weight loss?
2. How successful are they at weight loss?
3. What factors predict changes in weight, diet and physical activity among self-managed weight losers?

For consideration of the challenges of researching self-managed weight loss, the following additional research questions were included:

1. What data are important to collect about self-managed weight loss?
2. Is Facebook a feasible mechanism to reach and recruit those attempting self-managed weight loss in the population?
3. Among those who self-manage, what characteristics differentiate those who are completely unassisted and those who may still utilise some form of professional help?

1.5 References

1. WHO | Obesity [Internet]. Who.int. 2020 [cited 10 April 2020]. Available from: https://www.who.int/topics/obesity/en/.
2. Australian Institute of Health and Welfare 2017. A picture of overweight and obesity in Australia 2017. Cat. no.PHE 216. Canberra: AIHW.
3. Risk factors to health, Causes of overweight and obesity - Australian Institute of Health and Welfare [Internet]. Australian Institute of Health and Welfare. 2020 [cited 10 April 2020]. Available from: https://www.aihw.gov.au/reports/biomedical-risk-factors/risk-factors-to-health/contents/overweight-and-obesity/causes-of-overweight-and-obesity.
4. Swinburn B, Egger G & Raza F 1999. Dissecting obesogenic environments: the development and
application of a framework for identifying and prioritizing environmental interventions for obesity.
Prev Med 29:563–70.
5. World Health Organization (WHO) 2000. Obesity: preventing and managing the global epidemic. Report of a WHO consultation. WHO technical report series 894. Geneva: WHO.
6. Overweight and obesity: an interactive insight, What is overweight and obesity - Australian Institute of Health and Welfare [Internet]. Australian Institute of Health and Welfare. 2020 [cited 10 April 2020]. Available from: https://www.aihw.gov.au/reports/overweight-obesity/overweight-and-obesity-an-interactive-insight/contents/what-is-overweight-and-obesity.
7. National Health Survey: First Results, 2017-18 [Internet]. Abs.gov.au. 2020 [cited 10 April 2020]. Available from: https://www.abs.gov.au/statistics/health/health-conditions-and-risks/national-health-survey-first-results/latest-release
8. National Health Survey: First Results, 2014-15 Canberra Australian Bureau of Statistics [updated 8th December 2015]. Available from: http://www.abs.gov.au/ausstats/abs@.nsf/mf/4364.0.55.001.
9. Technical Paper Socio-Economic Indexes
for Areas (SEIFA) 2033.0.55.001 In: Statistics ABo, editor. Canberra: Australian Bureau of Statistics 2016.
10. Luppino FS, de Wit LM, Bouvy PF, Stijnen T, Cuijpers P, Penninx BWJH, et al. Overweight, Obesity, and Depression: A Systematic Review and Meta-analysis of Longitudinal Studies. Arch Gen Psychiatry. 2010;67(3):220-9.

11. Simon GE, Von Korff M, Saunders K, Miglioretti DL, Crane PK, van Belle G, et al. Association between obesity and psychiatric disorders in the US adult population. Arch Gen Psychiatry. 2006;63(7):824-30.
12. University of North Carolina: Obesity Linked With Higher Risk for COVID-19 Complications. Washington, D.C.: Targeted News Service; 2020.
13. Colagiuri S, Lee CMY, Colagiuri R, Magliano D, Shaw JE, Zimmet PZ, et al. The cost of overweight and obesity in Australia. Med J Aust. 2010;192(5):260.
14. Weighing the cost of obesity: A case for action. PwC Australia; 2015.
15. Wing RR, Lang W, Wadden TA, Safford M, Knowler WC, Bertoni AG, et al. Benefits of modest weight loss in improving cardiovascular risk factors in overweight and obese individuals with type 2 diabetes. Diabetes Care. 2011;34(7):1481-6.
16. Goldstein DJ. Beneficial health effects of modest weight loss. Int J Obes Relat Metab Disord 1992;16(6):397.
17. Case CC, Jones PH, Nelson K, O'Brian Smith E, Ballantyne CM. Impact of weight loss on the metabolic syndrome. Diabetes Obes Metab.2002;4(6):407-14.
18. Liebermeister H. Effects of weight-reduction on obesity-associated diseases. Ger Med Sci. 2003;1:Doc04.
19. Barte JCM, Ter Bogt NCW, Bogers RP, Teixeira PJ, Blissmer B, Mori TA, et al. Maintenance of weight loss after lifestyle interventions for overweight and obesity, a systematic review. Obes Rev. 2010;11(12):899-906.
20. Franz MJMSRD, VanWormer JJMS, Crain ALP, Boucher JLMSRD, Histon TP, Caplan WMD, et al. Weight-Loss Outcomes: A Systematic Review and Meta-Analysis of Weight-Loss Clinical Trials with a Minimum 1-Year Follow-Up. J Am Diet Assoc. 2007;107(10):1755-67.
21. Gloy VL, Briel M, Bhatt DL, Kashyap SR, Schauer PR, Mingrone G, et al. Bariatric surgery versus non-surgical treatment for obesity: a systematic review and meta-analysis of randomised controlled trials. BMJ. 2013;347.
22. Atlantis E, Kormas N, Samaras K, Fahey P, Sumithran P, Glastras S, et al. Clinical Obesity Services in Public Hospitals in Australia: a position statement based on expert consensus: Expert consensus on clinical obesity services. Clin Obes. 2018;8(3):203-10.
23. Clinical Practice Guidelines for the Management of Overweight and Obesity in Adults, Adolescents and Children in Australia (2013) | National Health and Medical Research Council [Internet]. Nhmrc.gov.au. 2018 [cited 28 June 2018]. Available from: https://www.nhmrc.gov.au/guidelines-publications/n57.
24. Dombrowski SU, Avenell A, Sniehott FF. Behavioural interventions for obese adults with additional risk factors for morbidity: systematic review of effects on behaviour, weight and disease risk factors. Obes Facts. 2010;3(6):377-96.
25. Booth HP, Prevost TA, Wright AJ, Gulliford MC. Effectiveness of behavioural weight loss interventions delivered in a primary care setting: a systematic review and meta-analysis. Fam Pract. 2014;31(6):643-53.
26. Gilmartin J, Murphy M. The effects of contemporary behavioural weight loss maintenance interventions for long term weight loss: a systematic review. J Res Nurs. 2015;20(6):481-96.
27. Sherrington A, Newham JJ, Bell R, Adamson A, McColl E, Araujo-Soares V. Systematic review and meta-analysis of internet-delivered interventions providing personalized feedback for weight loss in overweight and obese adults. Obes Rev. 2016;17(6):541-51.

28. Wilson KJ, Brown HS, Bastida E. Cost-Effectiveness of a Community-Based Weight Control Intervention Targeting a Low-Socioeconomic-Status Mexican-Origin Population. Health Promot Pract. 2015;16(1):101-8.
29. Zomer E, Leach R, Trimmer C, Lobstein T, Morris S, James WP, et al. Effectiveness and cost-effectiveness of interventions that cause weight loss and reduce the risk of cardiovascular disease. Diabetes Obes Metab. 2017;19(1):118-24.
30. Tang JCH, Abraham C, Greaves CJ, Nikolaou V. Self-directed interventions to promote weight loss: a systematic review and meta-analysis. Health Psychol Rev. 2016;10(3):358-72.
31. Johns DJ, Hartmann-Boyce J, Jebb SA, Aveyard P, on behalf of the Behavioural Weight Management Review G. Weight change among people randomized to minimal intervention control groups in weight loss trials: Weight Loss in Minimal Intervention Control Groups. Obesity (Silver Spring). 2016;24(4):772-80.
32. Hartmann-Boyce J, Jebb SA, Fletcher BR, Aveyard P. Self-help for weight loss in overweight and obese adults: systematic review and meta-analysis. Am J Public Health. 2015;105(3):e43-e57.
33. Hartmann-Boyce J, Boylan AM, Jebb SA, Fletcher B, Aveyard P. Cognitive and behavioural strategies for self-directed weight loss: systematic review of qualitative studies. Obes Rev. 2017;18(3):335-49.
34. Williams L, Germov J, Young A. Preventing weight gain: A population cohort study of the nature and effectiveness of mid-age women's weight control practices. Int J of Obesity, 2007; 31: 978-986.
35. Williams L, Germov J and Young A. The effect of social class on mid-age women's weight control practices and weight gain. Appetite 2011; 56; 3: 719-725.
36. Michie S, Richardson M, Johnston M, Abraham C, Francis J, Hardeman W, et al. The Behavior Change Technique Taxonomy (v1) of 93 Hierarchically Clustered Techniques: Building an International Consensus for the Reporting of Behavior Change Interventions. Ann Behav Med. 2013;46(1):81-95.
37. Michie S, Ashford S, Sniehotta FF, Dombrowski SU, Bishop A, French DP. A refined taxonomy of behaviour change techniques to help people change their physical activity and healthy eating behaviours: The CALO-RE taxonomy. Psychol Health. 2011;26(11):1479-98.
38. Hartmann-Boyce J, Johns DJ, Jebb SA, Aveyard P, Behavioural Weight Management Review G. Effect of behavioural techniques and delivery mode on effectiveness of weight management: systematic review, meta-analysis and meta-regression. Obes Rev. 2014;15(7):598-609.
39. Hartmann-Boyce J, Aveyard P, Koshiaris C, Jebb SA. Development of tools to study personal weight control strategies: OxFAB taxonomy: OxFAB Taxonomy and Questionnaire. Obesity (Silver Spring). 2016;24(2):314-20.
40. Stubbs J, Whybrow S, Teixeira P, Blundell J, Lawton C, Westenhoefer J, et al. Problems in identifying predictors and correlates of weight loss and maintenance: implications for weight control therapies based on behaviour change. Obes Rev. 2011;12(9):688.
41. Ramage S, Farmer A, Apps Eccles K, McCargar L. Healthy strategies for successful weight loss and weight maintenance: a systematic review. Appl Physiol Nutr Metab. 2013;39(1):1-20.
42. Elfhag K, Rössner S. Who succeeds in maintaining weight loss? A conceptual review of factors associated with weight loss maintenance and weight regain. Obes Rev. 2005 Feb;6(1):67-85

43. Ogden LG, Stroebele N, Wyatt HR, Catenacci VA, Peters JC, Stuht J, et al. Cluster analysis of the national weight control registry to identify distinct subgroups maintaining successful weight loss. Obesity (Silver Springs). 2012;20(10):2039-47.
44. Vieira PN, Silva MN, Coutinho SR, Santos TC, Santos I, Sardinha LB, et al. Successful weight loss maintenance in Portugal and in the USA: Comparing results from two National Registries. Revista Portuguesa de Saude Publica. 2012;30(2):115-24.
45. Rafiei Z. Factors contributing to the success of self-directed weight loss [Thesis]. Sydney, NSW: University of Sydney; 2016.
46. Santos I, Sniehotta FF, Marques MM, Carraça EV, Teixeira PJ. Prevalence of personal weight control attempts in adults: a systematic review and meta-analysis. Obes Rev . 2017;18(1):32-50.
47. Hartmann-Boyce J, Boylan AM, Jebb SA, Fletcher B, Aveyard P. Cognitive and behavioural strategies for self-directed weight loss: systematic review of qualitative studies. Obes Rev. 2017;18(3):335-49.
48. Varkevisser RDM, van Stralen MM, Kroeze W, Ket JCF, Steenhuis IHM. Determinants of weight loss maintenance: a systematic review. Obes Rev. 2018;20(2).
49. Hintsanen M, Jokela M, Cloninger CR, Pulkki-Råback L, Hintsa T, Elovainio M, et al. Temperament and character predict body-mass index: A population-based prospective cohort study. J Psychosom Res. 2012;73(5):391-7.
50. Bariatric Surgery Registry [Internet]. Public Health and Preventive Medicine. 2018 [cited 27 September 2018]. Available from: https://www.monash.edu/medicine/sphpm/registries/bariatric.
51. Chapman S, MacKenzie R. The global research neglect of unassisted smoking cessation: causes and consequences. PLoS Med. 2010;7(2):e1000216.
52. Smith AL, Chapman S, Dunlop SM. What do we know about unassisted smoking cessation in Australia? A systematic review. Tob Control. 2015 Jan;24(1):18-27
53. Swinburn BA. Obesity prevention: the role of policies, laws and regulations. Aust New Zealand Health Policy. 2008;5(12):12-.
54. Kite J, Grunseit A, Bohn-Goldbaum E, Bellew B, Carroll T, Bauman A. A Systematic Search and Review of Adult-Targeted Overweight and Obesity Prevention Mass Media Campaigns and Their Evaluation: 2000-2017. J Health Commun. 2018;23(2):207-32.
55. Santos I, Sniehotta FF, Marques MM, Carraça EV, Teixeira PJ. Prevalence of personal weight control attempts in adults: a systematic review and meta-analysis: Weight control attempts in adults. Obes Rev. 2017;18(1):32-50.
56. Hull RD, Pineo GF, Brant RF, Mah AF, Burke N, Dear R, et al. Self-Managed Long-Term Low-Molecular-Weight Heparin Therapy: The Balance of Benefits and Harms. Am J Med. 2007;120(1):72-82.e3.
57. Klem ML, Wing RR, McGuire MT, Seagle HM, Hill JO. A descriptive study of individuals successful at long-term maintenance of substantial weight loss. Am J Clin Nutr . 1997;66(2):239.
58. Yoong SL, Carey ML, Sanson-Fisher RW, D'Este C. A cross-sectional study assessing the self-reported weight loss strategies used by adult Australian general practice patients. BMC Fam Pract. 2012;13(1):48-.
59. Partridge SR, Juan SJH, McGeechan K, Bauman A, Allman-Farinelli M. Poor quality of external validity reporting limits generalizability of overweight and/or obesity lifestyle prevention interventions in young adults: a systematic review. Obes Rev. 2015;16(1):13-31.

60. Partridge SR, Balestracci K, Wong AT, Hebden L, McGeechan K, Denney-Wilson E, et al. Effective Strategies to Recruit Young Adults Into the TXT2BFiT mHealth Randomized Controlled Trial for Weight Gain Prevention. JMIR Res Protoc. 2015;4(2):e66.
61. Brown WJ, Bryson L, Byles JE, Dobson AJ, Lee C, Mishra G, et al. Women's Health Australia: Recruitment for a National Longitudinal Cohort Study. Women Health. 1998;28(1):23-40.
62. Rosenkranz RR, Duncan MJ, Rosenkranz SK, Kolt GS. Active lifestyles related to excellent self-rated health and quality of life: cross sectional findings from 194,545 participants in The 45 and Up Study. BMC Public Health. 2013;13(1):1071.
63. Kapp JM, Peters C, Oliver DP. Research Recruitment Using Facebook Advertising: Big Potential, Big Challenges. J Cancer Educ. 2013;28(1):134-7.
64. Arigo D, Pagoto S, Carter-Harris L, Lillie SE, Nebeker C. Using social media for health research: Methodological and ethical considerations for recruitment and intervention delivery. Digital health. 2018;4.
65. Australia's most popular social media sites 2020: Civic Web Media; 2020 [Available from: https://www.civicwebmedia.com.au/australias-most-popular-social-media-sites-2020/.
66. Gilligan C, Kypri K, Bourke J. Social networking versus Facebook advertising to recruit survey respondents: a quasi-experimental study. JMIR Res Protoc 2014;3(3):e48.
67. Thornton LK, Harris K, Baker AL, Johnson M, Kay-Lambkin FJ. Recruiting for addiction research via Facebook. Drug and Alcohol Rev. 2016;35(4):494-502.
68. Kosinski M, Matz SC, Gosling SD, Popov V, Stillwell D. Facebook as a research tool for the social sciences: Opportunities, challenges, ethical considerations, and practical guidelines. Am Psychol. 2015;70(6):543-56.
69. Fenner Y, Garland SM, Moore EE, Jayasinghe Y, Fletcher A, Tabrizi SN, et al. Web-based recruiting for health research using a social networking site: an exploratory study. J Med Internet Res 2012;14(1):e20.
70. Michal Kosinski DS. myPersonality Project [cited 2017 15th August]. Available from: http://mypersonality.org/wiki/doku.php.
71. Sinnenberg L, Buttenheim AM, Padrez K, Mancheno C, Ungar L, Merchant RM. Twitter as a tool for health research: a systematic review.(Author abstract). Am J Public Health. 2017;107(1):143.
72. Glover A. Recruiting research participants using Twitter [cited 2017 15th August]. Available from: https://theresearchwhisperer.wordpress.com/2016/11/15/recruiting-participants-using-twitter/.
73. Hamed AA, Wu X, Rubin A. A twitter recruitment intelligent system: association rule mining for smoking cessation. Social Network Analysis and Mining. 2014;4(1):1-19.
74. SurveyMonkey 2020 [cited 2020 14/12/2020]. Available from: https://www.surveymonkey.com/.
75. Maymone MBC, Venkatesh S, Secemsky E, Reddy K, Vashi NA. Research Techniques Made Simple: Web-Based Survey Research in Dermatology: Conduct and Applications. J Invest Dermatol. 2018;138(7):1456-62.
76. Andrews D, Nonnecke, B., Preece, J. Conducting Research on the Internet: Online Survey Design, Development and Implementation Guidelines2003. 185-210 p.
77. Eysenbach G, Wyatt J. Using the Internet for surveys and health research. J Med Internet Res. 2002;4(2):E13-E.

78. Dillman DA. Internet, phone, mail, and mixed-mode surveys : the tailored design method. Fourth edition. ed. Smyth JD, Christian LM, editors. Hoboken, New Jersey: Wiley; 2014.
79. Beyler A. Declining Response Rates in Federal Surveys: Trends and Implications (Background Paper). Mathematica Policy Research; 2013.
80.
81. Parkinson B, Meacock R, Sutton M, Fichera E, Mills N, Shorter GW, et al. Designing and using incentives to support recruitment and retention in clinical trials: a scoping review and a checklist for design. Trials. 2019;20(1):624-.
82. Singer E, Ye C. The Use and Effects of Incentives in Surveys. The ANNALS of the American Academy of Political and Social Science. 2013;645(1):112-41.
83. Tang J, Abraham C, Greaves C, Yates T. Self-directed interventions to promote weight loss: A systematic review of reviews. J Med Internet Res. 2014;16(2).

Chapter 2: Thesis Outline and Methods

This chapter provides an outline of the thesis, with chapter summaries and overall methods. As self-managed weight losers in the general population have not been extensively researched, methodological decisions about how to reach and recruit them, how best to collect data from them, what data are important to collect, and methods used were important to the execution of the research.

As this thesis was exploratory in nature, it was not initially approached from a particular research paradigm. The study design, methods and techniques selected were those that were assessed as most appropriate and feasible to answer each of the questions. The pilot and longitudinal studies are situated in positivist paradigm as they sought to identify associations through quantitative approaches.

While detailed descriptions of the methods used in the individual studies are provided within the relevant chapters, the overall approach to the thesis and rationale for study design decisions are discussed in this chapter, along with relevant literature.

2.1 Research Objectives

High levels of obesity in Australia have significant impacts at individual and population levels, and raise capacity issues for the healthcare service systems. Even as research on self-directed weight loss is focused on finding effective low-intensity interventions that can be scaled up to population levels, there are many individuals who self-manage or 'DIY', and lose weight on their own without accessing the services of health and medical professionals or other professional weight management services. At present, we have very little understanding of what the characteristics are of those who self-manage their weight, how successful they are, and what strategies they use to achieve weight loss, as well as what differentiates them. Self-managed weight losers as a population group have not been researched in-depth before. They have little or no direct contact with weight management clinics or health research groups.

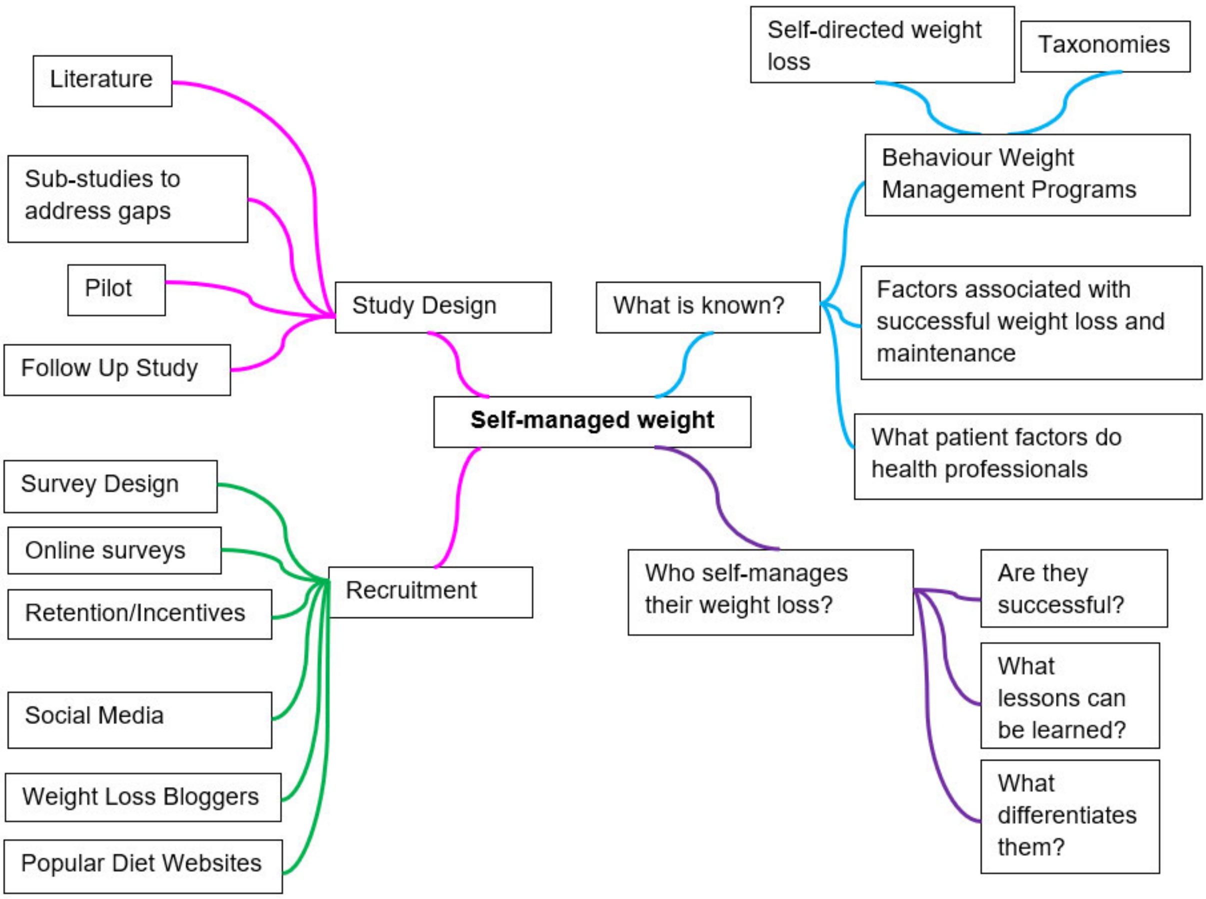


Figure 2.1: Researching self-managed weight loss: A mind map

A number of ideas and concepts shaped the design of this thesis. A mind map or a visual representation of these lines of enquiry is shown in Figure 2.1. The right side of the mind map is concerned with the body of knowledge around self-managed weight loss, with the two main branches dealing with (a) what is already known about the issue, and (b) what is unknown and needs to be researched. The left side of the mind map is concerned with methodology to research self-managed weight loss. One branch lays out the approach to study design, and the other branch is dedicated to the issue of recruitment as this was a key challenge that needed to be addressed for this research. Within recruitment, a key enquiry was where we might find self-managed weight losers; the second was the best way of collecting data. The mind map helped evolve the following key research questions for the thesis:

1. What are the characteristics of people who self-manage their own weight loss?
2. How successful are they at weight loss?
3. What factors predict change in weight, diet and physical activity among self-managed weight losers?

Additionally, the thesis included the questions that informed the methods, as follows:

1. What data are important to collect about self-managed weight loss?
2. Is Facebook a feasible mechanism to reach and recruit those attempting self-managed weight loss in the population?
3. Among those who self-manage, what characteristics differentiate those who are completely unassisted and those who may still utilise some form of professional help?

2.2 Thesis Outline and Chapter Summaries

The thesis is composed of chapters based on a series of published papers, submitted manuscripts and unpublished work undertaken as part of the PhD program. For consistency and ease of reading, each of the chapters dealing with research issues has been written and presented in a format that follows the structure of a scientific publication. A brief abstract of each chapter is presented below. The thesis is structured into five sections. **Section 1** consists of Chapters 1 and 2, which provide an introduction and overall methodology, and Chapter 3, a preliminary study that informed data collection in the thesis. **Section 2** consists of Chapters 4 and 5, which together constitute the pilot study. **Section 3** consists of Chapters 6 and 7, which are the quantitative analysis of the longitudinal study. **Section 4** consists of Chapters 8 and 9, the qualitative studies conducted on data collected in the longitudinal study. **Section 5** consists of Chapter 10, which contains the overall discussion, conclusion and recommendations made by the thesis**.**

A brief abstract of each chapter is presented below.

2.2.1 Section 1

2.2.1.1 Chapter 1: Introduction

Chapter 1 presented what is already known about the scale of the obesity issue in Australia and the need to consider a range of weight management options—especially low-intensity and wide-reaching options such as self-directed weight management. However, this approach has been relatively unexplored, and researching people who self-manage creates methodological and recruitment challenges that need to be addressed. Chapter 1 also reviewed recruitment through social media and online survey design mechanisms, as these seemed promising ways to engage self-managed weight losers.

2.2.1.2 Chapter 2: Thesis outline and methods

Research questions, thesis outline and chapter summaries are presented in this chapter. While descriptions of individual studies are available in respective chapters, the overall approach to the thesis, the rationale for study design decisions, and specific methodologies and definitions used in the thesis are discussed along with relevant literature.

2.2.1.3 Chapter 3: Standard baseline data collections in obesity management clinics: A Delphi study with recommendations from an expert panel

Background: Understanding what patient data obesity treatment specialists consider before they commence weight management can inform data that are important to collect for research in self-managed weight loss. In Australia, specialist obesity management services (or clinics) variably provide physician-led intensive multidisciplinary team care including behavioural interventions, weight loss pharmacotherapy, and access to bariatric surgery for patients with severe obesity and complex care needs. However, the patient data collected vary substantially, limiting data pooling for research activities or for improving quality of care. This study therefore aimed to develop an expert consensus on standardising data collections in specialist obesity management clinics in Australia.

Method: A panel of 16 experts participated in a structured consensus-driven Delphi process to reach agreement on a minimum set of baseline patient data collections for consideration in specialist obesity services. The panel included surgeons, clinicians, allied health professionals (dietitians, exercise physiologists and psychologists), a bariatric nurse, and obesity researchers.

Results: A recommended list of core and useful data items that should comprise the baseline patient dataset was produced. Consensus was achieved for recommended measures of demographic, anthropometric, biochemical, weight loss history, medication, medical history, and comorbidity data items using a 70% agreement threshold.

Conclusion: This is the first expert panel consensus on recommendations for a minimum and standard set of baseline patient data collections in obesity management services in Australia. Implementation of these recommendations should facilitate data pooling for clinical audits and research collaborations across clinics seeking to improve the quality of specialist obesity care.

2.2.2 Section 2: Pilot study

2.2.2.1 Chapter 4: An exploration of recruitment through Facebook to an online survey on self-managed weight loss in Australia—Lessons learned from a pilot study

Background: Those that attempt weight loss on their own preclude patients who are treated through the obesity clinics, and it is unlikely to find large numbers of such participants in the health system or through professional weight loss services. Social media, particularly Facebook, is increasingly accessed by health information seekers, including for diet and nutrition advice. Use of Facebook for recruitment of research participants is on the rise for a range of social and health research purposes. Understanding is still poor on the mechanisms, efficiencies and tracking of recruitment within Facebook. This study aimed to explore feasibility of recruitment of self-managed weight losers to complete an online survey.

Methods: This exploratory-descriptive study consisted of an iterative design, allowing for the adaptation of mechanisms within Facebook advertisement configurations and recruitment process improvements. Australian adults who were attempting weight loss on their own were eligible to participate in the survey. Two iterations or phases each of paid (Facebook advertisements) and free (posts in Facebook groups) recruitment campaigns were conducted. The second iteration included design improvements as incentives. For paid advertisements, data were collected on reach (the number of unique people in whose screen the advertisement entered), number of link clicks, amount spent in AUD, and the cost per click. Total numbers of surveys (complete and incomplete) were collected for both paid and free mechanisms.

Results: Paid advertisements yielded better results (*n* = 153) than free promotion through Facebook groups (n = 80), and costed on average AUD9.95 per completed survey, as did spreading budgets over a 7-day period. Raffle incentives and simplified online consent showed a very minor improvement in completion rates (7% paid promotions, 4% free promotions). Lessons learned about advertisement copy, targeting, researcher transparency, recruiting through Facebook groups, and tracking conversion rates are discussed.

Conclusion: Using Facebook paid promotions is a feasible mechanism to reach and recruit self-managed weight losers in Australia. While free promotions are useful, they should be precluded from population studies as they can introduce selection bias in the study.

Note: While examining Facebook for recruitment, the burgeoning online advice on nutrition and diet websites was evident. This led to a piece of research on the identification of the most popular sites in Australia, and a review of the advice they are promoting. As this study was not a key component to this thesis, it is not presented as a chapter, but reported in a publication 'Food Trends and Popular Nutrition Advice Online—Implications for Public Health'.(1) The paper is available in the appendixes.

2.2.2.2 Chapter 5: Self-managed weight loss in Australia—Preliminary analysis of data gathered in the pilot study

Background: The study on recruitment of self-managed weight losers in Australia through Facebook produced several completed surveys. The aim of this study was to conduct a preliminary analysis to (a) describe the characteristics of self-managed weight losers—demography, weight and weight history, lifestyle risk factors (smoking and drinking), diet, physical activity, and weight loss strategies, and (b) explore any potential differences between subgroups that are purely unassisted and those who may have accessed some form of professional help, which we term 'assisted'.

Methods: Descriptive statistics were calculated for a range of factors including demographics, BMI category, weight history, smoking, alcohol consumption, diet, physical activity, and weight loss strategies. Subgroup 'assisted' consisted of participants who reported using the services of health and medical professionals, commercial weight loss programs or prescription weight loss medication. The remaining participants were classified as 'unassisted'. Multiple binary regression models were constructed to examine factors influencing 'assisted' or 'unassisted'. All analysis was conducted at a priori 95% confidence levels, using IBM SPSS software.

Results: A total of 407 participants accessed the survey, of whom 57% (n = 233) completed the entire survey. The absolute weight of participants was 93 kg (mean 93 [SD 29], median 87 [IQR 74, 105]). A majority (54%) of the participants had obesity (BMI ≥30), and 32% were overweight (BMI ≥25); 13% were of normal weight. Participants were skewed towards female (78%); English-speaking (85%); and married, in a de facto relationship or living with a partner (70%). A greater proportion had higher education levels—47% had completed degree or higher degree qualifications, 20% were diploma holders and another 20% held trade or technical certificates; 12% had completed HSC (high school certificate) or below. A higher proportion

(61.5%) were classified ‘unassisted’. Age range, BMI, weight gained in adulthood, self-monitoring, and use of aids such as diet books or smart phone apps were associated with the type of self-management (unassisted or assisted).

Conclusion: Most self-managed weight losers have overweight or obesity. They are skewed towards English-speaking females. Subgroups identified as ‘assisted’ and ‘unassisted’ differed in demographics, BMI, weight gained in adulthood and self-monitoring. These preliminary findings warrant further exploration. Identification of subgroups in self-management requires a modification of survey questions to provide clarity and differentiation.

2.2.3 Section 3: Longitudinal study: Quantitative analysis

2.2.3.1 Chapter 6: Characteristics of self-managed weight loss in Australian Adults—A descriptive study

Background: Obesity is a major public health issue, with health and economic impacts at individual and population levels. While treatment options exist, access and availability for the majority of the public that are overweight or have obesity is severely limited. It is known that a large number of people ‘self-manage’ and attempt weight loss on their own; however, there is little known about this phenomenon. The aims of this study were to (a) describe the characteristics of people who self-manage their weight loss (b) examine if those that self-managed their weight loss were successful (c) examine differences between characteristics of the subgroups of self-managed weight losers (unassisted and assisted), and their weight and weight-related behaviour outcomes, and (d) identify clusters or homogeneous groups among those who self-manage their weight loss, and compare weight outcomes among them.

Methods: Australian adults attempting to self-manage their weight loss were recruited through advertisements on Facebook between 15 January and 15 March 2020 to complete an online survey. It is pertinent to note that a considerable portion of the recruitment and follow-up overlapped with the onset of COVID-19 and lockdowns in Australia. A 12-week follow-up survey was sent to each participant who completed the baseline survey. Data were collected on demographics, height and weight, weight history, health status, diet and physical activity, weight loss strategies, psychosocial and eating behaviour related factors, and new exploratory factors (self-management type, learning from previous weight loss experiences, and embedding behaviour changes in lifestyle). Descriptive statistics; comparison between ‘assisted’ and ‘unassisted’ subgroups; changes in weight, diet, and physical activity; and a description of

clusters (using two-step cluster analysis) and weight outcomes among clusters are described. All statistical analysis was carried out using IBM SPSS software at a priori 95% confidence levels.

Results: The initial survey was completed by 205 participants, and 102 completed the follow-up survey. Participants were skewed towards female (87.3%), married or with partner (72.5%), and English-speaking (85.3%). The majority (88%) had overweight (23%) or obesity (65%), and were 'unassisted' (85%). Slightly more than half the participants had at least one chronic disease (52.9%), with a third reporting diagnosed depression (27.5%). Participants lost 2.07 kg at the 12-week follow-up, and this was statistically significant (2.07, SD 4.89; $p \leq 0.001$). A third of the participants (32.4%) were 'successful' in losing 3% or more of their initial body weight, and 19 participants (18.6%) achieved clinically significant weight loss of 5% or more of their initial body weight. Nearly half the participants did not lose or gain weight (47%), whereas 10 participants (9.8%) gained weight. Although effect sizes were very small, changes that were significant include reduction in fruit (.96, $t = 1.7$; $p = 0.09$); cake, pies, biscuits and pastries (.79, $t = 1.89$; $p = 0.06$); takeaways (.27, $t = 2.06$; $p = 0.04$); and SSBs (.95, $t = 2.49$; $p = 0.01$). Although the mean total minutes for physical activity increased, the changes were not significant. Four clusters were identified among self-managed weight losers: 'older, ill and stressed' (29.9%), 'younger aged and healthy, but poor and stressed' (28.9%), 'wealthy but ill and stressed' (26.8%) and 'wealthy, relaxed and healthy'" (14.4%). Cluster 4 'wealthy, relaxed and healthy' had the highest proportion of successful weight losers (6, 42.9%), whereas Cluster 2 'younger aged and healthy, but poor and stressed' had the lowest number of successful weight losers, but these results were not statistically significant.

Conclusion: This is one of the first studies to examine weight loss among those who 'self-manage' their weight loss or do it by themselves in the general population. A large range of characteristics have been described, and four clusters of self-managed weight losers have been identified. More than half the participants had chronic disease, with a third reporting diagnosed depression. A third of self-managed weight losers were successful, and a fifth achieved clinically significant weight loss, despite the unique adverse effects of COVID-19 on their weight loss journeys. These are promising results, prompting further research of self-managed weight loss, and have applications in obesity management strategies.

2.2.3.2 Chapter 7: Factors predicting change in weight and weight-related behaviours among self-managed weight losers

Background: Large population studies and clinical trials have identified a range of factors associated with successful weight loss, and diet and exercise behaviour change outcomes. This study aimed to examine factors predicting these outcomes among those that self-manage their weight loss. Research questions addressed in this chapter include what factors predict (a) absolute weight change in kilograms, (b) successful weight loss (3% or greater weight loss), (c) clinically significant weight loss (5% or greater), (d) changes in food consumption (fruit and veg, discretionary foods, sugar sweetened beverages), and (e) physical activity (walking, vigorous physical activity).

Methods: Data were available for over 50 theoretically relevant factors. Univariate analysis was conducted to identify variables with strong influence on outcomes. Next, multiple linear and logistic regressions modelling was carried out to assess the influence of the factors on the outcomes. Regression analysis was not carried out for clinically significant weight loss and moderate physical activity because of data sparsity.

Results: Higher initial BMI (Model 9: B = −0.24, p = 0.022, 95% CI = −0.43, −0.04), non-English speakers (Model 9: B = −4.2, p = 0.016, 95% CI = −7.95, −0.88), cancer (Model 6: B = −7.85, p = 0.045, 95% CI = −15.53, −0.17), and use of weight loss products (Model 9: B = −2.39, p = 0.023, 95% CI = −4.438, −0.334) were predictive of weight loss. Increased consumption of discretionary foods (Model 9: B = 0.27, p = 0.01, 95% CI = 0.53, 0.045) predicted weight gain.

Increase in discretionary foods (Model 8: B = −0.628, p = 0.005, 95% CI = −0.628, 0.199) and SSBs (Model 3: B = −0.628, p = 0.005, 95% CI = −0.628, 0.199) showed reduced fruit and vegetable consumption. Those who perceived their health as ‘fair’ (Model 4: B = 129.195, p = 0.018, 95% CI = 25, 233) showed higher changes in vigorous physical activity.

Conclusion: Some characteristics influencing weight loss success and weight-related behaviours among self-managed weight losers have been identified, and some agree with the literature on successful weight loss and weight maintenance. However, results are not conclusive because of the small sample size, and should be interpreted with caution. Research with sufficiently powered sample size is recommended.

2.2.4 Section 4: Qualitative studies

2.2.4.1 Chapter 8: Strategies for weight loss and barriers for sustaining weight loss among self-managed weight losers in Australia—A thematic analysis

Introduction: As part of the broader research in this thesis about self-managed weight loss, study participants were asked open-ended questions in the 12-week follow-up survey about any key changes they had made to their diet and exercise to support their weight loss attempt, as well as any barriers they saw in sustaining their weight loss going forward. This study describes the thematic analysis applied to the responses, and reports findings.

Methods: Participant responses to the open-ended survey questions were analysed by applying the 6-phase framework of thematic analysis. The analysis was theoretically driven by the research questions: What are the key strategies used by self-managed weight losers? What are the barriers for successful weight maintenance?

Results: A number of themes were identified, and these included diet themes (snack management tactics; awareness of portion control; following specific diets and eating rules) and exercise themes (many ways of walking; starting or increasing level of exercise; plans, routines, goals, and monitoring). Barriers to sustaining weight loss included health issues and state of mind and body; losing motivation and relapsing; and unconducive environments and unhelpful social situations. Two miscellaneous themes identified include ‘I am trying’ and ‘Perpetual struggle’.

Conclusion: The study identified several key themes related to diet and exercise-related weight loss strategies and practices; barriers to sustaining weight loss; and additional themes prevalent among self-managed weight losers. The findings can inform public health campaigns and communication strategies to inspire self-management of weight loss.

2.2.4.2 Chapter 9: Impact of COVID-19 lockdown on self-managed weight loss journeys and Weight, Diet and Physical Activity Outcomes of Self-managed Weight Losers

Background: Beginning mid-March 2020, the Australian government began introducing measures to control the spread of the COVD-19 virus, and lockdown restrictions were progressively implemented. This occurred during the recruitment phase of the main and final research study of this thesis. This study aimed to (a) examine issues that affected the weight loss journeys of our participants because of the lockdowns, and to (b) compare weight, diet and

physical activity outcomes between those who reported their weight loss journeys were affected and those who reported no impact.

Methods: An additional set of open-ended questions were sent to participants recruited (n = 205) to the longitudinal study in this thesis, asking if their weight loss, diet and exercise strategies were changed because of the lockdowns, and if they wanted to share anything else. A summary of negative and positive impacts was produced after content analysis. Weight, diet, and exercise outcomes were compared for those that reported their diet (DI) or exercise (EI) was affected, against those who indicated diet (D0) or exercise (E0).

Results: Fifty-eight participants responded to the additional questions survey, and had also completed the 12-week follow-up survey. Participants reported high levels of 'stress eating' and 'eating out of boredom', followed by 'higher food consumption', 'more opportunities to eat' and 'higher consumption of junk foods'. The most common exercise impacts reported were the 'lack of access to facilities' and the 'loss of social exercising'. Most experienced anxiety, depression, fear and loss of motivation, and missed social life. Fewer (n = 2) reported positive impacts, 'more time' and 'less stress'. Among those reporting negative impacts (n = 56), nearly a third (29%) were successful at losing weight. A greater proportion of unaffected participants at 33% were successful, compared with 28% in the affected groups. There were no differences in fruit and vegetable consumption between the 'Diet: impact' and 'Diet: no impact' groups, as indicated by median food consumption scores. Discretionary food was reduced in all groups by a very small amount. The median walking time increased by 10 minutes overall, but there was a decline of 7 minutes in vigorous activity in the 'Exercise: impact' group. None of the results were statistically significant.

Conclusion: Negative impacts of the COVID-19 lockdown restrictions were reported by our sample of those attempting self-managed weight loss in Australia. Those reporting negative impact were less successful at weight loss, but no differences in reported dietary behaviours could be detected. Vigorous physical activity might have been reduced in those who reported impacts to their exercise routines. Despite the range of issues, nearly a third of the participants in this sample achieved weight loss of ≥3% of their body weight. Although this was an opportunistic study and limited by the very small sample size, the study shows that there are those that are successful with self-managed weight loss despite extreme pressures brought upon them, as with the COVID-19 lockdown restrictions.

2.2.5 Section 5

2.2.5.1 Chapter 10: Discussion and conclusion

With a staggering number of people with overweight and obesity in Australia, achieving and maintaining a healthy weight is a constant struggle and endeavour for many Australians who attempt self-managing their weight loss. This thesis first explored methodological questions on researching self-managed weight loss, how to recruit self-manged weight losers, and what information is important to collect. It then went on to recruit a group of self-managed weight losers for the first time as they began their weight loss journey, and followed them up 12 weeks later.

Chapter 10 discusses the findings of the different elements of the thesis and examines what these findings add to our existing knowledge on this issue. It addresses the range of characteristics of self-managed weight losers, the level of successful weight loss among participants, and the key strategies used, and barriers to sustaining weight loss. While some characteristics that have been identified appear to be commonly associated with successful weight loss, firm conclusions cannot be made.

Strengths of the study relate to the uniqueness of the population studied and the design, rationale and implementation of the studies undertaken. The main limitations are those inherent in online studies using a social media platform. Sample size limitations and the arrival of COVID-19 affect generalisability.

In conclusion, while it is early to make specific recommendations about self-managed weight loss, it is unmistakeably worth encouraging and supporting in the general population. Self-managed weight loss in the general population, both unassisted and assisted, is clearly an area worth exploring further.

2.3 A Snapshot of Studies and Methods Used in this Thesis

A mixture of qualitative and quantitative methods was used throughout the studies in this thesis. Table 2.1 provides a snapshot of the methods and techniques that comprise the individual studies and the timelines for data collection. The rationale for the methods used along with relevant literature is discussed below.

Table 2.1: Studies and methods used

Section	Methods
Chapter 1: Introduction	Literature reviews
Chapter 3: Standard baseline data collections in obesity management clinics: A Delphi study with recommendations from an expert panel *March 2018 – April 2018*	Online modified Delphi survey method
Pilot Study	
Chapter 4: Using Facebook to recruit participants to an online survey on self-managed weight loss in Australia	Iterative design exploration Online recruitment using Facebook
Chapter 5: Self-managed weight loss in Australia—Results from data gathered in the pilot study *August 2018 – December 2018*	Cross-sectional online survey Descriptive statistics Binary logistic regression
Longitudinal Study—Quantitative Analysis	
Chapter 6: Characteristics of self-managed weight loss in Australian Adults —A descriptive study *January 2020 – June 2020**	12-week follow-up online survey study Descriptive statistics Before and after analysis (paired t-tests) Two-step cluster analysis
Chapter 7: Factors predicting change in weight and weight-related behaviours among self-managed weight losers	Univariate analysis Multiple linear regression Multiple logistic regression
Longitudinal Study—Qualitative Analysis	
Chapter 8: Strategies for weight loss and barriers for sustaining weight loss among self-managed weight losers in Australia—A thematic analysis	Thematic analysis
Chapter 9: Impact of COVID-19 lockdown on self-managed weight loss journeys and Weight, Diet and Physical Activity Outcomes of Self-managed Weight Losers April – June 2020	Content analysis Kruskal–Wallis H test

** COVID-19 first wave in Australia - March – April 2021*

2.4 The Delphi Method

2.4.1 Background on the Delphi method

The Delphi method can be classified as a type of survey. It is gaining recognition and popularity as a research technique, and is accepted as relevant evidence in the field of healthcare and research.(2, 3)

The main premise of the Delphi method is based on the assumption that expert group opinion is more valid than individual opinion. The Delphi process consists of two or more rounds of surveys administrated to a panel of experts. The first round seeks opinions from the panel of experts on a certain topic through open-ended questions. These responses are then analysed and sent back to the expert panel in the form of statements or questions. The expert panel then rates or ranks the statements within the second round according to their expert opinion on the subject. Rounds continue until a consensus is reached on some or all items as required.(4)

Two main purposes for which the Delphi technique is used in healthcare are (a) to set priorities, for example, to identify research priorities in nursing, and (b) to develop consensus, for example, developing position statements or clinical guidelines in the absence of existing literature or evidence on the topic.(4)

The Delphi process has evolved and been adapted to suit different purposes, and many variations are found in the execution of the Delphi process. The online Delphi process, as the name suggests, is the classical Delphi but surveys are completed and submitted online.(4)

2.4.2 Rationale for the choice of method

For reviewing what obesity treatment factors professionals consider important in this thesis, clinical management guidelines for obesity were found for Australia but few other countries. However, there were no existing guidelines on baseline data collection at obesity clinics. To address this gap, our purpose was to develop consensus among obesity experts in Australia on a standard set of baseline data collections in obesity management clinics. Therefore, the Delphi technique was used. The identified experts spanned multiple health disciplines, actively treated patients for obesity or worked in clinical research in obesity, and were spread across locations in Australia. Further, a process that was not too time consuming had to be used as bringing together these busy professionals was not a feasible option and would affect participation. Therefore, an online Delphi survey was designed and administered to the professionals by email.

2.5 Using Facebook for Recruitment of Participants

2.5.1 Rationale for choosing Facebook for recruitment

The participants of interest in this study are people in the community and general population who attempt weight loss on their own. Patients that are treated medically for obesity, or provided direct support through structured weight loss programs and services for weight loss, are a different segment that were not the focus of our research. This precluded recruitment in traditional settings such as GP clinics, specialist clinics and hospitals, and other professional weight loss groups and centres.

With the proliferation of the internet, online health information seeking as well as sharing is a common phenomenon for a range of health issues.(5, 6) Blogs are online journals where people document issues and events in their lives or share what they are doing. Bloggers share information and can potentially attract followers or an audience similar to themselves or interested in the bloggers' lives. In the eating disorders space, blogs have attracted research interest in the mechanisms of social and emotional support between bloggers and their followers.(7) There are a plethora of bloggers documenting their weight loss journeys as well,(8) and several blogs were assessed as potential data sources. Although bloggers' journals provide interesting insights into many aspects of weight loss journeys, data from blogs are not suitable for extraction for quantitative analysis, and so were not pursued in this thesis.

Weight loss, diet and nutrition advice are very popular topics that are widely sought after online.(5) Health and wellness is one of the top reasons that motivate people to lose weight. It is reasonable to assume that our population of interest would be found among those following popular websites and Facebook pages that provide nutrition advice, so an exploration was undertaken on the most popular sites providing health and nutrition advice in Australia. This exercise led to an additional study and publication(1) on food trends and popular online nutrition advice (Appendix A). Although this study did not directly answer the research questions in this thesis, examining popular sites and activity in Facebook suggested that it is a platform where we should be able to find our population of interest. Further, studies have shown that Facebook is valuable in accessing and recruiting groups that are hard to reach.(9, 10)

Facebook presented an attractive option for some additional reasons. It has a near ubiquitous reach, with nearly 94% of Australians having a Facebook account.(11) While other social media platforms such as Twitter and Instagram could also potentially be used, even less is known about their effectiveness or potential issues in samples recruited (at the time of commencing this study). Flexibility and ease are key drivers to using online methods, eliminating the need for extensive logistics in sending out surveys and compiling data. Utilising Facebook, along with Research Electronic Data Capture (REDCap),(12) the university-approved online survey database, greatly simplifies the process. A computer or device is all that is needed, and the entire recruitment can be easily executed by a single researcher in a short period.

2.5.2 Iterative design exploration

Iterative design is an approach that is used in a variety of fields—especially in the area of human–computer interaction (HCI)—to continually improve a design or product.(13) The process involves creating an archetype, testing it, making improvements and testing again, and repeating these cycles until the goal or solution is reached. The iterative design process is seen in the field of healthcare and health research as well, for example, in design of health and health education interventions,(14-16) tools for clinicians to aid diagnostics and treatments,(17, 18) and to inform recruitment strategies.(14)

A primary goal for the feasibility study was to compare paid and free mechanisms within Facebook to recruit our population of interest. As efforts were directed to recruit the maximum numbers possible through both mechanisms, iterative changes were made to test 'what works'. Key advantages to this approach were:

- early identification of Facebook advertisement policies and, in practical terms, ad copy that will be automatically rejected or accepted by Facebook
- iterative testing of paid advertisement variations (weekday, weekend, budget spread over 7 days, targeting men)
- flexibility in adapting design and preventing wastage of budgets, for example, stopping display of an advertisement, changing images (single, multiple, depiction of people, other weight loss symbols) and resuming the advertisement.

Two main iterations in the study were named Phase 1 and Phase 2, and both included a series of paid and free mechanisms for recruitment. The key difference was that in the Phase 2 iteration, two key modifications were introduced: (a) offering raffle/lottery incentives and (b) simplifying the online consent form as large numbers that accessed the survey dropped off at the consent page.

2.5.3 Online set-up for the pilot study

Three online platforms were used for the campaign:

REDCap is a web-based application to create databases and projects for research. It is highly secure and has institutional approval. Survey instruments and forms can be created to capture data from research participants and directly store it in a project. The data collected can be exported as .csv files to use in other statistical programs and other data analysis software.(12, 19) For this feasibility study, a project was created on REDCap and the online survey designed. The survey itself was open, and consisted of questions on demographics, height and weight, lifestyle behaviours, and weight management strategies, and was expected to take 25–30 minutes to complete.

WIX is a cloud-based website development platform. It does not require complex website building skills, and allows users to create through the use of online drag and drop features and customisable templates.(20) WIX was used to create the study information website for this study. A visually attractive website, with University of Sydney logo, was generated to create trust and transparency among participants. Information on the goal of the research, why it is important, what is involved, how data are collected and stored, and the identity of the researchers was detailed on the website. These details were presented in user-friendly language as an FAQ section on the website. The images used were deliberately chosen to create positivity, and depicted people with obesity engaging in cooking, eating, exercising, and socialising with friends and family in a respectful manner. These are images that are freely available from the image banks of global obesity organisations (World Obesity Federation(21), Obesity Canada(22), Rudd Center(23), and Obesity Action Coalition(24)), and image credits were clearly provided on the website. A link to access the survey website was featured in prominent positions within the website as a large 'SURVEY' button. A copy of the website is available in Appendix E.

Facebook pages were created for the study. Pages are necessary to access Ad Manager(25), which allows the owner of the page to create and manage paid advertisements, as well as see how well the advertisement performs. Through Ad Manager, the objective of the campaign, ad placement, type of ad (e.g. single image, video or carousel of multiple images), targeting audiences by demographics or interests, specification of budgets, and duration of the ad can be configured. The performance of advertisements, once live, was monitored daily through the duration of recruitment by accessing the Ad Manager dashboard, and data were collected for reach, link clicks and amounts spent.

2.5.4 Sources of data and collection methods

The Facebook pixel is a piece of code that can be embedded in websites to track conversion rates or allow attributing clicks on the website to specific advertisements. However, the

REDCap database does not allow this integration. Therefore, this process could not be used to directly measure users accessing the survey through a particular advertisement. Although we could have used this feature in WIX, and measured clicks to the 'SURVEY' button, set-up of the pixel on the website proved difficult and beyond the skills and scope of this thesis. Instead, numbers of people accessing and completing surveys were directly captured from the REDCap database. This allowed attribution to individual advertisements. One constraint with this process was that multiple advertisement sets could not be carried out concurrently, therefore extending the time frame for recruitment. In Phase 2 of the study, with the upcoming Christmas season, some advertisements had to run concurrently to compare them with Phase 1; however, recruitment on those dates could not be tracked down to individual advertisements.

2.6 Defining Levels of Support for Obesity Management

People undertake a program of health improvement with varying levels of support, which range from no assistance to intensive health professional intervention. Defining and accurately describing this level of support has important implications for consideration of the relative success or merit of different approaches. The term 'unassisted' (unassisted smoking cessation)(26) has been used in the area of tobacco control to describe people who quit smoking unaided, or without treatments. The terms 'self-help', 'self-directed' and 'personal weight control' have been used varyingly in the literature. The terms 'self-help' and 'self-directed' are described as those that 'do not require professional input to deliver', and include various formats such as print, internet and mobile phone–delivered programs.(27) A systematic review and meta-analysis that assessed prevalence of 'personal weight control attempts' in adults used a question on the prevalence of weight control (loss and/or maintenance) within the 12-month period preceding the survey as eligibility.(28) However, studies that reported utilising professional support, such as receiving advice from a healthcare professional or attending a weight control program or group, are also included among the 'personal weight control strategies'. The concept of 'self-management' is seen in chronic disease management strategies. For example, patients with diabetes and heart disease are expected to manage their day-to-day treatments, symptoms and lifestyle modifications.(29) NHMRC guidelines recommend clinicians support individual self-management of obesity.(30)

Therefore, the management of obesity can be thought of as a spectrum, with those that do not rely on any form of professional or health services to manage their weight loss on one end of the spectrum and patients with obesity that are medically treated with behavioural therapy, pharmacotherapy or surgery at the other end. In-between are those that utilise differing levels of support varying from the use of websites, books and apps, to using professional services such as gyms, meal deliveries and more intensive weight loss programs, as shown in Figure 2.2 below.

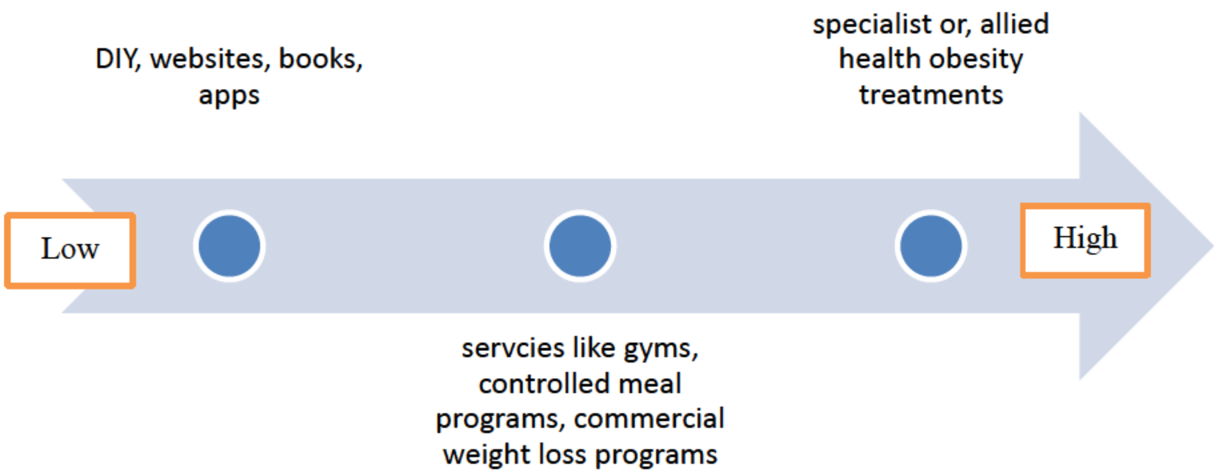


Figure 2.2: Obesity management—Levels of support

2.6.1 Self-managed unassisted and self-managed assisted subgroups

Our study was named 'DIY Weight Loss Survey' on the website and promotional materials used for participant recruitment, and sought 'Australians attempting weight loss on their own'. Recruitment was carried out only through Facebook. Recruitment did not utilise health services, including primary care, or gyms, weight loss groups and commercial weight loss programs. This allowed attracting participants who are at the 'DIY' end of the spectrum, rather than patients treated for obesity. Subgroups of participants could be identified at lower or higher levels by their responses to a multiple-choice question in the pilot study. If participants selected clinical or allied health professionals, prescription medication or commercial weight loss programs as their approach, they were grouped as 'assisted'. The remaining participants were grouped as 'unassisted'. In the final survey, however, participants were asked to select from three options:

- I plan to manage my weight loss by myself without any direct assistance from health professionals or commercial weight loss programs.

- I plan to manage my weight loss with the assistance of a structured commercial weight loss program or service (e.g. weight loss coach, Weight Watchers®, Lite n' Easy®, Sureslim®, JennyCraig®).
- I plan to manage my weight loss with consultation or assistance from a health or medical professional (e.g. general practitioner, specialist medical professional, dietitian, nutritionist, psychologist, exercise physiologist).

Participants who selected the first option were classified 'self-managed: unassisted', and those that selected the second and third options were classified 'self-managed: assisted'. In this thesis, the term 'self-managed' has been used to describe all our population of interest. The term 'self-directed' is used especially when discussing low-intensity interventions.

2.6.2 Successful and clinically significant weight loss

There are deliberations on the definition of the percentage of loss of initial body weight that can be defined as clinically significant,(31) although health professionals agree that there are substantial health benefits from a modest loss of 5–10%.(32, 33) Measurement criteria for 'weight loss maintenance' also vary in different research studies, from maintaining 100% of body weight loss for 4–5 years after completion of a weight loss program to losing at least 10% of initial body weight at 4 years.(32) For example, the NWCR recruits those who have maintained at least a 30-pound (13.6 kg) weight loss for 1 year or longer.(34) A widely adopted measure of long-term weight maintenance is a weight change of less than 3% of body weight in either direction. This definition was proposed to be applicable to diverse body sizes; to be easily understood across clinicians, researchers and the general public; and to be a range that is larger than normal biological variations yet smaller than generally recognised meaningful changes in body weight; and to permit comparisons among studies.(35)

The scope of this thesis was limited to weight loss and not weight maintenance. As self-managed weight loss is an unexplored phenomenon, there was the need for our definitions to allow capturing even small weight loss successes. Therefore, the following definitions were used to measure weight outcomes:

- **Successful weight loss:** A weight loss of 3% or more body weight reported at 12-weeks' follow-up compared with the initial survey.
- **Clinically significant weight loss:** A weight loss of 5% or more body weight reported at 12-weeks' follow-up compared with the initial survey.

2.7 Questionnaire Construction and Online Survey Design

An initial and follow-up survey questionnaire, as well as an additional set of questions (to assess COVID-19 impact) was constructed for the study. All surveys were constructed using features and functionality of REDCap, the university-approved secure data collection and storage platform.

2.7.1 Questionnaire construction

The objective of the initial and follow-up surveys was to capture data from participants on the factors (demography, height and weight, health status, weight history, motivation, psychosocial factors, exploratory factors), self-management type, weight-related outcomes, and secondary outcomes of changes in diet and exercise.

Where possible, it is recommended that existing questionnaires (or specific questions) that are already widely used and proven reliable and valid should be used.(36) Therefore, as a first step, existing national surveys including the NSW Population Health Survey,(37) National Nutrition and Physical Activity Survey,(38) 45 and Up Study,(39) IPAQ (International Physical Activity Questionnaire) long-form(40) and short-form,(41) and Active Australia Survey(42) were reviewed for their utility in collecting the data needed for this study. Apart from the 45 and Up Study, which is a self-administered survey that is posted to participants to complete and post back, all other surveys are computer-aided telephonic interviews (CATIs), where considerable efforts are made in training the interviewer to administer the surveys. However, many of the questions within these surveys have been successfully self-administered within other studies. The IPAQ short-form was designed for self-administration.

For food consumption, the intent was to capture the changes at baseline and at follow-up for food items that are generally associated with weight changes. Data was therefore collected on the five food groups, fats, and discretionary foods. Discretionary foods were further segregated into processed meats, cakes/biscuits/pastries, takeaways, sugar sweetened beverages, and potato/hot chips. Shortened dietary assessment questions were developed from the Lifescripts short dietary assessment tool for assessing diet in relation to CHD risk (43). Participants were asked to choose serves they would normally eat from ordinal categories ranging through never/occasionally, 1-2 serves/week, 3-5 serves/week, 1 serve/day, 2 serves/day and 3 or more serves/day. Serves were described in cup measure to improve understanding for example ½ cup of fruit = 1 serve. These questions were tested in the pilot study and then utilized for the longitudinal study.

A panel of questions relevant for our study was compiled from these previously implemented large-scale surveys. The number of questions was reduced and minimal changes to the wording made to facilitate the development of our self-administered web survey.

Psychosocial factors and cognitive processes (e.g. disinhibited eating, feelings of hunger, stress eating, binge eating, flexible control, self-efficacy, social support, stability, dichotomous thinking, coping skills and weight stigma) are associated with weight loss and weight maintenance.(44-46) Several instruments and their variants have been constructed to measure each of these factors. For example, the Three Factor Eating Questionnaire (47) and its variants are commonly used to measure dietary restraint, disinhibition and hunger. Practicalities of assessment of all these factors through the administration of lengthy surveys presented a problem, yet these factors warranted exploration. Therefore, a key statement that described each factor was used as a quasi-indicator within this survey: ‘I feel hungry almost all the time’ to indicate feelings of hunger, ‘I find myself eating if I am stressed/anxious/sad/lonely’ as an indicator of stress eating, and ‘I believe that I have the ability to follow my weight loss plan and achieve my weight loss goal’ to indicate self-efficacy. A 4-point Likert scale—*Like me to a large extent*, *Somewhat like me*, *Very little like me*, and *Not at all like me*—presented as vertically unidirectional response options was used to measure responses to these factors.(48)

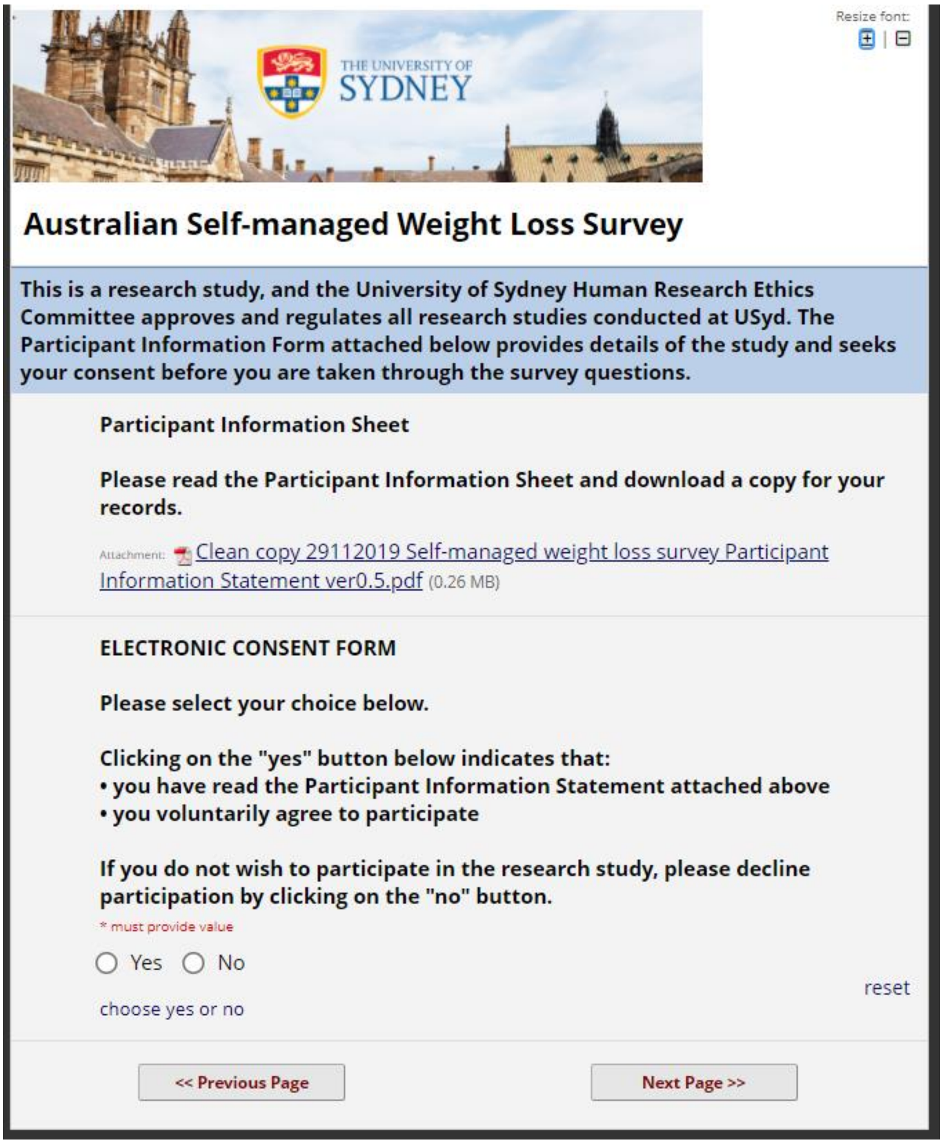
There is considerable discussion around open- and close-ended questions, with pros and cons for each.(49) Close-ended questions were mainly used in the baseline (initial) survey, where data were collected on demography, health status, weight history and food consumption as quantifiable data, and the ability to categorise the data was important. Where additional details were required to provide insights, for example, on the type of diet followed by the participant, an ‘other’ option was provided. If ‘other’ was selected, an open question prompted the participant to describe what ‘other’ entailed.

The follow-up survey and the COVID-19 impact survey contained more open-ended questions where we sought qualitative inputs. All surveys included an open-ended comment question ‘Is there anything else you would like share?’ at the end to provide the respondent the opportunity to raise any important issue that they felt was not addressed in the survey.

2.7.2 Online survey design

All online surveys were designed using features and functionality available within REDCap. Lengthy surveys risk drop-outs mid-way of taking the survey.(50) As this was an exploratory survey, there was the need to include a range of questions on known and exploratory items. Therefore, every effort was made in simplification and making the user experience as agreeable as possible for participants by adopting best practices in design.

The landing page of the survey contained the screening questions to assess eligibility (residing in Australia, over 18 years of age, and currently attempting weight loss or about to commence in the near future). Only participants that met the eligibility criteria were allowed to proceed to the second page. The participant information form was provided as a .pdf file that was available for the participant to download, and a simplified consent form (an improvement made over the pilot study, which was approved by the Human Research Ethics Committee), as shown in Figure 2.3.



Resize font:

THE UNIVERSITY OF SYDNEY

Australian Self-managed Weight Loss Survey

This is a research study, and the University of Sydney Human Research Ethics Committee approves and regulates all research studies conducted at USyd. The Participant Information Form attached below provides details of the study and seeks your consent before you are taken through the survey questions.

Participant Information Sheet

Please read the Participant Information Sheet and download a copy for your records.

Attachment: Clean copy 29112019 Self-managed weight loss survey Participant Information Statement ver0.5.pdf (0.26 MB)

ELECTRONIC CONSENT FORM

Please select your choice below.

Clicking on the "yes" button below indicates that:
• you have read the Participant Information Statement attached above
• you voluntarily agree to participate

If you do not wish to participate in the research study, please decline participation by clicking on the "no" button.

* must provide value

Yes No

reset

choose yes or no

<< Previous Page

Next Page >>

Figure 2.3: Simplified online consent form

Guidelines for web surveys,(49, 51) design tips on simplifying presentation, and user-friendly input mechanisms(52) were incorporated. These included listing only a few questions per screen, reducing response errors through pre-defined responses and validation rules, pagination, and a motivating message mid-way (‘Thanks for coming this far—you’re more than halfway through the survey’).

Although forcing responses for all questions in an effort to minimise missing data seemed advantageous, there is the risk of annoying participants, who may provide arbitrary responses to proceed.(52) Therefore, only questions for screening and consent were forced. For other key questions where response was critical (e.g. weight management approach, height and weight), the phrase ‘must provide value’ was included in the response input area. If participants missed these key questions, a message indicated that they had missed responding to provide an opportunity to respond; however, they were not prevented from proceeding to further questions.

Although there is no conclusive evidence on best types of incentive,(53) incentives do improve the likelihood of response in web surveys.(54) A $500 budget was available for incentives; therefore, a raffle for gift cards was devised for participants completing both the initial and follow-up surveys. To increase opportunities for winning, one $200, two $100 and ten $20 gift cards were provided.

2.7.3 Testing and face reliability

There are no existing gold standards for a survey instrument to assess self-managed weight loss. However, face validity(36) was established by testing the survey with senior obesity researchers within the university, as well as other staff and students, to capture any technical or usability and design issues.

2.8 Statistical Analysis

All statistical analysis for the thesis was carried out through IBM SPSS software,(55) and all tests were carried out at 95% confidence levels. A number of relevant statistical tests and techniques were employed for quantitative analysis of data collected in the pilot study, as well as the longitudinal study. Descriptive statistics are presented as frequencies and percentages for categorical variables, and as mean and standard deviation, or median and interquartile ranges, as appropriate for continuous variables. Chi-square and Fisher's exact tests were used in comparing proportions between groups. Normality assumptions were checked throughout the thesis, however reliance of normality was not based on formal normality tests alone, as they are very sensitive to sample size. Where 'n' was small, visual assessments (56) of the bell-shape were made using histograms fitted with a normal curve. Even though data may not have met strict criteria for normality it was assumed normal to allow appropriate statistical analysis. For comparing means between groups, independent *t*-tests were used, and in the longitudinal study, outcomes at baseline and follow-up were compared using paired *t*-tests.

Regression models were used to analyse the relationships between variables and outcomes of interest.(57) Univariate regressions (linear regression where the outcome measure was continuous, and binary logistic regression where the outcome measure was binary and categorical) allow testing the impact of one factor or a single outcome of interest.(58) These were carried out for all factors in the pilot and longitudinal studies to assess the influence on a range of outcomes that were analysed in the study. The univariate analysis provided information on the choice of factors in multiple regression modelling.

Multiple binary logistic regression modelling was used to analyse factors influencing the choice of self-management (assisted, unassisted) in the pilot study, and successful weight loss in the longitudinal study. Several multiple linear regression models were executed to analyse influence of factors on weight, diet and physical activity outcomes. Regressions employed entering groups of variables in blocks and their effect on the outcomes.(58)

Cluster analysis refers to a set of exploratory techniques that allow verifying the existence of groups of participants with similar behaviour or characteristics with respect to certain variables. Clusters are groups within which internal homogeneity exists.(59) This analysis does not involve hypothesis testing and calculation of observed significance levels, but is useful for descriptive studies.(60) The two-step cluster analysis available in SPSS was employed in this thesis to identify homogeneous groups among self-managed weight losers as it can form clusters based on either categorical or continuous data,(59) and it is increasingly used in identifying clinically relevant groups.(61-63)

2.9 Thematic Analysis and Content Analysis

Thematic analysis and content analysis are two commonly used methods in analysing qualitative data and textual information. They are similar in approach and so are often used interchangeably in the literature.(64) Similarities include codes and coding; in addition, both methods may attempt to describe what is directly observable (manifest), as well as ideas or underlying meanings (latent), and both need to be applied only after the research question is available.(65)

Thematic analysis is described as a method for identifying patterns or themes in qualitative data.(66) The process is highly flexible and can be used in diverse fields of enquiry as it is not bound by any theoretical or epidemiological viewpoints.(67) The six-phase thematic analysis framework proposed by Braun and Clarke was applied to analyse the participants’ responses to open-ended survey questions on diet and physical activity changes made to support weight loss, as well as barriers in sustaining weight loss.(66, 67)

Content analysis is suitable for the simple reporting of common issues stated in data(68) and presents opportunity for quantification(65). Therefore, responses to the additional survey questions asked of participants to understand the impact of COVID-19 were analysed using content analysis, and the frequency of themes reported.

2.10 Impact of COVID-19 on the Thesis

The recruitment for the main population study was planned for 3 months commencing mid-January, followed by the 12-weeks' follow-up study. This has affected ongoing research in many ways, including the rapid advancement of utilising technologies.(69) Although this study was completely online, it is hard to know the ways in which the effects of the pandemic influenced public participation in this research. The uncertainties around daily living, and anxieties on how to prepare for it, were certainly the top concerns compared with everything else. The required numbers for recruitment for the study were not met, despite continuation of Facebook promotions until mid-March as planned. Hard restrictions and lockdowns were introduced in different states across Australia by mid-March, influencing food choices and ways in which people exercised, and would have affected the study participants. This is therefore one of the biggest limitations in this thesis.

2.11 Ethical Considerations

Ethical approval was granted by the Human Ethics Committee at the University of Sydney for all aspects of the studies undertaken in this thesis. Approval letters for protocol numbers 2017/755 and 2018/526 are available in Appendix C.

The ethical considerations particularly in relation to use of social media to recruit participants to this study was carefully considered, and best practices such as researcher transparency, and obtaining permission of administrators of Facebooks prior to making posts were incorporated (70). Facebook was used only to promote recruitment, and there was no participant data about that was collected from Facebook. Participation was completely voluntary, and data was collected separately through the survey hosted on the university approved database after obtaining consent.

Utmost care was taken to avoid inadvertent perpetuation of obesity stigma on advertisements, Facebook pages and website. First-person language was adopted for the thesis, and depiction of obesity was respectful with images sourced from image libraries of global obesity organizations (21-24) which are obtained from people with lived experience with their permission. Participants were provided contact details of the researchers, as well as the ethics committee in case of any concerns.

2.12 References

1. Ramachandran D, Kite J, Vassallo AJ, Chau JY, Partridge S, Freeman B, et al. Food Trends and Popular Nutrition Advice Online - Implications for Public Health. Online J Public Health Inform. 2018;10(2):e213-e.
2. Hasson F, Keeney S, McKenna H. Research guidelines for the Delphi survey technique. J Adv Nurs. 2000;32(4):1008.
3. Obbarius A, van Maasakkers L, Baer L, Clark DM, Crocker AG, de Beurs E, et al. Standardization of health outcomes assessment for depression and anxiety: recommendations from the ICHOM Depression and Anxiety Working Group. Qual Life Res. 2017;26(12):3211-25.
4. Keeney S. The Delphi technique in nursing and health research. Hasson F, McKenna HP, editors. Chichester, West Sussex: Wiley-Blackwell; 2011.
5. Pew Research Center: Internet, Science & Tech. Online Health Search [Internet]. 2006 [cited 9 November 2015]. Available from: http://www.pewinternet.org/files/old-media/Files/Reports/2006/PIP_Online_Health_2006.pdf.pdf.
6. Fox S. The Social Life of Health Information, 2011 [Internet]. Pew Research Center: Internet, Science & Tech. 2011 [cited 9 November 2015]. Available from: http://www.pewinternet.org/2011/05/12/the-social-life-of-health-information-2011/.
7. Tong ST, Heinemann-Lafave D, Jeon J, Kolodziej-Smith R, Warshay N. The use of pro-ana blogs for online social support. Eat Disord. 2013;21(5):408-22.
8. Top 10 Mom Weight Loss Blogs & Websites To Follow in 2021: Feedspot; 2021 [Available from: https://blog.feedspot.com/mom_weight_loss_blogs/.
9. Thornton L, Batterham PJ, Fassnacht DB, Kay-Lambkin F, Calear AL, Hunt S. Recruiting for health, medical or psychosocial research using Facebook: Systematic review. Internet Interven. 2016;4:72-81.
10. Whitaker C, Stevelink S, Fear N. The Use of Facebook in Recruiting Participants for Health Research Purposes: A Systematic Review. J Med Internet Res. 2017;19(8):e290-e.
11. Sensis. Social Media Report 2017. 2017.
12. REDCap [Internet]. Redcap.sydney.edu.au. 2018 [cited 28 June 2018]. Available from: https://redcap.sydney.edu.au/.
13. Eby K. The Power of Iterative Design and Process: Smartsheet; 2019 [Available from: https://www.smartsheet.com/iterative-process-guide.

14. Huberty J, Green J, Gold KJ, Leiferman J, Cacciatore J. An iterative design process to develop a randomized feasibility study and inform recruitment of minority women after stillbirth. Pilot Feasibility Stud. 2019;5(1):140.
15. Jiang R, McKanna J, Calabrese S, Seif El-Nasr M. Iterative Design and Testing for the Development of a Game-Based Chlamydia Awareness Intervention: A Pilot Study. Games Health J. 2017;6(4):205-16.
16. Adam M, McMahon SA, Prober C, Bärnighausen T. Human-Centered Design of Video-Based Health Education: An Iterative, Collaborative, Community-Based Approach. J Med Internet Res. 2019;21(1):e12128-e.
17. Yoo DW, Birnbaum ML, Van Meter AR, Ali AF, Arenare E, Abowd GD, et al. Designing a Clinician-Facing Tool for Using Insights From Patients' Social Media Activity: Iterative Co-Design Approach. JMIR Ment health. 2020;7(8):e16969-e.
18. Wachter SB, Agutter J, Syroid N, Drews F, Weinger MB, Westenskow D. The Employment of an Iterative Design Process to Develop a Pulmonary Graphical Display. J Am Med Inform Assoc. 2003;10(4):363-72.
19. Patridge EF, Bardyn TP. Research Electronic Data Capture (REDCap). Journal of the Medical Library Association : JMLA. 2018;106(1):142-4.
20. WIX n.d [Available from: https://www.wix.com/.
21. Image Bank - World Obesity Federation: World Obesity Federation; n.d [13 April 2019]. Available from: https://www.worldobesity.org/resources/image-bank
22. Image Bank. Obesity Canada: Obesity Canada; n.d [13 April 2019]. Available from: https://obesitycanada.ca/resources/image-bank/
23. UConn Rudd Center for Food Policy and Obesity: Rudd Center Image Library; n.d. [13 April 2019]. Available from: http://www.uconnruddcenter.org/image-library
24. OAC Image Gallery .Obesity Action Coalition: Obesity Action Coalition; n.d. [Available from: https://www.obesityaction.org/get-educated/public-resources/oac-image-gallery/.
25. Ads Manager Basics Facebook for Business; n.d [Available from: https://www.facebook.com/business/help/415745401805534.
26. Smith AL, Chapman S, Dunlop SM. What do we know about unassisted smoking cessation in Australia? A systematic review. Tob Control. 2015 Jan;24(1):18-27
27. Hartmann-Boyce J, Jebb SA, Fletcher BR, Aveyard P. Self-help for weight loss in overweight and obese adults: Systematic review and meta-analysis. Am J Public Health. 2015;105(3):e43-e57.
28. Santos I, Sniehotta FF, Marques MM, Carraça EV, Teixeira PJ. Prevalence of personal weight control attempts in adults: a systematic review and meta-analysis. Obes Rev. 2017;18(1):32-50.
29. Miller WR, Lasiter S, Bartlett Ellis R, Buelow JM. Chronic disease self-management: A hybrid concept analysis. Nurs Outlook. 2015;63(2):154-61.
30. Clinical Practice Guidelines for the Management of Overweight and Obesity in Adults, Adolescents and Children in Australia (2013) | National Health and Medical Research Council [Internet]. Nhmrc.gov.au. 2018 [cited 28 June 2018]. Available from: https://www.nhmrc.gov.au/guidelines-publications/n57.
31. Williamson DA, Bray GA, Ryan DH. Is 5% weight loss a satisfactory criterion to define clinically significant weight loss? Obesity. 2015;23(12):2319-20.
32. Sumithran P, Proietto J. The defence of body weight: a physiological basis for weight regain after weight loss. Clinical science (London, England : 1979). 2013;124(4):231-41.

33. Grima M, Dixon JB. Obesity: Recommendations for management in general practice and beyond. Aust Fam Physician. 2013;42(8):532-41.
34. Klem ML, Wing RR, McGuire MT, Seagle HM, Hill JO. A descriptive study of individuals successful at long-term maintenance of substantial weight loss. Am J Clinical Nutr. 1997;66(2):239.
35. Stevens J, Truesdale KP, Mcclain JE, Cai J. The definition of weight maintenance. Int J Obes. 2005;30(3):391.
36. Meadows KA. So you want to do research? 5: Questionnaire design. Br J Community Nurs. 2003;8(12):562-70.
37. NSW Population Health Survey 2019 Collection Year (Version: 30/06/2020) 2019 Available from: https://www.health.nsw.gov.au/surveys/adult/Documents/questionnaire-2019.pdf.
38. National Nutrition and Physical Activity Survey
2011-12 2011-12 Available from: https://tinyurl.com/246jbwc4.
39. 45 and Up Study - Questionnaires: SAX Institute; [Available from: https://www.saxinstitute.org.au/our-work/45-up-study/questionnaires/.
40. International Physical Activity Questionnaire - October 2002 [Available from: http://www.sdp.univ.fvg.it/sites/default/files/IPAQ_English_self-admin_long.pdf.
41. Craig CL, Marshall AL, Sjostrom M, Bauman A, Booth ML, Ainsworth BE, Pratt M, Ekelund U, Yngve A, Sallis JF, Oja P, International Physical Activity Questionnaire: 12-country reliability and validity. Medicine and Science in Sports and Exercise. 2003, 35: 1381-1395. 10.1249/01.MSS.0000078924.61453.FB.
42. The Active Australia Survey: a guide and manual for implementation, analysis and reporting: AIHW; [Available from: https://www.aihw.gov.au/reports/physical-activity/active-australia-survey/summary.
43. Australian Government, Department of Health, 'Lifescripts practice manual: supporting lifestyle risk factor management in general practice' 2nd edn, (Canberra: Commonwealth of Australia, 2010) [Available from:
https://goodfoodresources.com/sites/default/files/07%20GP.Lifescripts.Nutrition.pdf
44. Santos AL, Pasquali R, Marcon SS. Feelings and living experiences of individuals taking part in a support groupfor control of obesity: An exploratory study. Online Brazilian Journal of Nursing. 2012;11(1):3-13.
45. Rasmussen N. Stigma and the addiction paradigm for obesity: Lessons from 1950s America. Addiction. 2015;110(2):217-25.
46. Elfhag K, Rössner S. Who succeeds in maintaining weight loss? A conceptual review of factors associated with weight loss maintenance and weight regain. Obes Rev. 2005 Feb;6(1):67-85
47. Stunkard AJ, Messick S. The three-factor eating questionnaire to measure dietary restraint, disinhibition and hunger. J Psychosom Res. 1985;29(1):71-83.
48. Maeda H. Response option configuration of online administered Likert scales. International Journal of Social Research Methodology. 2015;18(1):15-26.
49. Dillman DA. Internet, phone, mail, and mixed-mode surveys : the tailored design method. Fourth edition. ed. Smyth JD, Christian LM, editors. Hoboken, New Jersey: Wiley; 2014.
50. Dillman DA, Sinclair MD, Clark JR. Effects of Questionnaire Length, Respondent-Friendly Design, and a Difficult Question on Response Rates for Occupant-Addressed Census Mail Surveys. The Public Opinion Quarterly. 1993;57(3):289-304.

51. Don A. Dillman RT, Dennis Bowker. Principles for Constructing Web Surveys. 1999.
52. Schonlau M, Fricker RD, Elliott MN. GUIDELINES FOR DESIGNING AND IMPLEMENTING INTERNET SURVEYS. Conducting Research Surveys via E-mail and the Web: RAND Corporation; 2002. p. 41-54.
53. Parkinson B, Meacock R, Sutton M, Fichera E, Mills N, Shorter GW, et al. Designing and using incentives to support recruitment and retention in clinical trials: a scoping review and a checklist for design. Trials. 2019;20(1):624-.
54. Singer E, Ye C. The Use and Effects of Incentives in Surveys. The ANNALS of the American Academy of Political and Social Science. 2013;645(1):112-41.
55. IBM SPSS software. 27 ed.
56. Ghasemi, A., & Zahediasl, S. (2012). Normality tests for statistical analysis: a guide for non-statisticians. Int J Endocrinol Metab. Spring 2012;10(2):486-9.
57. Landau S, Everitt B. A handbook of statistical analyses using SPSS. Boca Raton, Fla.;: Chapman & Hall/CRC; 2004.
58. Pallant J. SPSS survival manual : a step by step guide to data analysis using IBM SPSS. 7th edition. ed. S.l: ALLEN & UNWIN; 2020.
59. Fávero LP, Belfiore PP. Data science for business and decision making. First edition. ed. London, United Kingdom ;: Academic Press; 2019.
60. Norusis MJ. IBM SPSS statistics 19 statistical procedures companion. Upper Saddle River, New Jersey: Prentice Hall; 2012.
61. Rundle-Thiele S, Kubacki K, Tkaczynski A, Parkinson J. Using two-step cluster analysis to identify homogeneous physical activity groups. Marketing Intelligence & Planning. 2015;33(4):522-37.
62. Green MA, Strong M, Razak F, Subramanian SV, Relton C, Bissell P. Who are the obese? A cluster analysis exploring subgroups of the obese. J Public Health (Oxf). 2016;38(2):258-64.
63. Heshka S, Greenway F, Anderson JW, Atkinson RL, Hill JO, Phinney SD, et al. Self-help weight loss versus a structured commercial program after 26 weeks: A randomized controlled study. Am J Med. 2000;109(4):282-7.
64. Vaismoradi M, Turunen H, Bondas T. Content analysis and thematic analysis: Implications for conducting a qualitative descriptive study. Nurs Health Sci. 2013;15(3):398-405.
65. Neuendorf, K. A. (2019). Content analysis and thematic analysis. In P. Brough (Ed.), Research methods for applied psychologists: Design, analysis and reporting New York: Routledge; 2019.
66. Braun V, Clarke V. Using thematic analysis in psychology. Qual Res Psychol. 2006;3(2):77-101.
67. Maguire M, Delahunt B, editors. Doing a thematic analysis: A practical, step-by-step guide for learning and teaching scholars2017.
68. Green J, Thorogood N. Qualitative methods for health research. 4th edition. ed. London; SAGE Publications Ltd; 2018.
69. Mitchell EJ, Ahmed K, Breeman S, Cotton S, Constable L, Ferry G, et al. It is unprecedented: trial management during the COVID-19 pandemic and beyond. Trials. 2020;21(1):784.
70. Gelinas, L., Pierce, R., Winkler, S., Cohen, I. G., Lynch, H. F., & Bierer, B. E. Using Social Media as a Research Recruitment Tool: Ethical Issues and Recommendations. Am J Bioeth. 2017 Mar;17(3):3-14.

Chapter 3: Standard Baseline Data Collections in Obesity Management Clinics: A Delphi Study with Recommendations from an Expert Panel

Baseline patient data collected upon commencement of obesity management can help clinicians with diagnosis and inform strategies and plans, and can help in reviewing effectiveness of treatment provided. While the focus of this research is on those in the community who do not access professional or clinical help in their weight loss, data deemed appropriate and necessary to collect on those beginning a weight management program within a health professional-led clinical environment will advise what information is important to collect about self-managed weight loss. While clinical guidelines are available for the management of obesity, this thesis identified a gap where there no standardised list of patient baseline data items that should be collected by obesity treatment professionals on a participant entering a program of weight management. The study below used the Delphi technique to build consensus among obesity experts in Australia, and a standardised list was produced. The published study is presented below.

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ORIGINAL RESEARCH ARTICLE

Standard baseline data collections in obesity management clinics: A Delphi study with recommendations from an expert panel

Divya Ramachandran[1,2] | Evan Atlantis[3,4] | Tania Markovic[1,2,5,6] | Samantha Hocking[1,2,5,6] | Timothy Gill[1,2]

[1]The Boden Institute of Obesity, Nutrition, Exercise & Eating Disorders, Sydney School of Public Health, University of Sydney, Sydney, Australia

[2]Charles Perkins Centre, Faculty of Medicine and Health, University of Sydney, Sydney, Australia

[3]School of Nursing and Midwifery, Western Sydney University, Sydney, Australia

[4]School of Medicine, The University of Adelaide, Adelaide, Australia

[5]Metabolism and Obesity Services, Royal Prince Alfred Hospital, Sydney, Australia

[6]Central Clinical School, Faculty of Medicine and Health, University of Sydney, Sydney, Australia

Correspondence
Divya Ramachandran, The Boden Institute, Level 2, Charles Perkins Centre, D 17 Johns Hopkins Drive, Camperdown, NSW 2006, Australia.
Email: divya.ramachandran@sydney.edu.au

We aimed to develop an expert consensus on standardizing data collections in specialist obesity management clinics in Australia. A panel of 16 experts participated in a structured consensus-driven Delphi process to reach agreement on a minimum set of baseline patient data collections for consideration in specialist obesity services. The panel included surgeons, clinicians, allied health professionals (dietician, exercise physiologist, psychologist), a bariatric nurse and obesity researchers. We produced a recommended list of core and useful data items that should comprise the baseline patient data set. Consensus was achieved for recommended measures of demographic, anthropometric, biochemical, weight-loss history, medication, medical history and comorbidity data items using a 70% agreement threshold. In this iterative process, there was also consideration of specific data items for patients referred for bariatric surgery. We present the first expert panel consensus on recommendations for a minimum and standard set of baseline patient data collections in obesity management services in Australia. These may be relevant to other countries with similar obesity management service models. Implementation of these recommendations should facilitate data pooling for clinical audits and research collaborations across clinics seeking to improve the quality of specialist obesity care.

KEYWORDS
data collection, Delphi studies, obesity, obesity management systems, outpatient clinics, weight loss

1 | INTRODUCTION

Obesity is a disease state of excessive accumulation of adipose tissue, causing a range of serious health issues worldwide. In Australia, nearly 28% of the adult population is classified as obese with a body mass index (BMI) of ≥30 kg/m^2.[1,2] Australian clinical practice guidelines for the management of obesity, recommend that patients with BMI >35 kg/m^2 or >30 kg/m^2 with comorbidities be provided referral to specialist healthcare professionals and obesity management clinics to support lifestyle and intensive interventions, as well as manage comorbidities.[3] This is consistent with recommendations in other countries with similar healthcare systems including the United Kingdom,[4,5] Canada[6] and New Zealand.[7]

Specialist obesity management services including care by multidisciplinary teams[8] and treatment with pharmacotherapy[9] and bariatric surgery[10] have been shown to be effective for improving health outcomes for patients with obesity.[11–13] In Australia, these services have arisen ad hoc and include services in both the public and private health sector. Specialist obesity services in public hospitals in Australia have been described in detail by the Clinical Obesity Services in Public Hospitals (COSiPH) collaborators, including variations in the composition of services, limitation of access to obesity services by geography, disease severity and cost and inadequate resourcing of clinics, including both staff and infrastructure, along with recommendations for improvements.[14] One of the recommendations put forth by the panel of experts in the COSiPH Working Group was a systematic capturing of minimum and standardized clinical data for ongoing monitoring and evaluation within services and to promote collaboration between services, such as information sharing for quality assurance as well as data linkage for future research purposes.

Presently, there is an increased priority to harness health data to reform the health sector.[15] The problem of data fragmentation in Australia, with separate data collections that are not comparable from one jurisdiction to another has been highlighted as an issue across all health areas and diseases.[16,17] Achieving systematic and standardized capturing of health data in obesity management clinics in Australia, requires a consensus between experts on minimum clinically important data collections in patients with obesity. Current data collections are likely to vary substantially among individual clinics, different healthcare specializations and distinct professionals, such as endocrinology, bariatric surgery, dietetics, exercise physiology or psychology. Other than that, driven by routine hospital reporting,[18] there is no uniform data collection across medical obesity services, nor common baseline data that provides a complete profile of patients with obesity. By contrast, the bariatric surgery registry in Australia was established in 2009 and provides a framework for standardizing data for patients who have had bariatric surgery. The contribution to this database is voluntary rather than mandatory and focuses on a small number of outcomes.[19] A minimum list of baseline data collections for all patients receiving specialized obesity services may facilitate data pooling for clinical audits and research collaborations across clinics seeking to improve the quality of specialist obesity care in the future.

To address this issue, we aimed to develop an expert consensus on standard or minimum data collections in specialist obesity management clinics in Australia. This paper presents the findings of a Delphi study used to develop an expert consensus on recommendations for standard baseline data collections in obesity management clinics.

WHAT IS ALREADY KNOWN ABOUT THIS SUBJECT

- Specialist obesity management services (or clinics) variably provide physician-led intensive multidisciplinary team care, including behavioural interventions, weight-loss pharmacotherapies and access to bariatric surgery for patients with severe obesity and complex care needs.
- Data collections vary substantially among specialist obesity management clinics, which limits data pooling for clinical audit, health service planning and research activities for improving quality of care.
- Expert recommendations for standard patient data collections in obesity management clinics are absent.

WHAT THIS STUDY ADDS

- This is the first expert panel consensus on recommendations for standard baseline patient data collections in obesity management clinics in Australia, which may also be relevant to similar health settings worldwide.
- These recommendations inform physicians, bariatric surgeons and healthcare professionals providing specialized obesity management services on a minimum set of baseline patient data collections for consideration.
- Implementation of these recommendations should facilitate data pooling for clinical audits and research collaborations across clinics seeking to improve the quality of specialist obesity care.

2 | MATERIALS AND METHODS

2.1 | Purpose and rationale

Since the purpose of our study was to develop an expert consensus on a standard set of baseline data collections in obesity management clinics, we used the Delphi technique. The Delphi technique is an iterative expert consultation and consensus building process that is accepted as relevant evidence in the field of health care and research.[20,21] This paper follows the proposed standards for Guidance on Conducting and Reporting Delphi Studies (CREDES).[22]

2.2 | Expert panel

A range of experienced healthcare professionals and researchers working in clinical obesity management were invited to participate on the expert panel. A recruitment email with participant information was distributed to 38 experts identified from the following:

1. An email group-list of surgeons, clinicians, allied health professionals and researchers who work in the area of obesity management and who have previously been identified and worked with The Boden Institute of Obesity, Nutrition, Exercise and Eating Disorders.
2. Members of the COSiPH Working Group
3. Additional experts selected from the member lists of Obesity Surgery Society of Australia and New Zealand (OSSANZ), and Australia and New Zealand Obesity Society (ANZOS).

In addition, we invited seven private obesity management hospitals and clinics identified through an internet search using a combination of a range of search terms: "obesity management services," "metabolic clinic" and "bariatric surgery" (limiting geographical scope within Australia).

2.3 | Description of the methods

As a first step we reviewed literature for any existing recommendations on baseline data collection at obesity clinics. While we did not find existing recommendations, we identified a number of guidelines for obesity management.[3,5,23–26] To inform our understanding of the patient data collections that could be useful in practice, in addition to reviewing the guidelines, we also referred to a working group discussion document prepared by healthcare professionals from the Metabolism and Obesity Services of Royal Prince Alfred

Hospital (the first obesity management service established in a tertiary hospital in Australia), which defined minimum data items for reporting within the hospital. We used these sources to identify and evolve categories of data relevant to patient care to develop the survey. Eight categories of data were identified – demographic data, anthropometric data, biochemical measures, medical history and comorbidities, weight loss history, medication and lifestyle risk behaviours.

For Round 1 of the Delphi, an online survey questionnaire was designed to systematically collate expert opinion on potentially important data items within these eight categories. To provide clarity, example data items were provided for each category. After pre-testing the survey, an additional optional open-ended question was included to capture any additional data items considered essential by the experts. The final questionnaire used for Delphi survey Round 1 (Supporting Information Appendix S1) was then made available to experts for 1 month.

Responses received were aggregated and synthesized using a proportion-based ranking of responses for each variable as follows:

- Core variables: 50%-100% of participants
- Useful variables: 30%-49% of participants
- Other variables: 20%-29% of participants

We created a summary of findings (Appendix S2) and designed Round 2 of the Delphi survey (Appendix S3) to seek agreement, disagreement and comments. Round 2 of the online survey was sent only to participants who responded to Round 1. This survey was also made available to experts for 1 month. Responses received were then further analysed.

2.4 | Definition and attainment of consensus

A 70% threshold was used to define attainment of consensus for data items to be included in the final baseline data collection. For data items with at least 20% of agreement between respondents who listed the same change (eg, the ranking of a data item), the change was discussed and implemented with reasons recorded. To provide feedback, we created and shared the final set of data items with all of the participants.

2.5 | Ethics approval

The approval of the University of Sydney ethics committee was obtained prior to commencing the study. The online surveys were hosted on REDCap,[27] a secure database within the University of Sydney.

3 | RESULTS

The stages of the Delphi process are illustrated in Figure 1.

Sixteen experts from specialist obesity services across Australia (endocrinologist: n = 7; surgeons: n = 3; dieticians: n = 2; exercise physiologist: n = 1; psychologist: n = 1; nurse: n = 1; and clinical researcher: n = 1) responded to the first survey. All but one of the 15 health professionals were also involved in research. The experts worked in multiple settings, with 90% working in public hospitals, 45% in specialist clinics, 28% in research institutes and 17% in private hospitals.

Nine out of 16 experts that participated in Round 1 (endocrinologist: n = 4; surgeons: n = 2; dieticians: n = 1; psychologist: n = 1; and researcher: n = 1) responded to the second round of the survey (56% response rate). Work settings included 80% public hospitals, 40% in specialist clinics, 20% in research institutes and 20% in private hospitals.

Table 1 shows the level of agreement among experts in each data category in Round 2. Changes included in the final list and were recommended by 20% or more of the experts are also indicated.

The resulting final baseline data set from the Delphi survey is listed in Table 2. Bariatric surgeons recommended additional data items as core or important for surgery patients and have been included.

While there was consensus on which lifestyle risk behaviours are essential for data collection, this Delphi could not resolve which measurement instruments should be used.

4 | DISCUSSION

We present the first expert panel consensus on recommendations for standard baseline patient data collection in obesity management clinics in Australia. The expert panel had unanimous agreement on demographic, anthropometric and weight loss history data items. Most differences regarding biochemical measures, medical history and comorbidity data items were mostly attributable to differences between the requirements for non-surgical and surgical obesity services.

There was good agreement among the experts that it was essential to collect data on four lifestyle risk behaviours: (a) smoking, (b) alcohol intake, (c) diet and (d) physical activity including structured exercise. Clinicians were familiar with collecting information concerning smoking and alcohol consumption. For instance, the panel mentioned a World Health Organization (WHO) tool called AUDIT (the Alcohol Use Disorders Identification Test) for assessing harmful patterns of alcohol consumption[28] and the WHO STEPwise approach to Surveillance (STEPS), which is a simple, standardized method for collecting, analysing and disseminating data on chronic disease risk.[29] However, there is no tool or questionnaire routinely used for collection of data regarding diet and physical activity across clinical services for obesity management. Further, our expert panel was unable to determine the best instrument to use for lifestyle data collections. However, a range of possible approaches suggested included food frequency questionnaires, diet diaries, number of steps walked and using wearable devices. Existing research tools for assessing diet and physical activity are typically too time consuming for clinical settings.[30,31] Integrating aspects of existing brief assessment tools such as the WHO's AUDIT and STEPS could be considered in a busy clinical service for the purposes of assessment, patient education and evaluation of the extent of behaviour change.

Currently, the bariatric surgery registry collects baseline data and outcome measures for patients undergoing bariatric surgery across

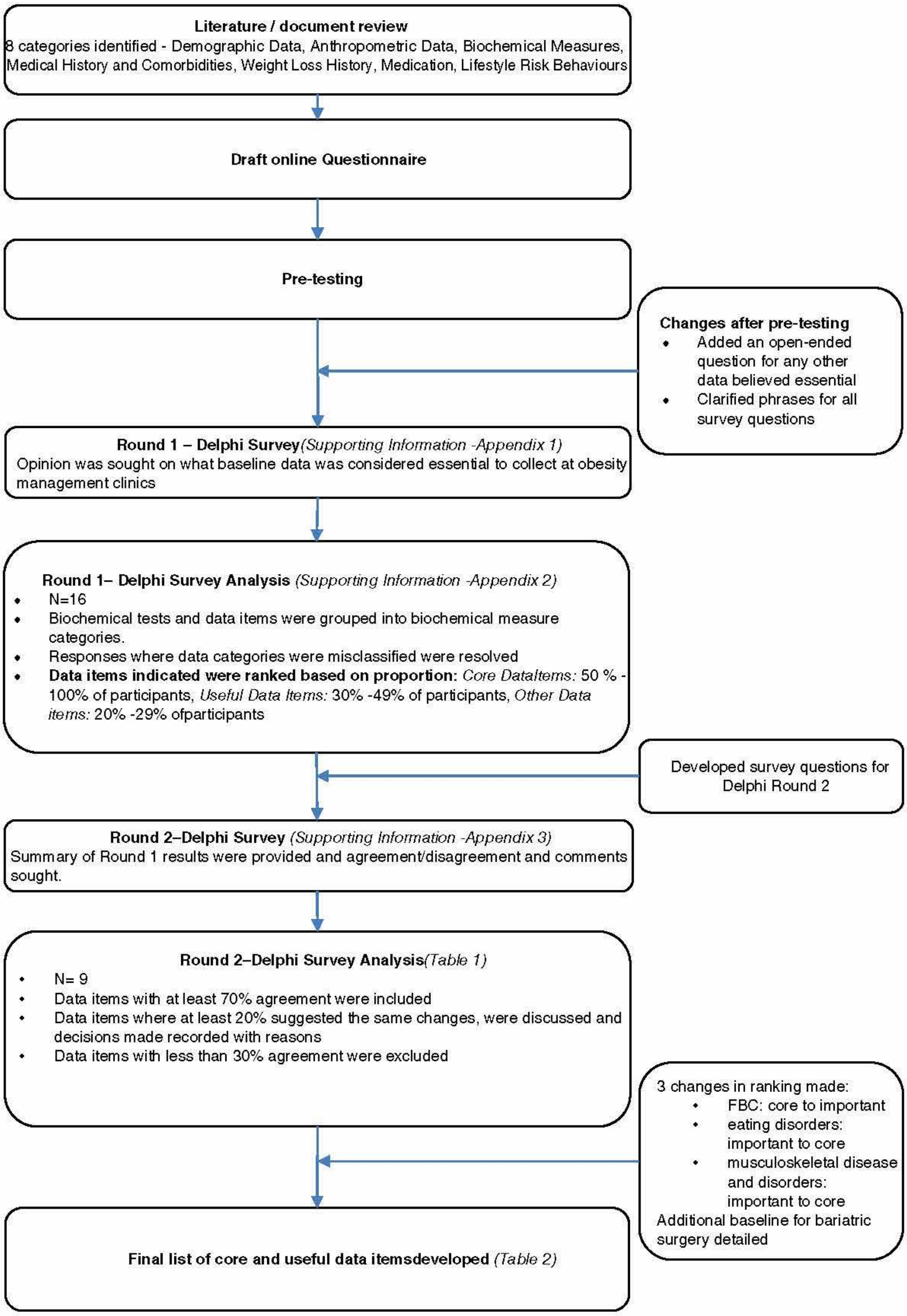

FIGURE 1 Stages of the Delphi process

public and private hospitals in Australia and New Zealand. The purpose of the registry is to assess surgical outcomes, collate peri-operative and post-operative complications, and undertake research. Participation in the registry is voluntary and contributors to the database also provide financial support to offset the costs of maintaining the registry. Although the database is extensive, it does not contain a comprehensive array of data on individual patients. The BARIACT Project in the United Kingdom has also examined how best to monitor the benefits and adverse events associated with bariatric and metabolic surgery and produced a comprehensive list of outcome measures

TABLE 1 Level of agreement on baseline data variables to be collected by obesity management clinics upon patient attendance in Round 2

Data category	Level of agreement (%)	Recommended changes (%)
Demographic data	100	No change
Anthropometric data	100	BP included in Core (20%)
Biochemical measures	70	FBC moved from Core to Important (20%) Bariatric surgery: include calcium, vitamin D, PTH, iron studies, B_{12} as Core (20%)
Medical history and comorbidities	70	Musculoskeletal disease and joint disorders (arthritis, back pain) added to core variables (40%) eating disorders moved to core variables (30%)
Weight loss history	80	Eating disorders as above
Medication	70	Insulin is a glucose lowering medication and does not need to be listed separately from other medications for diabetes (20%) Anti-hypertensive drugs moved to core (20%)
Lifestyle risk behaviours	100	No consistency in measurement tools to use. Need for standardized measures

Abbreviations: BP, blood pressure; FBC, full blood count; PTH, parathyroid hormone.

for practice and research.[32] The BARIACT core outcome set is substantially different from the list of data items produced by our study, as the focus of their work was developing uniform data sets to study the outcomes from one form of intervention for persons with severe obesity. Our study was intended to develop a core set of data to ensure uniform assessment of persons with severe obesity and complex care needs who are being enrolled in a multidisciplinary weight management clinic and to assess outcomes regardless of the therapeutic regime they adopt.

As highlighted earlier, a search of literature revealed that there are several existing clinical guidelines for obesity management.[3,5,23–26] While these clinical guidelines suggest broad patient parameters, they lack guidance on specific patient data that are important for screening for obesity-related comorbidities or determining pathways for management of obesity and its complications. The findings from our Delphi study are compatible with the broader parameters listed in the clinical guidelines we reviewed,[3,23–26,33] although some parameters mentioned in these guidelines were either not raised or not raised by a sufficient number of experts on our panel. Key examples include an assessment for the presence of polycystic ovarian syndrome in women,[3,26] readiness for weight loss or lifestyle change[3,5,24] and review of genetic factors that may cause obesity.[23–25,33] All guidelines included assessment of a range of measures of mental disorders, particularly depression and mood disorders. In line with this, our panel also identified a history of mental health and psychiatric disorders as a core variable in this Delphi study.

The purpose of this study was to establish the baseline patient data essential for clinical care and future monitoring of persons with

TABLE 2 Baseline data to be collected by obesity management clinics on patient admission – Delphi survey results

Category	Core data	Useful data
Demographic data	Age, sex, ethnicity, socioeconomic status	
Anthropometric data	Weight, height, waist circumference, blood pressure	
Biochemical measures	Lipids (total cholesterol, LDL, HDL, triglycerides)	Insulin (fasting insulin, C-peptide)
	Glucose control (HbA1c, fasting glucose)	Iron studies
	Liver function (ALT, AST, GGT)	Thyroid function (TSH)
	Renal function (EUC or creatinine, eGFR)	Vitamin D (25-OH VitD, PTH)
	In case of bariatric surgery patients:	Sex hormones (testosterone, SHBG, LH, FSH, E2)
	Calcium	Nutrition: folate, B_{12}
	Vitamin D (25-OH VitD, PTH)	Haematology (FBC)
	Iron studies	
	Nutrition: (B_{12})	
Medical history and comorbidities	Diabetes, hypertension, sleep apnoea, mental health and psychiatric disorders, musculoskeletal disease and joint disorders (arthritis, back pain), eating disorders	Cardiovascular diseases, dyslipidaemia, liver abnormality, dyspepsia, addictions and substance abuse In case of bariatric surgery patients: Surgical history, fertility issues, addictions, dysphagia, thromboembolic disease, GORD history
Weight loss history	Previous weight loss attempts, weight over lifespan, age of onset of obesity	Family history of obesity
Medication	All medications, but attention to diabetes medication, weight-loss medication, anti-psychotics and anti-depressants, anti-coagulants, anti-hypertensive drugs	Glucocorticoids
Lifestyle risk behaviours	Diet, smoking, alcohol intake, physical activity and exercise	Sleep

ALT, alanine aminotransferase; AST, aspartate aminotransferase; eGFR, estimated glomerular filtration rate; E2, estradiol; EUC, electrolytes urea creatinine; FSH, follicle-stimulating hormone; GGT, gamma-glutamyltransferase; GORD, gastro-oesophageal reflux disease; HDL, high-density lipoprotein; LDL, low-density lipoprotein; LH, luteinizing hormone; PTH, parathyroid hormone; SHBG, sex-hormone-binding globulin; TSH, thyrotrophin.

obesity being managed in obesity management services. In this initial study, we focused on outcomes that the clinicians determined to be appropriate rather than attempting to also capture the outcomes deemed a priority by those persons whose weight problems are being managed within these clinics. This is an area that could be explored in further work. In addition, we did not attempt to determine feasibility or constraints of collecting this data by such services, although efficient ways of collecting and managing the data can be envisaged. For example, one of the panellists recommended patients complete an electronic form to collect demographic and lifestyle data during or before their first visit to the clinic. Electronic patient records are prevalent within the Australian healthcare system and their value and usage have been the subject of widespread discussion with the development and operation of a consolidated online personal health record system which is set to become opt-out by end of 2018.[34]

The Delphi technique is increasingly becoming an important tool in establishing consensus to address issues in healthcare and health research.[20–22] In our experience, we found the Delphi framework a simple but effective mechanism for facilitating agreement. Since the survey was online, it proved efficient in involvement of experts regardless of their geographical location. Our study design also allowed flexibility for respondents to respond in their own time within a 1-month time frame. This is ideally suited to obtaining input from professionals with busy schedules, where bringing professionals together at the same time is highly unlikely. The CREDES framework[22] provides a clear structure for reporting the study.

A possible risk in running an online Delphi process, is that some obvious items may be overlooked in the iteration process. For example, in our study quality-of-life (QoL) data was not reflected in the final data sheet produced, although it is widely recognized as an important health indicator, and we know that it is collected by most of the obesity clinics. Although QoL was identified in Round 1 by only one panellist, it was not commented on in Round 2, and therefore was not included in the final datasheet. This we believe is a result of oversight, rather than disagreement among experts. As with any process, we recommend that Delphi process is used sensibly and that applications of results should evolve in practice.

4.1 | Strengths and limitations of study

The main limitation of our study was that the expert panel consisted of a small number of representatives. Respondents were mainly endocrinologists and surgeons, 90% of whom worked in public hospitals. Representation from allied health professionals was limited, as was representation from clinicians working in the private sector. Despite these limitations, the participants consisted of those most qualified to provide expert opinions, as they are currently practicing clinicians in specialist obesity services and many also have an involvement in research in this area. The workload of these professionals creates significant time constraints, and the drop-out rate in our study (only nine from an initial 16 respondents participated in Round 2), reflected this. Despite the high drop-out rate, we achieved consensus between at least two-thirds of the experts on all of the categories which we believe justified our decision to not conduct further polling.[35] Instead we shared findings with all participants, including the list of variables that did not make the final list (Appendix S4). This study could not resolve what instruments would be best to capture lifestyle data. We recommend further studies recruiting allied health professionals who manage obesity to resolve these unanswered questions. Further analysis is also suggested to identify feasible mechanisms for collection and management of this data and their relevance to other services (including primary healthcare services) that manage persons with obesity.

In order to do a contained study within optimum time frames, we did not carry out a systematic review of published papers on baseline data set items for patients with obesity. We acknowledge this is a limitation in the study. However, the recommendations obtained from this Delphi study are compatible with the existing obesity management guidelines of comparable countries.

However, in light of the limitations discussed, we feel that additional research is needed to generate broad expert consensus on the minimum data collections across the full range of clinical obesity services provided within each relevant healthcare system. We believe that the list of baseline data items we produced provides an important starting point for transforming current data collection practices across clinical obesity services worldwide.

5 | CONCLUSION

We present the first expert panel consensus on recommendations for standard baseline patient data collections in obesity management clinics in Australia, which might also be relevant to other similar health settings worldwide. The results of this study should assist future efforts in standardizing data collection in patients with obesity, enabling better patient care, future monitoring and evaluation of health services, as well as research efforts to improve the health of people with obesity in Australia and elsewhere.

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CONFLICTS OF INTEREST

D.R. reports personal fees from The Boden Institute of Obesity, Nutrition, Exercise and Eating Disorders, Prevention Research Collaboration and Capital Market Cooperative Research Centre, Sydney, NSW, Australia, outside the submitted work. E.A. reports personal fees from Novo Nordisk, outside the submitted work. T.M. reports personal fees from NovoNordisk, outside the submitted work. No conflict of interest was declared for S.H. and T.G.

AUTHOR CONTRIBUTION

D.R. designed and executed the project and analysed the data, under the supervisory guidance of T.G. E.A. assisted with recruitment of experts in the Clinical Obesity Services in Public Hospitals group. All authors provided intellectual and professional insights, and were involved with writing the paper. All authors had final approval of the submitted and published versions.

ORCID

Divya Ramachandran https://orcid.org/0000-0001-6311-9795

Evan Atlantis https://orcid.org/0000-0001-5877-6141

REFERENCES

1. Australian Bureau of Statistics. *National Health Survey: First Results, 2014–15*. Canberra, Australia: Australian Bureau of Statistics [updated December 8, 2015]. http://www.abs.gov.au/ausstats/abs@.nsf/mf/4364.0.55.001. Accessed September 27, 2018.
2. Sharman MJ, Breslin MC, Kuzminov A, et al. Population estimates and characteristics of Australians potentially eligible for bariatric surgery: findings from the 2011-13 Australian Health Survey. *Aust Health Rev*. 2017. https://doi.org/10.1071/AH16255.
3. National Health and Medical Research Council. *Clinical Practice Guidelines for the Management of Overweight and Obesity in Adults, Adolescents and Children in Australia* (2013); 2018. https://www.nhmrc.gov.au/guidelines-publications/n57. Accessed June 28, 2018.
4. Welbourn R, Hopkins J, Dixon JB, et al. Commissioning guidance for weight assessment and management in adults and children with severe complex obesity: weight assessment and management clinics. *Obes Rev*. 2018;19(1):14-27.
5. NICE. *Obesity: Clinical Assessment and Management. Guidance and Guidelines*; 2018. https://www.nice.org.uk/guidance/qs127. Accessed September 27, 2018.
6. Lau DCW, Douketis JD, Morrison KM, et al. 2006 Canadian clinical practice guidelines on the management and prevention of obesity in adults and children [summary]. *CMAJ*. 2007;176(8):S1-S13.
7. Ministry of Health New Zealand. *Clinical Guidelines for Weight Management in New Zealand Adults*; 2018. https://www.health.govt.nz/publication/clinical-guidelines-weight-management-new-zealand-adults. Accessed August 7, 2018.
8. Flodgren G, Deane K, Dickinson HO, et al. Interventions to change the behaviour of health professionals and the organisation of care to promote weight reduction in overweight and obese people. *Cochrane Database Syst Rev*. 2010;(3);CD000984.
9. Franz MJ, VanWormer JJ, Crain AL, et al. Weight-loss outcomes: a systematic review and meta-analysis of weight-loss clinical trials with a minimum 1-year follow-up. *J Am Diet Assoc*. 2007;107(10):1755-1767.
10. Gloy VL, Briel M, Bhatt DL, et al. Bariatric surgery versus nonsurgical treatment for obesity: a systematic review and metaanalysis of randomised controlled trials. *BMJ*. 2013;347:f5934.
11. Sumithran P, Prendergast LA, Haywood CJ, Houlihan CA, Proietto J. Review of 3-year outcomes of a very-low-energy diet-based outpatient obesity treatment programme: review of weight clinic 3-year outcomes. *Clin Obes*. 2016;6(2):101-107.
12. Lih A, Pereira L, Bishay RH, et al. A novel multidisciplinary intervention for long-term weight loss and glycaemic control in obese patients with diabetes. *J Diabetes Res*. 2015;2015:1-7.
13. Bishay RH, Omari A, Lih A, Kormas N, Zang J. Divide and conquer: the multidisciplinary approach to achieving significant long-term weight loss and improved glycemic control in obese patients with type 2 diabetes. *Clin Diabetes*. 2013;31(1):14-20.
14. Atlantis E, Kormas N, Samaras K, et al. Clinical obesity services in public hospitals in Australia: a position statement based on expert consensus. Expert consensus on clinical obesity services. *Clin Obes*. 2018;8(3):203-210.
15. Council of Australian Governments. *Heads of Agreement Between the Commonwealth and the States and Territories on Public Hospital Funding and Health Reform*. Canberra, Australia: Commonwealth of Australia; 2018. https://www.coag.gov.au/sites/default/files/agreements/heads_agreement_hospital_funding_0.pdf. Accessed July 2, 2018.
16. Productivity Commission. *Data Availability and Use*. Report No. 82. Canberra, Australia: Productivity Commission; 2017
17. Australian Institute of Health and Welfare. *Australia's Health 2018*. Australia's Health Series No. 16. AUS 221. Canberra, Australia: AIHW; 2018.
18. MyHospitals.gov.au. *About the Data – Data Overview*; 2018. https://www.myhospitals.gov.au/about-the-data/data-overview. Accessed November 5, 2018.
19. Bariatric Surgery Registry. *Public Health and Preventive Medicine*; 2018. https://www.monash.edu/medicine/sphpm/registries/bariatric. Accessed September 27, 2018.
20. Obbarius A, van Maasakkers L, Baer L, et al. Standardization of health outcomes assessment for depression and anxiety: recommendations from the ICHOM Depression and Anxiety Working Group. *Qual Life Res*. 2017;26(12):3211-3225.
21. Hasson F, Keeney S, McKenna H. Research guidelines for the Delphi survey technique. *J Adv Nurs*. 2000;32(4):1008-1015.
22. Jünger S, Payne SA, Brine J, Radbruch L, Brearley SG. Guidance on Conducting and REporting DElphi Studies (CREDES) in palliative care: recommendations based on a methodological systematic review. *Palliat Med*. 2017;31:684-706.
23. British Obesity and Metabolic Surgery Services. *Commissioning Guide: Weight Assessment and Management Clinics (Tier 3)*; 2018. http://www.bomss.org.uk/wp-content/uploads/2017/10/Revision-of-Commissioning-guide-Tier-3-clinics-04042017.pdf. Accessed June 28, 2018.
24. Kushner RF. Clinical assessment and management of adult obesity. *Circulation*. 2012;126(24):2870-2877.
25. Yumuk V, Tsigos C, Fried M, et al. European guidelines for obesity management in adults. *Obes Facts*. 2015;8(6):402-424.
26. Diabetessociety.com.au. *The Australian Obesity Management Algorithm*; 2018. https://diabetessociety.com.au/documents/ObesityManagementAlgorithm18.10.2016FINAL.pdf. Accessed June 29, 2018.
27. REDCap. Research Electronic Data Capture; 2018. https://redcap.sydney.edu.au/. Accessed June 28, 2018.
28. World Health Organization. *AUDIT: The Alcohol Use Disorders Identification Test*; 2018. http://www.who.int/substance_abuse/publications/audit/en/. Accessed July 30, 2018.
29. World Health Organization. *STEPwise Approach to Surveillance (STEPS)*; 2018. https://www.who.int/ncds/surveillance/steps/en/. Accessed November 5, 2018.
30. Gibson RS. *Principles of Nutritional Assessment*. New York, NY: Oxford University Press; 1990.
31. Dowd KP, Szeklicki R, Minetto MA, et al. A systematic literature review of reviews on techniques for physical activity measurement in adults: a DEDIPAC study. *Int J Behav Nutr Phys Act*. 2018;15(1):15.
32. Coulman KD, Hopkins J, Brookes ST, et al. A core outcome set for the benefits and adverse events of bariatric and metabolic surgery: the BARIACT project. *PLoS Med*. 2016;13(11):e1002187.
33. Kushner RF, Sorensen KW. Prevention of weight regain following bariatric surgery. *Curr Obes Rep*. 2015;4(2):198-206.
34. Office of the Australian Information Commissioner – OAIC. *My Health Records*; 2018. https://www.oaic.gov.au/privacy-law/other-legislation/my-health-records. Accessed July 2, 2018.
35. Schmidt RC. Managing Delphi surveys using nonparametric statistical techniques. *Decis Sci*. 1997;28(3):763-774.

SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article.

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Supporting Information

Filename	Description
cob12301-sup-0001-AppendixS1.docx Word 2007 document , 26.7 KB	**Appendix S1**. Delphi Survey Round 1 Questionnaire **Appendix S2**. Summary from Delphi Round 1. **Appendix S3**. Delphi Round 3 Questionnaire **Appendix S4**. Summary of Findings from Delphi Round 2

Please note: The publisher is not responsible for the content or functionality of any supporting information supplied by the authors. Any queries (other than missing content) should be directed to the corresponding author for the article.

(See Appendix F1)

Section 2

Chapters 4 and 5

Pilot Study

Chapter 4: An Exploration of Recruitment through Facebook to an Online Survey on Self-managed Weight Loss in Australia—Lessons Learned from a Pilot Study

Reaching and engaging self-managed weight losers in the community was a key challenge that needed careful consideration in this thesis. Those that self-manage or 'DIY' their weight loss are not likely to be engaged with health services such as weight management clinics—the traditional avenues for recruitment for weight management research. Online methods offer the advantage of wide reach across Australia, speed, and reduced workload due to the ease of data collection and management, and do not require participants to physically come into a research centre or clinic.(1, 2)

Having decided to use online methods, our next task was to identify where the population of interest may be found. Social media platforms were an obvious place to look,(3) especially those that may follow popular diet websites, and Facebook page users may presumably be engaged in managing their health and weight.(4, 5) Exploring the most popular websites in Australia that provide nutrition information led to an additional piece of research and a publication titled 'Food Trends and Popular Nutrition Advice Online—Implications for Public Health', which is presented in Appendix A.

A second avenue that was explored was bloggers who share regular updates about their weight loss journeys. Blogger characteristics such as gender, age, country and even education are usually available. Further, as blog posts are chronologically listed in reverse order, they present opportunity for longitudinal research.(6) Data can be extracted through a range of techniques from manual content analysis to sophisticated natural language processing and text mining approaches.(7) A large number of blogs were reviewed, but the data that were gathered did not lend itself to optimally interpretable quantitative analysis. Therefore, this avenue was not pursued.

Recruitment through social media—particularly Facebook—is increasingly reported in health and social research. Combining recruitment through Facebook with effective online survey design was identified as most likely to meet the thesis requirements.

Pilot work was undertaken in this thesis to assess the feasibility of the online processes, methods, and resources to inform the development of a longitudinal study. A key focus area was an iterative design study testing mechanisms of recruitment of research participants within Facebook. This component of the pilot has been submitted to the *International Journal of Social Research Methodologies* and is under review, and presented as submitted below. The supporting online supplementary information submitted along with this paper is included in Appendix F2 in this thesis.

4.1 References

1. Hewson C, Vogel CM, Laurent D. Internet research methods. 2nd edition. ed. London: SAGE Publications Ltd; 2016.
2. Andrews D, Nonnecke, B., Preece, J. Conducting Research on the Internet: Online Survey Design, Development and Implementation Guidelines2003. 185-210 p.
3. Sensis. Social Media Report 2017. 2017.
4. Bennett E, Gough B. In pursuit of leanness: The management of appearance, affect and masculinities within a men's weight loss forum. Health (United Kingdom). 2013;17(3):284-99.
5. Lewis S, Thomas SL, Blood RW, Castle D, Hyde J, Komesaroff PA. 'I'm searching for solutions': Why are obese individuals turning to the Internet for help and support with 'being fat'? Health Expect. 2011;14(4):339-50.
6. Tremayne M. Blogging, citizenship, and the future of media. London ;: Routledge; 2007.
7. Kao A, Poteet SR. Natural Language Processing and Text Mining. London: Springer London; 2007.

An exploration of recruitment through Facebook to an online survey on self-managed weight-loss in Australia – Lessons Learned

Divya Ramachandran, Ang Li and Timothy Gill

Boden Collaboration for Obesity, Nutrition, Exercise and Eating Disorders, University of Sydney, Sydney, Australia

Corresponding Author:
Divya Ramachandran
Address: The Boden Institute, Level 2, Charles Perkins Centre, D 17 Johns Hopkins Drive, Camperdown NSW 2006 Australia;
Email: divya.ramachandran@sydney.edu.au
Twitter: @DivRamachandran
Phone: +61 413234862
ORCID ID: https://orcid.org/0000-0001-6311-9795

Biographical notes:

Divya Ramachandran MPH, is an IT professional with expertise in Learning & Development, Technology Adoption and Change Management. Divya completed a Masters in Public and has worked with different health research organisations, on projects spanning prevention, digital health, and internet research methodologies. She is currently in the final year of a PhD (medicine and health) At the University of Sydney.

Ang Li ng Li, is a Postdoctoral Research Associate, at Charles Perkins Centre, Bodden Collaboration, . She has an MA in Economics and Econometrics and PhD in Economics from the University of Sydney. Her research interests are in health economics, demographic economics, microeconometrics, and public policy. Her current research focuses on assessing the impact of public and social policies as well as the effectiveness of health services and clinical interventions

Timothy Gill BSc (Hons), GradDipDiet, PhD
Professor of Public Health Nutrition & Research Programs Director, Boden Collaboration of Obesity, Nutrition, Exercise & Eating Disorders
Professor Timothy (Tim) Gill is an academic, researcher and public health policy advisor on nutrition, obesity, and chronic disease prevention. He is the Director of Boden Collaboration of Obesity, Nutrition, Exercise and Eating Disorders at University of Sydney. He is experienced in varied aspects of obesity

prevention and management including public policy development and tailoring communication messages around weight management. Professor Gill is past Scientific Secretary for the International Obesity Taskforce (IOTF), London, UK where he coordinated and helped implement IOTF projects worldwide, established formal IOTF links with the Commonwealth of Nations and major UN organisations, and was a regular advisor to WHO consultations on obesity and chronic disease. The work of the IOTF drove a global shift in the designation of obesity from a minor aesthetic issue to a major health concern. Professor Gill has helped develop polices and guidelines on obesity and public health nutrition-related issues for the EU and the UK Government and authored key reports on obesity for Australian Federal and State government departments. He is a member of the Scientific and Technical Advisory Committee, Public Health and Policy, World Obesity Federation.

Recruitment through Facebook to an online survey on self-managed weight-loss in Australia – Lessons Learned

The need for effective online research methods are presently felt more than ever, with the circumstances arising from the pandemic. The use of Facebook, the largest social media platform, for recruitment of research participants were on the rise, even prior to the pandemic for a range of social and health research purposes. However, the understanding of mechanisms and data collection and tracking of recruitment within Facebook are still less understood among researchers. We present our exploration, novel online set-up methods, results, lessons learned and recommendations from recruiting Australian adults to complete an online survey on self-managed weight-loss. Paid advertisements yielded better results (n = 153), than free promotion through Facebook Groups (n= 80), and costed on average AUD 9.95 per completed survey, as did spreading budgets over a 7-day period. Raffle incentives and simplified online consent showed minor improvement in completion rates (7% paid promotions, 4% free promotions). Lessons learned about advertisement copy, targeting and reach, researcher transparency, recruiting through Facebook groups, and tracking conversion rates are discussed.

Keywords: social media; Facebook; recruitment

Introduction

While much research is done online, the flexibility offered by online research methods are more crucial now with the circumstances created by the pandemic (Kara & Khoo, 2020). Use of Facebook for recruitment of research participants were on the rise, even prior to the pandemic for a range of social and health research purposes (Thornton et al., 2016; Whitaker et al., 2017) and demonstrate the variety in methods and results. The ubiquitous nature and penetration of Facebook (Sensis, 2017) presents an attractive means for participant recruitment.

Facebook for recruitment of research participants

Studies using Facebook for recruitment vary widely in purpose, design, and success rates. In an Australian study to examine workplace supports accessed by working parents, participants were recruited to complete a 15-minute online survey (Bennetts et al., 2019). Paid mechanisms yielded 3440 participants and were recruited at a cost of AUD 2.32 per completed survey, with another 1225 participants obtained through free promotions. In a male online mental study (Choi et al., 2017), authors used paid Facebook advertising to recruit 372 men. Costs per participant varied in advertisement sets with different visual and copy, and ranged from AUD 0.55 to AUD 3.85. In a comparison of outcomes of different modes of recruitment used to recruit young adults to a randomized controlled trial (RCT), for prevention of weight gain (Partridge et al., 2015), authors efforts in using paid advertisements yielded only two enrolments at a cost of AUD $945 each.

In the US, examples of outliers are seen. In the field of social sciences, the use of games and novelty to achieve virality was demonstrated on the 'myPersonality' project (Stillwell and Kosinski, 2004). Using a simple snowballing technique that originated with 150 of the authors' Facebook friends, the study went on to attract over 6 million participants in 4 years. However, this was at a time when Facebook games were a novelty. These kinds of projects now compete with well-funded commercial applications (Kosinski et al., 2015). At the other extreme, an attempt to recruit women to a survey of mammogram use (Kapp et al., 2013) authors could not recruit even one participant despite offering incentives.

Recent systematic reviews note that the use of Facebook recruitment in health and social research are increasing rapidly; are cost-effective; and that they are especially useful in accessing hard-to-reach populations (Thornton et al., 2016; Whitaker et al., 2017). However, not only do the rates and costs of vary widely, generalisability is further limited because recruitment has spanned a wide variety of topics, study populations, study designs, and settings, and employ different promotional strategies within Facebook.

Our Study

Obesity is an important public health issue in Australia, with nearly 64% of the population above healthy weight ranges (Overweight and Obesity: an interactive insight, 2020) Studies show that a large proportion of the general adult population are either attempting to lose weight, or trying to maintain weight-loss (Santos et al., 2017). While the general public can access a range of weight-loss intervention options, many try to 'self-manage' or do it on their own without utilising professional help. At present little is known about self-managed weight-loss, how successful they are, and what strategies they employ to achieve success. (Rafiei, 2018)

As part of this broader enquiry into self-managed weight-loss, we wanted to recruit Australian adults about to commence a weight-loss journey on their own, without accessing the services of health professionals or other formal weight management programs. Consequently, recruitment through general practice or through other weight management services was precluded, making these participants difficult to reach. The pervasiveness of Facebook (Clifford et al., 1991) and the prospects of potentially accessing this population led to our own exploration of Facebook for recruitment to our study.

Specifically, we aimed to **a)** compare recruitment rates for paid and free promotion through Facebook groups, and cost per completed survey for paid advertisements **b)** test different advertisement configurations, and iterative improvements to the process (providing incentives, and simplifying online consent forms) and **c)** synthesise lessons learned and recommendations that can be carried forward to recruitment for a future population study.

The results, key lessons learned, and recommendations synthesised from the recruitment process are presented in this paper. The recommendations are of instructional value and relevant for health and social as well as researchers in other areas planning to use Facebook for their research recruitment.

Materials and Methods

This is an exploratory descriptive study, which consisted of iterative design (Eby, 2019) allowing for the adaptation of mechanisms within Facebook advertisement configurations, and recruitment process improvements.

Participants

Persons living in Australia, 18 years or older, who were attempting weight-loss on their own were eligible to participate in the survey.

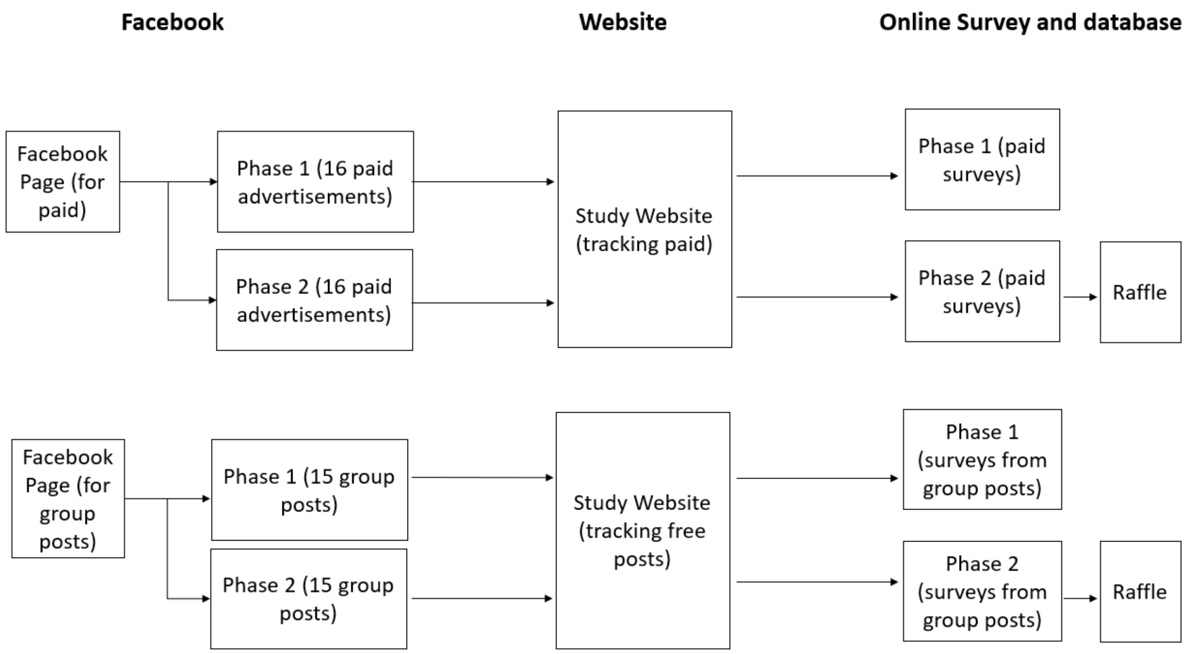
Study Website and Online Survey

Three online platforms were used for the campaign:

- A survey tool with a secure database, which had institutional approval.
- A website creation tool to create the study information website.
- Facebook - to create necessary Facebook Pages to facilitate paid advertisements, and to access online community groups.

The study consisted of two iterations or phases each of both paid and free recruitment mechanisms. In order to track the number of recruitments that came from these four streams of recruitment, we designed the survey set-up illustrated in Figure 1. Two clones of the Facebook Page, Study website as well as the survey were created – one for recruitment through paid advertisements, and one for free promotion through groups. Phase 2 commenced after Phase 1 ended, without any overlapping time periods. This set-up enabled a simple mechanism for tracking each group, while there was no obvious difference for end-users accessing the survey.

Figure 1: Online set up for research recruitment



Advertisement Design

Advertisements consisted of content, one or more images, and a "learn more" button that linked to the study website (a direct link to the online survey was used in one set of advertisement variation). Images were selected from the image banks of obesity organisations (World Obesity Federation, Rudd Center for Food Policy and Obesity, Obesity Canada, and Obesity Action Coalition) as they depict people with obesity in a respectful manner. Examples of the advertisements are available in Appendix 1.

Online Survey Design

The online survey consisted of short questions on demographics, height and weight, lifestyle behaviours, and weight loss strategies, expected to take 25-30 minutes to complete. The survey was tested for usability and technical functionality with a groups of University staff and students, and improvements were made to improve readability and design. The survey was open and not restricted, and could be accessed through links shared on Facebook as well as the study website.

Facebook Recruitment Iterations

The Facebook recruitment campaign consisted of 62 advertisements across two main iterations or phases, and spanned a period of four months (22nd August 2018 to 21st December 2018). *Phase 1* consisted of 16 paid advertisements in four variations (weekday n=4, weekend n=4, 7-day duration n=4, direct link to the survey bypassing information website n=4.); and one free post each in 15 Facebook Groups from whom permission was obtained. *Phase 2* also consisted of 16 paid advertisements and 15 free group posts in the same pattern as Phase 1. However, in Phase 2 there were two modifications. A raffle to win one of three $50 gift vouchers was introduced as an incentive for completing the survey; and to reduce drop-off numbers that were occurring at the consent stage of the survey, formidable legal language of the consent form was simplified to a user-friendly language (Appendix 2)

The target audience for paid promotion was defined as any gender, located in Australia, and aged 18 to 65 years. As initial advertisements showed poor recruitment of males, the target audience for 12 advertisements (8 in Phase 1 with 2 of each variation, and 4 in Phase 2 with 2 of each variation) were set to target men.

The advertisement objective was set to "Traffic" in order to drive traffic outside Facebook to visit the study website. The payment option selected was "*pay-per click"* where payments are made based on the number of link clicks (rather than "pay per impression" where the payment is made based on number of times the advertisement is displayed). (Facebook for Business. CPC (Cost per Link Click), 2020) The maximum budget limit per advertisement was set at AUD 50.

For free advertisements, Facebook groups and pages were searched with terms "weight-loss", "Obesity", "health", "fitness". In addition, large community groups (>=2000 members) that were known to the researchers were also included. In all, administrators of 50 Facebook groups and were contacted for permission to post the advertisements. Fifteen groups provided permission and the researchers posted advertisements in these groups – once each in Phase 1 and Phase 2. Seventeen relevant Facebook Pages were contacted initially, and as there was no response, further pages were not pursued.

Measures Collected

For the paid advertisements, data was collected on reach (the number of unique people in whose screen the advertisement entered), number of link clicks, amount spent in AUD, and the cost per click. This data is available within Facebook Ad Manager section. From the survey database, the number of surveys attempted, complete, and incomplete were collected, and the cost per completed survey was calculated.

For the free promotion through posting in groups, the total number of surveys (complete and incomplete) were collected.

For Phase 1 of the survey, details for each advertisement variation (weekday, weekend, 7-day duration, and direct link to the survey, targeted at men) was collected. In Phase 2, due to time limitations and the upcoming Christmas season, some advertisements were promoted concurrently and therefore only total numbers of surveys were collected and recruitments could not be not be linked to individual advertisements.

Completion rates and costs were calculated following CHERRIES (Checklist for Reporting Results of Internet E-Surveys)(Eysenbach, 2004)

Assessing the representativeness of the sample

The population of interest in this study are Australian adults who are attempting weight-loss on their own. Previously researched groups in the area of weight-loss are usually people with obesity attending weight management clinics or intervention research, and therefore different from our population of interest who are self-managed. To our knowledge this segment has not been previously researched. As such, direct comparisons were not possible. However, we did compare the demographic characteristics and BMI of the sample with the Australian population data. (ABS, n.d & AIHW, n.d).

Iterative design improvement

As we aimed to recruit the maximum numbers possible, the recruitment process was iterative, with changes and improvements. Data was collected or major iterative changes (Phases 1 and 2, and variations in advertisement configurations), but not for minor changes (for example, use of a single image or multiple images used in the advertisement). What worked and did not, were debriefed, and regularly discussed and reflected upon, and then the next change made, through-out the duration of the recruitment. These informed the Lessons learned and recommendations made in this paper.

Ethical approval and Informed Consent

The Human Research Ethics Committee of the University of Sydney approved this study (protocol number: 2018/526). Participants were informed details about the purpose of the study, researchers involved, data collection, storage and privacy, duration of the survey and risks through a) a detailed study website b) the online consent form included prior to the survey questions. Only participants who agreed, were able to proceed to the survey.

Results

Table 1 shows the results for the four-month Facebook recruitment campaign. A total of 407 participants accessed the survey, of whom 57% (N=233) completed the entire survey. Of those who completed the survey, about 65% of the participants (N = 153) were acquired through paid advertising, whereas the remaining (N=80) were acquired through free promotions among Facebook Groups. Survey completion rate in the free campaign was only slightly higher at 63% compared with the paid campaign at 56%.

Table 1: Participants recruited through paid advertisements and free promotions in groups on Facebook

Type of Promotion	**Accessed survey**	**complete**	**incomplete**	**Completion rate (%)**
Paid advertisements	272	153	119	56%
Free promotion in Groups	127	80	47	63%
Total	**407**	**233**	**127**	**57%**

In all, there were a total of 64 advertisements (34 paid, and 30 group posts). Two of the paid advertisements did not run the entire duration specified due to a Facebook error. These two promotions yielded 8 surveys (4 complete and 4 incomplete). These two advertisements (n= 1 for 7-day targeting men, and n=1 for weekday) were excluded, leaving N = 62 advertisements for analysis.

Table 2: Comparison of results of Phase 1 and Phase 2 Facebook recruitment campaign

Ad Phase	**Count**	**Reach**	**Link Clicks**	**Total Spend (AUD)**	**Average Cost Per Click (AUD)**	**No of Records**	**Complete**	**Incomplete**	**Completion Rate**	**cost per complete survey (AUD)**
Phase 1 - Paid	16	33274	441	$685 74	2 56	130	68	64	52 30%	$10 08
Phase 2 - Paid	16	31778	457	$792 79	2 31	142	85	57	59 85%	$9 32
Average	**16**	**32526**	**449**	**$739.27**	**2.44**	**136**	**76.5**	**60.5**	**54.64%**	**$9.95**
Total	**32**	**65052**	**898**	**$1478.53**	**-**	**272**	**151**	**121**	**-**	**$19.90**
Phase 1 - Free	15	-	-	-	-	88	54	33	62 50%	-
Phase 2 - Free	15	-	-	-	-	39	26	13	66 67%	-
Average	15	-	-	-	-	63	42	34	64 58%	-
Total	**30**	**-**	**-**	**-**	**-**	**127**	**59**	**68**	**46.46%**	**-**

Table 2 shows a comparison of the results of Phase 1 and Phase 2 of the campaign for both paid advertisements and free promotions or posting in groups. Despite adding a raffle incentive and simplifying language in the consent form in Phase 2, the results for paid advertising in Phase 2 were only marginally better compared with Phase 1, for numbers accessing the survey (142 Phase 2, versus 130 Phase 1), however, completion rates showed small improvements in Phase 2 (7% for Paid; 4% for Free). Cost per completed survey was lower at $9.67 in Phase 2, versus $11.50 phase 1. In the free advertisements, Phase 2 had poor results for numbers accessing the survey (39 Phase 2 versus 88 Phase 1), with completion rates only marginally better. (67.67% Phase 2 versus 62.50% Phase 1)

In Phase 1, we were able to track measurements for variations in paid advertisements. **Table 3** below shows the results from these advertisement variations:

- weekday: advertisement runs for 24 hours on a weekday
- weekend: advertisement runs for 24 hours during the weekend
- 7-days: advertisement runs for 7 continuous days
- Direct link to survey: The advertisement is directly linked to the survey, bypassing the information website, and ran for 24 hours on a weekday

Table 3: Results of Phase1 Facebook recruitment campaign by advertisement variation type

Ad variant	Count	Reach	Link Clicks	Total Spend (AUD)	Average Cost Per Click (AUD)	No of Records	Complete	Incomplete	Completion Rate	Cost per complete survey (AUD)
Direct link to Survey	4	7617	70	$197 66	3 69	21	11	10	52 38%	$17 97
Weekend	4	7678	106	$162 61	1 93	31	14	17	45 16%	$11 62
7 days	4	10115	179	$186 92	1 09	49	26	23	55 10%	$7 19
weekday	4	7864	86	$138 55	3 53	29	15	14	51 72%	$9 24
Average	**4**	**8318**	**110**	**171.44**	**2.56**	**33**	**17**	**16**	**51.09%**	**$11.50**
Total	**16**	**33274**	**441**	**685.74**	**12.80**	**130**	**66**	**64**	**51.54%**	**$46.01**

The 7-day duration advertisements had maximum reach (10115), link clicks (179), numbers accessed (49), completed surveys (26), and also the highest completion rate (55%), and the lowest cost per completed survey ($9.24). While the number of participants that clicked on the advertisements (106) and accessed the survey on the weekend (31), were higher compared to the weekday advertisement, the cost per complete survey was less at $9.24 for the weekday advertisements, when compared with $11.62 for the weekend advertisement. Results for advertisements with direct links to the survey, bypassing the study website had less reach, fewer link clicks, and completed surveys compared with advertisements which took participants to the study website first. The cost of recruitment was also the highest at $17.97 per completed survey.

In Phase 1 from the advertisements that targeted men, a total of 17 men completed the survey compared with only 3 males (and 47 females) that completed the survey, for advertisements that were targeted for any gender. The average cost per completed survey for advertisements aimed at men was AUD 29.26.

Participant characteristics

Our sample had a significantly (p = <.001) higher proportion of overweight and obesity (86%) than the population (67%). Over half (54%) had obesity (BMI => 30)
and 32% were overweight (BMI => 25), 13% were of normal weight, compared with Australian population levels (31% Obesity, 36% overweight, 32% normal weight). This, however, is expected in a sample that's attempting weight-loss. Although a directly comparable population for this sample is not available to assess representativeness, in comparison with the Australian adult population**,** the sample recruited was skewed towards females (78%), English speaking (85%), were married or in de-facto relationship or living with a partner (70%). A greater proportion of our sample had higher education levels - 47% had completed a degree or higher degree qualification, 20% were diploma holders and another 20% held trade or technical certificates, 12 % had completed HSC (High School Certificate) or below. This skew towards higher educated people as an indicator of socio-economic status however is a common occurrence for online surveys (Jang & Vorderstrasse, 2019).

Lessons Learned and Recommendations

This study explored different Facebook mechanisms to promote recruitment of Australian adults attempting weight-loss, to complete an online research survey. Paid promotions were effective compared with free promotions through posting within Facebook groups, as was spreading the budget over a longer duration ($50 for 7 days versus $50 for a single day). The recruitment in this study was 233 complete surveys (153 from paid promotion and 80 from free promotion), similar to a recent systematic review(Whitaker et al., 2017) which reported a median of 264 recruits. The cost per paid recruitment in this study was AUD $11.50 compared with AUD 20.08 (USD $ $14.41) per recruitment reported in the same systematic review (Whitaker et al., 2017). Free posts in groups generated rapid completion in the initial stages, however, the numbers recruited sharply declined over time, which is similar to a recent evaluation comparing paid and free mechanisms within Facebook (Bennetts et al., 2019). While evidence for improving research participation through monetary incentives exist, much depends on the size and kind of incentive provided (Parkinson et al., 2019). One systematic review and meta-analysis found that the effect of financial incentives was not changed between guaranteed payments versus raffle or lottery incentives(Mantzari et al., 2015). However, in our study improving the process through the introduction of a raffle incentive, and simplification of online consent showed only marginal improvement in completion rates. Directing participants to a detailed study website rather than having them land directly on the survey questionnaire, worked favourably in this study.

As this study was an exploration and our intent was to recruit as many participants as possible, some design elements of the study were modified during the course of the study. For example, use of different images; single or multiple images in the advertisement. Although we did not assess the impact of these variations on recruitment rates, one Australian study reports that content of advertisements seems to have differential effects on recruitment rates as well as participant characteristics(Choi et al., 2017). Due to a lack of integration between Facebook Pixel (a piece of code by Facebook that is embedded on a website which offers a mechanism to track advertisement conversion rate) and our survey database, and our decision to run advertisements in Phase 2 concurrently, we were unable to track results at an advertisement level, although the main groups of advertisements could be tracked. Despite these limitations, the process of recruitment yielded many practical insights. The lessons distilled from the process of recruitment are shared below. They inform some of the practical aspects and considerations that can help in research recruitment projects that use Facebook.

Facebook rejection of advertising content

The advertisement wording "*Have you just begun or plan to start a weight-loss journey in the near future? We would love to hear from you. Join the University of Sydney study",* triggered automatic rejection by Facebook. Facebook advertising policies do not permit *"direct or indirect assertions or implications about a person's personal attributes".* This means you can't directly or indirectly tell users in the advertisement copy that you know anything about them. The copy "Have you ….weight-loss?" is construed an indirect assertion of a 'personal attribute' by Facebook algorithm.

Recommendation 1: Using the same wording presented by Facebook with minimal modifications reduce the chances of advertisement rejection. These wordings are found in potential advertisement examples that tend to appear in the feed of, and are only visible to the

Page owner. They are indeed Facebook's own promotion of their advertising services. The wording eventually approved by Facebook was: "*USyd survey study of Australians attempting weight-loss on their own. Visit website for details and to take the survey", where no assertion is made that we are telling the reader that we are targeting them.*

Targeted Advertising can improve recruitment samples

Facebook allows granularity in whom your advertisements will be displayed to, in terms of location, gender, age group, and language. In addition, you can also target advertisements depending on participants interests, or create 'custom audiences.'

Recommendation 2:

Narrowing down participant characteristics and targeting the advertisements accordingly helps effective budget utilisation. Targeted campaigns with tailored advertisements helped improve recruitment rates of men in our sample. In our research, targeting men helped to improve proportion of men in the sample, although costing three times more than the overall average cost per completed survey.

Transparency of the researchers and research conducted is critical in Facebook.

As has been raised previously, respect for participants requires research and researcher transparency to ensure public trust in the research project. This plays an important role in recruitment through Facebook groups (Gelinas et al., 2017). Most Facebook groups that this study aimed to reach were closed groups, and membership criteria required the person to be affected by obesity or attempting weight-loss. Gaining access to these groups required answering several questions, prior to the administrator approving membership.

Recommendation 3:

Researcher transparency is ideally promoted by using a personable Facebook profile, along with University credentials to add to legitimacy. While seeking access, the purpose of joining – that is, to recruit research participants - should be shared, along with the link to the research study website. After having obtained access, further permission should be sought from the administrator by providing post content, including intended frequency of posting. Posts should be monitored and comments must be responded to in an appropriate and timely manner. In this study, the fact the researcher had obesity may have improved chances of joining and posting closed groups.

Finding relevant Facebook Groups have limitations

A Facebook internal search tool is available to find groups. To ensure high relevance, Facebook algorithms automatically tailor the search by the characteristics of the person searching. This creates a problem of sampling bias.

Recommendation 4: We do not recommend using Facebook groups promotion as the sole mode of recruitment for studies (despite slightly better completion rates), as people in a particular group create sampling bias. While representativeness of population samples is an issue, they are useful in studies targeting participants with very specific characteristics, for example a specific health condition. However, the rapid and low-cost recruitment offered by Facebook Groups play a valuable role in boosting recruitment rates, therefore they can form part of a broader recruitment strategy, with careful considerations.

Conversion Tracking

Facebook Pixel (Stuart & Mitchell, 1978) is a piece of code that can be placed on websites. This allows conversion tracking and tracking the effectiveness of each individual advertisement; repeated presentation of the advertisement to those who showed initial interest but did not follow through, thereby improving chances of conversion; and building targeted audiences for future advertising. Pixel can be deployed on websites, and integration is available with a few popular survey tools. This integration was not possible with our institution-approved survey software.

Recommendation 6: Deploying the Pixel is invaluable for an in-depth analysis of the performance of each individual Facebook advertisement. However, we presented a novel simple alternative to tracking broad categories of interest, is the design set-up of clone pages, websites and surveys, described in the Methods section. One constraint in this method is that multiple advertisements cannot be deployed concurrently if there is a need to track response at an individual advertainment level.

Conclusion

Even as online research methods become more crucial for researchers as a consequence of the pandemic, and there is an amplified interest in using Facebook for research recruitment, predicting success factors are difficult, because different studies vary widely in subject area, types of participants recruited, mechanisms used, and degree of engagement and involvement of the participants. In this paper, we discuss our experience of recruiting Australian adults attempting weight-loss to complete an online survey, and present a novel online set-up that is simple and can be used without specialist web analytic skills. The lessons learned and recommendations have instructional value and can inform those attempting research recruitment through Facebook.

Conflict of interest

The authors declare that there is no conflict of interest.

Contributorship

DR and TG researched literature, conceived the study and developed the survey. DR created the website, recruited participants on Facebook, analysed the data, and drafted the initial manuscript. TG and AL reviewed and provided feedback on the study design and implementation. All authors edited the manuscript, and approved the final version of the manuscript.

Ethical approval

The Human Research Ethics Committee of the University of Sydney approved this study (protocol number: 2018/526)

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References:

Bennetts, S. K., Hokke, S., Crawford, S., Hackworth, N. J., Leach, L. S., Nguyen, C., Nicholson, J. M., & Cooklin, A. R. (2019). Using Paid and Free Facebook Methods to Recruit Australian Parents to an Online Survey: An Evaluation. *Journal of Medical Internet Research*, *21*(3), e11206-e11206. https://doi.org/10.2196/11206

Choi, I., Milne, D. N., Glozier, N., Peters, D., Harvey, S. B., & Calvo, R. A. (2017). Using different Facebook advertisements to recruit men for an online mental health study: Engagement and selection bias. *Internet Interventions*, *8*, 27-34. https://doi.org/10.1016/j.invent.2017.02.002

Clifford, P. A., Tan, S. Y., & Gorsuch, R. L. (1991). Efficacy of a self-directed behavioral health change program: Weight, body composition, cardiovascular fitness, blood pressure, health risk, and psychosocial mediating variables [Article]. *Journal of Behavioral Medicine*, *14*(3), 303-323. https://doi.org/10.1007/BF00845457

Eby, K. (2019). *The Power of Iterative Design and Process*. Smartsheet https://www.smartsheet.com/iterative-process-guide

Eysenbach, G. (2004). Improving the quality of Web surveys: the Checklist for Reporting Results of Internet E-Surveys (CHERRIES). *Journal of Medical Internet Research*, *6*(3), e34-e34. https://doi.org/10.2196/jmir.6.3.e34

Facebook for Business. CPC (Cost per Link Click) [Internet]2020 [cited 10 April 2020] Available from: CPC (Cost per Link Click) | Facebook Business Help Center

Gelinas, L., Pierce, R., Winkler, S., Cohen, I. G., Lynch, H. F., & Bierer, B. E. (2017). Using Social Media as a Research Recruitment Tool: Ethical Issues and Recommendations. *The American Journal of Bioethics*, *17*(3), 3-14. https://doi.org/10.1080/15265161.2016.1276644

Jang, M., & Vorderstrasse, A. (2019). Socioeconomic Status and Racial or Ethnic Differences in Participation: Web-Based Survey. *JMIR research protocols*, *8*(4), e11865-e11865. https://doi.org/10.2196/11865

Kosinski, M., Matz, S. C., Gosling, S. D., Popov, V., & Stillwell, D. (2015). Facebook as a research tool for the social sciences: Opportunities, challenges, ethical considerations, and practical guidelines. *The American psychologist*, *70*(6), 543-556. https://doi.org/10.1037/a0039210

Mantzari, E., Vogt, F., Shemilt, I., Wei, Y., Higgins, J. P. T., & Marteau, T. M. (2015). Personal financial incentives for changing habitual health-related behaviors: A systematic review and meta-analysis. *Preventive Medicine*, *75*, 75-85. https://doi.org/10.1016/j.ypmed.2015.03.001

Overweight and obesity: an interactive insight, What is overweight and obesity - Australian Institute of Health and Welfare [Internet]. Australian Institute of Health and Welfare. 2020 [cited 10 April 2020]. Available from: https://www.aihw.gov.au/reports/overweight-obesity/overweight-and-obesity-an-interactive-insight/contents/what-is-overweight-and-obesity.

Parkinson, B., Meacock, R., Sutton, M., Fichera, E., Mills, N., Shorter, G. W., Treweek, S., Harman, N. L., Brown, R. C. H., Gillies, K., & Bower, P. (2019). Designing and using incentives to support recruitment and retention in clinical trials: a scoping review and a checklist for design. *Trials*, *20*(1), 624-624. https://doi.org/10.1186/s13063-019-3710-z

Rafiei, N., Gill, T. (2018) Identification of factors contributing to successful self-directed weight loss: a qualitative study. *J Hum Nutr Diet*. 31, 329– 336 https://doi.org/10.1111/jhn.12522

Santos, I., Sniehotta, F. F., Marques, M. M., Carraça, E. V., & Teixeira, P. J. (2017). Prevalence of personal weight control attempts in adults: a systematic review and meta-analysis. *Obes Rev*, *18*(1), 32-50. https://doi.org/10.1111/obr.12466

Stuart, R. B., & Mitchell, C. (1978). Self-help weight control groups. A professional and a consumer perspective. *Psychiatric Clinics of North America*, *1*(3), 697-711.

https://www.scopus.com/inward/record.uri?eid=2-s2.0-0018257388&partnerID=40&md5=6b2268d015996c904756ddb1fda21121

Thornton, L., Batterham, P. J., Fassnacht, D. B., Kay-Lambkin, F., Calear, A. L., & Hunt, S. (2016). Recruiting for health, medical or psychosocial research using Facebook: Systematic review. *Internet Interventions*, *4*, 72-81. https://doi.org/10.1016/j.invent.2016.02.001

Whitaker, C., Stevelink, S., & Fear, N. (2017). The Use of Facebook in Recruiting Participants for Health Research Purposes: A Systematic Review. *Journal of Medical Internet Research*, *19*(8), e290-e290. https://doi.org/10.2196/jmir.7071

See Appendix F2 for online supplementary materials submitted along with this paper.

Chapter 5: Self-managed Weight Loss in Australia—Preliminary Analysis of Data Gathered in the Pilot Study

5.1 Introduction

Pilot studies are useful in assessing the feasibility of processes; adequacy of time and budgets, data collection, management and procedures, and for scientific purposes such as estimation of effects.(1) Pilots are also useful to highlight any unforeseen problems that may arise. As self-managed weight losers in the general community have not been researched extensively before, pilot work was undertaken in this thesis to inform the development of a longitudinal study. A key area of focus for the pilot work in this study was exploring paid and free mechanisms within Facebook to reach and recruit people who self-manage their weight loss to complete an online survey, and has been presented in Chapter 4.

This chapter presents the preliminary analysis of the data collected through the pilot. Although the survey instrument was improved and repeated in the longitudinal study, the preliminary data offered the opportunity for some early insights through descriptive analysis, subgroup analysis and the exploration of associations.

Although the aim of the thesis was to recruit those who manage their own weight loss, the levels of support of those who embark on health improvements can range from no assistance to intensive health professional intervention. The term 'DIY weight loss' was used on the study website, and recruitment advertisements specified the study was about 'people who lose weight by themselves' to attract this population. While the majority of the participants were indeed unassisted, as the responses came in, some participants who identified as self-managed indicated that they also used some form of professional help. These subgroups needed to be explored for differences.

With these considerations, the aims of the pilot study data analysis of the study were to:

1. describe the characteristics of self-managed weight losers—demographic factors, height and weight, weight-related history, food consumption, physical activity, and weight loss strategies
2. compare subgroups of self-management, either unassisted or assisted (take some form of help from professional services—commercial or health)

3. explore which characteristics or factors most strongly influenced the self-management approach, either unassisted or assisted.

5.2 Methods

5.2.1 Study design

The study design was cross-sectional, with data collected through an online survey hosted on REDCap, the university-approved secure data collection platform. Detailed descriptions of the recruitment procedures are provided in the previous chapter.

5.2.2 Participants

The eligibility criteria of the participants were that they were Australian or living in Australia, were aged 18 years or more, and had just commenced or were about to commence their weight loss journey.

5.2.3 Recruitment

The participants were recruited from October to December 2018 through a Facebook campaign of 62 advertisements to complete an online survey, as described in Chapter 4.

5.2.4 Data collected

Data were collected from participants about a large range of characteristics and included demographic factors, height and weight, weight-related history, food consumption, physical activity, and weight loss strategies. A copy of the survey questions is attached in Appendix D1.

5.2.5 Data processing

The data collected were cleansed and transformed to assist with analysis. Age ranges were reduced from 14 categories (in ranges of 5 years from 18 onwards) to four categories (18–34 years, 35–44 years, 45–54 years, 55 years and above) to ensure sufficient counts in each category for analysis. Height and weight were used to calculate BMI using the formula BMI = weight in kg/height in m^2. BMI was then categorised into underweight, normal weight, overweight, obesity level 1, obesity level 2 and obesity level 3 per standard classifications used in Australia.(2)

Responses to the categorical survey questions were reduced to fewer categories if counts were too few for meaningful analysis. For example, marital status was reduced from six categories (single, married, de facto/living with a partner, widowed, divorced, separated) to three categories by combining them into logical groups (single, married/de facto/living with a partner, widowed/divorced/separated).

Where converting to categorical data improved analysis and understanding, continuous data were converted into categorical data. For example, participant responses to weight gained in adulthood ranged from '0' to '180' kg (biologically possible), and therefore, these data were converted into weight gained in quintiles and analysed as ordinal data. Number of drinks per week was converted into low risk (less than 10 drinks per week) and risky (>10 drinks per week), based on guidelines on how much alcohol is safe to drink.(3)

Responses were also collapsed into common themes where appropriate. For example, in one question, participants were asked to choose 'all that apply' from eight possible reasons for their weight loss attempt ('For improved health', 'To feel more energetic', 'To feel more attractive', 'To please others (e.g. family, friends, spouse)', 'To have more confidence', 'To fit into my favourite clothes', 'To ease joint pain', and 'For other reasons'). The other reasons stated were reviewed and categorised into one of the main groups, for example, 'It is a requirement for my job' was reclassified as 'To please others'. The eight categories were then further reduced into three categories: 'Health and other reasons', 'Energy and other reasons, but not health', and 'Confidence and aesthetics (but not health and energy)'.

Data for food consumption were collected as discrete ordinal data ranging from 'never/occasionally' through to '3 or more serves per day'. To allow meaningful comparison, each category was transformed to weekly serves as shown as follows:

- never/occasionally = 0
- 1–2 serves/week = 1.5 serves per week
- 3–5 serves/week = 4 serves per week
- 1 serve/day = 7 serves per week
- 2 serves per day = 14 serves per week
- 3 or more serves a day = 21 serves per week

he means were then calculated for each participant and used as the indicator score, referred to as mean weekly food consumption score (in serves). These scores were treated as continuous data for analysis.

For walking, and moderate and vigorous physical activity, respondents were asked to provide number of days activity was performed in the last week, and how much time they usually spent on one day for that activity (in minutes). As the majority of responses for the time spent in a day were incomplete, only the number of days were used for analysis. The days per week were converted into three categorical variables (none, 1–3 days per week, 4 days or more per week).

Finally, participants were categorised into two groups, ‘unassisted’ and ‘assisted’, by their responses to the question ‘What approach do you currently use or plan to use to lose weight or to control your weight? (choose all that apply)’. If participants selected even one of the following—general practitioner, specialist medical professional, dietitian, nutritionist, psychologist, exercise physiologist, personal trainer, health coach, naturopath, commercial weight loss programs, or prescription weight loss—they were categorised as ‘assisted’. All the remaining participants were categorised as ‘unassisted’.

5.2.6 Statistical analysis

Descriptive statistics were used to quantitatively describe demographics, BMI categories, weight history, smoking, alcohol consumption, diet, physical activity, and weight loss strategies (self-monitoring, use of weight loss products), and weight management approach (unassisted or assisted). Data analysis was conducted in IBM SPSS Statistics for Windows, version 27 (IBM Corp., Armonk, NY). Mean and standard deviation (SD) were calculated for continuous variables, and proportions for categorical variables. As the population of interest is unique in that past data on the segment of the general public who attempt weight loss on their own are not available, direct comparisons could not be made with other samples or populations. However, the demographic characteristics and BMI were compared against the Australian population data.

A subgroup analysis was undertaken to compare differences between assisted and unassisted groups within the self-managed sample. Statistical significance was set a priori at $p < 0.05$. Statistical comparisons were conducted using two-sided Fisher’s exact tests for categorical data, while independent samples *t*-tests and Mann–Whitney U tests were used as appropriate for continuous data.

A step-wise multiple binary logistic regression model was constructed to further explore the impact of demographics, BMI category, weight history, smoking, alcohol consumption, diet, physical activity, and weight loss strategies (self-monitoring, use of weight loss products) variables on self-management weight loss approach (unassisted or assisted). Dependant variables were entered into the model using block-wise entry. Model 1 consisted of all demographic variables (age range, gender, marital status, highest level of educational qualifications, language spoken at home). Model 2 consisted of Model 1 and BMI categories and weight history (reason for weight loss, weight gained since late teens or early twenties in quintiles, number of previous weight loss attempts). In Model 3, the risk factors of smoking and drinking were added. Model 4 added in physical activity (walking, moderate, vigorous). In Model 5, in addition to the previous model, the food consumption variables (cereals and grains, vegetables, fruits, dairy and dairy products, oil/soft margarine, as well as meat and poultry, fish, eggs, tofu, nuts and seeds and legumes/beans), snacks (processed meats, cakes & biscuits, chips), and sugar sweetened beverages (SSBs) were added. Model 6 included self-monitoring variables (tracking of exercise, diet, or both) in addition. Model 7 included all previous models as well as the use of weight loss products or aids (diet books, smart phone apps). Results reported are odds ratios and corresponding 95% confidence intervals. All analyses had an alpha level of $p < 0.05$. Chi-square and *p*-values are reported for all blocks.

5.3 Results

5.3.1 Demographics and BMI of participants

A total of 407 participants accessed the survey, of whom 57.2% (n = 233) completed the survey. The mean absolute weight of the participants was 93 kg (mean ± SD: 93.28 ± 29.58). The majority (54.4%) of the participants had obesity (BMI ≥30), 32.3% were overweight (BMI ≥25) and 13.3% were of normal weight compared with Australian population levels (31% obesity, 36% overweight, 32% normal weight). Higher proportions of people with obesity are expected as the participants were attempting weight loss.

Compared with the Australian adult population, participants were skewed towards female (78%); English-speaking (85%); and married, in a de facto relationship or living with a partner (70%). A greater proportion had higher education levels: 47% had completed degree or higher degree qualifications, 20% were diploma holders, 20% held trade or technical certificates, and 12% had completed HSC or below. A higher proportion (61.5%) were classified ‘unassisted’.

Table 5.1 below shows comparison of demographics by self-management. Differences in the demographic distribution among assisted and unassisted groups were not significant.

Table 5.1: Participant demographics by self-management type

		Self-management type								
		Assisted		Unassisted		Total				
		n	%	*n*	%	*n*	%	$\chi 2$	df	*p*-value
Gender								0.082	1	0.869
	Male	18	20.7	31	22.3	49	21.7			
	Female	69	79.3	108	77.7	177	78.3			
Total		87	100.0	139	100.0	226	100.0			
Age group								4.001	3	0.263
	18–34 years	25	28.7	42	29.6	67	29.3			
	35–44 years	25	28.7	35	24.6	60	26.2			
	45–-54 years	22	25.3	26	18.3	48	21.0			
	>55 years	15	17.2	39	27.5	54	23.6			
Total		87	100.0	142	100.0	229	100.0			
Highest level of qualification								0.724	3	0.869
	HSC or year 12 and below	12	13.8	16	11.3	28	12.2			
	Trade and technical certificates	17	19.5	30	21.1	47	20.5			
	Diploma	19	21.8	27	19.0	46	20.1			
	Degree and higher degree	39	44.8	69	48.6	108	47.2			
Total		87	100.0	142	100.0	229	100.0			
Marital status								5.709	2	0.056
	Single	18	20.7	21	14.8	39	17.0			
	Married/Partner/De facto	53	60.9	107	75.4	160	69.9			
	Divorced/Separated/Widowed	16	18.4	14	9.9	30	13.1			
Total		87	100.0	142	100.0	229	100.0			
Language other than English								0.013	1	1
	No	74	85.1	120	84.5	194	84.7			
	Yes	13	14.9	22	15.5	35	15.3			
Total		87	100.0	142	100.0	229	100.0			

5.3.2 BMI, weight history and reason for weight loss attempt

The average absolute weight gained by participants since their early teens or early adulthood was 28 kg (mean ± SD: 27.93 ± 24.33).

About half the participants (51%) were currently gaining weight, and a large majority (72%) of the participants had previously attempted weight loss four times or more. A majority (88%) selected health as a reason for attempting weight loss, with fewer participants selecting feeling energetic (4%), or for aesthetics and feeling confident (7%).

Table 5.2: BMI, weight history and reason for weight loss attempt by self-management type

		Self-management type								
		Assisted		Unassisted		Total				
		n	%	*n*	%	*n*	%	χ^2	df	*p*-value
BMI								23.91	4	<.001
	Normal	5	5.9	25	17.7	30	13.3			
	Overweight	20	23.5	53	37.6	73	32.3			
	Obesity class 1	23	27.1	30	21.3	53	23.5			
	Obesity class 2	13	15.3	22	15.6	35	15.5			
	Obesity class 3	24	28.2	11	7.8	35	15.5			
Total		85	100.0	141	100.0	226	100.0			
Gaining weight								0.015	1	1
	No	44	50.6	73	51.4	117	51.1			
	Yes	43	49.4	69	48.6	112	48.9			
Total		87	100.0	142	100.0	229	100.0			
Number of previous weight loss attempts								0.043	1	0.88
	3 times or less	25	28.7	39	27.5	64	27.9			
	4 times or more	62	71.3	103	72.5	165	72.1			
Total		87	100.0	142	100.0	229	100.0			
Weight gained as an adult								14.797	4	0.005
	Q1: up to 10 kg	10	11.5	43	30.3	53	23.1			
	Q2: 11–18 kg	14	16.1	25	17.6	39	17.0			
	Q3: 19–25 kg	18	20.7	28	19.7	46	20.1			
	Q4: 26–40 kg	22	25.3	28	19.7	50	21.8			
	Q5: 46 kg or more	23	26.4	18	12.7	41	17.9			

		Self-management type							
		Assisted		Unassisted		Total			
		n	%	*n*	%	*n*	%	χ^2	df	*p*-value
Total		87	100.0	142	100.0	229	100.0			

Reason for weight loss										NR*
	Health (and other reasons)	82	94%	119	84%	201	88%			
	Energy (and other reasons but not health)	2	2%	8	6%	10	4%			
	Confidence, aesthetics (but not health and energy)	3	3%	14	10%	17	7%			
Total		87	100%	141	100%	228	100%			

Note: *<5 cases; therefore, did not perform statistical comparison.

The distribution of BMI ranges is significantly different between groups (see Table 5.2). Proportions of normal (17.7%) and overweight (38%) are higher in the unassisted group than the assisted group (normal 5.9%, overweight 23.5%). Obesity class 1 (27.1%) and obesity class 3 (28.2%) are higher in the assisted group than the unassisted group (obesity class 1, 21.3%; obesity class 3, 7.8%). Obesity class 2 is equally distributed between groups (15.3% and 15.6%, respectively)

The distribution of participants in terms of the weight they had gained in quintiles in their adulthood significantly differed between groups. A higher proportion of participants that had gained up to a maximum of 10 kg were in the unassisted group (30.3%) than the assisted group (11.5%), whereas a higher proportion of participants who had gained 46 kg or more in their adulthood were in the assisted group (26.4%) than the unassisted group (12.7%).

5.3.3 Smoking, drinking, physical activity and diet

A large majority of the participants were not regular smokers (*n* = 213, 93%), and nearly half the participants responded with ‘0’ for the number of drinks consumed per week (*n* = 112, 49%). Only six participants (2.7%) had risky drinking (>10 standard drinks per week).

Table 5.3: Physical activity levels of participants by self-management type

		Self-management type								
		Assisted		Unassisted		Total				
		n	%	*n*	%	*n*	%	χ^2	df	*p*
Vigorous physical activity								1.268	2	0.55
	none	40	46.0	64	45.4	104	45.6			
	1–3 days per week	29	33.3	55	39.0	84	36.8			
	4 days or more per week	18	20.7	22	15.6	40	17.5			
Total		87	100.0	141	100.0	228	100.0			
Moderate physical activity								0.417	2	0.814
	none	40	46.0	60	42.3	100	43.7			
	1–3 days per week	34	39.1	57	40.1	91	39.7			
	4 days or more per week	13	14.9	25	17.6	38	16.6			
Total		87	100.0	142	100.0	229	100.0			
Walking								0.953	2	0.659
	none	13	15.1	15	10.7	28	12.4			
	1–3 days per week	22	25.6	38	27.1	60	26.5			
	4 days or more per week	51	59.3	87	62.1	138	61.1			
Total		86	100.0	140	100.0	226	100.0			

A majority of the participants (*n* = 138, 61%) walked on 4 days per week or more, whereas nearly half (*n* = 104, 46%) did not engage in vigorous physical activity, and nearly 45% did not engage in moderate physical activity (n = 100, 44%). The differences between unassisted and assisted groups were not significant, as shown in Table 5.3.

Table 5.4: Mean weekly food consumption scores (in serves) of participants

Food category	Mean weekly score (serves)	SD
Cereals, grains and pasta	7.2	2.6
Vegetables	4.9	1.8
Fruits	3.5	1.5
Dairy and dairy products	3.7	1.3
Oil, soft margarine	3.2	1.3
Lean meat and poultry, fish, eggs, tofu, nuts and seeds and legumes/beans	7.8	2.2
Snacks (processed meat, cakes, chips)	5.1	1.7
Takeaway food	1.5	0.7
SSBs	1.7	1.1

Table 5.4 shows the averages and SD of the 'mean weekly food consumption score'. Participants consumed on average seven serves of cereals, grains and pasta (mean ± SD: 7.2 ± 2.6), nearly five serves of vegetables (mean ± SD: 4.9 ± 1.8) and more than three serves of fruit (mean ± SD: 3.5 ± 1.5). Consumption of protein-rich foods (lean meat and poultry, fish, eggs, tofu, nuts and seeds and legumes/beans) amounted to almost eight serves (mean ± SD: 7.8 ± 2.2). Takeaway consumption score was 1.5 serves (mean ± SD: 1.5 ± 0.7) and SSBs were 1.7 serves (mean ± SD: 1.7 ± 1.1)

To check if food consumption (serves per week) influenced self-managed type, a logistic regression was performed, as shown in Table 5.5. The model explained 6.0% (Nagelkerke R^2) of the variance in 'unassisted' and correctly classified 62.0% of cases. However, the model was not statistically significant ($\chi^2(4) = 10.660$, $p > 0.05$).

Table 5.5: Results of binary logistic regression to examine association of food consumption with self-management type

Variables in the equation					
				95% CI for OR	
Mean weekly food consumption score in serves		p-value	OR	Lower	Upper
Step 1[a]	Grains, cereals, pasta	0.967	0.997	0.881	1.129
	Vegetables	0.823	1.021	0.849	1.228

Fruit	0.275	0.892	0.725	1.096
Dairy	0.445	1.099	0.862	1.402
Oil, soft margarine	0.566	1.073	0.844	1.363
Lean meat and poultry, fish, eggs, tofu, nuts and seeds and legumes/beans	0.171	0.907	0.788	1.043
Snacks (salami, cakes, chips)	0.182	1.142	0.939	1.389
Takeaways	0.019	0.545	0.328	0.904
SSBs	0.585	1.080	0.819	1.426

Note: Dependent variable encoding: assisted, 0; unassisted, 1.

5.3.4 Weight loss services and strategies

Although participants have identified themselves as self-managed or using 'DIY' methods of weight loss, upon being asked 'What approach do you currently use or plan to use to lose weight or to control your weight? (choose all that apply)', a range of responses were selected by participants, as shown in Table 5.6.

Table 5.6: Weight loss services, products and aids used for 'self-managed' weight loss

Strategy	*n*	%
Commercial weight loss program	107	45.9
Meal replacement shakes and bars	107	45.9
Smartphone apps	101	43.3
Diet books	90	38.6
Personal trainer	81	34.8
GP	75	32.2
Dietitian	65	27.9
OTC weight loss supplements	50	21.5
Prescription weight loss medication	47	20.2
Nutritionist	28	12.0
Psychologist	21	9.0
Exercise physiologist	13	5.6
Specialist	12	5.2
Health coach	8	3.4

The most frequently reported strategies were commercial weight loss programs and meal replacement shakes and bars (107, 45.9%), followed by smart phone apps (101, 43.3%) and diet books (90, 38.6%). About a third of participants reported using a personal trainer (81, 34.8%) or their GP (75, 32.2%) and dietitians (65, 27.9%).

Table 5.7: Weight loss strategy used by self-managed weight losers

Diet and exercise	Self-management type					
	Assisted		Unassisted		Total	
	n	%	*n*	%	*n*	%
Diet only	3	5.9	12	11.1	15	9.4
Exercise only	3	5.9	5	4.6	8	5.0
Diet and exercise	45	88.2	91	84.3	136	85.5
Total	51	100.0	108	100.0	159	100.0

Note: <5 cases; therefore, did not perform statistical comparison.

As seen in Table 5.7, a large majority of participants (88.2% assisted, 84.3% unassisted) used both diet and exercise to lose weight. More participants in the unassisted group used diet only (12, 11.1%) than in the assisted group (3, 5.9%); however, fewer participants in the unassisted group (5, 4.6%) used only exercise than in the assisted group (3, 5.9%).

Table 5.8: Tracking or self-monitoring by self-management type

		Self-management type								
		Assisted		Unassisted		Total				
		n	%	*n*	%	*n*	%	χ^2	df	*p*-value
Track diet								0.292	1	0.346
	No	30	34.5	54	38.0	84	36.7			
	Yes	57	65.5	88	62.0	145	63.3			
Total		87	100.0	142	100.0	229	100.0			
Track exercise								0.014	1	1
	No	35	40.2	56	39.4	91	39.7			
	Yes	52	59.8	86	60.6	138	60.3			
Total		87	100.0	142	100.0	229	100.0			
Track weight								0.065	1	0.462

	No	19	21.8	29	20.4	48	21.0
	Yes	68	78.2	113	79.6	181	79.0
Total		87	100.0	142	100.0	229	100.0

Table 5.8 shows that many participants in both assisted and unassisted groups reported tracking their weight (68/87, 78.2% assisted; 181/229, 79% unassisted). Proportions tracking their exercise in both groups were similar (52/87, 59.8% assisted; 86/142, 60.6% unassisted), as were the proportions that tracked their diet (57/87, 65.5% assisted; 88/142, 62% unassisted). The differences between groups were not significant.

5.3.5 Logistic regression exploring factors affecting unassisted and assisted groups among self-managed weight losers

For analysis of what factors might predict type of self-management (i.e. do any of the characteristics commonly associated with weight change predict how people self-manage—unassisted or assisted?), logistic regressions were constructed. Variables were tested in logical groupings, beginning with demographic factors, followed by weight and weight history, and so on with other groups of variables. In all, seven models were constructed by adding the groups of variables incrementally, as shown below:

- Model 1: Demographic factors
- Model 2: Model 1 + BMI and weight history
- Model 3: Model 2 + lifestyle risks (smoking and drinking)
- Model 4: Model 3 + physical activity
- Model 5: Model 4 + food consumption
- Model 6: Model 5 + self-monitoring
- Model 7: Model 6 + use of weight loss aids (diet books, smart phone apps)

The dependant variable encoding for this regression was unassisted = 0, and assisted = 1. The results of this analysis are shown in Table 5.9.

Table 5.9: Factors in unassisted and assisted self-managed weight loss

	Model 1			Model 2			Model 3			Model 4			Model 5			Model 6			Model 7		
χ^2, df (*p*-value)	13.69, 10 (0.187)			27.03, 11 (0.005)			1.38, 3 (0.709)			2.29, 6 (0.891)			8.67, 8 (0.370)			2.8, 3 (0.423)			9.32, 2 (0.009)		
		95% CI			95% CI			95% CI			95% CI			95% CI			95% CI			95% CI	
	OR	Lower	Upper	OR	Lower	Upper	OR	Lower	Upper	OR	Lower	Upper	OR	Lower	Upper	OR	Lower	Upper	OR	Lower	Upper
Age range																					
35–44 years	1.51	0.59	3.89	2.51*	0.88	7.12	2.5*	0.85	7.33	2.62*	0.86	7.94	2.69	0.81	8.89	2.80	0.81	9.67	2.77	0.76	10.14
45–54 years	2.44*	1.03	5.79	3.12*	1.22	7.97	2.95*	1.14	7.61	3.06*	1.16	8.11	2.83*	1.00	7.99	2.95*	1.02	8.52	3.08*	1.03	9.21
>55 years	2.5*	0.99	6.29	2.62*	0.96	7.14	2.61*	0.95	7.13	2.75*	0.96	7.90	2.75*	0.90	8.46	2.82*	0.89	8.94	2.73	0.82	9.09
Female	0.93	0.44	1.99	0.63	0.27	1.44	0.62	0.27	1.44	0.59	0.24	1.44	0.48	0.18	1.28	0.46	0.17	1.25	0.44	0.15	1.23
Married/Partner/De facto	0.80	0.25	2.57	0.86	0.24	3.07	0.86	0.24	3.10	0.96	0.25	3.60	1.12	0.28	4.49	1.23	0.30	5.00	0.99	0.23	4.18
Divorced/Separated/Widowed	0.36*	0.15	0.86	0.43*	0.17	1.07	0.44*	0.17	1.10	0.44*	0.17	1.14	0.49	0.18	1.32	0.46	0.17	1.26	0.42	0.15	1.20
Highest level of qualification																					
Trade and technical certificates	1.31	0.53	3.23	1.54	0.56	4.26	1.41	0.49	4.00	1.58	0.54	4.64	1.69	0.55	5.24	1.74	0.56	5.42	1.88	0.59	6.05
Diploma	0.92	0.40	2.14	0.83	0.33	2.07	0.80	0.32	2.02	0.88	0.34	2.30	0.87	0.32	2.41	0.86	0.31	2.39	0.79	0.28	2.27
Degree and higher degree	1.41	0.64	3.12	1.33	0.56	3.17	1.25	0.52	2.99	1.35	0.55	3.31	1.36	0.54	3.43	1.26	0.49	3.23	1.21	0.46	3.18
Language other than English	0.88	0.39	1.95	0.80	0.33	1.92	0.75	0.31	1.83	0.74	0.30	1.81	0.82	0.30	2.27	0.80	0.28	2.24	0.94	0.33	2.71

	Model 1			Model 2			Model 3			Model 4			Model 5			Model 6			Model 7		
		95% CI			95% CI			95% CI			95% CI			95% CI			95% CI			95% CI	
	OR	Lower	Upper	OR	Lower	Upper	OR	Lower	Upper	OR	Lower	Upper	OR	Lower	Upper	OR	Lower	Upper	OR	Lower	Upper
BMI category																					
Overweight				0.31*	0.08	1.16	0.31*	0.08	1.19	0.28*	0.07	1.10	0.25*	0.06	1.07	0.22	0.05	0.98	0.23*	0.05	1.04
Obesity				0.61	0.28	1.34	0.56	0.25	1.25	0.56	0.24	1.28	0.53	0.23	1.23	0.50	0.21	1.18	0.50	0.21	1.20
Reason for weight loss																					
Energy (and other reasons but not health)				1.71	0.40	7.28	1.96	0.45	8.63	2.37	0.52	10.72	2.52	0.53	11.87	2.78	0.57	13.55	3.28	0.63	17.06
Confidence, aesthetics (but not health and energy)				0.75	0.08	7.14	0.83	0.08	8.50	0.90	0.08	9.72	0.87	0.08	10.17	1.20	0.10	14.20	1.96	0.17	22.64
Weight gained in quintiles																					
Q2: 11–18 kg				0.25*	0.07	0.87	0.26*	0.07	0.94	0.31	0.08	1.19	0.26*	0.06	1.08	0.25*	0.06	1.05	0.24*	0.05	1.02
Q3: 19–25 kg				0.65	0.22	1.90	0.66	0.22	1.97	0.77	0.25	2.37	0.55	0.17	1.83	0.58	0.17	1.95	0.56	0.16	1.97
Q4: 26–40 kg				0.63	0.24	1.66	0.63	0.23	1.72	0.70	0.25	1.96	0.60	0.20	1.77	0.57	0.19	1.72	0.61	0.19	1.93
Q5: 46 kg or more				0.52	0.19	1.38	0.48	0.18	1.32	0.52	0.19	1.43	0.47	0.16	1.35	0.45	0.15	1.31	0.46	0.15	1.41
Number of weight loss attempts																					
1–3 times				1.31	0.22	7.63	1.30	0.22	7.69	1.21	0.20	7.45	1.18	0.16	9.02	1.19	0.16	8.66	1.14	0.15	8.64
4 times or more				1.38	0.61	3.15	1.32	0.57	3.08	1.26	0.53	3.00	1.23	0.48	3.16	1.25	0.48	3.25	1.31	0.49	3.52
I am always trying to lose weight				0.56	0.27	1.17	0.53	0.25	1.13	0.53	0.24	1.15	0.47*	0.21	1.05	0.47*	0.20	1.07	0.48	0.20	1.15

	Model 1			Model 2			Model 3			Model 4			Model 5			Model 6			Model 7		
		95% CI			95% CI			95% CI			95% CI			95% CI			95% CI			95% CI	
	OR	Lower	Upper	OR	Lower	Upper	OR	Lower	Upper	OR	Lower	Upper	OR	Lower	Upper	OR	Lower	Upper	OR	Lower	Upper
Regular smoker							0.63	0.18	2.21	0.62	0.17	2.29	0.61	0.16	2.38	0.56	0.14	2.18	0.58	0.15	2.23
Drinking risk																					
Low risk							0.41	0.06	2.89	0.42	0.06	2.95	0.39	0.05	3.06	0.37	0.04	3.08	0.50	0.06	4.28
High risk							0.42	0.06	2.91	0.43	0.06	3.00	0.40	0.05	3.02	0.39	0.05	3.19	0.45	0.06	3.74
Vigorous physical activity																					
1–3 days per week										0.64	0.23	1.77	0.78	0.27	2.28	0.82	0.27	2.46	0.65	0.21	2.03
4 days or more per week										0.62	0.24	1.58	0.70	0.27	1.86	0.71	0.26	1.89	0.72	0.26	2.02
Moderate physical activity																					
1–3 days per week										1.91	0.64	5.65	1.99	0.64	6.17	1.96	0.62	6.25	2.07	0.63	6.84
4 days or more per week										1.59	0.55	4.60	1.65	0.55	4.95	1.61	0.53	4.90	1.48	0.47	4.68
Walking																					
1–3 days per week										1.04	0.36	2.99	0.96	0.31	2.97	0.99	0.31	3.13	1.45	0.44	4.78
4 days or more per week										0.83	0.38	1.78	0.92	0.41	2.06	0.93	0.41	2.10	0.90	0.39	2.09
Cereals and grains													1.07	0.91	1.25	1.07	0.91	1.25	1.08	0.92	1.28
Vegetables													0.90	0.71	1.14	0.91	0.71	1.15	0.91	0.71	1.16
Fruits													1.10	0.86	1.42	1.12	0.87	1.45	1.11	0.85	1.45
Dairy and fortified dairy products													0.91	0.67	1.24	0.92	0.67	1.28	0.87	0.63	1.22
Oil, soft margarine													0.87	0.65	1.16	0.87	0.64	1.17	0.84	0.62	1.15

	Model 1			Model 2			Model 3			Model 4			Model 5			Model 6			Model 7		
		95% CI			95% CI			95% CI			95% CI			95% CI			95% CI			95% CI	
	OR	Lower	Upper	OR	Lower	Upper	OR	Lower	Upper	OR	Lower	Upper	OR	Lower	Upper	OR	Lower	Upper	OR	Lower	Upper
Meat and poultry, fish, eggs, tofu, nuts and seeds and legumes/beans consumption													1.15	0.97	1.37	1.14	0.96	1.36	1.16	0.97	1.40
Snacks (processed meats, cakes & biscuits, chips)													0.94	0.74	1.20	0.94	0.74	1.20	0.93	0.73	1.20
SSBs													0.80	0.56	1.14	0.78	0.54	1.13	0.75	0.51	1.11
Self-Monitoring																					
Tracks weight																0.81	0.32	2.05	0.80	0.31	2.07
Tracks exercise																0.73	0.31	1.73	0.64	0.26	1.60
Tracks diet																2.43	0.83	7.08	3.28*	1.05	10.17
Uses smart phone apps																			1.32	0.32	5.40
Uses diet books																			4.10	1.53	11.02

The results show that age range influences the self-managed weight loss approach (assisted or unassisted), and those who are middle aged are more likely to be assisted (Model 7: OR = 3.08, p = 0.05). Participants with marital status of 'divorced, separated or widowed' were more likely to be self-managed (Model 1: OR = 0.36, p = 0.02; Model 2: OR = 0.43, p = 0.07; Model 3: OR = 0.44, p = 0.08; Model 4: OR = 0.44, p = 0.09). Note that the insignificance of marital status in later models was likely due to the correlation between marital status and additional covariates included.

Overweight participants were 77% more likely to be 'unassisted' (Model 7: OR = 0.23, p = 0.06). A weight gain of 11–18 kg since late teens or early twenties was also more likely to be 'unassisted' (Model 7: OR = 0.24, p = 0.05).

Those participants who responded 'I am always trying to lose weight' were also more likely to be defined 'unassisted' (Model 5: OR = 0.47, p = 0.06; Model 6: OR = 0.47, p = 0.07).

Diet tracking was more likely to be associated with 'assisted' (Model 7: OR = 3.28, p = 0.04), as was use of diet books (Model 7: OR = 4.10, p = 0.01).

Lifestyle risks of smoking and drinking, food consumption, and physical activity were not significantly associated with 'unassisted' or 'assisted'.

Model 7 was the most comprehensive model (χ^2 = 9.320 (2), p = 0.009) and explained 35% (Nagelkerke R^2) of the variance in 'unassisted' and correctly classified 72.5% of cases.

5.4 Discussion

This study presents analysis of preliminary data gathered from the pilot study on self-managed weight loss. A range of characteristics of self-managed weight losers are described and subgroups of self-management, either unassisted or assisted (taking some form of help from professional services—commercial or health), are compared. Factors affecting self-management approach, either unassisted or assisted, are explored.

Adults from the general population of Australia attempting weight loss by themselves (self-managed) participated in this study. Participants were mostly female, English-speaking, married, or living with a partner. The characteristics of the female participants in this study are very similar to those reported in the Australian Longitudinal Study on Women's Health

(ALSWH), a large cohort of middle-aged women attempting to control their weight. (2) Compared with national statistics,(3) a higher proportion of the sample had obesity (70.5%). However, this is not unusual in a sample that is actively trying to lose weight. Reviews have shown that even perceived overweight increases the prospects of participants attempting weight loss.(5) Participants reported an average absolute weight gain of 28 kg in their adulthood, and nearly half were currently gaining weight. Consistent with reports on personal weight control attempts,(6) health and wellness were a primary reason for attempting weight loss, followed by aesthetics and confidence. A majority of participants had previously attempted weight loss four times or more.

A majority of the participants (61%) walked on 4 days per week or more; however, nearly half (45%) did not engage in vigorous physical activity, or even in moderate physical activity (45%). The Healthy Weight Guide(6) published by the Department of Health recommends adults to be 'physically active on most, or preferably all days per week'. However, 38.9% of participants walked on fewer than 4 days a week, and nearly half did not engage in vigorous and moderate physical activity each week, and so fall way below recommended levels, even for those not attempting weight loss. This is therefore surprising among a group that is actively attempting weight loss. Data on how much time was spent on physical activity in a day were affected by very poor response rates, and therefore, only number of days per week per type of physical activity could be used for analysis. Issues in validity of physical activity data collected through online surveys have been highlighted before,(8) and therefore, these results are interpreted with caution.

The findings from the National Health Survey show that majority of Australian do not meet the guidelines for the recommended daily serves.(9) In this exploratory study the diet measures or scores were used to capture trends and should not be interpreted as a precise assessment of total dietary intakes, and therefore direct comparisons cannot be made.. However, the food consumption scores when extrapolated to a week, indicate that both vegetable and fruit consumption were high among self-managed weight losers. Concerningly, the self-reported discretionary food consumption were high for those attempting weight loss, more so when studies suggest that those attempting weight loss and who may self-report 'eating healthy' do not reflect their actual behaviours and tend to report lower consumption of discretionary foods (5, 10).

Consistent with other studies that indicate a large proportion of people that attempt weight loss do so on their own(11, 12), our sample identified themselves as attempting weight loss by themselves or with 'DIY weight loss' programs (self-managed). However, the level of support used by these participants varied and ranged from books and apps to some assistance from both allied health and professional services. A third of the participants accessed some support from their GP, and a few even accessed specialist help. This pilot study attempted to find and recruit those in the general population that were self-managing their own weight loss journey—without reliance on or accessing professional or medical health services. Definitions of self-management are not consistent in the literature,(6, 13-15) and therefore, it was important to assess the interpretation of the participants that identified themselves into this survey, which was titled 'DIY Weight Loss in Australia', and with the recruitment advertisement, which called for people who were 'attempting weight loss on their own'. Participants were segregated into the 'unassisted' group by excluding those who reported utilising the services of any health or allied health professional or service, prescription weight loss medication, or commercial weight loss programs. This allowed a comparison between these subgroups. To capture those unassisted and assisted among the self-managed weight losers, an explicit question is needed in the survey instrument. This is an area of improvement identified for the main survey to help distinguish these groups.

Several factors such as age range, marital status, BMI, weight gained in adulthood, self-monitoring, and use of aids such as diet books or smart phone apps affect the type of self-management (unassisted, assisted) in this sample—and these findings warrant further exploration in the longitudinal study as the subgroups may differ in important ways. However, these findings cannot be generalised because the participant selection was not random. The free methods involved recruitment of participants from Facebook groups that revolved around specific weight loss methods, demographic groups such as 'mums' or specific geographical locations, and these can cause selection bias. Therefore, the use of recruitment through Facebook groups is not recommended.

One of the limitations in this pilot was that an investigation of reasons for incomplete surveys was not possible. The RedCap survey instrument only records a timestamp when a survey is started for incomplete surveys and when a survey is submitted for complete surveys. However, time taken to complete the survey is not recorded. Further, emails of participants were not collected from those who did not complete the survey, and this precluded further investigations on why they did not complete the survey.

5.5 Conclusion

In conclusion, this study focused on the preliminary analysis of data collected in the pilot study. As the participants were recruited with the aim of assessing feasibility of recruitment approaches, the sample selection was not random as many in the sample were recruited through Facebook groups. However, the interesting finding from this analysis was the existence of subgroups among self-managed weight losers based on the level of support accessed. Few of the characteristics commonly associated with weight loss and weight maintenance, such as age range, marital status, BMI, weight gained in adulthood, self-monitoring, and use of aids such as diet books or smart phone apps, also influenced the type of self-management of the participants, either unassisted or assisted. The pilot study showed that it is feasible us to reach and recruit and collect data from those that are self-managing their weight loss in the population, with preliminary findings that suggest people who do not use any assistance in their weight loss may differ from those accessing some level of support. These findings need further investigation in the longitudinal study, and to aid clarity for participants and to clearly separate the subgroups by levels of self-management, modification of survey questions is needed.

5.6 References

1. Thabane L, Ma J, Chu R, Cheng J, Ismaila A, Rios LP, et al. A tutorial on pilot studies: the what, why and how. BMC Med Res Methodol. 2010;10(1):1.
2. Williams L, Germov J, Young A. Preventing weight gain: A population cohort study of the nature and effectiveness of mid-age women's weight control practices. Int J of Obesity, 2007; 31: 978-986.
3. Australian Institute of Health and Welfare 2017. A picture of overweight and obesity in Australia 2017.
Cat. no.PHE 216. Canberra: AIHW.
4. How much alcohol is safe to drink? : Australian Government, Department of health 2020 [Available from: https://www.health.gov.au/health-topics/alcohol/about-alcohol/how-much-alcohol-is-safe-to-drink.
5. Haynes A, Kersbergen I, Sutin A, Daly M, Robinson E. A systematic review of the relationship between weight status perceptions and weight loss attempts, strategies, behaviours and outcomes. Obes Rev. 2018;19(3):347-63.
6. Santos I, Sniehotta FF, Marques MM, Carraça EV, Teixeira PJ. Prevalence of personal weight control attempts in adults: a systematic review and meta-analysis. Obes Rev. 2017;18(1):32-50.

7. Physical Activity and sedentary behaviour guidelines - adults (18-64 years) - fact sheet do you need to do? : Australian Government: Department of Health. https://www.health.gov.au/resources/publications/physical-activity-and-sedentary-behaviour-guidelines-adults-18-to-64-years-fact-sheet
8. Curtis RG, Olds T, Plotnikoff R, Vandelanotte C, Edney S, Ryan J, et al. Validity and bias on the online active Australia survey: activity level and participant factors associated with self-report bias. BMC Med Res Methodol. 2020;20(1):6-.
9. National Health Survey: First Results, 2017-18 [Internet]. Abs.gov.au. 2020 [cited 10 April 2020]. Available from: https://www.abs.gov.au/statistics/health/health-conditions-and-risks/national-health-survey-first-results/latest-release
10. Gillen MM, Markey CN, Markey PM. An examination of dieting behaviors among adults: Links with depression. Eat Behav. 2012;13(2):88-93.
11. Klem ML, Wing RR, McGuire MT, Seagle HM, Hill JO. A descriptive study of individuals successful at long-term maintenance of substantial weight loss. Am J Clin Nutr. 1997;66(2):239.
12. Yoong SL, Carey ML, Sanson-Fisher RW, D'Este C. A cross-sectional study assessing the self-reported weight loss strategies used by adult Australian general practice patients. BMC Fam Pract. 2012;13(1):48-.
13. Stuart RB, Mitchell C. Self-help weight control groups. A professional and a consumer perspective. Psychiatr Clin North Am. 1978;1(3):697-711.
14. Santosa S, Demonty I, Jones PJH, Lichtenstein AH. Moderate weight loss: A self-directed protocol for women. Can J Diet Pract Res. 2008;69(1):23-7.
15. Hartmann-Boyce J, Jebb SA, Fletcher BR, Aveyard P. Self-help for weight loss in overweight and obese adults: Systematic review and meta-analysis. Am J Public Health. 2015;105(3):e43-e57.

Section 3

Chapters 6 and 7

Longitudinal Study—Quantitative Analysis

Chapter 6: Characteristics of Self-managed Weight Loss

6.1 Introduction

With the scale of the obesity issue in Australia, access and availability of health services for weight management are grossly inadequate.(1) A large number of people ‘self-manage’ and attempt weight loss on their own, and researching this population group was the objective for this thesis. The pilot work done in the thesis established that it is feasible to reach and recruit self-managed weight losers from the general community and gather a breadth of data on characteristics of interest by employing online methods. Preliminary assessment showed that among people who self-manage their weight loss, different levels of support are accessed. This ranged from those who do not access any professional services and manage their own weight loss (referred to as ‘self-managed: unassisted’) and others who still self-manage but may access some levels of support (referred to as ‘self-managed: assisted’). Data analysis from the pilot study revealed that the behaviours of these groups differ in some ways.

Lessons learnt from the pilot study were used to develop a longitudinal study and to target and recruit self-managed weight losers who were just beginning their weight loss attempt, and then follow them up at 12 weeks to examine how they fared.

The aims of this longitudinal study were to:

1. describe the characteristics of people who self-manage their weight loss
2. examine if they were successful
3. examine differences between unassisted and assisted groups, and their relation to weight and weight-related behaviour outcomes
4. identify clusters or homogeneous groups among those who self-manage their weight loss, and compare weight outcomes among them.

The pilot feasibility study to recruit people who self-manage their weight loss, and the preliminary analysis of data collected through the study, are described in Chapter 4. Lessons from the pilot were applied to conduct the population study. A range of analyses were undertaken, including descriptive, inferential and qualitative assessments, which are described in this chapter and subsequent chapters.

This chapter reports the descriptive analysis of self-managed weight losers in detail. The key research questions addressed in this chapter are:

1. What are the characteristics of people who self-manage their weight loss?
2. Are they successful?
3. Are there differences between characteristics of the subgroups of self-managed weight losers (unassisted and assisted), and the primary outcome of weight loss and secondary outcomes of changes in diet and physical activity?
4. Are there clusters or homogeneous groups among those who self-manage their weight loss, and if so, how did the different clusters fare in their weight loss attempt?

6.2 Materials and Methods

6.2.1 Study design

The study design was longitudinal and consisted of a 12-week follow-up online survey. This study was developed using lessons learned from the pilot study. These included improvements in recruitment, as well as survey design and instruments.

6.2.2 Participants

Study participants were people living in Australia, 18 years or older, and who were just beginning their self-managed weight loss attempt.

6.2.3 Recruitment

The recruitment phase for this study lasted from mid-January to mid-June 2020, incorporating improvements and lessons learned from the pilot study. The online setup as described in detail in Chapter 4 and used for the pilot study, was used for the longitudinal study as well. The key difference was that only Paid Facebook advertisements were used to recruit participants. Free advertising in groups were avoided to prevent any influences that might affect the characteristics. As with the pilot, the paid advertisements were linked to a study information website (see Appendix E), on which the link to the initial online survey was provided. The initial survey was hosted on REDCap—the University of Sydney approved secure database for research data collection. Recruitment for the initial survey occurred between 15 January 2020 until 15 March 2020. A learning from the pilot was that the budget for paid advertisements spread over longer duration of time generally yielded slightly better results, and therefore for the longitudinal study the entire budget of AUD 1500 was divided into two advertisements of AUD 750 each from 15th January to 15th February 2020, and 16th February to 15th March 2021 respectively. The target audience for the advertisements were defined as any gender, located in Australia, and aged 18 to 65 years. As with the pilot, the advertisement objective was set to "Traffic" in order to drive traffic outside Facebook to visit the study website. The payment option selected was "pay-per click". Email addresses of participants who completed the initial survey were collected. The administration follow-up survey was automated through the use of rules that can be configured within REDCap. This allowed participants who completed the initial survey to receive an email with the link to the follow-up survey (again hosted on RedCap), exactly 12 weeks from the date they completed the initial or baseline survey. In case of non-response to the follow-up survey request after a week, a maximum of two reminder emails were sent in the subsequent week to improve follow-up response rates.

Survey incentives were communicated at the outset on the website as well as the introduction section of the online survey. Those completing both parts of the survey were eligible to enter a raffle draw to win one of several gift cards: $200 × 1, $100 × 2, and $20 × 10.

6.2.4 Data collection

The data that were collected at baseline comprised a range of factors that included demographics, motivation, health status, height and weight, weight history, smoking, drinking, physical activity, diet, weight loss strategies, and psychosocial factors. Additionally, the data that were collected in the 12-week follow-up survey included questions to capture weight, physical activity, diet, and weight loss strategies.

Open-ended questions were included to gather qualitative data on key dietary and physical activity changes made by participants during the weight loss journey and the potential barriers they saw in sustaining the weight loss or behaviour changes, as well as anything else that the participants wanted to share regarding their weight loss journey. With the arrival of the COVID-19 pandemic in March 2020, additional questions were sent to participants to examine the impact of the social restrictions and lockdowns on their weight loss journeys. Copies of the survey questionnaires are available in Appendix D.

6.2.5 Data processing

Data were examined and managed for irrelevant/erroneous observations and structural errors. Missing data were examined to ascertain if they were random. While data transformations were undertaken to allow meaningful analysis, some data are presented before transformation to reflect the actual data (for example, age range). Data transformations were undertaken as described below.

Where counts were too few among responses to categorical survey questions, the responses were reduced to fewer categories. For example, age ranges were reduced from 14 categories in ranges of 5 years to four categories (18–34 years, 35–44 years, 45–54 years, and 55 years or more). Marital status was combined from six separate categories (single, married, de facto/living with a partner, widowed, divorced, separated) into two categories (single, widowed, divorced or married or with partner). The IRSD SEIFA score(2) was calculated by postcode, and categorised into low (1–3), medium (4–7) and high (8–10).

Weight and Height were collected as whole numbers (in both kilograms or stone and pounds; or centimetres, or feet and inches respectively). All imperial units were transformed into metric scale and then the weight in whole kilograms, as well as height converted to metres were used to calculate BMI (BMI = weight in kg/height in m^2). BMI was then categorised into underweight, normal weight, overweight, obesity level 1, obesity level 2 and obesity level 3 per standard classification used in Australia.(3) Absolute weight change in kilograms, BMI and BMI category were recorded for both initial and follow-up surveys. Percentage change in body weight at follow-up was calculated.

Smoking was retained as a binary category variable indicating if the participant was a regular smoker or not. Alcohol consumption was changed to a binary categorical variable: low risk (10 or less standard drinks per week) and risky (more than 10 standard drinks per week).

Nominated weight loss diet followed was reduced to six categories as follows:

- no diet: no particular diet
- healthy diet: ‘I just try to eat healthy’, Mediterranean, vegetarian, pescatarian, whole/real food, plant-based, low-GI diet, doctor/practitioner recommended diet, locavore

- paleo-like diet: paleo, ketogenic, low-carb, low-carb-high-fat, Weston-Price/GAPS, high-protein diets
- restricted diet: gluten-free, dairy-free, vegan, raw-vegan
- calorie-restricted diet: calorie restriction, fasting, low-sugar/sugar-free diet, low-fat diet, commercially prepared weight loss diets
- other: others not listed, prefer not to say.

Data for food consumption were collected as discrete ordinal data ranging from 'never/occasionally' through to '3 or more serves per day'. To allow meaningful comparison, each category was transformed to weekly serves as shown as follows:

- never/occasionally = 0
- 1–2 serves/week = 1.5 serves per week
- 3–5 serves/week = 4 serves per week
- 1 serve/day = 7 serves per week
- 2 serves per day = 14 serves per week
- 3 or more serves a day = 21 serves per week

The means were then calculated for each participant and used as the indicator score, referred to as mean weekly food consumption score (in serves). These scores were treated as continuous data for analysis.

Secondary outcomes for food consumption were calculated for (a) fruit and veg
(total of scores for fruit and veg), (b) discretionary foods (total of scores for cakes, takeaways, hot chips) and (c) SSBs.

To measure changes in outcome, the differences in weekly food consumption score and physical activity at follow-up were calculated.

Psychosocial characteristics were reduced from 4-point Likert scale responses to binary options: 'unlike me' and 'like me'.

For self-management classification, those who used some form of help from commercial or health programs were combined into 'assisted'.

6.2.6 Weight outcome measures

Three measures were used as weight outcome measures:

- *Absolute weight change in kilograms* was computed as the difference between weight (kg) at 12-week follow-up and baseline weight.
- *Clinically significant weight loss* was computed as a categorical binary variable. If the percentage of body weight loss was 5% or greater, it was termed 'clinically significant'.
- *Successful weight loss* was computed as a categorical binary variable. If the percentage of weight loss was 3% or greater it was termed 'successful'.

6.2.7 Secondary outcome measures

Differences in weekly food consumption scores (follow-up minus initial scores) were computed for change in (a) fruit and veg (total of scores for fruit and veg), (b) discretionary foods (total of scores for cakes, takeaways, hot chips) and (c) SSBs.

Differences in total weekly physical activity minutes (total weekly follow-up minutes minus total weekly initial minutes) were computed for (a) walking, (b) moderate physical activity and (c) vigorous physical activity.

6.2.8 Statistical analysis

All statistics were performed using IBM SPSS software. Significance was calculated at 95% confidence interval levels and considered significant if the *p*-value was less than 0.05. Normality was assessed through visual assessment of the 'bell shape' using histograms fitted with a normal curve throughout the chapter.

6.2.8.1 Descriptive statistics

Descriptive statistics were calculated for all variables. Mean and standard deviation are used to describe continuous data. Where data were not normally distributed, median and interquartile range are used. Categorical variables are described with frequency and valid percentage.

6.2.8.2 Comparison of subgroups

Differences in characteristics of subgroups 'unassisted' and 'assisted' were compared using univariate regressions. Odds ratio and 95% confidence interval are reported (dependent variable coding: assisted = 1). Where counts were too small for univariate regression, Fisher's exact test statistics are reported.

6.2.8.3 Differences in weight, food consumption and physical activity at baseline and follow-up

Paired *t*-tests were used to compare changes in weight, diet and physical activity, and chi-square tests were used to statistically compare the differences in responses to categorical questions between the initial and final surveys. Results comparing 'assisted' and 'unassisted' groups are presented; however, because of the small sample size in the assisted group, statistical measures are not presented.

6.2.8.4 Cluster analysis

The two-step cluster analysis available in SPSS was used to identify clusters among self-managed weight losers. First, the analysis was done with the full range of data available to explore if clusters exist within self-managed weight losers. Next, analysis was undertaken on fewer variables potentially useful in further study of self-management. This included demographic variables (gender, age range, English-speaking, IRSD, health status, initial BMI, self-management type). Stress eating was chosen for inclusion as it was most frequently reported (63, 75.9%) among the eating behaviour variables. As the initial BMI was missing for five participants, these were excluded from cluster analysis.

Cases were arranged in random order to reduce effects that ordering records may produce in cluster solutions.(4) Automated cluster selection procedures were employed using log-likelihood distance measures and Schwarz's Bayesian clustering (BIC) criterion.(4) Chi-squares were performed for categorical variables, and a one-way ANOVA was performed for initial BMI (continuous variable) to identify the importance of individual variables in a cluster and indicate significant differences among clusters. Absolute weight change and weight loss success among the clusters identified are reported.

6.3 Results

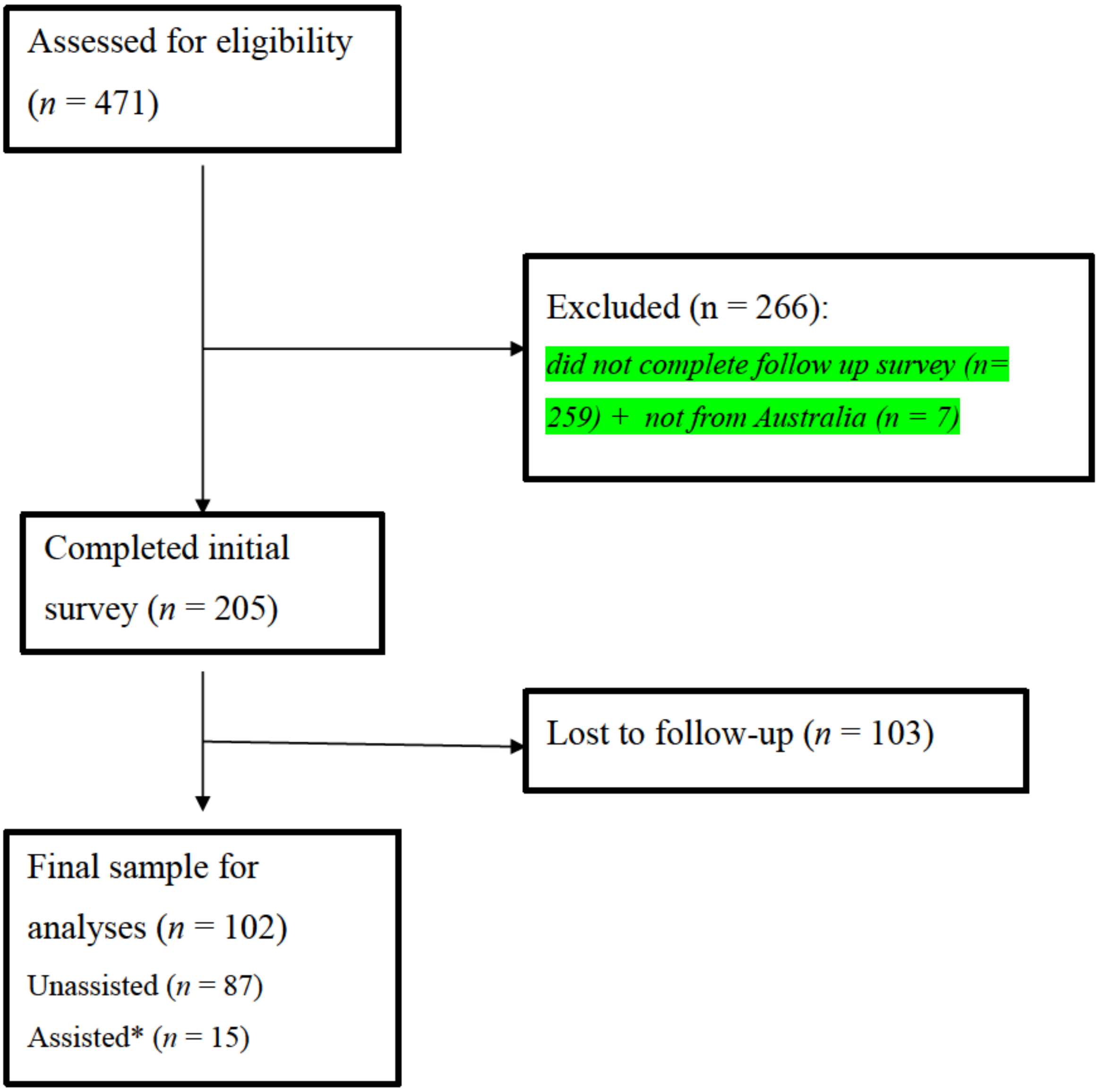
The results are presented in five sections below and include:

- *Response rates* are reported for baseline and follow-up surveys, along with numbers assisted and unassisted.

- *Descriptive characteristics* are provided of self-managed weight losers, comparing assisted and unassisted groups. These include a range of characteristics defining demographics, health status, weight history, perceived reasons for weight issues, reasons for attempting weight loss, smoking and drinking, weight loss strategies, food consumption, physical activity, psychosocial features, and eating behaviour related characteristics, as well as new exploratory characteristics that may be associated with self-managed weight loss.
- *Outcomes of self-managed weight loss* are reported, including weight outcomes in terms of absolute weight loss, successful weight loss (3% or more of body weight lost) and clinically significant weight loss (5% or more of body weight lost). Changes in diet include differences in fruit and veg, discretionary and SSBs consumption, and changes in physical activity include changes in walking, moderate physical activity and vigorous physical activity. Participant perceptions and satisfaction about their weight loss are reported as well.
- *Comparison of outcomes between assisted and unassisted groups* reveal the differences between weight, diet and physical activity outcomes between assisted and unassisted groups.
- *Homogeneous clusters* among self-managed weight losers are identified through the cluster analysis are presented. Weight outcomes of clusters are reported as well.

6.3.1 Response rates

A total of AUD 1078 was spent on Facebook advertising, with an average cost per click of AUD 2.28. Four hundred and seventy-one respondents accessed the eligibility questions, but 7 did not meet the eligibility criteria and 259 did not proceed to take the survey. Of the 205 respondents that to proceed to the last page and submitted the initial survey, 103 did not commence the follow-up survey. The remaining 102 were included in analysis (see Figure 6.1). The cost per completed survey at follow-up was therefore AUD 10.56. Only 15 (14.2%) used some form of assistance from commercial weight loss or health and medical services.



* Commercial weight loss service assistance programs (*n* = 8) and health and medical assistance (*n* = 7)

Figure 6.1: Recruitment results and sample for analysis

The baseline characteristics of participants who completed both surveys were comparable with those only completed the first survey as shown in Table 6.1

Table 6.1: Comparison of baseline characteristics of participants who only completed only the initial survey and both surveys

	Completed initial survey only		Completed both surveys	
	n	%	*n*	%
Gender				
male	30	14.7	13	12.7
female	174	85.3	89	87.3
Age range				
18 - 39 years	60	29.5	32	31.4
40 - 54 years	74	36.4	34	33.3
55 years and above	69	33.9	36	35.3
Highest educational qualification				
HSC	57	27.8	28	27.5
Trade certificate or diploma	72	35.1	35	34.3
Graduate degree	44	21.4	22	21.6
Post graduate qualifications	32	15.6	17	16.7
Marital status				
Single, widowed, divorced	54	26.4	28	27.5
married or with partner	150	73.5	74	72.5
Language				
English speaking	172	84.3	87	85.3
Language other than English	32	15.6	15	14.7
IRSD				
Low	57	28.1	28	27.5
Medium	82	40.4	41	40.2
High	64	31.5	32	31.4
Initial BMI category				
normal weight	26	13.5	12	12.0
overweight	44	22.9	23	23.0
obesity	122	63.5	65	65.0
Self-management type				
unassisted	167	82.3	87	85.3
assisted	36	17.3	15	14.7

[a]IRSD = Index of Relative Socio-economic Disadvantage

6.3.2 Descriptive characteristics of people who self-manage their weight loss

6.3.2.1 Demographic characteristics

The demographic characteristics of study participants are shown in Table 6.2. A directly comparable population for self-management in the general population is not available; however, in comparison with the Australian adult population**,** our sample of 102 were skewed towards female (87.3%), married or with a partner (72.5%), and English-speaking (85.3%).

The frequency of participants across age ranges (before data transformation) is shown in Figure 5.2. There were no participants in the 18–19 years and 20–24 years age groups, and only three participants in the 25–29 years age group. Among the older age groups, there were four and three participants, respectively, in the age groups 65–69 years and 70–74 years.

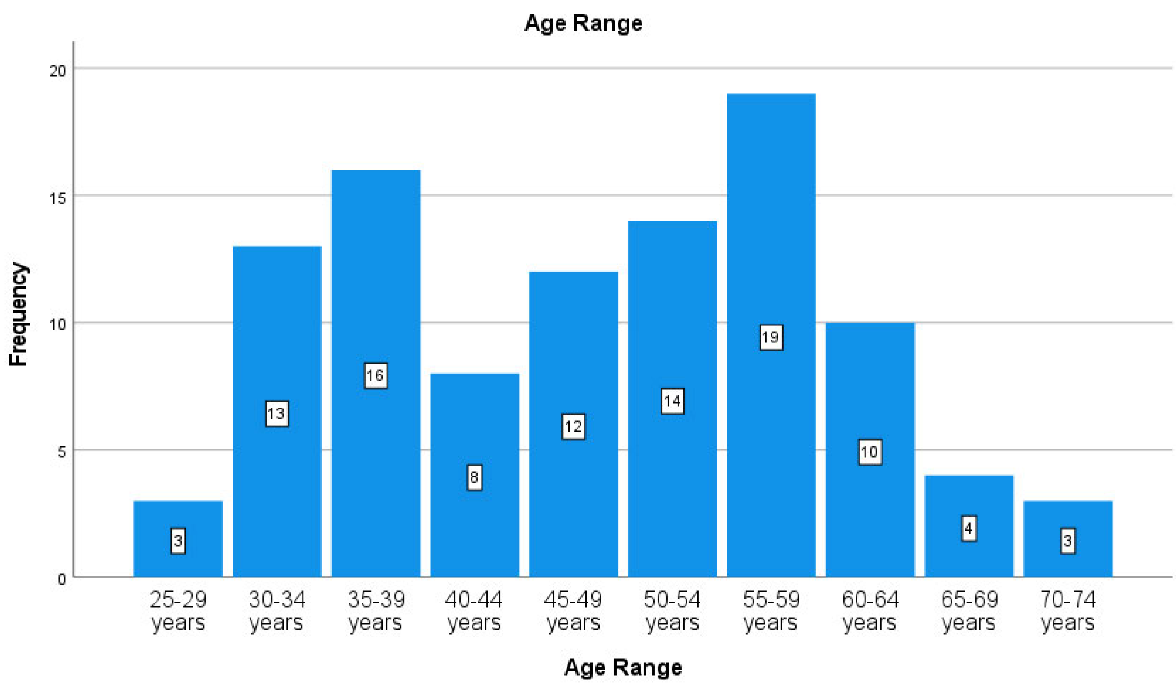


Figure 6.2: Frequency of participants across age groups

After transformation into three categories, the proportions were as follows: 18–39 years, 31.4%; 40−54 years, 33.3%; and 55 years or more, 35.3%.

The IRSD showed a reasonable spread (low, 27.5%; medium, 40.2%; high, 31.4%). Participants were relatively well educated, as indicated by their reported highest qualifications (HSC, 27.5%; trade certificate or diploma, 34.3%; graduate degree, 21.6%; postgraduate qualifications, 16.7%).

A high majority (88%) of the self-managed weight losers had a weight above the healthy range (overweight, 23%; obesity, 65%) compared with Australian population levels (67% above healthy range: 31% obesity, 36% overweight). Twelve per cent were normal weight compared with 32% in the Australian population. Participants on average weighed 94.64 kg (mean 94.64, SD 24.31). Males were significantly (F = 6.011, p = 0.016) heavier at 110 kg (mean ± SD: 109.69 ± 26.97) than females, who had a mean weight of 92 kg (mean ± SD: 92.39 ± 23.23).

The vast majority of participants were classified as unassisted (87, 85.3%). Those whose highest qualifications were 'trade certificate or diploma' were more likely to be unassisted, compared with those with HSC (OR = 0.09, 95% CI = 0.01, 0.77). The differences between assisted and unassisted groups were not significant.

Table 6.2: Demographic characteristics of self-managed weight losers in Australia

		Self-management type						
		Unassisted		Assisted			95% CI	
		n	%	*n*	%	OR	Lower	Upper
Gender	Female	75	86.2	14	93.3			
	Male	12	13.8	1	6.7	2.24	0.269	18.63
Age range	18–39 years	30	34.5	2	13.3			
	40–54 years	27	31.0	7	46.7	3.89	0.743	20.356
	55 years and above	30	34.5	6	40.0	3	0.56	16.07
Highest level of qualification	HSC	21	24.1	7	46.7			
	Trade certificate, diploma	34	39.1	1	6.7	0.09*	0.01	0.77
	Degree and higher	32	36.8	7	46.7	0.66	0.20	2.14
Language	English	75	86.2	12	80.0			
	Language other than English	12	13.8	3	20.0	1.6	0.38	6.36
Marital status	Single, widowed, divorced	25	28.7	3	20.0			
	Married or with partner	62	71.3	12	80.0	1.61	0.42	6.2
IRSD	Low	24	27.9	4	26.7			

	Medium	34	39.5	7	46.7	1.23	0.32	4.69
	High	28	32.6	4	26.7	0.857	0.19	0.38
Initial BMI category	Normal weight	11	12.9	1	6.7			
	Overweight	19	22.4	4	26.7	2.3	0.23	23.41
	Obesity	55	64.7	10	66.7	2.0	0.23	17.26

Note: $*p < 0.05$. [a]IRSD = Index of Relative Socio-economic Disadvantage

6.3.2.2 Health status of participants

The majority of the participants reported that their health was ‘good’ (47.1%) or ‘fair’ (34.3%). Few reported that their health was ‘bad’ (6.9%) or ‘very bad’ (3.9%). Eight participants (7.8%) reported their health was ‘very good’. As shown in Figure 6.3a, almost a third (27.5%) of the participants had diagnosed depression, followed by sleep apnoea (14.7%), osteoarthritis (13.7%) and diabetes (11.8%). Figure 6.3b shows a little over half the participants had chronic health conditions (52.9%). Table 6.3 shows the distribution by self-management types. All participants with cancer (n = 4) or heart disease (n = 4) were unassisted. Table 6.4 shows the odds of presence of chronic disease was nearly two times likely in the assisted group.

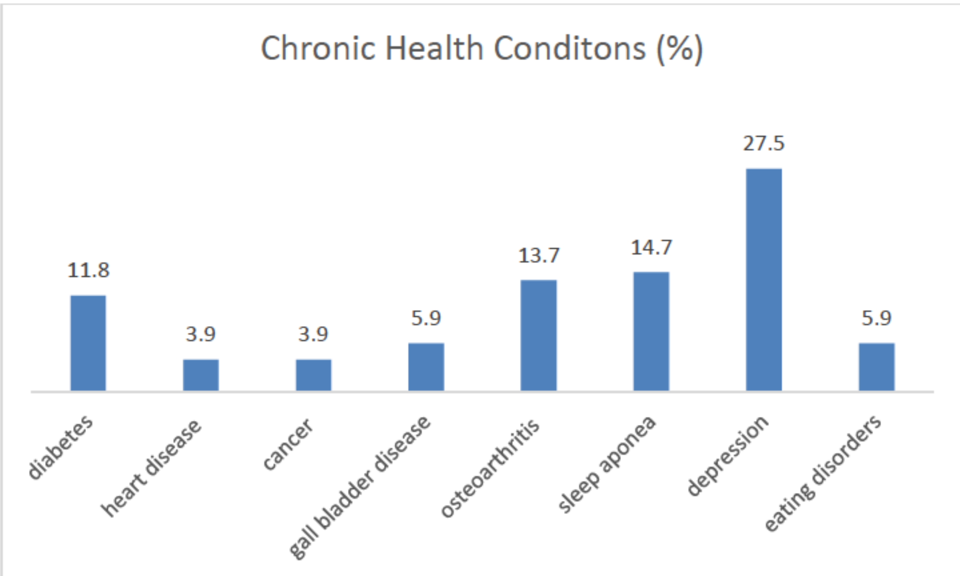


Figure 6.3a: Presence of chronic health conditions by type

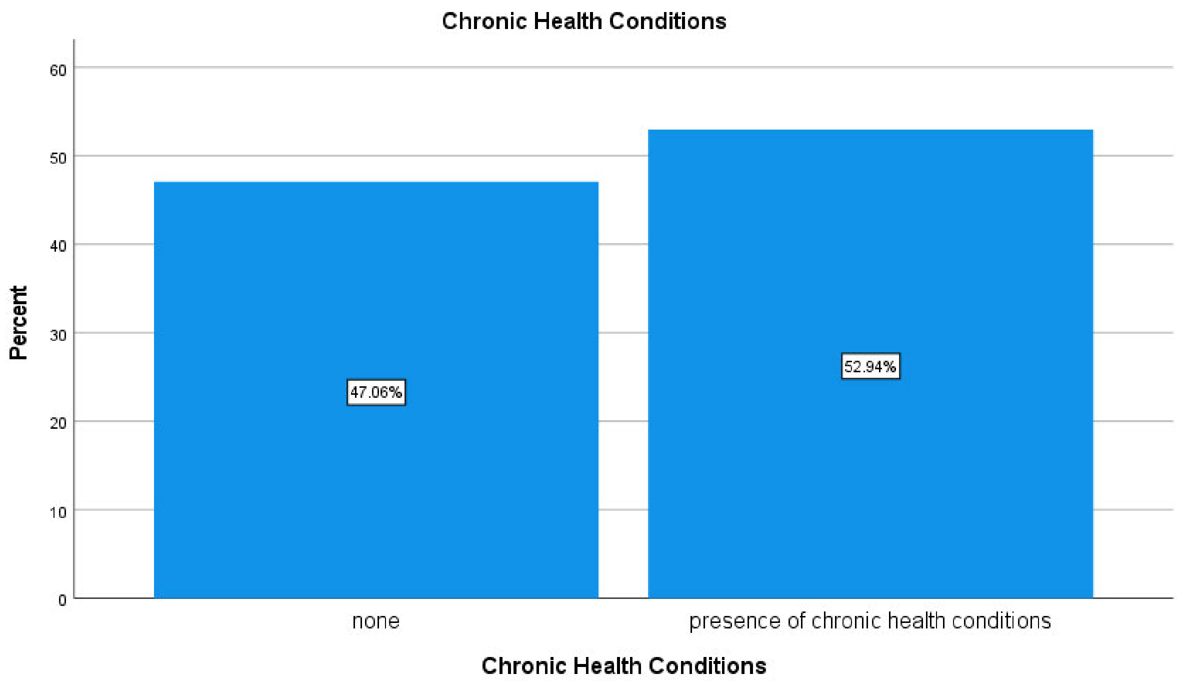


Figure 6.3b: Presence of chronic health conditions overall

Table 6.3: Chronic disease conditions by self-management type

		Self-management type				Fisher's exact test
		Unassisted		Assisted		
		n	%	*n*	%	
Diabetes	No	79	90.8	11	73.3	
	Yes	8	9.2	4	26.7	0.740
Cancer	No	83	95.4	15	100.0	
	Yes	4	4.6	0	0.0	1.000
Sleep apnoea	No	75	86.2	12	80.0	
	Yes	12	13.8	3	20.0	0.459
Osteoarthritis	No	75	86.2	13	86.7	
	Yes	12	13.8	2	13.3	1.000
Depression	No	66	75.9	8	53.3	
	Yes	21	24.1	7	46.7	0.113
Eating disorders	No	83	95.4	13	86.7	
	Yes	4	4.6	2	13.3	0.213
Heart disease	No	83	95.4	15	100.0	
	Yes	4	4.6	0	0.0	1.000
Gall bladder disease	No	82	94.3	14	93.3	
	Yes	5	5.7	1	6.7	1.000

Table 6.4: Presence of chronic conditions by self-management type

Chronic health conditions	Self-management type					95% CI	
	Unassisted		Assisted				
	n	%	*n*	%	OR	Lower	Upper
None	43	51.8	5	35.7			
Presence of chronic health conditions	40	48.2	9	64.3	1.94	0.598	6.265

6.3.2.3 Weight history, perceived reasons for weight issues, and main reason for weight loss attempt

When asked about a time when the participant felt comfortable with their weight, more than half the participants (54.9%) responded 'a long time ago', followed by about a quarter each of participants responding 'never' (18.6%) and 'in recent times' (22.5%); the remaining were 'unsure'. About half the participants reported gaining weight without trying (51%). More than half reported they were 'always trying to lose weight' (61%). Proportions for these responses were compared between assisted and unassisted groups; however, these differences were not significant (see Table 6.5).

Table 6.5: Weight-related history

		Self-management type				Fisher's exact test
		Unassisted		Assisted		
		n	%	*n*	%	
Time when comfortable with weight and wellbeing	Never/Unsure	21	24.1	2	13.3	
	Long time ago	45	51.7	11	73.3	na
	In recent times	21	24.1	2	13.3	
Gaining weight without trying to	No	47	54.0	5	33.3	
	Yes	40	46.0	10	66.7	1.69
No. of previous weight loss attempts	3 times or less	30	34.5	1	6.7	
	4 times or more	16	18.4	3	20.0	na
	Always trying to lose weight	41	47.1	11	73.3	

The most common issue that participants believed contributed to their weight issue was ‘poor diet’ (43.1%), followed by ‘lack of exercise’ (21.6%), ‘medical reasons’ (15.7%), ‘lack of time, resources or lack of availability or access to healthy food’ (10.8%), and their family trait or genes (8.8%). The majority of the participants were attempting to lose weight for ‘health and wellness’ (63.7%), followed by ‘medical reasons’ (14.7%), ‘aesthetic reasons’ (10.8%) or ‘other reasons (to please others, job requirement, to feel confident)’ (10.8%). Figure 6.4 shows the comparison of these responses between assisted and unassisted groups. The differences were not found to be significant.

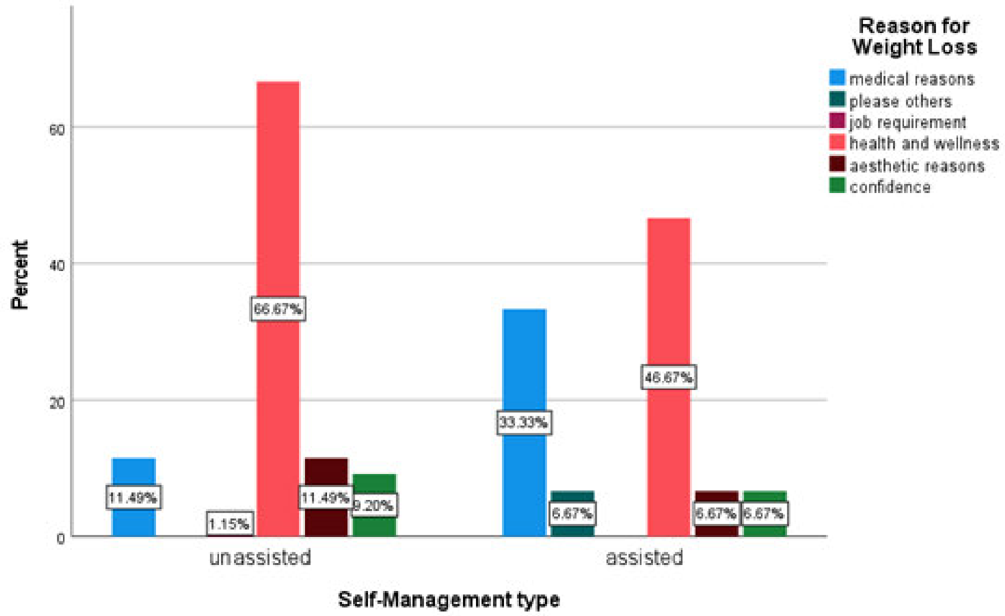


Figure 6.4: Main reason for weight loss attempt

6.3.2.4 Psychosocial characteristics and eating behaviours

Participants responded to a range of statements (transformed to ‘like me’ or ‘unlike me’) that are suggestive of psychosocial characteristics and eating behaviours. A large proportion of participants indicated that they ate when triggered by negative emotions (80, 78.4%), as well as binged even when not hungry (62.7%). However, a majority of participants also indicated they had self-efficacy (80.4%), had coping skills (74.5%), and felt supported by family and friends (70.6%).

In relation to questions about participants experiencing weight bias, the most frequent response was ‘never’ (35.3%), followed by equal numbers reporting ‘rarely’ and ‘sometimes’ (26.5% each). A tenth of participants indicated that they ‘almost always’ feel weight bias (11.8%).

Table 6.6: Psychosocial characteristics and eating behaviours

		Self-management type						
		Unassisted		Assisted				
		n	%	*n*	%	OR	95% CI	
I eat whatever I like, whenever I like	Like me	48	57.8	6	42.9			
	Unlike me	35	42.2	8	57.1	2.12	0.69	6.45
I feel hungry almost all the time	Like me	32	38.6	8	57.1			
	Unlike me	51	61.4	6	42.9	0.45	0.15	1.37
I find myself eating if I am stressed/anxious/sad/lonely	Like me	63	75.9	12	85.7			
	Unlike me	20	24.1	2	14.3	0.52	0.11	2.48
I continue eating binges even though I am not hungry	Like me	50	60.2	10	71.4			
	Unlike me	33	39.8	4	28.6	0.82	0.26	2.60
I am able to limit food and still able to avoid feelings of tight restrictions or of deprivation	Like me	48	57.8	4	28.6			
	Unlike me	35	42.2	10	71.4	2.70	0.85	8.57
I feel supported by my family/friends in my weight loss efforts	Like me	63	75.9	7	50.0			
	Unlike me	20	24.1	7	50.0	2.44	0.79	7.47
I feel I have the capacity to deal with challenges and cope with stressful or adverse situations	Like me	62	74.7	11	78.6			
	Unlike me	21	25.3	3	21.4	0.70	0.18	2.69
I think of things in 'black and white' terms. For example, I think of food as either 'good' or 'bad' or I think of myself as doing things either very well or very badly	Like me	46	55.4	10	71.4			
	Unlike me	37	44.6	4	28.6	2.40	0.72	8.04
I have stability in my life—personal and professional	Like me	70	84.3	11	78.6			
	Unlike me	13	15.7	3	21.4	1.20	0.30	4.78
Face weight stigma	Never	31	37.3	3	21.4			
	Rarely	23	27.7	3	21.4	1.35	0.25	7.29
	Sometimes	22	26.5	3	21.4	1.41	0.26	7.64
	Always	7	8.4	5	35.7	7.38	1.42	38.42
Have self-efficacy	Like me	69	83.1	9	64.3			
	Unlike me	14	16.9	5	35.7	2.74	0.8	9.41

Table 6.6 shows the comparison of participant responses that are suggestive of psychosocial characteristics and eating behaviours between assisted and unassisted groups. None of these characteristics were significantly different for different self-management types.

6.3.2.5 Lifestyle risk factors

Almost all participants were non-smokers (96.1%), and had low risk for alcohol consumption (94.1%).

6.3.2.6 Weight loss strategies

Participants selected a range of different diets that they followed at the time of attempting weight loss, as illustrated in Figure 6.5. More than half reported that they just ate a healthy diet (52.6%), followed by ‘no diet’ (13.4%). Another 13.4% followed paleo-like diets, followed by calorie-restricted diets (11.34%). Fewer followed the remaining types of diets.

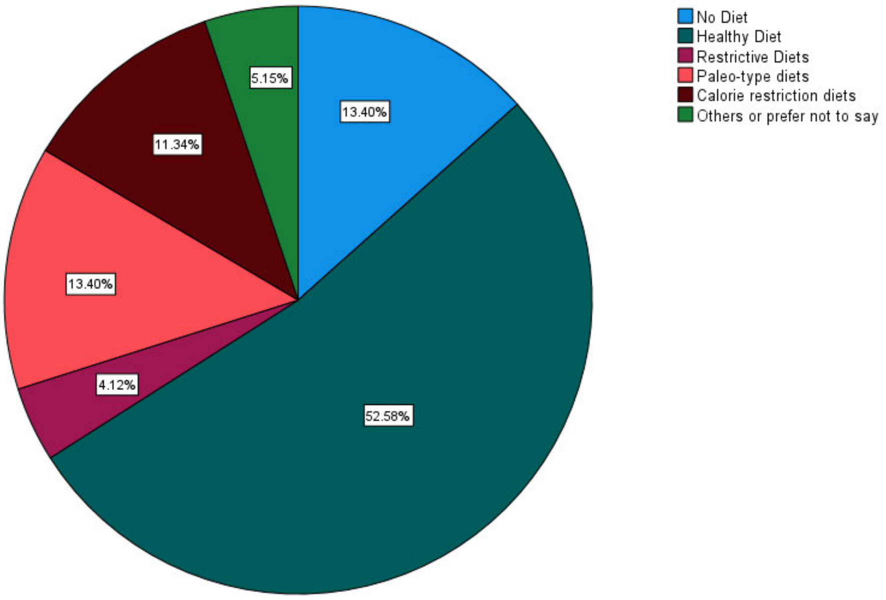


Figure 6.5: Diet types followed by self-managed weight losers

Table 6.7: Diet types by self-management type

Diet categories	Self-management type							
	Unassisted		Assisted				95% CI	
	n	%	*n*	%	*p*-value	OR	Lower	Upper
No diet	11	12.6	3	20.0	0.418			
Healthy diet	48	55.2	5	33.3	0.231	0.38	0.08	1.84
Restrictive diets	3	3.4	1	6.7	0.880	1.22	0.09	16.43
Paleo-like diets	11	12.6	4	26.7	0.742	1.33	0.24	7.40
Calorie-restriction diets	11	12.6	0	0.0				
Others or prefer not to say	3	3.4	2	13.3	0.425	2.44	0.27	22.02

More than a third of the participants used weight loss products such as meal replacement shakes and bars and calorie-controlled prepared meals, such as Lean Cuisine, supermarket weight loss meals and McCain healthy choice (35.3%). Approximately a quarter utilised diet books and websites (23.5%), and less than a quarter used smartphone app diet programs (20.6%).

A majority (69.6%) tracked their weight, whereas just over half tracked their diet (52.9%) and exercise (52%). Among those participants who tracked either one or all of these variables, most used wearable devices (n = 36), smart phone apps (n = 35), or pen and paper diary (n = 21).

No significant differences between unassisted and assisted groups were detected for any of these strategies, as seen in Table 6.7.

6.3.2.7 Exploratory self-management variables

Participant responses to two new exploratory variables are shown below. When asked to indicate how true the statement ‘I was able to use the knowledge obtained from my previous weight loss experiences to shape my approach to my most recent weight loss attempt’ was in relation to their current weight loss attempt, 51 (61.4%) were in agreement (see Figure 6.6).

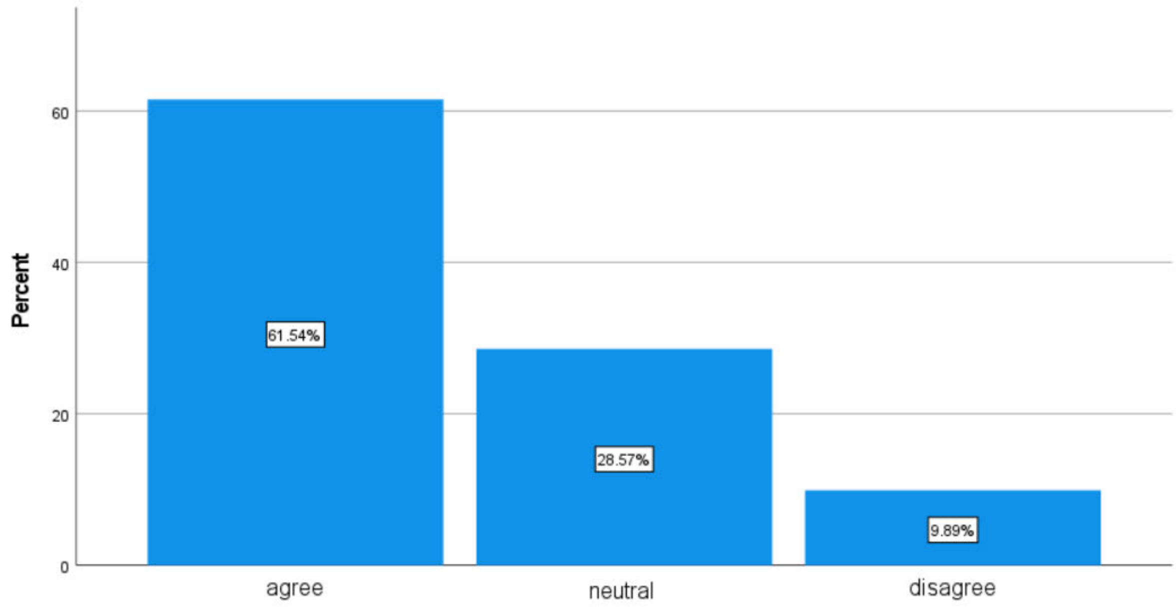


Figure 6.6: Previous knowledge shaping current weight loss approach

When asked how likely they were to continue any diet and exercise changes made as a regular part of their lifestyle, a large majority (79.12%) were affirmative (see Figure 6.7).

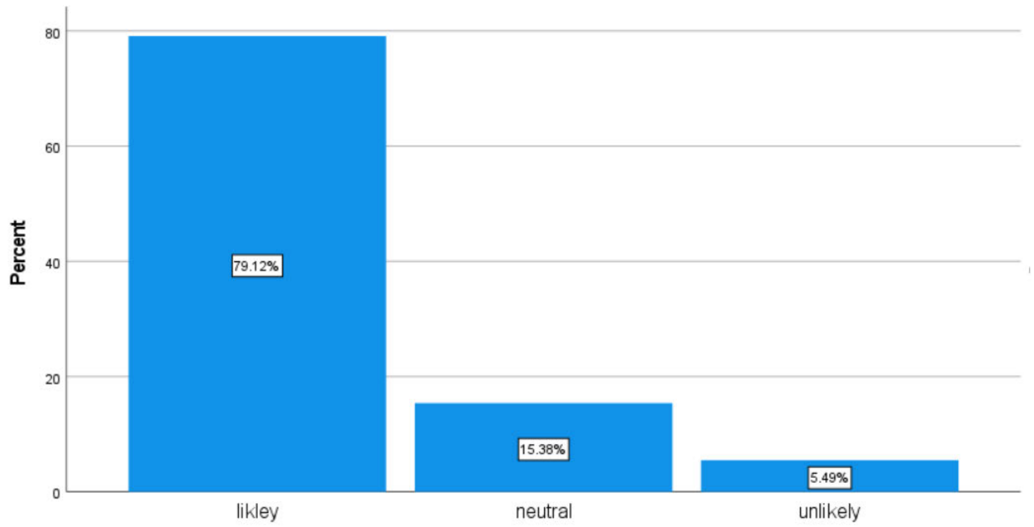


Figure 6.7: Likelihood of making positive behaviour changes a regular part of lifestyle

The likelihood of continuing positive behaviour change made during this weight loss attempt did not significantly differ between unassisted and assisted groups, as shown in Table 6.8.

Table 6.8: New exploratory variables by self-management type

		Self-management type						
		Unassisted		Assisted			95% CI	
		n	%	*n*	%	OR	Lower	Upper
Likelihood of embedding positive diet and physical activity changes in lifestyle	likely	60	77.9	12	85.7			
	neutral	12	15.6	2	14.3	0.83	0.17	4.21
	unlikely	5	6.5	0	0.0			
Previous experience shaped current weight loss approach	agree	49	63.6	7	50.0			
	neutral	21	27.3	5	35.7	1.67	0.47	5.85
	disagree	7	9.1	2	14.3	2.00	0.34	11.62

6.3.3 Outcomes of self-managed weight loss attempts

In this section, the results of the before and after analysis are presented for weight, diet and physical activity outcomes. In particular, the proportions of participants that were successful at weight loss (3% or more body weight lost), and proportions that achieved clinically significant weight loss (5% or more body weight lost), are reported. The changes in food consumption and physical activity are presented as well. These outcomes are compared between assisted and unassisted groups of participants.

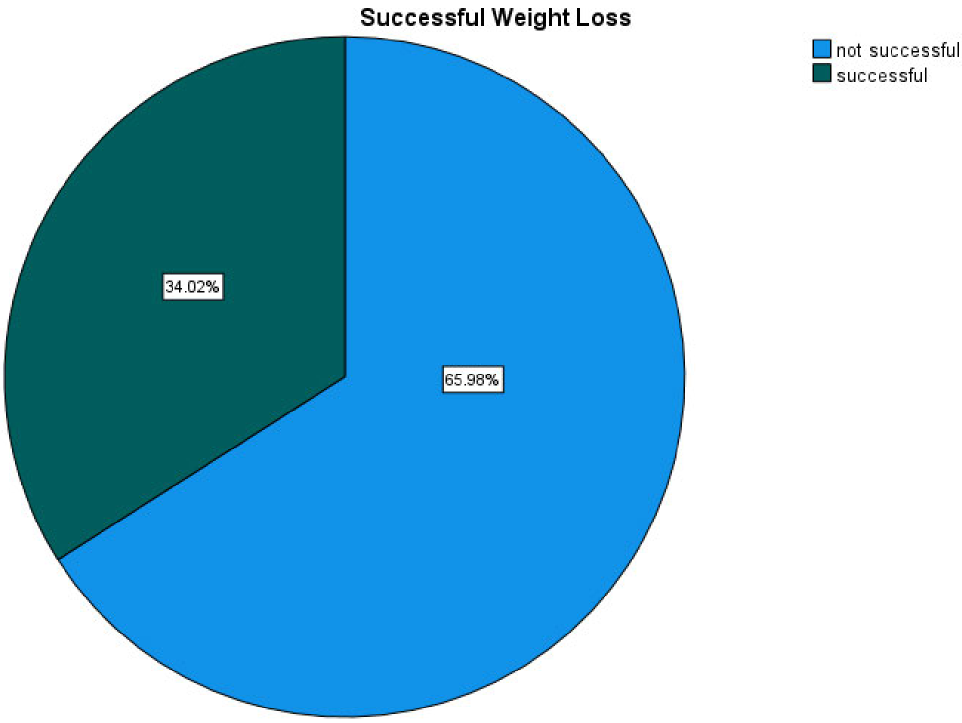
In Table 6.9, the comparisons of the changes in absolute weight, mean weekly food consumption scores (serves) and total weekly minutes for physical activity between baseline and 12-week follow-up are shown.

Table 6.9: Changes in weight, food consumption and physical activity outcomes

Outcomes		**Baseline**		**Follow-up**			
	n	Mean	SD	Mean	SD	Paired *t*-value	*p*-value
Weight							
Weight (kg)	97	94.59	24.44	92.52	23.78	4.18	<0.001*
Food consumption							
Vegetables	94	14.24	11.08	15.15	11.07	−0.96	0.34
Fruit	94	6.65	6.16	5.68	5.42	1.70	0.09*
Grains, cereals, rice, bread, pasta, noodles	94	8.54	6.58	8.59	6.51	−0.07	0.95
Meat, fish, poultry, eggs	94	8.27	5.92	8.27	5.20	−0.01	0.99
Milk, yoghurt, cheese and/or their alternatives	94	7.69	5.63	7.51	5.66	0.30	0.77
Oil	94	7.45	5.67	6.94	5.38	0.96	0.34
Cakes, biscuits, pies, pastries	94	3.02	4.31	2.22	2.75	1.89	0.06*
SSBs	94	2.06	4.12	1.11	2.92	2.49	0.01*
Takeaways	94	0.80	1.23	0.53	0.92	2.06	0.04*
Processed meat	94	1.28	1.67	1.17	1.47	0.60	0.55
Hot chips	94	0.90	1.72	0.81	1.27	0.48	0.63
Physical activity							
Walking	61	125.79	107.35	494.15	2673.44	−1.09	0.28
Vigorous physical activity	28	112.21	92.15	124.89	155.95	−0.51	0.61
Moderate physical activity	8	81.38	56.22	122.25	196.82	−0.60	0.57

**p*-value less than 0.05.

Participants lost an average of 2.07 kg at the 12-week follow-up, and this was statistically significant (mean ± SD: 2.07 ± 4.89, $p < 0.001$). A third of participants (34%) were 'successful' in losing 3% or more of their initial body weight, and nearly a fifth of the participants (19.6%) achieved clinically significant weight loss of 5% or more of their initial body weight (see Figure 6.8). Nearly half the participants did not lose or gain weight, whereas 10 participants gained weight.



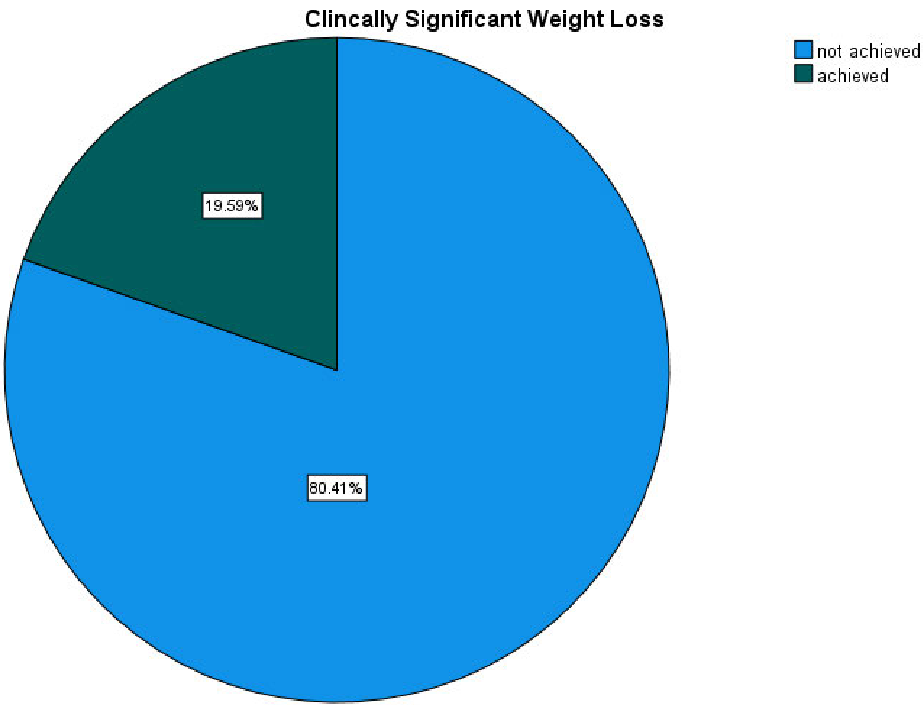


Figure 6.8: Successful and clinically significant weight loss

When asked if participants felt they had achieved their weight loss goal, the majority responded 'no' (56.9%), followed by 'somewhat' (27.5%) and 'yes' (12.7%). Half the participants were dissatisfied with their weight loss attempt (50%); about a third of participants were satisfied (34.7%), and the remaining (14.7%) were neither satisfied nor dissatisfied.

The mean weekly food consumption scores increased for grains, cereals, rice, bread, pasta and noodles, and meat, fish, poultry and eggs, but changes were not statistically significant. Although effect sizes were very small, changes that were significant include a reduction in fruit (.96, $t = 1.7$, $p = 0.09$); cake, pies, biscuits and pastries (.79, $t = 1.89$, $p = 0.06$); takeaways (.27, $t = 2.06$, $p = 0.04$); and SSBs (.95, $t = 2.49$, $p = 0.01$).

Although total minutes increased for walking, physical and moderate activity at follow-up, none of the changes were statistically significant. There was a large amount of missing data for physical activity. Only 61 (59.8), 28 (27.45%) and 8 (7.84%) responses were available for walking, vigorous and moderate physical activity, respectively. Further, high standard deviations indicate that the data are very widely spread and therefore not reliable.

6.3.4 Comparison of weight, food consumption and physical activity changes between assisted and unassisted groups

Table 6.10 shows that the unassisted group lost on average 2 kg at follow-up (mean ± SD: −2 ± 4.9), whereas the assisted group lost on average 2.7 kg (mean ± SD: −2.7 ± 4.8). The differences between the two groups were not significant (0.431 kg, $p = 0.6$, 95% CI = −1.78, 2.77).

Table 6.10: Absolute weight change (kg) at 12-week follow-up by self-management type

Descriptive statistics		Self-management type	
		Unassisted	Assisted
N	Valid	83.0	14.0
	Missing	4.0	1.0
Mean		−2.0	−2.7
SD		4.9	4.8
Minimum		−21.0	−16.0
Maximum		14.0	2.0

Independent samples *t*-test for equality of means							
		t	df	*p*-value	Mean difference	95% CI	
						Lower	Upper
Absolute weight	Equal variances assumed	0.431	95	0.667	0.50	−1.78	2.77

change in kilograms

Table 6.11 shows that the assisted group increased their weekly fruit and veg consumption by close to two serves (mean ± SD: 1.8 ± 16.5), whereas the unassisted group showed negligibly reduced fruit and veg consumption at follow-up (mean ± SD: −0.3 ± 11.4). However, there is large variation and the differences between the two groups are not statistically significant (−0.54, p = 0.58, 95% CI = −9.02, 5.13)

Table 6.11: Change in mean weekly fruit and vegetable consumption scores (serves at 12-week follow-up by self-management type)

Descriptive statistics		Self-management type	
		Unassisted	Assisted
N	Valid	82.0	14.0
	Missing	5.0	1.0
Mean		−2.0	-0.3
SD		4.9	11.4
Minimum		−21.0	-42.0
Maximum		14.0	35.0

Independent samples *t*-test for equality of means							
		t	df	*p*-value	Mean difference	95% CI	
						Lower	Upper
Change in fruit & veg consumption	Equal variances assumed	−0.546	92	0.587	−1.94	−9.02	5.13

As shown in Table 6.12, there were no significant changes in consumption (median values) of discretionary foods and SSBs within either the assisted or unassisted group.

Table 6.12: Change in mean weekly food consumption scores (serves) for discretionary foods (takeaways, processed meats, cakes, pies, pastries, biscuits) and SSBs at 12-week follow-up by self-management type

		Change in discretionary food consumption		Change in SSBs consumption	
Self-management type		Unassisted	Assisted	Unassisted	Assisted
N	Valid	80.0	14.0	80.0	14.0
	Missing	7.0	1.0	7.0	1.0
Median		0.0	−1.5	0.0	0.0
Minimum		−28.0	−25.5	−21.0	−7.0
Maximum		8.5	8.0	7.0	3.0
Percentiles	25	−2.9	−9.0	0.0	−2.1
	75	1.5	4.8	0.0	0.0

The changes in physical activity were variable across the different forms of activity and the level of assistance (see Table 6.13). In the unassisted group, total weekly mean minutes for vigorous (mean ± SD: 17 ± 135), moderate (mean ± SD: 58 ± 201), and walking (mean ± SD: 35 ± 150) activity increased at follow-up. However, in the assisted group, vigorous activity reduced by 15 minutes (mean ± SD: −15 ± 65). A response was available for only one participant for moderate activity, which reduced by 80 minutes; however, walking minutes increased by 8 minutes (mean ± SD: 8 ± 126). Very large standard deviations indicate these results are unreliable.

Table 6.13: Change in physical activity at 12-week follow-up by self-management type

		Self-management type					
		Unassisted			Assisted		
Change in physical activity (weekly minutes)		Vigorous	Moderate	Walking	Vigorous	Moderate	Walking
N	Valid	26	7	55	3	1	7
	Missing	61	80	32	12	14	8
Mean		17	58	35	−15	−80	8
SD		135	201	150	65		126

As shown in Table 6.14, there was no significant difference between assisted and unassisted groups in the change in total walking (0.502 minutes, $p = 0.62$, 95% CI = −88.97, 148.59). With low counts, statistical tests comparing differences between assisted and unassisted groups for moderate and vigorous physical activity are not reported.

Table 6.14: Changes in walking minutes in different self-management groups

Independent samples *t*-test for equality of means						95% CI	
		t	df	*p*-value	Mean difference	Lower	Upper
Walking difference	Equal variances assumed	0.502	59	0.617	29.807	−88.975	148.589

6.3.5 Homogeneous clusters among self-managed weight losers

Cluster analysis was undertaken to determine if there were any common groupings of characteristics among our participants that might define self-managers of weight loss. The analysis based on the full range of variables produced just one cluster and no variations were seen.

However, the two-step cluster analysis based on eight key variables showed multiple clustering options, as shown in Figure 6.9, where the BIC change is plotted against number of clusters. ‘Kinks’ or ‘elbows’ are seen at 3, 4, 7, 8 and 9 as potential numbers of cluster options. Fewer large clusters were preferred to a large number of small clusters; therefore, the four-cluster option was selected.

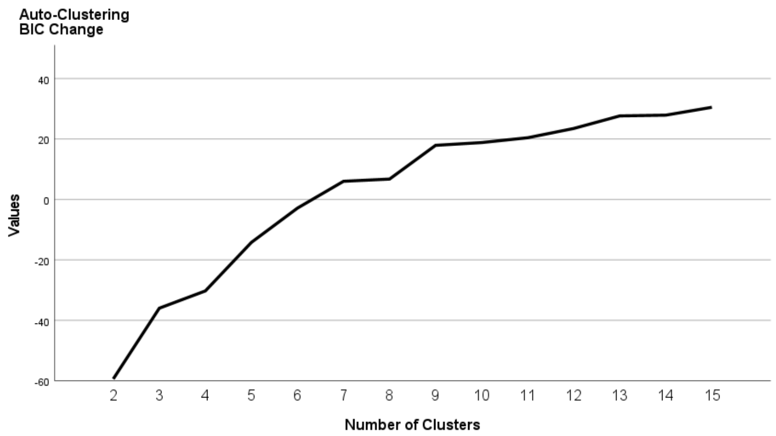


Figure 6.9: Change in Bayesian information criterion (BIC) against number of clusters

When the two-step cluster analysis was conducted, it revealed four clusters among the self-managed weight losers. The cluster quality was rated ‘fair’, with a silhouette measure of cohesion and separation of 0.3. The predictive importance was highest for age range (100%), followed by stress eating (47%), health status (31%) and initial BMI (10%). IRSD (6%), gender (5%), language (3%) and self-management (3%) had low predictive importance.

Table 6.15: Cluster distribution among self-managed weight losers

	Cluster 1		**Cluster 2**		**Cluster 3**		**Cluster 4**		**Total**	***p*-value**
Variable	*n*	%	*n*	%	*n*	%	*n*	%	*n*	
Cluster distribution	29	29.90	28	28.90	26	26.80	14	14.40	97	na
Initial BMI **(mean and SD)**	38.41	8.30	32.09	7.19	36.84	11.05	29	5.75	35	**0.002*****
Gender										0.056
Male	5	38.5	0	0	4	30.8	4	30.8		
Female	24	28.6	28	33.3	22	26.2	10	11.9		
Age										
18–44 years	2	6.70	24	80.00	0	0.00	4	13.30	30	**<.001***
45–54 years	0	0.00	0	0.00	26	83.90	5	16.10	31	
55 years and above	27	75.00	4	11.10	0	0.00	5	13.90	36	
Language										0.134
English	28	33.70	24	28.90	21	25.30	10	12.00	83	
Other than English	1	7.10	4	28.60	5	35.70	4	28.60	14	
IRSD										**0.021***
1 to 3	4	14.80	13	48.10	9	33.30	1	3.70	27	
4 to 7	14	36.80	11	28.90	8	21.10	5	13.20	38	
8 to 10	11	34.40	4	12.50	9	28.10	8	25.00	32	
Health status										**<.001***
Healthy (absence of disease)	2	0.04	20	0.42	12	0.25	14	0.29		
Presence of disease	27	0.55	8	0.16	14	0.29	0	0.00		
Self-management										0.218
Unassisted	24	28.90	25	30.10	20	14.00	17	16.90	83	
Assisted	5	35.70	3	21.40	6	42.90	0	0.00	14	
Stress eating										**<.001***

	Cluster 1		Cluster 2		Cluster 3		Cluster 4		Total	*p*-value
Variable	*n*	%	*n*	%	*n*	%	*n*	%	*n*	
Like me	23	30.70	28	37.30	24	32.00	0	0.00	75	
Unlike me	6	27.30	0	0.00	2	9.10	14	63.60	22	

Note: **p*-value <0.05. [a]IRSD = Index of Relative Socio-economic Disadvantage

As shown in Table 6.15, clusters differed significantly for age range, health status, IRSD, stress eating and initial BMI. However, the differences in gender, language and self-management type were not significant.

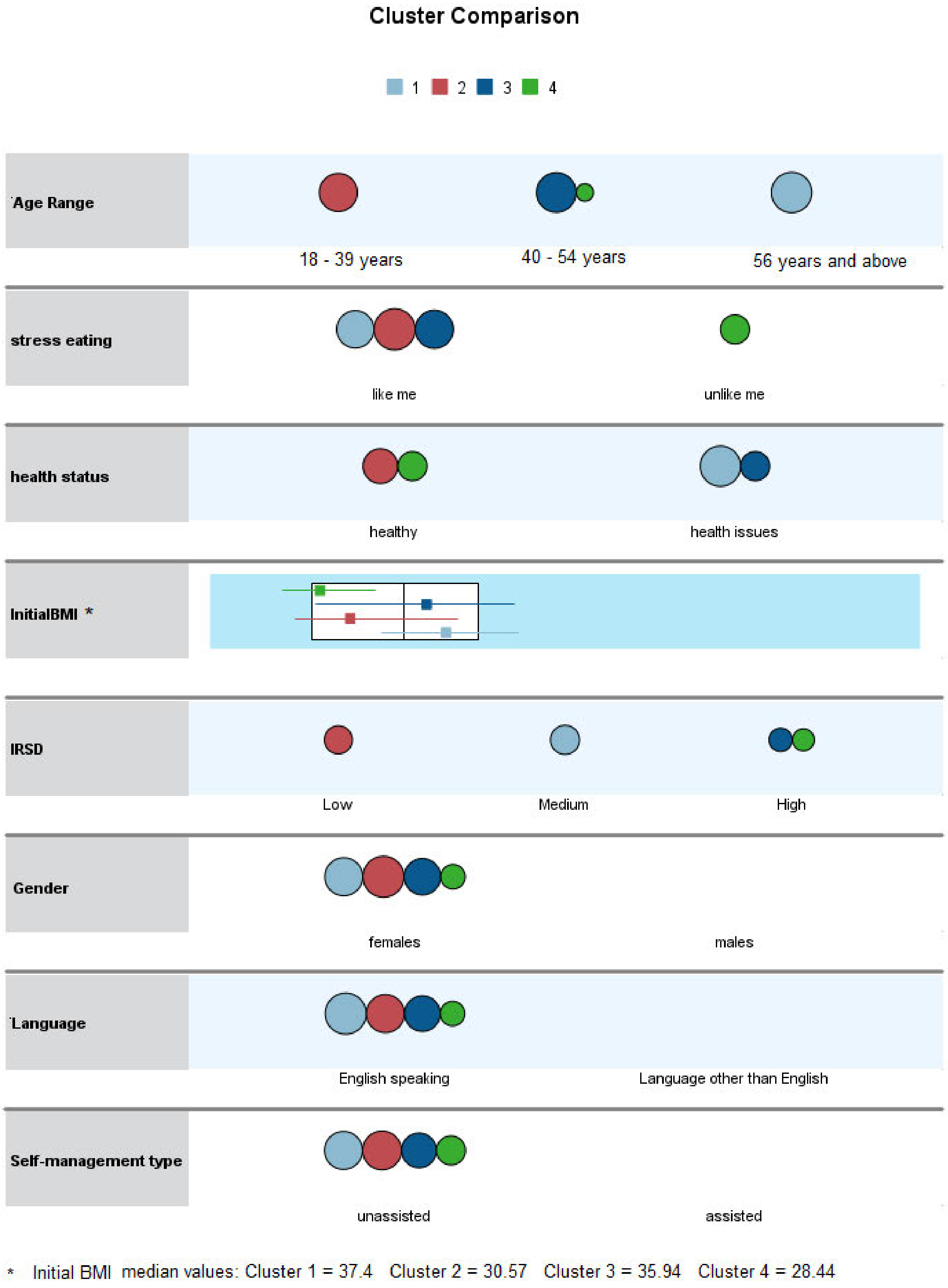


Figure 6.10: Visualisation of clusters in self-managed weight losers

Figure 6.10 shows a visual representation of the four clusters, which can be described as follows:

- **Cluster 1: 'older, ill and stressed'** was the largest cluster (29.9%), and consisted of the older aged (55 years and above) with chronic ailments, and class 2 obesity (mean BMI 38.41). They are in the middle IRSD group (4–7) and are prone to eating if they find themselves stressed/anxious/sad/lonely.
- **Cluster 2: 'younger aged and healthy, but poor and stressed'** was nearly as large as Cluster 1 (28.9%), and consisted of younger and middle-aged participants (18–39 years). This group has class 1 obesity (mean BMI 32.09), but is otherwise healthy and not suffering from any chronic ailments. This cluster is the most disadvantaged (IRSD = 1 to 3), and is also prone to eating out of stress, anxiety, sadness or loneliness.
- **Cluster 3: 'wealthy but ill and stressed'** is the third largest cluster (26.8%). This group have limited social disadvantage, and live in high IRSD postcodes (8–10). However, they are not healthy and have chronic disease, and also have class 2 obesity (mean BMI 36.84), and eat out of stress, anxiety, sadness or loneliness.
- **Cluster 4: 'wealthy, relaxed and healthy'** is the smallest cluster (14/4%). This group is middle aged, and of low social disadvantage. They are overweight but do not have obesity (mean BMI 29.09), and do not eat because of stress, anxiety, sadness or loneliness.

All four clusters were characterised as English-speaking females, and unassisted in their weight loss attempt. In terms of proportions (see Table 6.15), most males were found in the 'older, ill and stressed' cluster (Cluster 1, 5, 38.5%). Most of the non-English-speaking participants, (Cluster 2, 5, 35.7%), and most of the 'unassisted' self-managed weight losers (Cluster 2, 25, 30.1%), were found in the 'younger aged and healthy, but poor and stressed' group. Meanwhile, most of the 'assisted' were found in the 'wealthy, but ill and stressed' group (Cluster 3, 6, 42.9%).

Table 6.16 shows mean differences in absolute weight change at 12-week follow-up for each cluster. The older, ill and stressed cluster lost the most, with a mean reduction of 2.89 kg (Cluster 1, mean ± SD: −2.89 ± 4.54), followed by the wealthy, but ill and stressed (Cluster 3, mean ± SD: −2.25 ± 2.5). The 'younger aged and healthy, but poor and stressed' lost the least weight (Cluster 2, mean ± SD: −1.33 ± 3.64).

Table 6.16: Absolute weight change (kg) at 12-week follow-up by cluster

	N	Minimum	Maximum	Mean	SD
Cluster 1	29	−16.00	5.00	−2.89	4.54
Cluster 2	28	−8.00	8.00	−1.33	3.64
Cluster 3	26	−21.00	14.00	−2.25	7.05
Cluster 4	14	−5.00	5.00	−1.57	2.50

Table 6.17 shows that Cluster 4 'wealthy, relaxed and healthy' had the highest proportion of successful weight losers (6, 42.9%), whereas Cluster 2 'younger aged and healthy, but poor and stressed' had the least number of successful weight losers. The differences, however, were not significant.

Table 6.17: Successful weight loss by cluster

	Successful weight loss		Not successful			
	n	%	*n*	%	OR	*p*-value
Cluster 1	11	37.9	18	62.1		0.804
Cluster 2	8	28.6	20	71.4	0.65	0.455
Cluster 3	9	34.6	17	65.4	0.87	0.799
Cluster 4	6	42.9	8	57.1	1.23	0.757

6.4 Discussion

This aim of this chapter was to describe those who self-manage their weight loss in the general population of Australia, and examine if they are successful. A breadth of characteristics in the categories of demographics, weight history, health status, lifestyle and risk behaviours, and psychosocial and eating behaviour related characteristics, as well as new exploratory characteristics, have been described. An analysis of the impact of these variables on change in weight and weight-related behaviour outcomes have been presented. In addition, these outcomes were compared between the assisted and unassisted subgroups. Finally, four clusters or homogeneous groups among self-managed weight losers were identified and described, and weight outcomes for the clusters were compared.

The majority of the self-managed weight losers were women and English-speaking, as is reported in other populations attempting weight loss (5, 6). This is not unexpected as an over-representation of English-speaking women when recruiting participants through Facebook is commonly reported.(7, 8) Most of the study participants were middle aged, and married or with a partner.

Higher weights or increasing BMI levels are associated with increasing weight loss attempts.(5) This was reflected in the BMI distribution among the self-managed weight losers as well, with 65% of the participants with obesity, followed by 23% with overweight and 12% within a healthy BMI range.

Most participants (85%) were classified as unassisted, and managed their weight loss journey on their own. A small number reported using some form of assistance from commercial weight loss programs or health professionals; however, the characteristics of these subgroups were not substantially different, suggesting that all participants who define themselves as self-managing their weight loss journey can be considered a common target for action. The self-managed weight losers lost a significant 2.07 kg at the 12-week follow-up (−2.07, 95% CI = −3.06, −1.09, $p < 0.001$). One review reports that lifestyle interventions delivered face-to-face in single or group sessions yielded a mean weight loss of 3.33 kg (95% CI = −5.06, −1.60)(9); however, the intervention time frame ranged from 16 weeks to 9 years. A more comprehensive systematic review and meta-analysis of behaviour weight loss in primary care settings reported a mean weight loss of −1.36 kg (−2.10 to −0.63, $p < 0.0001$) at 12 months, and −1.23 kg (−2.28 to −0.18, $p = 0.002$) at 24 months.(10) The mean weight loss achieved by our participants in a 12-week time frame is therefore comparable to groups who access professional weight loss services. It is important to note that these results were achieved even though the study occurred over the period of COVID-19 lockdowns in Australia. Despite the detrimental effects reported by our participants on eating, physical activity and mental health, an optimistic finding is that a third of participants were successful in achieving a weight loss of 3% or more of their initial body weight, and nearly a fifth achieved clinically significant weight loss of 5% or more of their initial body weight.

Weight loss can be achieved through unhealthy behaviours such as extreme dieting, which has been associated with long-term detrimental effects.(11, 12). However, over half of the participants (52.6%) reported that they ‘did not follow any diet, but just ate healthy’, and another 13.4% reported ‘no diet’. It was interesting that paleo-like diets were followed by

13.4% of participants, in line with popular diet trends propagated online in Australia.(13) Small but significant reductions were seen in consumption of discretionary foods such as cakes, pies, and pastries; SSBs; and takeaways. However, reductions were also seen in fruit consumption, and this is an undesirable change as Australians are reported to fall short of the recommended fruit intake.(14) However, other analyses have shown that the consumption of all fresh foods was affected during COVID lockdowns.(15)

The reason for attempting weight loss and the level of motivation have been associated with success in weight management, and are strongly associated with the extent of weight loss and long-term weight maintenance. For example, the motives of health and aesthetics for weight loss are reported in many studies.(16-18) The self-managed weight losers in our study seemed to be a strongly motivated group, and consistent with other studies, ‘health and wellness’ and ‘medical reasons’ were the most frequently reported motives, followed by aesthetics.

Although most participants perceived their health status as ‘good’ or ‘fair’, over half reported the presence of a chronic disease such as diabetes, cancer, heart disease, gall bladder disease, eating disorders and other chronic ailments. Nearly a third (27.5%) of the participants reported a diagnosis of depression. This is consistent with findings in the literature on the strong associations between depression and obesity.(19, 20) Benefits of weight loss in chronic disease management are widely known,(21) and clinicians may advise patients to lose weight, although they may not specifically provide obesity treatment. This may explain the presence of a large number of participants with chronic diseases among the self-managed weight losers.

A range of psychosocial and eating behaviours have been reported to affect weight loss, but these factors have not been studied extensively.(16) As this was an exploratory study, a single statement was developed to allow a brief assessment of each of these factors, and participants were asked to choose if the statements were like them or not on a 4-point Likert scale. In general, a larger proportion of participants indicated that they had self-efficacy, personal and social stability, support from family and friends, and the ability to cope with adverse events. However, at the same time, they reported high levels of stress eating and indulging in eating binges when not hungry. Although the study questions used to assess these factors were unrefined and not validated, and thus unreliable, these responses raise interesting questions about how these factors jointly predict weight outcomes. Again, the uncertainties of the COVID-19 lockdowns created unprecedented stressful situations, affecting people in unusual ways, even those who are seemingly better in coping skills and self-efficacy.(22, 23)

An earlier qualitative study within people who managed their own weight loss and were successful found that this group was able to define a time they were comfortable with their weight and had attempted weight loss multiple times before.(24) It appears that they learnt from previous successes and failures to shape their successful weight loss attempt, and their success was attributed to being able to integrate lifestyle behaviour changes into their daily life. Within this sample of self-managed weight losers, the majority reported that the last time they were comfortable with their weight was ‘a long time ago’ (78.4% total: 55.7% ‘a long time ago’ and 22.7% ‘never’). Many participants also reported multiple previous weight loss attempts (including 50.5% ‘always attempting weight loss’ and 17.5% ‘4 times or more’). The majority agreed that their previous experiences shaped their current weight loss attempt and were likely to embed positive changes in their lifestyle.

The study has identified four homogeneous clusters among those attempting weight loss: Cluster 1 ‘the older, ill and stressed’, Cluster 2 ‘younger aged and healthy, but poor and stressed’, Cluster 3 ‘wealthy but ill and stressed’, and Cluster 4 ‘wealthy, relaxed and healthy’. In a UK study with a large sample of over 4100 participants with obesity, similar variables were used and produced six clusters.(25) Despite a small sample size in our study, the results have some similarity in defining clusters of younger healthy females, anxious middle-aged people, and the older and sick. Health status and presence of chronic diseases is noted as a key differentiator in the cluster formation in the UK sample. Similarly in our sample, health status defined by the presence or absence of chronic disease showed a predictive value of 30%. Clusters identified among the successful weight maintainers in the NWCR(26) also indicate some similarity with our clusters in age and health (for example, older people with health problems), but also describe further characteristics such as reliance on a large number of resources and struggling to lose weight versus those reporting least difficulty with weight maintenance.

Self-management of weight loss has not been studied in detail before, and our study demonstrates how this can be done. Our recruitment and data collection methods were successful in reaching and recruiting self-managed weight losers in Australia, and capturing baseline values and outcomes at 12 weeks’ follow-up. As our pilot study showed that there may be subgroups within self-managed weight losers, survey modifications made to the population survey allowed a clear separation of those who are unassisted and those that may use some form of help from professional services. Using Facebook advertisements had reasonable success in reaching and recruiting self-managed users, with 85% of them unassisted. The remaining participants also identify themselves as 'DIY' or self-managing their own weight loss, albeit with some assistance. Self-management of weight loss is desirable and often expected of patients accessing health services for chronic disease management, in preparation for surgeries, and even recommended for mental health conditions such as depression. This may explain the paradox of how participants that define their weight loss program as 'self-managed'(27, 28) may still access help from professional or health service providers. The study also identified four segments within self-managed weight loss, and demonstrates that self-managed weight losers have common characteristics but are not one homogeneous group. These segments may help inform the tailoring of public health campaigns and communication.

Limitations in the study are that the sample recruited fell short of the desired target size of 500 participants to allow sophisticated statistical comparisons. Further, the impact of COVID-19 during the period of the study affected the research in many ways, some of them unknown. Along with the poor recruitment rates, participants also confirmed the influence of the pandemic on their weight loss journeys. The small study sample also meant that variations in physical activity, and smoking and drinking, could sometimes not be analysed by subgroups because of low counts. The number of 'assisted' participants in the longitudinal study were also low compared with the pilot study (although proportions were comparable). Low numbers of males and non-English-speaking participants also limited their impact on the influence in clustering algorithms, although gender was not featured, even in the clusters with 2228 participants from the US weight maintenance registry.(26) The overall small sample size also precluded internal validation by replication in our cluster analysis, as reported in other papers.(25, 29)

Future research comparing self-managed weight losers with patients undertaking medical treatment of obesity, for example, through obesity management clinics, is recommended for insights on differences between those who self-manage and those who utilise health services for weight loss.

6.5 Conclusion

In conclusion, this is one of a small number of studies to examine weight loss among those who 'self-manage' their weight loss, or do it by themselves, in the general population. This area of research is important as only a very small proportion of the population is able to access professional services to manage their weight problems, and the vast majority of those with a weight problem attempt to manage weight loss on their own. A large range of characteristics have been described, and four segments of self-managed weight losers have been identified. Despite more than half the participants having chronic diseases, including a third reporting diagnosed depression, self-managed weight losers can be successful without utilising professional health interventions.

The study provides optimistic findings that self-managed weight losers are motivated by health and wellness, and most try to lose weight without resorting to unhealthy practices. More participants might have achieved success without the adverse circumstances of COVID-19. These are promising results, prompting further research of self-managed weight loss, and have applications in obesity management strategies.

6.6 References

1. Atlantis E, Kormas N, Samaras K, Fahey P, Sumithran P, Glastras S, et al. Clinical Obesity Services in Public Hospitals in Australia: a position statement based on expert consensus: Expert consensus on clinical obesity services. Clin Obes. 2018;8(3):203-10.
2. Socio-economic indexes for areas (seifa) 2016: Australian Bureau of Statistcis [
3. Australian Institute of Health and Welfare 2017. A picture of overweight and obesity in Australia 2017.
Cat. no.PHE 216. Canberra: AIHW.
4. Norusis MJ. IBM SPSS statistics 19 statistical procedures companion. Upper Saddle River, New Jersey: Prentice Hall; 2012.
5. Crescent B. Martin MPH, M.A., Kirsten A. Herrick, Ph.D., M.Sc., Neda Sarafrazi, Ph.D., and Cynthia L. Ogden, Ph.D., M.R.P. Attempts to Lose Weight Among Adults in the United States, 2013–2016. USA: CDC, National Center for Health Statistics; 2018. Contract No.: NCHS Data Brief No. 313, July 2018.
6. Levy AS, Heaton AW. Weight control practices of U.S. adults trying to lose weight. Ann Intern Med. 1993;119(7 Pt 2):661-6.
7. Spahrkäs SS, Looijmans A, Sanderman R, Hagedoorn M. Recruiting participants for an international mHealth study via Facebook Ads: Experiences from the Untire App RCT. Internet Interv. 2021;23:100362.
8. Whitaker C, Stevelink S, Fear N. The Use of Facebook in Recruiting Participants for Health Research Purposes: A Systematic Review. J Med Internet Res. 2017;19(8):e290-e.
9. Terranova CO, Brakenridge CL, Lawler SP, Eakin EG, Reeves MM. Effectiveness of lifestyle-based weight loss interventions for adults with type 2 diabetes: a systematic review and meta-analysis. Diabetes Obes Metab. 2015;17(4):371-8.
10. Booth HP, Prevost TA, Wright AJ, Gulliford MC. Effectiveness of behavioural weight loss interventions delivered in a primary care setting: a systematic review and meta-analysis. Fam Pract. 2014;31(6):643-53.
11. Neumark-Sztainer D, Wall M, Story M, Standish AR. Dieting and Unhealthy Weight Control Behaviors During Adolescence: Associations With 10-Year Changes in Body Mass Index. J Adolesc Health. 2012;50(1):80-6.

12. Ferraro ZM, Patterson S, Chaput J-P. Unhealthy Weight Control Practices: Culprits and Clinical Recommendations. Clin Med Insights Endocrinol Diabetes. 2015;8:CMED.S23060.
13. Ramachandran D, Kite J, Vassallo AJ, Chau JY, Partridge S, Freeman B, et al. Food Trends and Popular Nutrition Advice Online - Implications for Public Health. Online J Public Health Inform. 2018;10(2):e213-e.
14. Poor diet, Poor diet in adults - Australian Institute of Health and Welfare Australian Institute of Health and Welfare; 2019.
15. Janssen M, Chang BPI, Hristov H, Pravst I, Profeta A, Millard J. Changes in Food Consumption During the COVID-19 Pandemic: Analysis of Consumer Survey Data From the First Lockdown Period in Denmark, Germany, and Slovenia. Front Nutr. 2021;8(60).
16. Elfhag K, Rössner S. Who succeeds in maintaining weight loss? A conceptual review of factors associated with weight loss maintenance and weight regain. Obes Rev. 2005 Feb;6(1):67-85.
17. O'Brien K, Venn BJ, Perry T, Green TJ, Aitken W, Bradshaw A, et al. Reasons for wanting to lose weight: different strokes for different folks. Eat Behav. 2007 Jan;8(1):132-5.
18. Teixeira PJ, Silva MN, Mata J, Palmeira AL, Markland D. Motivation, self-determination, and long-term weight control. Int J Behav Nutr Phys Act. 2012;9(1):22-.
19. Luppino FS, de Wit LM, Bouvy PF, Stijnen T, Cuijpers P, Penninx BWJH, et al. Overweight, Obesity, and Depression: A Systematic Review and Meta-analysis of Longitudinal Studies. Arch Gen Psychiatry. 2010;67(3):220-9.
20. Carey M, Small H, Yoong SL, Boyes A, Bisquera A, Sanson-Fisher R. Prevalence of comorbid depression and obesity in general practice: a cross-sectional survey. Br J Gen Pract. 2014;64(620):e122-7.
21. Impact of overweight and obesity as a risk factor for chronic conditions. Australia: AIHW; 2017.
22. Pellegrini M, Ponzo V, Rosato R, Scumaci E, Goitre I, Benso A, et al. Changes in Weight and Nutritional Habits in Adults with Obesity during the "Lockdown" Period Caused by the COVID-19 Virus Emergency. Nutrients. 2020;12(7):2016.
23. Mitchell EJ, Ahmed K, Breeman S, Cotton S, Constable L, Ferry G, et al. It is unprecedented: trial management during the COVID-19 pandemic and beyond. Trials. 2020;21(1):784.
24. Rafiei Z. Factors contributing to the success of self-directed weight loss [Thesis]. Sydney, NSW: University of Sydney; 2016.
25. Green MA, Strong M, Razak F, Subramanian SV, Relton C, Bissell P. Who are the obese? A cluster analysis exploring subgroups of the obese. J Public Health (Oxf). 2016;38(2):258-64.
26. Ogden LG, Stroebele N, Wyatt HR, Catenacci VA, Peters JC, Stuht J, et al. Cluster analysis of the national weight control registry to identify distinct subgroups maintaining successful weight loss. Obesity. 2012;20(10):2039-47.
27. Tang J, Abraham C, Greaves C, Yates T. Self-directed interventions to promote weight loss: A systematic review of reviews. J Med Internet Res. 2014;16(2).
28. Tang JCH, Abraham C, Greaves CJ, Nikolaou V. Self-directed interventions to promote weight loss: a systematic review and meta-analysis. Health Psychol Rev. 2016;10(3):358-72.
29. Rundle-Thiele S, Kubacki K, Tkaczynski A, Parkinson J. Using two-step cluster analysis to identify homogeneous physical activity groups. Marketing Intelligence & Planning. 2015;33(4):522-37.

Chapter 7: Factors Predicting Change in Weight and Weight-Related Behaviours among Self-managed Weight Losers

7.1 Introduction

Literature shows that a wide range of characteristics are associated with weight loss and weight maintenance,(1-5) and these are discussed in detail in Chapter 1. Understanding the relationship of these characteristics and how they predict weight and weight-related health behaviour outcomes among different population groups is important for planning obesity management interventions, strategies and policies.

This thesis captured data on a breadth of characteristics of people about to commence a weight loss journey and followed them up at 12 weeks. In Chapter 6, an in-depth descriptive report about the study participants has been provided. In this chapter, a range of analyses were undertaken to examine which characteristics or factors most strongly predict weight loss among self-managed weight losers in Australia. The primary outcome of weight loss was analysed using three weight outcome measures: absolute weight change in kilograms, successful weight loss (3% or greater body weight loss), and clinically significant weight loss (5% or greater body weight loss).

Weight loss attempts are commonly enacted through changes in food consumption and exercise. Diet, especially fruit and vegetable intake and SSBs consumption, and physical activity of the population form part of the framework for monitoring overweight and obesity in Australia.(6) Recent modelling of population obesity in Australia has shown that even small reductions of discretionary foods such as sweet biscuits have potential in weight reduction.(7) Improvements in these outcomes are associated with not only weight loss but also improved overall health. Capturing even small levels of improvement in health behaviours is useful in assessing the usefulness of self-managed weight loss. Therefore, analysis was also undertaken to examine the characteristics that most strongly predict changes in fruit and vegetable, discretionary food and SSBs consumption. For physical activity outcomes, changes in minutes for walking and vigorous physical activity were analysed, but because of data sparsity, moderate physical activity could not be analysed.

This chapter addresses five research questions. Among self-managed weight losers:

1. What factors predict absolute weight change in kilograms?
2. What factors predict successful weight loss?
3. What factors predict clinically significant weight loss?
4. What factors predict changes in food consumption (fruit and veg, discretionary foods, SSBs)?
5. What factors predict changes in physical activity (walking, vigorous physical activity)?

7.2 Methods

Detailed descriptions of protocols and methods are presented in Chapter 6, along with the detailed descriptive statistics.

7.2.1 Outcome measures for the longitudinal study

7.2.1.1 Weight outcome measures

The following weight outcome measures were as previously described:

- *Absolute weight change in kilograms* was computed as the difference between weight (kg) at 12-week follow-up and baseline weight.
- *Clinically significant weight loss* was computed as a categorical binary variable. If the percentage of body weight loss was 5% or greater, it was termed ‘clinically significant’.
- *Successful weight loss* was computed as a categorical binary variable. If the percentage of weight loss was 3% or greater it was termed ‘successful’.

7.2.1.2 Secondary outcome measures

Although change in weight status was the key primary endpoint in the 12-week follow-up of self-managed weight losers, the short duration of the study meant that secondary outcomes may provide a strong indication of the level of positive behaviour change, which might not have been translated into weight loss. Key diet and physical activity behaviour characteristics identified as potential secondary outcomes were included as follows:

- Change in mean weekly food consumption score (follow-up minus initial) for (a) fruit and vegetables, (b) discretionary foods, and (c) SSBs.
- Change in total weekly physical activity minutes (follow-up minus initial) for (a) walking and (b) vigorous physical activity.

7.2.2 Study factors examined for inclusion in regression models

It is well understood that a range of characteristics influence the extent of weight loss, and thus need to be considered when examining predictors of weight change. This study collected data on numerous factors that could be considered potential predictors (or confounders) within the regression models created to examine this relationship. These included demographics, initial BMI, weight history, self-management type, health status, a range of psychosocial and eating behaviour factors, dietary changes, physical activity change, use of weight loss products or aids, and self-monitoring, as shown in Table 7.1.

Diagnosed illnesses included those that can influence individual decisions to manage weight. Although some people with cancer can experience a lot of weight loss without trying to do so, the participants in this study who reported a diagnosis of cancer (n=4) have come forward voluntarily and reported that they are attempting weight-loss on their own. As this thesis aimed to capture characteristics of anybody who self-manages their weight in the population, a decision was made to not exclude the participants who reported a diagnosis of cancer.

Table 7.1: Complete list of potential predictors of weight outcomes

Demographics	Gender Age range Marital status Highest educational qualification Language spoken at home IRSD
Weight and weight history	Initial weight in Kgs Initial BMI Initial BMI category Time when comfortable with weight Reason for weight loss attempt Number of previous weight loss attempts Currently gaining weight Contributor to weight gain
Health status	Perceived health status Diagnosed illness: Diabetes Heart Disease Cancer Gall bladder disease Osteoarthritis Sleep apnoea Depression

	Eating disorders Health status (as indicated by the presence or absence of any of the diseases above)
Smoking and drinking	Smoker Risky drinking
Food consumption	Fruit and vegetables Discretionary foods (combined for processed meats, takeaways, hot chips, cakes, biscuits, pies and pastries) SSBs
Physical activity	Walking Moderate physical activity Vigorous physical activity
Self-management type	Unassisted Assisted
Weight loss strategies	Diet type Use of weight loss products (shakes and bars, low-calorie meals) Use of diet books/websites Use of smart phone app diets
Self-monitoring	Diet tracking Weight tracking Exercise tracking
Psychosocial factors and eating behaviours	‘I eat whatever I like, whenever I like’ ‘I feel hungry almost all the time’ Stress eating ‘I continue eating binges even though I am not hungry’ ‘I am able to limit food and still able to avoid feelings of tight restrictions of deprivation’ ‘I feel supported by my family/friends in my weight loss efforts’ ‘I feel I have the capacity to deal with challenges and cope with stressful or adverse situations" ‘I believe that I have the ability to follow my weight loss plan and achieve my weight loss goal’ ‘I think of things in “black and white” terms. For example, I think of food as either “good” or “bad” or I think of myself as doing things either very well or very badly’ ‘I have stability in my life—personal and professional’ Experienced weight stigma
New exploratory factors	‘Able to use the knowledge obtained from my previous weight loss experiences to shape my approach to my most recent weight loss attempt’ ‘Likely to continue diet and/or exercise changes that help you lose weight, as a regular part of lifestyle’

7.2.3 Statistical analysis

7.2.3.1 Data processing and factor selection

The measures of potential predictors created variables that were continuous, ordinal and categorical. As indicated in Table 7.1 above, there were over 50 theoretically relevant factors that were available for analysis. As these factors are theoretically driven, reducing the number of variables can be a critical step in building regression models to avoid non-convergence and losing the potential predictive power of the data given the limited sample size. Further, several assumptions need to be met before regression can be carried out.

Univariate analysis was conducted for each variable against each outcome measure (for absolute weight change outcomes, change in fruit and vegetable consumption, and change in walking) and values noted; *p*-values greater than 0.25 were used as the screening cut-off to eliminate variables that did not exhibit strong associations with outcomes. However, where the literature has extensively shown a strong relationship, the variables were still retained. All continuous variables were examined for normality and outliers, using visual graphs of histograms and box plots. As the sample size was small, and the outliers were biologically plausible, they were retained as is in the analysis. Categorical variables were examined through cross tabs to check for zero cell counts in the raw data and if assumptions of minimum expected counts for chi-square testing were met. If 25% of cells did not have the minimum expected counts, they were excluded from the analysis.

Next, correlations were used to examine relationships within each group of variables (demography, health conditions, food consumption, physical activity, self-monitoring, use of weight loss aids, psychosocial and eating behaviour related variables, and exploratory variables for self-management). If a variable was highly correlated with multiple variables, and potentially not providing any additional information, it was dropped from the regression equation. For example (highest educational qualification was significantly correlated with IRSD (.3, $p < 0.05$), as well as age (−.3, $p < 0.05$). IRSD is a general socio-economic index that already takes into consideration qualifications, among other factors such as income. Therefore, IRSD and age were retained and highest level of education was dropped. After examining all groups in this manner, a reduced list of variables was entered in the model. If a variable still showed unstable or unregular Exp(B) (e.g. extremely large odds), the variable was dropped from the model (for example, cancer showed very large odds of more than 20 in the logistic regression for successful weight loss, and therefore dropped).

7.2.3.2 Statistical tests

The assumptions of heteroscedasticity indicated by a cone or fan shape on the scatterplots of predicted values and residuals were checked for linear regressions. Multicollinearity assumption was tested using correlation coefficients and variance inflation factor (VIF) and tolerance values.(8)

Different approaches of regression (forward, backward etc.) can be used to decide which variables are used in the regression model, depending on the research questions. As this was an exploratory study, our goal was to explore models entering variables that are shown in the literature to have the strongest associations first, followed by those with less evidence. The regressions were carried out in IBM SPSS version 27, and variables entered in ‘blocks’. For linear regression, models were assessed using F change statistics. For logistics regression, omnibus tests of model coefficients and Nagelkerke R^2 statistics were used to assess model fit. Odds ratios and 95% CI are reported in result tables for each variable.

For clinically significant weight loss, data sparsity and low cell counts did not allow multiple regression analysis. Therefore, either strong associations (odds ratio) seen in the univariate analysis or variables of interest in independence tests (Fisher’s exact test statistics) are reported.

For moderate physical activity analysis, only eight complete cases were available. Analysis was therefore not performed because of data sparsity.

7.3 Results

The results presented in this section include the following:

- Primary weight outcomes
    - univariate analysis for absolute weight change in kilograms
    - multiple linear regression models for absolute weight change in kilograms
    - factors significantly associated with clinically significant weight loss (odds ratio and Fisher’s exact test statistics); regression models could not be performed because of data sparsity

- multiple binary logistics regression for successful weight loss

- Secondary outcomes—diet

    - univariate analysis for predicting change in fruit and vegetable consumption
    - multiple linear regression for changes in fruit and vegetable consumption
    - multiple linear regression for changes in discretionary food consumption
    - multiple linear regression for changes in SSBs consumption

- Secondary outcomes—physical activity

    - univariate analysis for changes in walking
    - multiple linear regressions for changes in walking
    - multiple linear regressions for changes in vigorous physical activity.

7.3.1 Primary outcome measures

7.3.1.1 Univariate analysis for absolute weight change (kg) at 12-week follow-up

The univariate linear regression analysis revealed that most of the characteristics did not show strong associations with absolute weight change (see Table 7.2). The predictors with *p*-values less than 0.25 were initial BMI, age range 18–39 years, heart disease, cancer, osteoarthritis, currently gaining weight, change in discretionary food consumption, diet tracking, use of weight loss products, has stability, time when comfortable with weight (in recent times), and number of attempts at weight loss (always trying to lose weight). These predictors provided a starting set of variables considered for inclusion in the multiple linear regression analysis, along with those predictors that have consistently shown strong relations in the literature (demographic factors, diet and physical activity) and new exploratory factors (self-management type).

However, only three predictors were found to have significant influence on absolute weight change at 12 weeks' follow-up. The presence of cancer predicted a weight loss of almost 6.5 kg (−6.44 kg, $p = 0.009$, 95% CI = −11.250, −1.629). Increases of one serve of discretionary food predicted a very small but significant weight gain (0.17 kg, $p = 0.038$, 95% CI = −.01, 0.34). Use of weight loss products such as meal replacement shakes, bars, protein powders and prepared low-calorie meals predicted a weight loss of slightly over 2 kg (−2.39 kg, $p = 0.023$, 95% CI = −4.438, −0.334).

Table 7.2: Univariate analysis of factors predicting absolute weight change (kg) at 12-week follow-up

Coefficients[a]		B	95% CI		*p*-value
			Lower	Upper	
Weight history	Initial weight (kg)	−0.02	−0.06	0.02	0.305
	Initial BMI	−0.11	−0.22	−0.01	0.037
	Initial BMI category	−0.51	−1.11	0.09	0.093
Demographics	Male	1.15	−1.75	4.05	0.432
	Married or with partner	1.54	−0.70	3.79	0.176
	Non-English-speaking	−2.31	−5.10	0.47	0.102
	IRSD (1–3)	−1.57	−3.76	0.62	0.158
	IRSD (4–7)	0.47	−1.56	2.50	0.649
	IRSD (8–10)	0.92	−1.18	3.02	0.386
	Qualifications: HSC	0.35	−1.86	2.56	0.753
	Qualifications: trade certifications, diplomas	−1.04	−3.12	1.04	0.323
	Qualifications: degree and higher	0.69	−1.34	2.73	0.502
	Age range (18–39 years)	1.29	−0.84	3.42	0.233
	Age range (40–54 years)	−0.32	−2.51	1.74	0.723
	Age range (56 and above)	−0.82	−2.87	1.22	0.426
Health	Diabetes	0.28	−2.73	3.29	0.855
	Heart disease	−2.84	−7.79	2.11	0.258
	Cancer*	**−6.44**	**−11.25**	**−1.63**	**0.009***
	Gall bladder disease	−2.02	−6.53	2.39	0.360
	Osteoarthritis	−2.84	−4.54	1.06	0.220
	Sleep apnoea	0.30	−2.52	3.12	0.834
	Depression	0.99	−1.21	3.2	0.373
	Eating disorders	0.61	−3.50	4.73	0.768
	Currently gaining weight	1.15	−0.83	3.12	0.252
Health status	Presence of disease	0.06	−1.92	2.04	0.953
Perceived health	Good health	−0.81	−2.79	1.18	0.423
	Fair health	1.05	−1.02	3.11	0.316
	Bad health	−0.43	−3.69	2.83	0.795
Physical activity (total minutes per week)	Change in walking	0.00	−0.01	0.01	0.373
	Change in vigorous physical activity	−0.01	−0.02	0.01	0.383

		B	95% CI		*p*-value
			Lower	Upper	
Food consumption	Change in fruit & veg consumption	−0.03	−0.12	0.05	0.441
(mean weekly score in serves)	**Change in discretionary food consumption***	0.17	0.01	0.34	0.038*
	Change in SSBs consumption	0.13	−0.15	0.40	0.365
Smoking and drinking	Regular smoker	−2.00	−6.98	2.96	0.425
	Risky drinking	−2.18	−6.27	1.92	0.294
Diet type	Healthy diet	−0.23	−2.22	1.75	0.817
	Restricted diets	1.51	−3.46	6.49	0.547
	Paleo-like diets	−1.04	−3.38	4.65	0.458
	Calorie restriction	0.39	−2.46	1.49	0.556
Self-monitoring	Diet tracking	1.35	−0.635	3.342	0.180
	Exercise tracking	0.87	−1.757	2.256	0.806
	Weight tracking	0.67	−1.507	2.848	0.543
Use of weight loss aids	**Weight loss products***	**−2.39**	**−4.438**	**−0.334**	**0.023**
	Diet books and websites	−1.66	−4.002	0.684	0.163
	Smartphone app diets	0.60	−1.949	3.146	0.642
Motivation	Reason for weight loss: medical	0.39	−2.782	2.860	0.978
	Reason for weight loss: others	1.08	−2.176	4.331	0.512
	Reason for weight loss: health and wellness	−0.03	−2.094	2.035	0.977
	Reason for weight loss: aesthetics	−0.97	−4.091	2.151	0.539
Psychosocial factors and eating behaviours	Disinhibited eating	−0.32	−2.313	1.676	0.752
	Feelings of hunger	−0.10	−2.118	1.910	0.918
	Stress eating	−0.98	−3.342	1.376	0.410
	Eating when not hungry	−0.79	−2.825	1.245	0.443
	Exercises flexible control	0.71	−1.268	2.697	0.476
	Family and social support	0.51	−1.704	2.716	0.650
	Has coping skills	−0.36	−2.660	1.933	0.754
	Has self-efficacy	−1.00	−3.488	1.492	0.428
	Has black and white thinking	−0.94	−2.939	1.057	0.352
	Has stability	−2.27	−4.898	0.365	0.091

		B	95% CI		p-value
New exploratory factors	Self-management type (assisted)	−0.70	−3.513	2.122	0.625
	Time when comfortable with weight (never)	−1.45	−3.802	0.896	0.222
	Time when comfortable with weight (long ago)	−0.26	−2.255	1.726	0.793
	Time when comfortable with weight (in recent times)	1.83	−0.511	4.165	0.124
	No. of attempts at weight loss (less than 3 times)	−0.66	−2.798	1.484	0.544
	No. of attempts at weight loss (4 or more times)	−1.08	−3.620	1.461	0.401
	No. of attempts at weight loss (always trying to lose weight)	1.21	−0.754	3.182	0.224

Note: [a]Dependent variable: absolute weight change in kilograms. * indicates significant influence on absolute weight change in kilograms. [b]IRSD = Index of Relative Socio-economic Disadvantage

7.3.1.2 Multiple linear regression examining factors predicting absolute weight change

The multiple linear regression models to examine the relationship between key variables and weight-related outcomes were developed on the basis of the findings from the univariate regression analysis and correlations. Variables were combined into logical groupings, and modelling consisted of adding groups of predictor variables beginning with those most strongly associated with weight loss. The models executed were as follows:

- Model 1: Initial BMI*
- Model 2: Model 1 + gender, age range
- Model 3: Model 2 + language, marital status, IRSD
- Model 4: Model 3 + cancer, depression
- Model 5: Model 4 + change in fruit & veg consumption, change in discretionary food consumption, change in walking
- Model 6: Model 5 + self-monitoring (diet tracking)
- Model 7: Model 6 + use of weight loss products
- Model 8: Model 7 + self-efficacy, stress eating
- Model 9: Model 8 + self-management type, always attempting weight loss.

*These models were repeated using initial weight in kilograms, instead of initial BMI, in all models.

As shown in Table 7.3, Model 1, consisting of initial BMI, was strongly significant (F change = 7.21, p = 0.009), and explained 11% of the variation in absolute weight change.

Model 4, which included health variables of depression and cancer, was significant (F change = 3.44, p = 0.039), and could explain 32% of the variation in absolute weight change.

Model 5, with additional variables of changes in fruit and veg consumption, discretionary food consumption, and amount of walking, was significant (F change = 3.13, p = 0.034), and explained 43% of the variation.

F change was not significant in Models 6, 7 and 8. The final model, Model 9, which included exploratory variables of self-management type and always trying to lose weight, explained 47% of the variation in absolute weight change; however, this was not significant.

Table 7.4 shows the results for each factor in the models. Initial BMI was significant in predicting absolute weight change (reduction) in all the models. In the final model, increasing initial BMI by 1 unit was associated with an average absolute weight decrease of 240 grams. (B = −0.24, p = 0.022, 95% CI = −0.43, −0.04). In the final model, being non-English-speaking predicted a loss of nearly 4.5 kg (B = −4.42, p = 0.016, 95% CI = −7.95, −.88). An increase in discretionary food consumption by one serve (mean weekly score) was associated with weight gain of approximately 0.25 kg (B = 0.27, p = 0.045, 95% CI = 0.01, 0.53). Diagnosis of cancer in Model 6 predicted a large weight reduction (−7.85, p = 0.045, 95% CI = −15.53, −0.17), which was no longer significant in the final model.

Table 7.3: Model summary for absolute weight change in kilograms

Model	R^2	Std. error	Change statistics		
			R^2 change	F change	*p*-value
1[a]	**0.11**	**4.95**	**0.11**	**7.21**	**0.009***
2[b]	0.16	4.89	0.05	1.74	0.185
3[c]	0.22	4.83	0.06	1.48	0.230
4[d]	**0.32**	**4.62**	**0.09**	**3.44**	**0.039***
5[e]	**0.43**	**4.36**	**0.11**	**3.13**	**0.034***
6[f]	0.43	4.37	0.01	0.79	0.379
7[g]	0.45	4.34	0.02	1.59	0.213
8[h]	0.46	4.40	0.01	0.44	0.646
9[i]	0.47	4.48	0.00	0.17	0.847

Note: [a]Predictors: (constant), initial BMI.

[b]Predictors: (constant), initial BMI, age, gender.

[c]Predictors: (constant), initial BMI, age, gender, language, IRSD (low), marital status.

[d]Predictors: (constant), initial BMI, age, gender, language, IRSD (low), marital status, depression, cancer.

[e]Predictors: (constant), initial BMI, age, gender, language, IRSD (low), marital status, depression, cancer, change in discretionary food consumption, change in walking, change in fruit & veg consumption.

[f]Predictors: (constant), initial BMI, age, gender, language, IRSD (low), marital status, depression, cancer, change in discretionary food consumption, change in walking, change in fruit & veg consumption, diet tracking.

[g]Predictors: (constant), initial BMI, age, gender, language, IRSD (low), marital status, depression, cancer, change in discretionary food consumption, change in walking, change in fruit & veg consumption, diet tracking, weight loss products.

[h]Predictors: (constant), initial BMI, age, gender, language, IRSD (low), marital status, depression, cancer, change in discretionary food consumption, change in walking, change in fruit & veg consumption, diet tracking, weight loss products, have self-efficacy, stress eating.

[i]Predictors: (constant), initial BMI, age, gender, language, IRSD (low), marital status, depression, cancer, change in discretionary food consumption, change in walking, change in fruit & veg consumption, diet tracking, weight loss products, have self-efficacy, stress eating, self-management type, always trying to lose weight.

[j]Dependent variable: absolute weight change in kilograms.

*p-value < 0.005. [b]IRSD = Index of Relative Socio-economic Disadvantage

Table 7.4: Factors affecting absolute weight change at 12-week follow-up

			95% CI		
Model	Coefficients[a]	B	Lower	Upper	p-Value
1	Initial BMI*	−0.22	−0.39	−0.06	0.009*
2	Initial BMI*	−0.24	−0.40	−0.07	0.006*
	Gender	3.31	−0.26	6.89	0.069
	Age	−0.57	−3.30	2.16	0.679
3	Initial BMI*	−0.22	−0.41	−0.03	0.021
	Gender	3.30	−0.28	6.89	0.070
	Age	0.23	−2.60	3.07	0.870
	Marital status	1.15	−1.85	4.14	0.445
	Language	−3.26	−6.86	0.34	0.075
	IRSD (low)	−1.11	−3.93	1.71	0.433
4	Initial BMI*	−0.28	−0.46	−0.09	0.004*
	Gender	2.49	−1.00	5.98	0.158
	Age	0.97	−1.81	3.76	0.487
	Marital status	0.75	−2.15	3.64	0.607
	Language	−3.67	−7.15	−0.18	0.040*
	IRSD (low)	0.19	−2.69	3.06	0.897
	Cancer*	−9.58	−17.20	−1.96	0.015*
	Depression	2.42	−0.61	5.45	0.115
5	Initial BMI*	−0.29	−0.46	−0.11	0.002*
	Gender	1.47	−1.94	4.88	0.390
	Age	2.48	−0.46	5.42	0.097
	Marital status	0.06	−2.75	2.86	0.968
	Language*	−4.26	−7.59	−0.93	0.013*
	IRSD (low)	−0.51	−3.36	2.34	0.722
	Cancer	−7.23	−14.77	0.30	0.059
	Depression	1.90	−0.99	4.79	0.192
	Change in discretionary food consumption*	0.26	0.02	0.49	0.034*
	Change in walking	0.00	−0.01	0.00	0.301
	Change in fruit & veg consumption	−0.09	−0.21	0.03	0.159
			95% CI		
Model	Coefficients[a]	B	Lower	Upper	p-Value
6	Initial BMI*	−0.28	−0.45	−0.10	0.003*
	Gender	1.19	−2.29	4.67	0.494
	Age	2.50	−0.45	5.46	0.094

	Marital status	0.09	−2.73	2.90	0.950
	Language*	−4.14	−7.49	−0.79	0.016*
	IRSD (low)	−0.35	−3.23	2.54	0.811
	Cancer*	−7.85	−15.53	−0.17	0.045
	Depression	1.91	−0.99	4.80	0.191
	Change in discretionary food consumption*	0.28	0.04	0.52	0.024*
	Change in Walking	0.00	−0.01	0.00	0.317
	Change in fruit & veg consumption	−0.09	−0.21	0.03	0.150
	Change in fruit & veg consumption	1.10	−1.39	3.59	0.379
7	Initial BMI*	−0.23	−0.42	−0.04	0.017*
	Gender	1.36	−2.11	4.82	0.436
	Age	2.42	−0.51	5.36	0.104
	Marital status	−0.03	−2.84	2.77	0.982
	Language*	−4.16	−7.49	−0.83	0.015*
	IRSD (low)	−0.42	−3.29	2.45	0.771
	Cancer	−7.95	−15.58	−0.31	0.042
	Depression	2.13	−0.78	5.03	0.147
	Change in discretionary food consumption*	0.27	0.03	0.51	0.030*
	Change in walking	0.00	−0.01	0.00	0.368
	Change in fruit & veg consumption	−0.08	−0.20	0.04	0.205
	Change in fruit & veg consumption	1.10	−1.37	3.58	0.375
	Weight loss products	−1.70	−4.41	1.01	0.213

			95% CI		
Model	Coefficients[a]	B	Lower	Upper	p-Value
8	Initial BMI*	−0.23	−0.42	−0.04	0.022*
	Gender	1.75	−1.89	5.40	0.338
	Age	2.67	−0.35	5.70	0.082
	Marital status	0.42	−2.60	3.44	0.782
	Language*	−4.27	−7.69	−0.86	0.015*

	IRSD (low)	−0.84	−3.88	2.20	0.581
	Cancer	−6.09	−15.03	2.85	0.177
	Depression	1.68	−1.42	4.77	0.281
	Change in discretionary food consumption*	0.28	0.03	0.53	0.029*
	Change in walking	0.00	−0.01	0.00	0.286
	Change in fruit & veg consumption	−0.09	−0.21	0.04	0.164
	Diet tracking	1.31	−1.24	3.86	0.306
	Weight loss products	−1.32	−4.19	1.55	0.359
	Stress eating	−1.60	−5.12	1.93	0.367
	Have self-efficacy	−0.66	−3.93	2.60	0.684
9	Initial BMI*	−0.24	−0.43	−0.04	0.022*
	Gender	1.71	−2.01	5.44	0.358
	Age	2.71	−0.38	5.81	0.084
	Marital status	0.35	−2.74	3.45	0.819
	Language*	−4.42	−7.95	−0.88	0.016*
	IRSD (low)	−0.78	−3.96	2.40	0.623
	Cancer	−5.91	−15.34	3.51	0.213
	Depression	1.57	−1.64	4.77	0.331
	Change in discretionary food consumption*	0.27	0.01	0.53	0.045*
	Change in walking	0.00	−0.01	0.00	0.326
	Change in fruit & veg consumption	−0.09	−0.22	0.04	0.171
	Diet tracking	1.31	−1.30	3.91	0.317
	Weight loss products	−1.43	−4.54	1.69	0.360
	Stress eating	−1.38	−5.09	2.33	0.456
	Have self-efficacy	−0.88	−4.42	2.66	0.619
	Self-management type	0.82	−3.32	4.97	0.690
	Always trying to lose weight	0.47	−2.20	3.14	0.724

Note: aDependent variable: absolute weight change in kilograms. *p-value < 0.05. [b]IRSD = Index of Relative Socio-economic Disadvantage

The results of multiple regression models with initial body weight in kilograms as predictor instead of initial BMI are not presented here, but available in Appendix B. Model 7 (addition of the variable ‘Use of weight loss products’) showed weak significance (F change = 4.22, *p* =

0.046), and explained 37% of the variation in absolute weight change. In this model, use of weight loss products (such as shakes, bars and low-calorie meals) showed a decrease in absolute weight change (B = −2.82, $p = 0.46$, 95% CI = −5.59, −0.058), but lost significance in the final model.

7.3.1.3 Factors associated with clinically significant weight loss

Data sparsity did not allow performing regressions to assess factors that predict clinically significant weight loss or 5% or greater weight loss of initial body weight. However, Fisher's exact tests showed that cancer ($p = 0.023$), low IRSD score of 1–3 (indicating high disadvantage) ($p = 0.010$), and middle IRSD score of 4–7 ($p = 0.016$) were significantly associated with clinically significant weight loss. Figure 7.1 shows three (75%) of the four participants that had cancer lost ≥5% of their body weight.

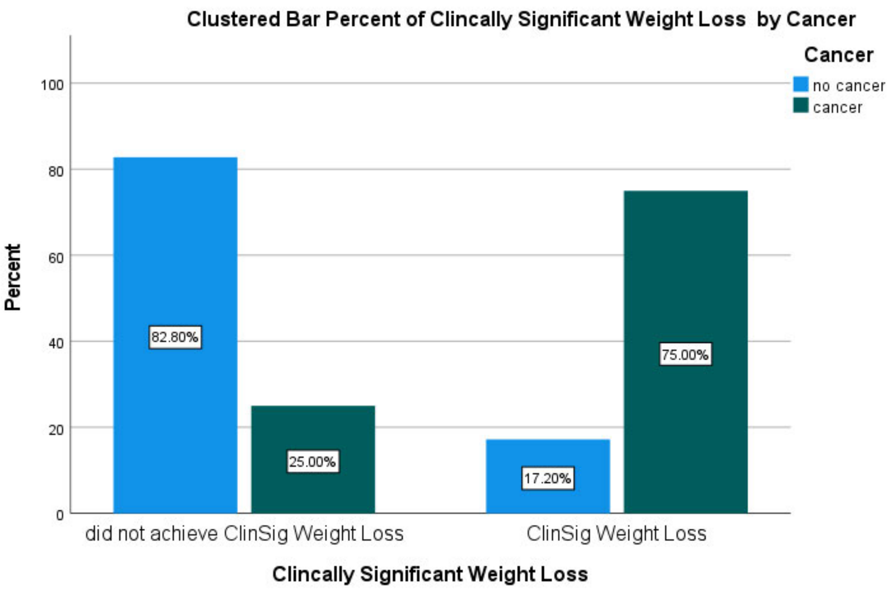


Figure 7.1: Clinically significant weight loss among participants with cancer

Figure 7.2 shows the distribution of participants across IRSD levels. Among the lower IRSD scores (1–3), more than half the participants achieved clinically significant weight loss compared with those who did not (22%), whereas in the middle IRSD levels (4–7), nearly half (44.87%) did not achieve clinically significant weight loss compared with 16% who did achieve clinically significant weight loss. No linear relationship was evident between IRSD score and clinically significant weight loss.

None of the other predictors showed significant associations with clinically significant weight loss.

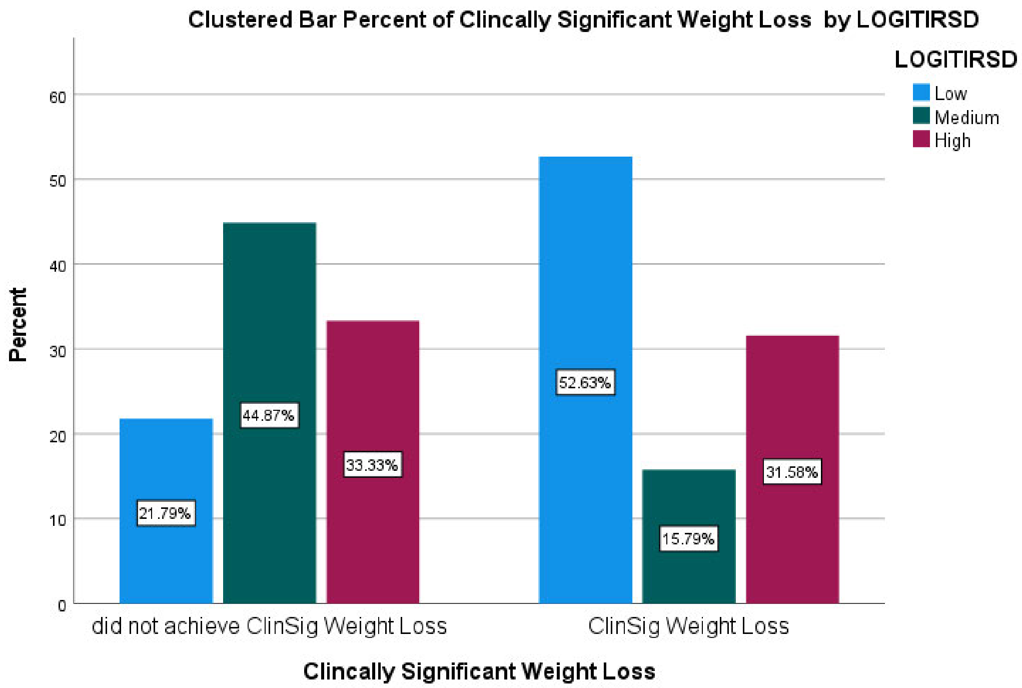


Figure 7.2: ISRD distribution by clinically significant weight loss

7.3.1.4 Multiple binary logistics regression for successful weight loss

Successful weight loss was measured as a binary categorical variable. Those who achieved 3% or higher body weight loss at follow-up were considered successful, and others unsuccessful. Multiple binary logistic regression models were performed to ascertain which characteristics predicted successful weight loss. The variable grouping used in this model was the same as that used in the models for absolute weight loss with the exception of the presence of cancer as the low counts of cancer among the subgroups of self-management affected reliability of the models.

The modelling for successful weight loss consisted of adding groups of variables incrementally as follows:

- Model 1: Initial BMI
- Model 2: Model 1 + gender, age range
- Model 3: Model 2 + language, marital status, IRSD
- Model 4*: Model 3 + depression

- Model 5: Model 4 + changes in walking, fruit and veg consumption, discretionary food consumption
- Model 5: Model 4 + self-monitoring (diet tracking)
- Model 5: Model 4 + self-management (type, previous learning, embedding learning into lifestyle)
- Model 7: Model 6 + use of (over-the-counter) weight loss products
- Model 8: Model 7 + self-efficacy, stress eating
- Model 9: Model 8 + self-management type, always attempting weight loss.

* Cancer was removed from these models as the low count affected reliability of the model. All four participants that had cancer lost 3% or more of their initial body weight (Fisher's exact test, p = 0.013).

As shown in the model summary for successful weight loss in Table 7.5, Model 9 explains 24% of variation in weight loss success; however, none of the models were significant. In addition, within each model, no significant association was found between individual predictors and weight loss success. Therefore, only the results from Model 9 are presented in Table 7.6. The complete result tables of all models are available in Appendix B2.

Table 7.5: Model summary for successful weight loss

Model	Omnibus tests of model coefficients			
	Chi-square	df	p-value	Nagelkerke R^2
1	0.59	1	0.440	0.01
2	4.26	2	0.235	0.93
3	6.03	6	0.419	0.13
4	6.08	7	0.530	0.13
5	10.43	10	0.403	0.22
6	10.65	11	0.473	0.21
7	10.67	12	0.557	0.22
8	11.36	12	0.581	0.23
9	11.64	15	0.706	0.24

Table 7.6: Results of Model 9 binary logistics regression for successful weight loss

		95% CI		
Variables	OR	Lower	Upper	p-value

Model 9	Initial BMI	1.02	0.92	1.12	0.756
	Gender (male)	4.24	0.41	44.15	0.227
	Age range (18–39 years)	1.36	0.60	3.07	0.457
	Age range (40–54 years)	1.93	0.39	9.65	0.422
	Age range (55 years and above)	0.59	0.26	1.36	0.216
	Marital status (married)	0.88	0.19	4.02	0.864
	Language (non-English)	0.97	0.21	4.46	0.969
	IRSD (1–3)	1.00	1.00	1.01	0.167
	IRSD (4–7)	1.01	0.96	1.08	0.647
	IRSD (8–10)	0.92	0.80	1.06	0.263
	Depression	0.70	0.19	2.53	0.587
	Change in walking	0.87	0.19	3.92	0.852
	Change in fruit & veg consumption	2.15	0.44	10.53	0.347
	Change in discretionary food consumption	0.57	0.07	4.76	0.602
	Diet tracking	1.08	0.29	4.03	0.907
	Weight loss products	1.02	0.92	1.12	0.756
	Have self-efficacy	4.24	0.41	44.15	0.227
	Self-management type (assisted)	1.36	0.60	3.07	0.457
	Number of weight loss attempts (3 times or less)	1.93	0.39	9.65	0.422
	Number of weight loss attempts (4 times or more)	0.59	0.26	1.36	0.216
	Number of weight loss attempts (always trying to lose weight)	0.88	0.19	4.02	0.864

Note: Dependant variable: successful weight loss. $\chi2 = 11.751$, df = 8, p = 0.163. None of the predictors were significant at 95% CI. [a]IRSD = Index of Relative Socio-economic Disadvantage

7.3.2 Secondary outcomes—diet

7.3.2.1 Univariate analysis for predicting change in fruit and vegetable consumption

Change in fruit and vegetable consumption was measured as a continuous variable—mean weekly food consumption score (in serves). Univariate linear regressions showed four predictors have significant associations with changes in fruit and veg consumption—a secondary outcome of the weight loss attempt of self-managed weight losers at 12 weeks' follow-up. These four predictors are (a) changes in discretionary foods and (b) SSBs consumption, (c) paleo-like diets, and (d) an eating behaviour indicator 'I eat whatever I want, whenever I want' (see Table 7.7).

An increase in mean weekly food consumption score by one serve for discretionary foods showed a little over half a serve reduction in fruit and vegetable consumption (−0.59 serve, p = 0.004, 95% CI = −1.93, −0.99). An increase in mean weekly food consumption score by one serve for SSBs showed almost a one serve decrease in fruit and vegetable consumption (−0.95 serve, p = 0.006, 95% CI = −1.61, −0.28).

Those who followed paleo-like diets reduced mean weekly fruit and veg consumption by over seven serves (−7.21 serves, p = 0.048, 95% CI = −7.21, −14.36). Those who responded 'like me' to 'I eat whatever I want, whenever I want' (disinhibited eating) reduced mean weekly fruit and veg consumption by over five serves (−5.23 serves, p = 0.039, 95% CI = −10.19, −0.27).

Table 7.7: Univariate regression results for change in fruit and vegetable consumption

Coefficients[a]		B	95% CI		*p*-value
			Lower	Upper	
Weight history	Initial weight (kg)	0.01	−0.09	0.12	0.805
	Initial BMI	0.01	−0.27	−0.24	0.939
	Initial BMI category	0.29	−1.26	−1.83	
Demographics	Male	−3.74	−11.26	3.78	0.326
	Married or with partner	0.49	−5.29	6.28	0.866
	Non-English-speaking	2.03	−5.27	9.33	0.582
	IRSD (1–3)	−3.04	−8.59	2.48	0.278
	IRSD (4–7)	2.86	−2.30	8.02	0.273
	IRSD (8–10)	−0.24	−5.61	5.13	0.93
Coefficients[a]		B	95% CI		*p*-value
			Lower	Upper	
	Qualifications: HSC	−0.85	−6.49	4.79	0.765
	Qualifications: trade certifications, diplomas	−0.31	−5.64	5.01	0.908
	Qualifications: degree and higher	1.02	−4.17	6.20	0.689
	Age range (18–39 years)	−3.52	−8.88	1.85	0.196
	Age range (40–54 years)	4.76	−0.57	10.08	0.079
	Age range (56 and above)	−1.16	−6.41	4.08	0.661
Health	Diabetes	1.75	−6.10	9.59	0.66
	Heart disease	12.81	−1.30	26.93	0.075
	Cancer	7.21	−5.20	19.62	0.252
	Gall bladder disease	−4.93	−17.39	7.53	0.432

	Osteoarthritis	−5.15	−12.16	1.86	0.148
	Sleep apnoea	0.77	−6.32	7.85	0.83
	Depression	−2.11	0.45	−7.67	3.451
	Eating disorders	1.59	−8.73	11.91	0.76
	Currently gaining weight	0.16	−4.90	5.22	0.949
Health status	Presence of disease	−0.68	−5.731	4.360	0.788
Perceived health	Good health	−1.15	−6.21	3.91	0.652
	Fair health	0.70	−4.55	5.95	0.791
	Bad health	1.45	−7.14	10.00	0.741
Physical activity (total minutes per week)	Change in walking	0.00	−0.02	0.02	0.822
	Change in vigorous physical activity	0.00	−0.03	0.03	0.907
Food consumption (mean weekly score in serves)	**Change in discretionary food consumption***	**−0.59**	**−0.99**	**−1.93**	**0.004***
	Change in SSBs consumption*	**−0.95**	**−1.61**	**−0.28**	**0.006***
Smoking and drinking	Regular smoker	−4.93	−17.39	7.53	0.434
	Risky drinking	−5.89	−16.14	4.38	0.257
Diet type	Healthy diet	2.30	−2.74	7.34	0.368
	Restricted diets	−4.41	−16.88	8.06	0.484
	Paleo-like diets*	**−7.21**	**−14.36**	**−0.05**	**0.048***
	Calorie restriction	−5.76	−13.86	2.39	0.161
Self-monitoring	Diet tracking	2.58	−2.51	7.67	0.316
	Exercise tracking	−1.65	−6.75	3.45	0.522
	Weight tracking				
Use of weight loss aids	Weight loss products	0.14	−5.37	5.65	0.96
		B	95% CI		*p-value*
			Lower	Upper	
	Diet books and websites	3.97	−1.33	9.28	0.14
	Smartphone app diets	−0.52	−6.58	5.54	0.865
Motivation	Reason for weight loss: medical	1.27	−6.03	8.58	0.73
	Reason for weight loss: others	5.21	−2.90	13.23	0.205
	Reason for weight loss: health and wellness	−1.79	−7.02	3.45	0.5
	Reason for weight loss: aesthetics	−2.27	−10.11	5.57	0.566
Psychosocial factors and eating behaviours	**Disinhibited eating***	**−5.23**	**−10.19**	**−0.27**	**0.039**
	Feelings of hunger	−2.23	−7.31	2.86	0.386
	Stress eating	−2.76	−9.02	3.50	0.384

	Eating when not hungry	0.58	−4.64	5.79	0.827
	Exercises flexible control	0.27	−4.79	5.33	0.916
	Family and social support	1.97	−3.66	7.59	0.489
	Has coping skills	2.28	−3.49	8.05	0.435
	Has self-efficacy	6.58	0.44	12.71	0.36
	Has black and white thinking	0.70	−4.39	5.78	0.787
	Has stability				
New exploratory factors	Self-management type (assisted)	1.94	−5.13	9.02	0.587
	Time when comfortable with weight (never)	4.80	−1.08	10.68	0.108
	Time when comfortable with weight (long ago)	−2.91	−7.39	2.12	0.253
	Time when comfortable with weight (in recent times)	−0.80	−6.85	5.26	0.794
	No. of attempts at weight loss (less than 3 times)	−2.83	−7.82	3.06	0.387
	No. of attempts at weight loss (4 or more times)	1.69	−5.01	8.40	0.617
	No. of attempts at weight loss (always trying to lose weight)	1.08	−3.97	6.13	0.672

Note: [a]Dependent variable: change in fruit & veg consumption.

*p-value < 0.05. [b]IRSD = Index of Relative Socio-economic Disadvantage

7.3.2.2 Multiple linear regression for changes in fruit and vegetable outcomes

Multiple linear regression models were performed to identify models that best predicted the change in mean weekly food consumption scores (serves) of fruit and vegetables. Again, those characteristics that most strongly predicted this outcome in the univariate analysis, along with other characteristics of theoretical importance, were included in the modelling. The change in discretionary food consumption was highly correlated with the change in SSBs consumption; therefore, only the changes in discretionary food consumption were retained in the model. The models consisted of adding groups of predictor variables as follows:

- Model 1: Initial BMI
- Model 2: Model 1 + gender, age range
- Model 3: Model 2 + changes in discretionary food consumption
- Model 4: Model 3 + paleo-like diet
- Model 5: Model 4 + diet tracking, use for diet books and websites

- Model 6: Model 5 + self-management type.

As shown in Table 7.8, Model 3 with the addition of change in discretionary food consumption, controlled for initial BMI, age and gender, was strongly significant (F change = 8.7, $p = 0.005$), and explained 14% of the variation in change in fruit and vegetable consumption. The final model predicted 19% of the variation but was not significant.

Table 7.9 shows the results for each factor in the models. In Model 3, an increase of one weekly serve of discretionary food predicted a reduction of a little more than a half serve of fruit and vegetables (Model 8: B = −0.628, $p = 0.005$, 95% CI = −0.628, 0.199).

Table 7.8: Model summary for change in fruit and vegetable consumption

		Change statistics		
Model	R^2	R^2 change	F change	*p*-value
1[a]	0.00	0.00	0.01	0.940
2[b]	0.05	0.05	1.50	0.220
3[c]	**0.14**	**0.09**	**8.47**	**0.005***
4[d]	0.17	0.04	3.63	0.060
5[e]	0.19	0.02	0.91	0.407
6[f]	0.19	0.00	0.22	0.639

Note: [a]Predictors: (constant), initial BMI.

[b]Predictors: (constant), initial BMI, gender, age range (40–54 years), age range (55 years and above).

[c]Predictors: (constant), initial BMI, gender, age range (40–54 years), age range (55 years and above), change in discretionary food consumption.

[d]Predictors: (constant), initial BMI, gender, age range (40–54 years), age range (55 years and above), change in discretionary food consumption, paleo-like diets.

[e]Predictors: (constant), initial BMI, gender, age range (40–54 years), age range (55 years and above), change in discretionary food consumption, paleo-like diets, diet books and websites, diet tracking

[f]Predictors: (constant), initial BMI, gender, age range (40–54 years), age range (55 years and above), change in discretionary food consumption, paleo-like diets, diet books and websites, diet tracking, self-management type (assisted).

Table 7.9: Factors predicting change in fruit and vegetable consumption

			95% CI		
Model	Coefficients[a]	B	Lower	Upper	*p*-value
1					
	Initial BMI	0.01	−0.27	0.29	0.940

	Initial BMI	−0.01	−0.29	0.28	0.971
	Gender (male)	−4.37	−12.36	3.62	0.280
2	Age range (40–54 years)	5.97	−0.60	12.55	0.075
	Age range (55 years and above)	1.75	−4.62	8.2	0.586
3					
	Initial BMI	−0.01	−0.29	0.27	0.951
	Gender (male)	−3.92	−11.58	3.75	0.313
	Age range (40–54 years)	5.34	−0.98	11.63	0.097
	Age range (55 years and above)	2.48	−3.65	8.61	0.424
	Change in discretionary food consumption*	**−0.63**	**−1.06**	**−0.2**	**0.005***
4					
	Initial BMI	−0.04	−0.32	0.23	0.761
	Gender (male)	−3.54	−11.11	4.02	0.355
	Age range (40–54 years)	5.53	−0.7	11.76	0.081
	Age range (55 years and above)	2.73	−3.31	8.77	0.372
	Change in discretionary food consumption	−0.61	−1.03	−0.19	0.005
	Paleo-like diet	−6.7	−13.83	0.3	0.060

			95% CI		
Model	Coefficients[a]	B	Lower	Upper	*p*-value
5					
	Initial BMI	−0.01	−0.3	0.27	0.940
	Gender (male)	−4.38	−12.06	3.30	0.260
	Age range (40–54 years)	5.53	−0.74	11.81	0.083
	Age range (55 years and above)	2.87	−3.20	8.94	0.350
	Change in discretionary food consumption	−0.6	−1.02	−0.16	0.008
	Paleo-like diet	−7.36	−14.48	−0.23	0.043
	Diet tracking	3.19	−1.94	8.32	0.220
	Diet books/websites	−1.65	−7.65	4.35	0.586
6					
	Initial BMI	−0.01	−0.29	0.27	0.923
	Gender (male)	−4.26	−11.2	3.47	0.276
	Age range (40–54 years)	5.38	−0.96	11.72	0.095

Age range (55 years and above)	2.68	−3.47	8.83	0.388
Change in discretionary food consumption	−0.58	−1.01	−0.14	0.010
Paleo-like diet	−7.72	−15.05	−0.4	0.039
Diet tracking	3.28	−1.89	8.46	0.210
Diet books/websites	−1.56	−7.61	4.48	0.609
Self-management type (assisted)	1.74	−5.63	9.12	0.639

Note: [a]Dependent variable: change in fruit & veg consumption.

*p-value < 0.05.

7.3.2.3 Multiple linear regression for changes in discretionary food consumption

Univariate regressions were not performed for change in discretionary food, and the same variables and models that were performed for change in fruit and vegetables were repeated for changes in discretionary food consumption to allow comparisons. The only change made to the models was that change in fruit and vegetables replaced change in discretionary food consumption as a predictor.

As shown in Table 7.10, Model 3 with the addition of change in fruit and vegetable consumption, controlled for initial BMI, age and gender, was strongly significant (F change = 8.47, p = 0.005), and explained 11% of the variation in change in discretionary consumption. The final model predicted 15% of the variation but was not significant.

Table 7.11 shows the results for each factor in the models. In Model 3, an increase of one weekly serve of fruit and veg consumption predicted a slight decrease in discretionary food consumption (B = −0.144, p = 0.005, 95% CI = −0.243, 0.046).

Table 7.10: Model summary for change in discretionary food consumption

		Change statistics		
Model	R^2	R^2 change	F change	*p*-value
1[a]	0.00	0.00	0.00	0.961
2[b]	0.02	0.02	0.71	0.551
3[c]	**0.11**	**0.09**	**8.47**	**0.005***
4[d]	0.11	0.00	0.03	0.874
5[e]	0.13	0.02	1.05	0.353
6[f]	0.15	0.01	1.15	0.286

Note: [a]Predictors: (constant), initial BMI.

[b]Predictors: (constant), initial BMI, gender, age range (40–54 years), age range (55 years and above).

[c]Predictors: (constant), initial BMI, gender, age range (40–54 years), age range (55 years and above), change in fruit and veg consumption.

[d]Predictors: (constant), initial BMI, gender, age range (40–54 years), age range (55 years and above), change in fruit and veg consumption, paleo-like diets.

[e]Predictors: (constant), initial BMI, gender, age range (40–54 years), age range (55 years and above), change in fruit and veg consumption, paleo-like diets, diet books and websites, diet tracking.

[f]Predictors: (constant), initial BMI, gender, age range (40–54 years), age range (55 years and above), change in fruit and veg consumption, paleo-like diets, diet books and websites, diet tracking, self-management type (assisted).

Table 7.11: Factors predicting change in discretionary food consumption

			95% CI		
Model	Coefficients[a]	B	Lower	Upper	p-value
1					
	Initial BMI	0.01	−0.131	0.14	0.961
2					
	Initial BMI	−0.01	−0.144	0.13	0.939
	Gender (male)	0.72	−3.104	4.55	0.708
	Age range (40–54 years)	−1.01	−4.154	2.15	0.529
	Age range (55 years and above)	1.16	−1.89	4.21	0.453
3					
	Initial BMI	−0.01	−0.14	0.13	0.927
	Gender (male)	0.09	−3.60	3.79	0.960
	Age range (40–54 years)	−0.14	−3.22	2.94	0.927
	Age range (55 years and above)	1.41	−1.52	4.34	0.342
	Change in fruit & veg consumption*	**−0.14**	**−0.24**	**−0.05**	**0.005**
4					
	Initial BMI	−0.01	−0.14	0.13	0.912

	Gender (male)	0.10	−3.62	3.82	0.957
	Age range (40–54 years)	−0.12	−3.23	2.98	0.937
	Age range (55 years and above)	1.42	−1.53	4.38	0.341
	Change in fruit & veg consumption	−0.15	−0.25	−0.04	0.005
	Paleo-like diet	−0.28	−3.81	3.25	0.874
5					
	Initial BMI	−0.01	−0.15	0.12	0.866
	Gender (male)	0.26	−3.52	4.04	0.892
	Age range (40–54 years)	−0.36	−3.48	2.76	0.818
	Age range (55 years and above)	1.23	−1.74	4.20	0.412
	Change in fruit & veg consumption	−0.14	−0.24	−0.04	0.008
	Paleo-like diet	−0.24	−3.81	3.33	0.893
	Diet tracking	−0.89	−3.41	1.63	0.485
	Diet books/websites	−1.82	−4.74	1.08	0.215

			95% CI		
Model	Coefficients[a]	B	Lower	Upper	p-value
6					
	Initial BMI	−0.01	−0.14	0.13	0.906
	Gender (male)	0.14	−3.64	3.92	0.940
	Age range (40–54 years)	−0.20	−3.33	2.93	0.899
	Age range (55 years and above)	1.41	−1.58	4.39	0.352
	Change in fruit & veg consumption	−0.14	−0.24	−0.03	0.010
	Paleo-like diet	0.19	−3.47	3.84	0.919
	Diet tracking	−0.99	−3.52	1.54	0.439
	Diet books/websites	−1.9	−4.81	1.01	0.198
	Self-management type (assisted)	−1.92	−5.48	1.64	0.286

Note: [a]Dependent variable: change in discretionary food consumption.

7.3.2.4 Multiple linear regression for changes in sugar sweetened beverages consumption

The models constructed for assessing the impact of characteristics on changes in discretionary food consumption were repeated for changes in SSBs as well, except that in Model 3, the predictors included both change in fruit and vegetables, and change in discretionary food consumption.

As shown in Table 7.12, Model 3 with the addition of changes in fruit and vegetables to demographic variables was significant (F change = 6.980, p = 0.010), and explained 7.5% of the variation in change in SSBs consumption. The final model predicted 9.3% of the variation but was not significant.

Table 7.13 shows the results for each factor in the models. In Model 3, an increase of one weekly serve of fruit and veg consumption predicted a very slight decrease in SSBs consumption (B = −0.085, p = 0.010, 95% CI = −0.148, 0.021).

Table 7.12: Model summary for changes in SSBs consumption

		Change statistics		
Model	R^2	R^2 change	F change	p-value
1	0.004	0.004	0.322	0.572
2	0.013	0.010	0.285	0.836
3	**0.088**	**0.075**	**6.980**	**0.010***
4	0.088	0.000	0.006	0.939
5	0.093	0.005	0.228	0.797
6	0.093	0.000	0.003	0.957

Note: [a]Predictors: (constant), initial BMI.

[b]Predictors: (constant), initial BMI, gender, age range (40–54 years), age range (55 years and above).

[c]Predictors: (constant), initial BMI, initial BMI, gender, age range (40–54 years), age range (55 years and above), change in discretionary food consumption, change in fruit & veg consumption.

[d]Predictors: (constant), initial BMI, gender, age range (40–54 years), age range (55 years and above), change in fruit and veg consumption, change in discretionary food consumption, paleo-like diets.

[e]Predictors: (constant), initial BMI, gender, age range (40–54 years), age range (55 years and above), change in fruit and veg consumption, change in discretionary food consumption, paleo-like diets, diet books and websites, diet tracking.

[f]Predictors: (constant), initial BMI, gender, age range (40–54 years), age range (55 years and above), change in fruit and veg consumption, change in discretionary food consumption, paleo-like diets, diet books and websites, diet tracking, self-management type (assisted).

Table 7.13: Factors predicting change in SSBs

			95% CI		
Model	Coefficients[a]	B	Lower	Upper	*p*-value
1					
	Initial BMI	0.024	−0.061	0.110	0.572
2					
	Initial BMI	0.025	−0.064	0.114	0.576
	Gender (male)	0.337	−2.119	2.793	0.786
	Age range (40–54 years)	−0.754	−2.776	1.268	0.460
	Age range (55 years and above)	0.041	−1.917	2.000	0.967
			95% CI		
Model	Coefficients[a]	B	Lower	Upper	*p*-value
3					
	Initial BMI	0.025	−0.061	0.111	0.570
	Gender (male)	−0.033	−2.425	2.359	0.978
	Age range (40–54 years)	−0.248	−2.241	1.744	0.805
	Age range (55 years and above)	0.189	−1.708	2.087	0.843
	Change in fruit & veg consumption	**−0.085**	**−0.148**	**−0.021**	**0.010**
4					
	Initial BMI	0.025	−0.062	0.112	0.569
	Gender (male)	−0.036	−2.443	2.371	0.976
	Age range (40–54 years)	−0.254	−2.263	1.756	0.802
	Age range (55 years and above)	0.185	−1.728	2.098	0.848
	Change in fruit & veg consumption	−0.084	−0.150	−0.019	0.012
	Paleo-like diet	0.088	−2.195	2.371	0.939

5	Initial BMI	0.025	−0.064	0.115	0.575
	Gender (male)	−0.051	−2.523	2.420	0.967
	Age range (40–54 years)	−0.186	−2.226	1.854	0.857
	Age range (55 years and above)	0.237	−1.704	2.177	0.809
	Change in fruit & veg consumption	−0.085	−0.152	−0.018	0.014
	Paleo-like diet	0.101	−2.230	2.433	0.931
	Diet tracking	0.157	−1.492	1.806	0.850
	Diet books/websites	0.613	−1.289	2.515	0.523

			95% CI		
Model	Coefficients[a]	B	Lower	Upper	*p*-value
6					
	Initial BMI	0.025	−0.065	0.115	0.576
	Gender (male)	−0.055	−2.546	2.435	0.965
	Age range (40–54 years)	−0.180	−2.243	1.882	0.862
	Age range (55 years and above)	0.243	−1.722	2.207	0.806
	Change in fruit & veg consumption	−0.085	−0.153	−0.017	0.015
	Paleo-like diet	0.116	−2.288	2.520	0.924
	Diet tracking	0.154	−1.510	1.818	0.854
	Diet books/websites	0.611	−1.305	2.527	0.528
	Self-management type (assisted)	−0.064	−2.407	2.279	0.957

Note: [a]Dependent variable: change in SSBs consumption.

7.3.3 Secondary outcomes—physical activity

7.3.3.1 Univariate analysis for change in walking

For identification of the characteristics that most strongly predicted changes in weekly walking minutes, a univariate regression analysis was undertaken. The results of the univariate analysis are shown in Table 7.14. None of the characteristics significantly predicted change in walking minutes at 12 weeks' follow-up, although IRSD (8–10), age range (40–54 years), poor perceived health, use of smartphone apps, and those who had attempted weight loss less than three times previously had *p*-values of less than 0.25.

Table 7.14: Univariate regression for change in walking

Coefficients[a]			95% CI		
		B	Lower	Upper	*p*-value
Weight history	Initial weight (kg)	0.96	−1.03	2.94	0.339
	Initial BMI	1.05	−5.99	3.88	0.671
Demographics	Male	−12.26	−119.19	94.67	0.819
	Married or with partner				
	Non-English-speaking	34.84	−67.24	136.92	0.497
	IRSD (1–3)	−20.12	−99.80	59.56	0.615
	IRSD (4–7)	−38.59	−116.96	39.78	0.328
	IRSD (8–10)	64.62	−16.85	146.08	0.118
	Qualifications: HSC	−11.03	−56.70	34.64	0.631
	Qualifications: trade certifications, diplomas	−16.93	−98.66	62.80	0.672
	Qualifications: degree and higher	23.19	−52.96	99.33	0.545
	Age range (18–39 years)	−22.74	−101.52	56.05	0.566
	Age range (40–54 years)	84.26	5.33	163.19	0.037
	Age range (56 and above)	−58.21	−137.59	21.18	0.148
Health	Diabetes	18.48	−108.83	145.79	0.772
	Heart disease	93.39	−118.27	305.05	0.381
	Cancer	95.98	−115.60	307.55	0.368
	Gall bladder disease	−10.00	−223.03	203.03	0.925
	Osteoarthritis	0.73	−126.67	128.13	0.991
	Sleep apnoea	−51.82	−204.49	100.85	0.5
	Depression	−25.40	−111.39	60.60	0.557
	Eating disorders	−64.51	−239.15	110.13	0.463
	Currently gaining weight	12.82	−63.24	88.88	0.737
Health Status	Presence of a diagnosed illness	−37.17	−112.52	38.18	.328

Perceived health	Good health	−4.76	−81.89	72.38	0.901
	Fair health	−33.21	−133.57	47.14	0.412
	Bad health	112.54	−22.61	247.72	0.101
Physical Activity	Change in vigorous physical activity (minutes per week)	0.14	−0.32	0.60	0.528
Smoking and Drinking	Regular smoker	106.31	−104.93	317.57	0.318
	Risky drinking	−5.00	−158.26	140.15	0.948
Self-Monitoring	Exercise tracking	−7.69	−83.58	68.18	0.84
	Weight tracking	−3.91	−83.76	75.93	0.922
Use of weight loss aids	Weight loss products	9.00	−70.82	88.81	0.822
	Smartphone app diets	−60.01	−161.41	41.27	0.241
Motivation	Reason for weight loss: medical	−11.73	−130.73	107.26	0.844
	Reason for weight loss: others	−14.79	−142.14	112.55	0.817
	Reason for weight loss: health and wellness	−8.70	−88.53	71.11	0.828
	Reason for weight loss: aesthetics	39.22	−72.71	151.15	0.486

			95% CI		
		B	Upper	Lower	p-value
Psychosocial factors and eating behaviours	Disinhibited eating	36.85	−38.43	112.13	0.331
	Feelings of hunger	13.34	−63.77	90.40	0.73
	Stress eating	−23.35	−118.96	71.90	0.626
	Eating when not hungry	11.33	−66.26	88.93	0.771
	Exercises flexible control	3.71	−72.25	79.68	0.922
	Family and social support	34.59	−48.11	117.29	0.406
	Has coping skills	−41.92	−127.49	43.64	0.331
	Has self-efficacy	16.06	−76.50	108.61	0.73
	Has black and white thinking	52.86	−21.77	121.49	0.162
	Has stability	−60.78	0.20	33.32	0.201
New Exploratory Factors	Self-management type (assisted)	−29.81	−148.60	88.80	0.617
	Time when comfortable with weight (never)	−39.68	−141.63	62.28	0.439
	Time when comfortable with weight (long ago)	−26.90	−51.07	104.87	0.493

Time when comfortable with weight (in recent times)	−5.25	−97.89	87.38	0.91
No. of attempts at weight loss (less than 3 times)	45.78	−36.55	128.11	0.27
No. of attempts at weight loss (4 or more times)	−19.82	−122.32	72.68	0.67
No. of attempts at weight loss (always trying to lose weight)	−24.80	−100.42	50.81	0.514

Note: [a]Dependent variable: change in walking minutes. [b]IRSD = Index of Relative Socio-economic Disadvantage

7.3.3.2 Multiple linear regression for changes in walking (change in weekly minutes)

Those variables identified as potentially strong predictors through the univariate analysis were included for the multiple linear regression models for assessing changes in levels of walking (weekly minutes) at 12-week follow-up. These were added into the regression model along with other demographics and exploratory factors.

The models consisted of adding groups of the predictor variables as follows:

- Model 1: initial absolute weight in kilograms
- Model 2: Model 1 + gender, age range
- Model 3: Model 2 + IRSD
- Model 4: Model 3 + perceived health
- Model 5: Model 4 + use of smartphone app diets
- Model 6: Model 5 + self-management, no. of previous attempts at weight loss.

As shown in Table 7.15, none of the models were significant in predicting change in walking. The final model accounted for 25% of the variation, but this was not significant.

In addition, none of the factors were significant in predicting change in walking (Table 7.16).

Table 7.15: Model summary for change in walking (weekly minutes)

		Change statistics		
Model	R^2	R^2 change	F change	*p*-value
1[a]	0.016	0.016	0.929	0.339
2[b]	0.104	0.088	1.799	0.158
3[c]	0.151	0.047	1.480	0.237
4[d]	0.202	0.051	1.642	0.204

5[e]	0.218	0.016	1.016	0.318
6[f]	0.251	0.033	1.057	0.355

Note: [a]Predictors: (constant), initial weight in kilograms.

[b]Predictors: (constant), initial weight in kilograms, gender, age range (40–54 years), age range (55 years and above).

[c]Predictors: (constant), initial weight in kilograms, gender, age range (40–54 years), age range (55 years and above), IRSD (4–7), IRSD (8–10).

[d]Predictors: (constant), initial weight in kilograms, gender, age range (40–54 years), age range (55 years and above), IRSD (4–7), IRSD (8–10), perceived health (fair), perceived health (poor). ePredictors: (constant), initial weight in kilograms, gender, age range (40–54 years), age range (55 years and above), IRSD (4–7), IRSD (8–10), perceived health (fair), perceived health (poor), smartphone app diets.

fPredictors: (constant), initial weight in kilograms, gender, age range (40–54 years), age range (55 years and above), IRSD (4–7), IRSD (8–10), perceived health (fair), perceived health (poor), smartphone app diets, self-management type (assisted), no. of attempts at weight loss less than 3.

[b]IRSD = Index of Relative Socio-economic Disadvantage

Table 7.16: Factors predicting change in total weekly walking minutes

			95% CI		
Model	Coefficients[a]	B	Lower	Upper	*p*-value
1					
	Initial weight (kg)	0.955	−1.028	2.938	0.339

			95% CI		
Model	Coefficients[a]	B	Lower	Upper	*p*-value
2					
	Initial weight (kg)	0.997	−0.970	2.965	0.314
	Gender	−27.490	−133.793	78.813	0.606
	Age range (40–54 years)	75.688	−17.557	168.932	0.110
	Age range (55 years and above)	−32.169	−123.045	58.707	0.481
3					
	Initial weight (kg)	1.241	−0.813	3.294	0.231
	Gender	−19.848	−125.763	86.067	0.709
	Age range (40–54 years)	67.141	−27.853	162.136	0.162
	Age range (55 years and above)	−47.113	−139.375	45.149	0.310

	IRSD (4–7)	17.967	−77.414	113.347	0.707
	IRSD (8–10)	78.873	−17.257	175.003	0.106
4					
	Initial weight (kg)	1.427	−0.646	3.499	0.173
	Gender	−11.753	−118.611	95.105	0.826
	Age range (40–54 years)	64.610	−31.136	160.356	0.181
	Age range (55 years and above)	−51.560	−143.329	40.210	0.265
	IRSD (4–7)	29.360	−65.933	124.654	0.539
	IRSD (8–10)	82.677	−12.557	177.912	0.087
	Perceived health (fair)	−27.116	−110.925	56.694	0.519
	Perceived health (poor)	104.529	−37.122	246.180	0.145
5					
	Initial weight (kg)	1.288	−0.804	3.380	0.222
	Gender	−8.886	−115.931	98.159	0.868
	Age range (40–54 years)	49.901	−50.259	150.062	0.322
	Age range (55 years and above)	−63.703	−158.637	31.231	0.184
	IRSD (4–7)	24.943	−70.787	120.673	0.603
	IRSD (8–10)	87.898	−7.934	183.730	0.071
	Perceived health (fair)	−32.338	−116.819	52.142	0.446
	Perceived health (poor)	93.405	−50.015	236.826	0.197
	Smartphone app diets	−54.497	−163.074	54.081	0.318

			95% CI		
Model	Coefficients[a]	B	Lower	Upper	*p*-value
6					
	Initial weight (kg)	1.772	−0.429	3.974	0.112
	Gender	−7.543	−114.593	99.507	0.888
	Age range (40–54 years)	57.704	−43.104	158.513	0.255
	Age range (55 years and above)	−47.339	−145.011	50.333	0.335
	IRSD (4–7)	41.590	−57.827	141.006	0.404
	IRSD (8–10)	94.675	−1.960	191.311	0.055
	Perceived health (fair)	−31.385	−115.867	53.097	0.459
	Perceived health (poor)	107.379	−37.374	252.133	0.142
	Smartphone app diets	−45.668	−155.005	63.669	0.405
	No. of attempts at weight loss less than 3	59.752	−31.343	150.847	0.193
	Self-management type	−17.633	−136.697	101.432	0.767

Note: [a]Dependent variable: change in walking minutes. [b]IRSD = Index of Relative Socio-economic Disadvantage

7.3.3.3 Multiple linear regression for changes in vigorous physical activity (change in weekly minutes)

The same groups of variables used for constructing regression models for changes in walking were also used to construct the models for vigorous physical activity. The models consisted of adding groups of predictor variables as follows:

- Model 1: initial absolute weight in kilograms
- Model 2: Model 1 + gender, age range
- Model 3: Model 2 + IRSD
- Model 4: Model 3 + perceived health (fair)*
- Model 5: Model 4 + use of smartphone app diets
- Model 6: Model 5 + self-management, no. of previous attempts at weight loss.

*Perceived health (poor) was excluded from the model as there was no vigorous physical activity data available for this category.

As shown in Table 7.17, Model 4, which included perceived health (fair), was significant in predicting change in vigorous physical activity, and accounted for 46% the variation (F change = 6.698, p = 0.018).

Table 7.18 shows the results for each factor in the models. In Model 4, those who perceived their health was fair increased their mean vigorous physical activity by 2.15 hours or 129 minutes per week (Model 4: B = 129.195, p = 0.018, 95% CI = 25, 233). Perceived health (fair) significantly predicted increase in vigorous physical activity in Models 5 and 6 as well, but the models were not significant.

Table 7.17: Model summary for vigorous physical activity

		Change statistics		
Model	R^2	R^2 change	F change	p-value
1[a]	0.024	0.024	0.652	0.427
2[b]	0.091	0.067	0.564	0.644
3[c]	0.285	0.194	2.850	0.080
4[d]	**0.465**	**0.179**	**6.698**	**0.018**
5[e]	0.465	0.001	0.026	0.874*

6[f]	0.482	0.017	0.272	0.765

Note: [a]Predictors: (constant), initial weight in kilograms.

[b]Predictors: (constant), initial weight in kilograms, gender, age range (40–54 years), age range (55 years and above).

[c]Predictors: (constant), initial weight in kilograms, gender, age range (40–54 years), age range (55 years and above), IRSD (4–7), IRSD (8–10).

[d]Predictors: (constant), initial weight in kilograms, gender, age range (40–54 years), age range (55 years and above), IRSD (4–7), IRSD (8–10), perceived health (fair).

ePredictors: (constant), initial weight in kilograms, gender, age range (40–54 years), age range (55 years and above), IRSD (4–7), IRSD (8–10), perceived health (fair), smartphone app diets.

[f]Predictors: (constant), initial weight in kilograms, gender, age range (40–54 years), age range (55 years and above), IRSD (4–7), IRSD (8–10), perceived health (fair), smartphone app diets, self-management type (assisted), no. of attempts at weight loss -less than 3. [g]IRSD = Index of Relative Socio-economic Disadvantage

Table 7.18: Factors predicting change in vigorous physical activity

			95% CI		
Model	Coefficients[a]	B	Lower	Upper	*p*-value
1					
	Initial weight (kg)	0.945	−1.460	3.350	0.427
			95% CI		
Model	Coefficients[a]	B	Lower	Upper	*p*-value
2					
	Initial weight (kg)	0.925	−1.648	3.499	0.465
	Gender	−38.497	−172.794	95.799	0.559
	Age range (40–54 years)	−14.472	−147.075	118.131	0.823
	Age range (55 years and above)	48.138	−85.551	181.828	0.464
3					
	Initial weight (kg)	−0.280	−2.903	2.343	0.826
	Gender	−83.585	−219.302	52.133	0.214
	Age range (40–54 years)	−5.443	−129.498	118.612	0.928
	Age range (55 years and above)	91.349	−39.750	222.448	0.162
	IRSD (4–7)	−84.717	−212.617	43.184	0.183
	IRSD (8–10)	−159.762	−300.561	−18.964	0.028
4					
	Initial weight (kg)	0.684	−1.776	3.143	0.568
	Gender	−27.597	−156.487	101.294	0.660

	Age range (40–54 years)	−40.200	−154.059	73.658	0.470
	Age range (55 years and above)	100.945	−15.936	217.825	0.087
	IRSD (4–7)	−81.204	−195.018	32.611	0.152
	IRSD (8–10)	−136.155	−262.846	−9.464	0.036
	Perceived health (fair)	**129.195**	**25.067**	**233.323**	**0.018**
5					
	Initial weight (kg)	0.675	−1.858	3.208	0.584
	Gender	−30.676	−169.213	107.860	0.648
	Age range (40–54 years)	−35.385	−168.263	97.493	0.584
	Age range (55 years and above)	103.969	−22.565	230.502	0.102
	IRSD (4–7)	−80.264	−197.990	37.461	0.170
	IRSD (8–10)	−138.714	−273.245	−4.183	0.044
	Perceived health (fair)	**129.814**	**22.388**	**237.239**	**0.020***
	Smartphone app diets	10.381	−124.876	145.637	0.874

			95% CI		
Model	Coefficients[a]	B	Lower	Upper	*p*-value
6					
	Initial weight (kg)	0.730	−2.108	3.567	0.595
	Gender	−28.291	−175.303	118.721	0.690
	Age range (40–54 years)	−33.291	−175.440	108.859	0.628
	Age range (55 years and above)	103.404	−37.294	244.102	0.139
	IRSD (4–7)	−79.244	−211.281	52.793	0.223
	IRSD (8–10)	−126.982	−273.927	19.962	0.086
	Perceived health (fair)	**136.350**	**22.078**	**250.622**	**0.022***
	Smartphone app diets	18.180	−127.009	163.370	0.795
	No. of attempts at weight loss less than 3	−30.139	−143.129	82.850	0.581
	Self-management type	−48.392	−231.002	134.218	0.583

[a]IRSD = Index of Relative Socio-economic Disadvantage

7.4 Discussion

An understanding of what characteristics predict weight loss among different population groups is important in finding best ways to help people with management of obesity, and a number of empirical studies have attempted to determine the characteristics that most likely predict weight outcomes.(1) In this 12-week longitudinal study, the predictive ability of a breadth of factors for weight loss, diet and physical activity outcomes were examined in a population group that self-managed their weight loss. In summary, higher initial BMI, non-English speakers, cancer, and use of weight loss products predicted weight loss, whereas increased consumption of discretionary foods predicted weight gain. The predictors of our secondary outcomes of diet and physical activity behaviours were less clear. An increase in discretionary foods, and SSBs, predicted reduction in fruit and vegetable consumption. However, a reported perceived health status of 'fair' predicted an increase in vigorous physical activity. These findings are discussed in comparison to literature below.

Higher initial BMI among self-managed weight losers as a predictor of increased absolute weight loss was consistently significant across all models, similar to the participants in formal behavioural weight loss.(9) However, the baseline absolute weight did not predict weight change as might be expected.

Health status of participants indicated by the presence or absence of chronic disease did not influence weight loss in this study. However, participants with cancer lost significant weight at follow-up, predicting a large weight reduction of nearly 8 kg of absolute weight loss, although the evidence was weak and it lost significance in the final model. Our sample only had four participants with cancer; three of them had obesity and one was within the healthy weight range. However, all of them achieved successful weight loss, with three participants losing 5% or more of their initial body weight. Recent public awareness about the fact that obesity is a risk factor for many cancers(10) is promoted by national health organisations,(11) and among patients with breast cancer, weight loss is important to prevent adverse prognosis.(12-14) It is possible that increased awareness prompts weight loss attempts among cancer patients. On the other hand, cachexia is a severe complication seen in some patients with cancer,(15) with a poor prognosis regardless of body weight.(16) Not surprisingly, there is a hesitancy among clinicians to broach the topic of weight management among cancer sufferers even where appropriate, with opportunity for training clinicians in weight management for patients with cancer.(17) It is concerning that of the patients with cancer in this study, all were 'unassisted' in their weight loss attempt as this group of patients may benefit from assistance and monitoring from health professionals.

In this study, half the non-English-speaking group (7/14, 50%) were successful at weight loss, compared with a third (27/83, 32.5%) of English-speaking participants, and being non-English predicted a weight loss of almost 4.5 kg with moderate evidence. Overweight and obesity vary among racial and ethnic groups, as well as gender, and country of birth.(18) Acculturation, defined by time of living in Australia, is however associated with higher obesity.(19) In our study, non-English-speaking participants were better placed with regard to weight to begin with, as only half these participants had obesity (compared with 67.6% for English-speaking), and lower mean weight (86.38 kg) to start with (compared with 95.32 kg among English-speaking). A past American study of hospital-based employees found that among diverse racial and ethnic groups, women and higher education were more likely to attempt to lose weight. This was seen in our sample of non-English speakers attempting self-managed weight loss—where the majority were higher-educated (64.3%) females (85.7%). The same study also found that self-perception of health and weight status was also associated with weight loss attempts. In our study, half the non-English participants perceived their health as either fair (35.7%) or poor (14.3%), even though only four reported diagnosed health issues. All but two of these participants were unassisted (85.7%). With nearly half the Australian population from diverse racial and ethnic backgrounds, and a fifth speaking a language other than English at home,(20) weight control attempts among diverse racial and ethnic groups may prove to be more successful than general population programs.

Increased consumption of discretionary food predicted marginally poorer weight loss outcomes, with moderate evidence, and these results are as expected.(7) Although discretionary food consumption was highly correlated with consumption of SSBs, the impact of SSBs consumption on change in weight was not significant.

Weight loss products such as meal replacement shakes, bars and prepared low-calorie meals are convenient and beneficial in weight loss; they can be safely recommended by clinicians(21, 22) and are a common strategy among people trying to lose weight.(23) Not surprisingly, almost a third of our participants reported using weight loss products. However, fewer participants who used these products were successful at weight loss (40.6%) compared with the total sample. Other studies have reported substantial weight loss (7.8% of initial body weight in 3 months) when two of three meals were replaced with products; however, this was done in controlled settings and among patients with diabetes, and this may explain the large differences in percentage weight loss.(24) In our study, both univariate analysis and regression modelling predicted over 2 kg of weight loss with use of weight loss products.

Changes in fruit and vegetable outcomes, and change in discretionary food consumption, showed inverse relationships with an increase in one predicting a decrease in the other. Although effect sizes were small, the evidence found was strong. An increase of one weekly serve of discretionary food predicted a reduction of a little more than a half serve of fruit and vegetables (Model 3: B = −0.628), whereas an increase of one weekly serve of fruit and veg consumption predicted a slight decrease in discretionary food consumption (Model 3: B = −0.144). Similar results were found for changes in SSBs consumption, where an increase of one weekly serve of fruit and veg consumption predicted a very slight decrease in SSBs consumption (B = −0.085,). Our findings are similar to studies based on 2011–12 National Nutrition and Physical Activity Survey (NNPAS) data,(25, 26) which show associations of higher discretionary food intake among those with lower fruit and vegetable intake.

The popularity of paleo diets is high in Australia, as found in our own examination of nutrition advice on Facebook,(27) and some studies have shown potential benefits on weight and improvements in metabolic syndrome among those following this diet.(28, 29) A little over a tenth (13.4%) of our participants reported following paleo or paleo-like diets (paleo, ketogenic diet, low-carb, low-carb-high-fat, Weston-Price/GAPS diet, high-protein diet). While the diet did not predict weight loss in our study, it predicted a reduction of fruit and veg consumption score by seven serves a week in the univariate analysis. This was surprising as paleo diets typically recommend avoidance of grains and dairy, but encourage vegetable consumption. Berries are recommended in moderation; however, fruits such as apples, pears and bananas are seen as ‘high-carb’, so many paleo websites and Facebook pages recommend avoidance,(27, 30) and this may explain the reduction.

Cognitive restraint, specifically lack of intention to control food intake to maintain or lose weight, as a factor is hypothesised to be associated with obesity. In our study, the phrase ‘I eat whatever I want, whenever I want’ was used as an indicator of a lack of restraint or disinhibition in eating. This statement was taken from the Three Factor Eating Questionnaire (TFEQ-21). In our study, those who responded ‘like me’ to this question reduced mean weekly fruit and veg consumption by over five serves in the univariate analysis (−5.23 serves, $p = 0.039$). However, this finding should be interpreted with caution because the statement in isolation, without the entire questionnaire, may not measure restraint accurately. For example, there is scope for participants to incorrectly interpret this single statement as ‘I am in control over my eating’. However, even more widely, these instruments need closer examination as the content validity of the TFEQ-21 in measuring cognitive restraint has been questioned.(31)

In terms of physical activity, those who self-reported their health was ‘fair’ increased their average weekly vigorous physical activity by over 2 hours (Model 4: B = 129.195). However, vigorous physical activity data were missing for all 10 participants (9.8%) who reported that their health was ‘poor’, although data on walking were available for five of the participants. While it is possible the participants did not answer this question, and so it should be treated as missing data, it is equally likely that they did not engage in vigorous physical activity. The connections between physical activity and self-reported health status and quality of life are shown in several studies among different population subgroups.(32-35) Similar findings have been made for the role of physical activity in reducing depressive symptoms.(36) These associations could not be fully investigated in this study because the online survey question was not able to gather accurate data despite adapting questions from validated self-administered instruments.(37)

This study examined a range of demographic, health, weight history, lifestyle risks, psychosocial factors and eating behaviours, including new exploratory variables (self-management type) and how they affect weight, diet and physical activity. Despite a small sample size, a univariate analysis, as well as a comprehensive variable reduction method, allowed examination of most of the range of variables.

A key limitation in this study is that all the data collected was the self-reported. However, a study of Australian middle-aged and elderly suggests that self-reported can be used to quantify relative measures such as BMI, but on average height was overestimated by a centimetre, whereas weight was underestimated by 1.6kgs. As the study design was entirely online, and self-managed weight losers are by definition not likely to engage with health services for their weight a validation with actual measurements was not feasible.

Another limitation is the small sample size that was ultimately used for analyses. Nearly half the participants who completed the initial survey, did not take the follow-up survey at 12-weeks, despite two reminders following the email for the survey, and the increased opportunity to win raffle incentives. Reasons why those who completed the baseline but not follow-up were not investigated as part of the thesis to avoid participant burden. The sudden onset of COVID-19 pandemic and its impact on all people may have distracted participants from survey, or indeed the weight loss attempt. Drop-off at follow up warrant further investigation in future studies. Among those who completed the survey, as well the impact of the impact of COVID-19 pandemic may have influenced self-managed weight loss journeys of participant. These limitations therefore preclude generalisability of findings. Moderate and vigorous physical activity could not be fully examined in self-managed weight losers because of data sparsity and missing data, and better instruments suited to brief online data gathering need to be developed.

7.5 Conclusion

In conclusion, this is one of the few studies that has investigated a range of factors that influence weight outcomes and secondary weight-related outcomes of diet and physical activity among a group of self-managed weight losers in Australia. The identification of these factors, while not generalisable, mostly tends to agree with what is found in the literature.

7.6 References

1. Stubbs J, Whybrow S, Teixeira P, Blundell J, Lawton C, Westenhoefer J, et al. Problems in identifying predictors and correlates of weight loss and maintenance: implications for weight control therapies based on behaviour change. Obes Rev. 2011;12(9):688.
2. Teixeira PJ, Silva MN, Mata J, Palmeira AL, Markland D. Motivation, self-determination, and long-term weight control. Int J Behav Nutr Phys Act. 2012;9(1):22-.
3. Hartmann-Boyce J, Boylan AM, Jebb SA, Fletcher B, Aveyard P. Cognitive and behavioural strategies for self-directed weight loss: systematic review of qualitative studies. Obes Rev. 2017;18(3):335-49.
4. Hartmann-Boyce J, Johns DJ, Jebb SA, Aveyard P. Effect of behavioural techniques and delivery mode on effectiveness of weight management: systematic review, meta-analysis and meta-regression. Obes Rev. 2014;15(7):598-609.
5. Elfhag K, Rössner S. Who succeeds in maintaining weight loss? A conceptual review of factors associated with weight loss maintenance and weight regain. Obes Rev. 2005 Feb;6(1):67-85
6. A framework for monitoring overweight and obesity in Australia. Australian Government. AIHW. ; 2020.
7. Lal A, Peeters A, Brown V, Nguyen P, Tran HNQ, Nguyen T, et al. The Modelled Population Obesity-Related Health Benefits of Reducing Consumption of Discretionary Foods in Australia. Nutrients. 2020;12(3):649.
8. Midi H, Sarkar SK, Rana S. Collinearity diagnostics of binary logistic regression model. Journal of Interdisciplinary Mathematics. 2010;13(3):253-67.
9. James BL, Roe LS, Loken E, Rolls BJ. Early predictors of weight loss in a 1-year behavioural weight-loss programme. Obes Sci Pract. 2018;4(1):20-8.
10. Brawer R, Brisbon N, Plumb J. Obesity and Cancer. Prim Care. 2009;36(3):509-31.

11. Overweight, obesity and cancer: Cancer Council; [Available from: https://www.cancercouncil.com.au/1in3cancers/lifestyle-choices-and-cancer/overweight-obesity-and-cancer/.
12. Befort CA, Klemp JR, Fabian C, Perri MG, Sullivan DK, Schmitz KH, et al. Protocol and recruitment results from a randomized controlled trial comparing group phone-based versus newsletter interventions for weight loss maintenance among rural breast cancer survivors. Contemp Clin Trials. 2014;37(2):261-71.
13. Djuric Z, DiLaura NM, Jenkins I, Darga L, Jen CKL, Mood D, et al. Combining weight-loss counseling with the Weight Watchers plan for obese breast cancer survivors. Obes Res. 2002;10(7):657-65.
14. Jen KLC, Djuric Z, DiLaura NM, Buison A, Redd JN, Maranci V, et al. Improvement of metabolism among obese breast cancer survivors in differing weight loss regimens. Obes Res. 2004;12(2):306-12.
15. Fearon K, Arends J, Baracos V. Understanding the mechanisms and treatment options in cancer cachexia. Nat Rev Clin Oncol. 2013 Feb;10(2):90-9.
16. Martin L, Birdsell L, Macdonald N, Reiman T, Clandinin MT, McCargar LJ, et al. Cancer cachexia in the age of obesity: skeletal muscle depletion is a powerful prognostic factor, independent of body mass index. J Clin Oncol. 2013;31(12):1539-47.
17. Anderson AS, Caswell S, Wells M, Steele RJC. Obesity and lifestyle advice in colorectal cancer survivors – how well are clinicians prepared? Colorectal Dis. 2013;15(8):949-57.
18. Menigoz K, Nathan A, Turrell G. Ethnic differences in overweight and obesity and the influence of acculturation on immigrant bodyweight: evidence from a national sample of Australian adults. BMC Public Health. 2016;16(1):932-.
19. Zapka J, Lemon SC, Estabrook B, Rosal MC. Factors related to weight loss behavior in a multiracial/ethnic workforce. Ethn Dis. 2009;19(2):154-60.
20. 2016 Census: Multicultural: Australian Bureau of Statistics 2017 [Available from: https://www.abs.gov.au/ausstats/abs@.nsf/lookup/media%20release3.
21. Craig J. Meal Replacement Shakes and Nutrition Bars: Do They Help Individuals With Diabetes Lose Weight? Diabetes Spectr. 2013;26(3):179.
22. Astbury NM, Piernas C, Hartmann-Boyce J, Lapworth S, Aveyard P, Jebb SA. A systematic review and meta-analysis of the effectiveness of meal replacements for weight loss. Obes Rev. 2019;20(4):569-87.
23. Levy AS, Heaton AW. Weight control practices of U.S. adults trying to lose weight. Ann Intern Med. 1993;119(7 Pt 2):661-6.
24. Ditschuneit HH, Flechtner-Mors M, Johnson TD, Adler G. Metabolic and weight-loss effects of a long-term dietary intervention in obese patients. Am J Clin Nutr. 1999 Feb;69(2):198-204
25. Fayet-Moore F, McConnell A, Cassettari T, Tuck K, Petocz P, Kim J. Discretionary intake among Australian adults: prevalence of intake, top food groups, time of consumption and its association with sociodemographic, lifestyle and adiposity measures. Public Health Nutr. 2019;22(9):1576-89.
26. Sui Z, Wong WK, Louie JCY, Rangan A. Discretionary food and beverage consumption and its association with demographic characteristics, weight status, and fruit and vegetable intakes in Australian adults. Public Health Nutr. 2017;20(2):274-81.
27. Ramachandran D, Kite J, Vassallo AJ, Chau JY, Partridge S, Freeman B, et al. Food Trends and Popular Nutrition Advice Online - Implications for Public Health. Online J Public Health Inform. 2018;10(2):e213-e.

28. Pitt CE. Cutting through the Paleo hype: The evidence for the Palaeolithic diet. Aust Fam Physician. 2016;45(1/2):35-8.
29. Manheimer EW, van Zuuren EJ, Fedorowicz Z, Pijl H. Paleolithic nutrition for metabolic syndrome: systematic review and meta-analysis. Am J Clin Nutr. 2015 Oct;102(4):922-32.
30. Will I lose weight Faster if I cut out Fruit? : The PaleoLeap; [Available from: https://paleoleap.com/will-i-lose-weight-faster-if-i-cut-out-fruit/
31. Julien Sweerts S, Fouques D, Lignier B, Apfeldorfer G, Kureta-Vanoli K, Romo L. Relation between cognitive restraint and weight: Does a content validity problem lead to a wrong axis of care? Clin Obes. 2019;9(5):e12330.
32. Silva AOd, Diniz PRB, Santos MEP, Ritti-Dias RM, Farah BQ, Tassitano RM, et al. Health self-perception and its association with physical activity and nutritional status in adolescents. J Pediatr (Rio J). 2019;95(4):458-65.
33. Pasanen TP, Tyrväinen L, Korpela KM. The Relationship between Perceived Health and Physical Activity Indoors, Outdoors in Built Environments, and Outdoors in Nature. Appl Psychol Health Well Being. 2014 Nov;6(3):324-46.
34. Granger E, Di Nardo F, Harrison A, Patterson L, Holmes R, Verma A. A systematic review of the relationship of physical activity and health status in adolescents. Eur J Public Health. 2017;27(suppl_2):100-6.
35. Heiestad H, Gjestvang C, Haakstad LAH. Investigating self-perceived health and quality of life: a longitudinal prospective study among beginner recreational exercisers in a fitness club setting. BMJ Open. 2020;10(6):e036250.
36. Rosenbaum S, Tiedemann A, Sherrington C, Curtis J, Ward PB. Physical activity interventions for people with mental illness: a systematic review and meta-analysis. J Clin Psychiatry. 2014 Sep;75(9):964-74.
37. Craig CL, Marshall AL, Sjostrom M, Bauman A, Booth ML, Ainsworth BE, Pratt M, Ekelund U, Yngve A, Sallis JF, Oja P: International Physical Activity Questionnaire: 12-country reliability and validity. Medicine and Science in Sports and Exercise. 2003, 35: 1381-1395. 10.1249/01.MSS.0000078924.61453.FB.
38. Ng S, Korda R, Clements M, Latz I, Bauman A, Bambrick H et al. Validity of self-reported height and weight and derived body mass index in middle-aged and elderly individuals in Australia. Aust N Z J Public Health. 2011 Dec;35(6):557-63. 2011;35(6):557-563.

Section 4

Chapters 8 and 9

Longitudinal Study: Qualitative Analysis

Chapter 8: Strategies for Weight Loss and Barriers for Sustaining Weight Loss among Self-managed Weight Losers in Australia—A Thematic Analysis

8.1 Introduction

As part of the broader research in this thesis about self-managed weight loss, study participants were asked open-ended questions about any key changes they had made to their diet and exercise to support their weight loss attempt, as well as any barriers they saw in sustaining their weight loss going forward, at the 12-week follow-up survey. This paper describes the thematic analysis applied to the responses, and reports findings.

8.2 Methods

During mid-January and mid-March 2020, Australian adults (18 years and above) who were attempting weight loss were recruited to a 12-week follow-up survey study on self-managed weight loss. The follow-up surveys (Appendix D3) sent to participants contained questions to assess weight and weight-related outcomes. Additionally, four open-ended questions were included, as listed below:

- Can you describe any key changes that you have made to your diet to support your weight loss journey?
- Can you describe key changes that you may have made to your physical activity/exercise in order to support your weight loss journey?
- Do you foresee any issues or barriers in sustaining your weight loss? Can you please describe them?
- Anything else you want to share about your weight loss journey?

Participant responses to these questions were collated and thematically analysed. A systematic process(1) of applying the six-phase Braun and Clarke framework(2) was followed, and the CASP checklist was used to guide reporting of the study.(3)

Our analysis used a theoretical(1) approach rather than an inductive process, and was driven by the specific aim of the thesis and the research questions below:

1. What are key strategies used by self-managed weight losers?
2. What are barriers for successful weight maintenance?

Step 1 involved becoming familiar with the data. The survey responses were extracted into an Excel spreadsheet, along with other relevant data such as self-management type and successful weight loss. Each survey response was examined, and initial impressions noted.

In **Step 2**, open coding was followed, and initial codes were generated separately by two researchers.

In **Step 3**, these codes were reviewed and modified together into themes. For example, there were several codes that related to managing snacks: ‘snacks: stop’, ‘snacks: time boundaries’, ‘snack: replace’, ‘snack: high protein’. These were combined into an initial theme ‘managing snacks’.

In **Step 4**, the initial themes generated were reviewed to determine if they were logical and were supported by data. For example, ‘amount of change’ was an initial theme identified (from codes ‘no change’ and ‘minimal change’). However, this was dropped because there were only two pieces of data supporting this theme. Further, these codes were generated from direct answers to our survey question that asked participants what changes they had made.

‘COVID-19 impacts’ was also an initial theme identified. Given the timing of the survey, this was a very obvious theme, but also very unique in how it influenced weight loss journeys, and therefore warranted closer examination. Our study had included additional survey questions to specifically understand these impacts as well. Therefore, this topic is dealt with and discussed in a separate chapter in the thesis. Themes were further checked for prevalence(2) in ‘successful’ and ‘unsuccessful’ groups, as well as ‘assisted’ and ‘unassisted’ groups.

Step 5 consisted of final refinement and definition of themes.

Finally, **Step 6** involved writing up the results, along with a selection of extracts and examples.

8.3 Results

Key themes related to diet and exercise weight loss strategies of self-managed weight losers and barriers in weight maintenance, as well as other themes that were found from thematic analysis, are shown in Table 8.1.

Table 8.1: Weight loss strategies and barriers to weight maintenance among self-managed weight losers—results of thematic analysis

Diet themes
Snack management tactics
Awareness of portion control
Following specific diets and eating rules
Exercise themes
Many ways of walking
Starting or increasing level of exercise
Plans, routines, goals, and monitoring
Barriers to sustaining weight loss
Health issues and state of mind and body
Losing motivation and relapsing
Unconducive environments and unhelpful social situations
Miscellaneous themes
‘I am trying’
Perpetual struggle

8.3.1 Diet themes

8.3.1.1 Snack management tactics

Snacking, and the ways to cope with the urge to snack, emerged as a key concern of self-managed weight losers. While snacks can be healthy, the term ‘snacks’ was used in the context of discretionary foods such as crisps, lollies, chocolates and fast food among our participants.

Some participants reported intent to limit or entirely eliminate treats: *‘Limit sugary drinks, eliminate lollies and chocolate, limit fast food’*.

A few tried substituting snacks with healthier options such as fruit: *‘Snacked on fruit rather than chocolate or sugary foods’*.

A few made healthy snacking a part of their overall diet strategy: *‘Eating small protein snacks frequently throughout the day’*.

Some tried to set time boundaries for themselves on when they could indulge: *'Stopped buying chocolates, ice cream and all the good stuff, but I have 1 day a week where I will have some treats'* and *'I still enjoy a chocolate or two each evening'*.

Participants went to great lengths in modifying their snacking behaviour, as evident from the following example: *'I have tried to buy smaller portion sizes of snacks, e.g. kids' multipack bags of Vegi chips instead of a few large bags. I have tried to buy other snacks, vegies, nuts and seeds to have on hand rather than chips'*.

8.3.1.2 Awareness of portion control

Participants had a high awareness of the need for portion control, and were mindful of portion sizes. Portion control was part of the 'tool kit' along with making healthy food choices, or as a part of overall reduction of food intake. Some participants showed greater food literacy, evident in the terminology they used, such as 'macronutrients', as seen in the following statements: *'Watching portion sizes and macronutrients of food'*, *'Portion control and healthy choices'* and *'Reduce portion sizes. Eat two meals a day'*.

8.3.1.3 Diet types and eating rules

Humans are creatures of habit, and rules provide structure, potentially making it easier for participants determined to lose weight. Rules among self-managed weight losers were set by themselves for themselves, or following certain diet types automatically provided rules and a framework for what, when and how much to eat. Rules and restrictions of certain foods or ingredients were also driven by specific health concerns: *'I am on a gluten-free, salt-reduced, plant-based vegan diet for health reasons'*.

The examples below illustrate rules of paleo-like diets (e.g. ketogenic diet, intermittent fasting): *'This diet has been the most successful diet I have been on. It works because the weight loss is consistent and quick (keto diet)'*, *'Reduced my carb intake. Trying to increase my fat intake slightly'* and *'No breakfast—fasting from 8 pm until 10 am. Having two snacks with fruit and good fat, e.g. nuts, nut spread. Two meals with protein and unlimited vegetables. Eat regularly means I am not hungry—limit sugars. Water 2–3 L per day'*.

8.3.2 Exercise themes

8.3.2.1 Many ways of walking

Walking as a form of exercise is often underrated among the general public; however, this was not the case among self-managed weight losers. Walking, in fact, was a central exercise theme with several aspects and behaviours related to walking dominating responses in relation to the exercise changes made to support their weight loss journey, with reports about how much they walked, who they walked with, why they walked, and when and where they walked, as seen in the following examples: *'Increased the amount of walking I do with my dogs'*, *'Walked with someone'*, *'I started walking, initially for my mental health, and gradually increased to walking 6 km each day'*, *'I walk uphill every morning'* and *'I walk to work'*.

Some consciously opted to add walking to increase levels of exercise: *'Added interval walking (slow/fast) as extra to my ultra-training'*, *'Tried to add more exercise, i.e. walking'*.

Meanwhile, some simply did it as a means of being more active: *'Making a mindful choice to be more active and choosing to walk more'*.

8.3.2.2 Initiation or increasing level of exercise

Participants either started exercise or increased existing levels of activity to support their current weight loss attempt. This included acquiring new forms of exercise: *'Started doing home workout by watching training videos from YouTube'* and *'I have taken up cycling'*.

Alternatively, others simply increased or added to familiar exercise activities: *'Increased exercise through long walks, swimming and bike riding'* and *'Added strenuous exercise—strength and cardio training'*.

8.3.2.3 Plans, routines, goals and monitoring

Planned exercise was evident among self-managed weight losers. Although the level of planning differed, strategies included setting quantitative goals, *'Increased a slow jog for 5 km three times a week'*, exercising on schedules and routines, *'I am doing regular exercise at home, aiming for four sessions of 30 mins each week'*, and prioritising regularity and consistency, *'Regular exercise in all weather' and 'More consistent exercise. I try to do something 6 days a week'*.

Some participants measured and monitoring exercise with devices: *'I now have a Fitbit and I make sure that I walk a minimum of 10,000 steps every day'*.

8.3.3 Barriers to sustaining weight loss

8.3.3.1 Health issues and state of mind and body

Poor mental health and state of mind, and physical and bodily impediments, are potential barriers in sustaining weight loss and weight loss behaviour changes. Physical issues were identified as barriers that affected exercise, whereas matters of the mind more often affected eating behaviours, as seen in the following examples.

Arthritis and joint problems were a barrier for exercise: *'Weak knees—sometimes painful to walk'* and *'Yes, my arthritis makes it hard to be physical, having to manage pain'*.

Emotional states such as stress negatively affected eating behaviours, *'At the moment, mental health—I'm a binge eater, and eat a lot when I'm stressed'*, and highlighted the difficulty in coping, *'Stress/anger/anxiety increases the temptation for me to binge eat. I have managed well so far with some techniques I've learnt, but it's still difficult at times'*.

Some participants reported physiological barriers: *'I have polycystic ovarian syndrome, which causes weight fluctuation, easily gained, hard to lose'* and *'Binge eating 1–2 days once a month (menstruation cravings)'*.

8.3.3.2 Loss of motivation and relapsing

Losing motivation, and frustration with failure and self-blame, are barriers to sustaining behaviour changes made to support weight loss: *'I just give up—I am not going to lose anything, I am meant to be fat no matter what I try. I basically need someone holding my hand—I am useless'*.

Significant efforts have been made by participants to lose weight, and they are unsure if they will be able to keep up the efforts long term. Many foresee and fear that they will lose willpower and give up or relapse into old habits, and expressed these feelings of weakness: *'To sustain my willpower indefinitely'*, *'Giving up when it gets hard'* and *'Being lazy and eating the wrong foods and listening to the voices in my head, making sure I stay strong and have willpower, especially when I am shopping'*.

Previous diet habits related to snacking, eating sweet treats, and portion sizes, and fears of relapsing into previous diet behaviours were raised, with less focus on previous exercise levels or sedentary habits: *'Increases in portion sizes, falling back into the snacking habit'* and *'Perhaps I may fall off the wagon and start eating sweets and chocolates like I used to'*.

8.3.3.3 Unconducive environments and unhelpful social situations

Environmental barriers included seasonal variation, especially the onset of the winter season, *'Short daylight hrs in winter limit opportunity for walking'* and *'Winter can be hard as the weather cools off and I want warm comforting foods and continuing to walk means going out in the cold'*, and changes such as moving countries, *'I am planning to move soon internationally to a colder climate and different food options. It may take some time to source my usual preferred foods or my diet might change'*.

Some reported cost and availability of food as barriers: *'Food available and price. Fresh fruit and vegetables have become very expensive'*.

Sedentary jobs were a barrier to exercise: *'I work in administration; sometimes it is difficult to achieve extra physical activity'*.

Social situations created barriers for managing weight, such as parties, *'At certain times, e.g. parties, colder weather'*, as well as family influence or pressures, *'Family pressures to eat unhealthy options or extra snacks'* and *'Time and kids'*.

8.3.4 Miscellaneous themes

8.3.4.1 'I am trying'

The recurrent use of the verb 'trying' was seen across strategies as well as barriers. This was seen in the contexts of extending goals, *'Trying to walk a little bit further'*, exercising dietary restraint, *'Avoiding foods that trigger cravings, trying to eat a balanced lunch and dinner'*, *'Trying to just have crackers at lunch'* and *'Trying to not eat sugar'*, as well as shifting attitudes and behaviours, *'I'm trying to get motivated for exercising at home using the Healthy Mummy app—just been quite lazy though'* and *'More attention to what I eat and volume of what I eat. Being careful and mindful. Trying to maintain more healthful habits'*.

8.3.4.2 Perpetual struggle

The weight loss journey of self-managed weight losers was not easy, and there was mention of the constant need for vigilance. The struggles with weight were identified as a constant battle by the participants.

While some responses showed a positive attitude in coping with the challenges, *'Every day is a new day. I try to think more positively and not to give up'* and *'It is always a battle, every day is hard, but 1 day at a time eventually turns into a week, month a year—it is not an overnight process, it is a marathon'*, others sometimes bordered on an unhealthy preoccupation with weight-related behaviours, *'I know what I should choose to eat and move to feel better and be healthy. Yet I still struggle to complete this. Every minute of the day is consumed by what I should eat, what I do eat, guilt or deprivation and it affects my mental health because I can't break the cycle for any decent period of time'*.

Some participants expressed futility and the need to be on a constant vigil: *'Even though I have lost some weight, as soon as I relax my vigilance on calories and portion sizes, I find that my weight will go up, even when I am training for a 50 km race'* and *'It is a struggle. I find it very easy to get side tracked and really need to focus on what is important to me to keep those kilos coming off'*.

Some participants have struggled with their weight since childhood: *'I have been overweight my entire life. I have tried so many times to lose weight and I just can't. I feel like my problem is that I have been an overeater since early childhood and I've never been able to break the habit'* and *'My weight loss journey has been all my life. Yoyoing all the time'*.

8.3.5 Differences between groups

A comparison of prevalence of themes between successful and unsuccessful weight losers did not show major differences, although the theme 'I am trying' seemed more evident in the unsuccessful group.

'Health issues and state of mind and body' was more evident among the self-managed assisted group.

8.4 Discussion

This study identified a number of themes related to diet and exercise strategies and practices, and barriers to sustaining weight loss, as well as two additional miscellaneous themes among self-managed weight losers. These themes provide insights for obesity management strategies—and thus, it is important to examine what can be learned from them and incorporated into formal health management strategies, as well as provide better support for self-managed weight loss.

Past studies have shown that diet strategies such as portion control,(4-6) replacing foods with healthier options,(7) and high-protein intakes(8) are associated with improved weight loss and weight maintenance, and it is not surprising that these strategies were reported by our participants as well. Participants perceived larger portions of food as detrimental to weight loss, while ‘portion control’ and ‘reducing portion sizes’ were presented as a key diet strategy for self-managed weight loss. This is consistent with recommendations of formal weight management programs to moderate portion sizes.(9) However, from the responses, it was not evident what specific strategies participants used to manage portions. Strategies such as consuming larger portions of low-calorie foods such as salads at the start of a meal are shown to improve satiety and reduce meal intake.(10) Improving public knowledge of this may benefit those that struggle with portion control and feelings of hunger.

Another key focus area for self-managed weight losers was managing the consumption of snacks to support their weight loss. Research evidence on snacking and weight loss varies according to participant definitions of snacking.(11) However, our participants clearly associated snacks and snacking with discretionary foods. The reduction of discretionary snacks such as chips, chocolates and lollies not only supports weight loss but also is beneficial to health.(12) Snacking is very common among Australians,(13) with a recent industry report showing nine in ten Australian adults eat packaged snacks.(14) This suggests that self-managed weight losers are self-aware of their snack habits, focusing on managing their snacking habits in line with existing evidence and recommendations. This theme could inform the development of public health education campaigns about healthy snacking, which would benefit all Australians and not only those engaged in weight loss.

Evidence about the health benefits of walking is steadily increasing.(15) Several papers discuss the physiological and mental health benefits of walking in outdoor spaces and nature.(16-18)

Walking was central to the exercise strategy of our participants, both on its own and supplementing other forms of physical activity. The theme ‘ways of walking’ included several different aspects that participants referred to in the context of walking—frequency, duration, social aspects, nature, step-counts and so on. High exercise intensity may induce injury among those with obesity,(19) and the fear of injury and embarrassment when engaging in vigorous activity has also been reported.(20, 21) In this context, promoting walking may be received favourably among the general public and offers a starting point for those wishing to self-manage their weight loss.

A key theme identified as a barrier to weight loss in this study is ‘loss of motivation and relapsing’, and this has been identified in other studies as well.(22, 23) Motivations for weight loss are many, and several reviews report associations between high levels of motivation and improved weight loss and maintenance.(24-27) The health belief model(28) commonly applied for health behaviour interventions suggests that six concepts—risk susceptibility, risk severity, benefits to action, barriers to action, self-efficacy, and cues to action—determine health behaviour. Williams et al. (29) explain, ‘*When applied to weight loss the theory suggests that people will be motivated to lose weight if: (a) they believe that weight loss will decrease their likelihood of contracting a life-threatening illness, (b) they have an internal locus of control and expect that specific behaviors such as reduced calorie intake and exercise will yield significant weight loss, and (c) they are confident that they are able to perform the requisite behaviors*’. Not meeting expected levels of weight loss, uncertainty, and lack of confidence in being able to sustain behaviour changes made to support weight loss are encompassed in the theme ‘loss of motivation and relapsing’ identified as a barrier by self-managed weight losers as well. Among the participants, uncertainties were also linked to losing focus or control in some situations, identified in the theme ‘unconducive environments and unhelpful social situations’. Health campaigns informed by theory have shown promising results in improving physical activity(30); therefore, public health messages directed at building self-efficacy in maintaining healthy behaviours, even in unfavourable environments and situations, can be thought of to inspire self-managed weight loss.

Two miscellaneous themes identified were ‘I am trying’ and ‘perpetual struggle’, and similar themes are reported in other studies.(22) The high prevalence of overweight and obesity,(31) and the large number of people attempting weight loss,(32) occurs at the same time as misinformation about people with obesity, and weight bias and stigma.(33-35) There is a common perception that people with obesity are ‘lazy’ or ‘lack self-control’.(36) Yet our participants, who were predominantly with overweight or obesity, are constantly attempting weight loss, and actively trying many different tactics to manage weight. For most, this is yet another battle in what can be described by the theme as a ‘perpetual struggle’, which requires constant vigilance, where they perceive that the slightest relaxation of rules or change in circumstances allows excess weight to develop. A concerted effort is needed to fight weight stigma and dispel myths about obesity. While this might help patients with clinical obesity seek treatments,(35) this will definitely help those who self-manage their weight loss, and encourage more people to do so.

One of the limitations in this study is that data used for the analysis were responses to optional open-ended questions in the online survey. As this requires greater time and thinking of participants to respond some insights may have been potentially lost from participants who did not answer these questions. Further exploration of some of the responses were not possible, which are possible through other methods such as interviews and focus groups. Despite these limitations, answers to the open-ended questions were utilized and insights gained on weight-loss practices of those that self-managed their weight loss. These themes can be further explored through interviews in future studies.

8.5 Conclusion

In conclusion, this study identified several themes related to diet and exercise-related weight loss strategies and practices, including barriers to sustaining weight loss, as well as additional themes prevalent among self-managed weight losers. The findings can inform public health campaigns and communication strategies to inspire self-management of weight loss.

8.6 References

1. Maguire M, Delahunt B, editors. Doing a thematic analysis: A practical, step-by-step guide for learning and teaching scholars2017.
2. Braun V, Clarke V. Using thematic analysis in psychology. Qualitative Research in Psychology. 2006;3(2):77-101.
3. Critical Appraisal Skills Programme (2018). CASP QualitativeStudies Checklist. [Available from: https://casp-uk.net/casp-tools-checklists/.
4. Rolls BJ, Morris EL, Roe LS. Portion size of food affects energy intake in normal-weight and overweight men and women. Am J Clin Nutr. 2002 Dec;76(6):1207-13

5. Pedersen SD, Kang J, Kline GA. Portion Control Plate for Weight Loss in Obese Patients With Type 2 Diabetes Mellitus: A Controlled Clinical Trial. Arch Intern Med. 2007;167(12):1277-83.
6. Kesman RL, Ebbert JO, Harris KI, Schroeder DR. Portion control for the treatment of obesity in the primary care setting. BMC Res Notes. 2011;4(1):346.
7. Tate DF, Turner-McGrievy G, Lyons E, Stevens J, Erickson K, Polzien K, et al. Replacing caloric beverages with water or diet beverages for weight loss in adults: main results of the Choose Healthy Options Consciously Everyday (CHOICE) randomized clinical trial. Am J Clin Nutr. 2012 Mar;95(3):555-63.
8. Westerterp-Plantenga MS, Lejeune MPGM, Nijs I, van Ooijen M, Kovacs EMR. High protein intake sustains weight maintenance after body weight loss in humans. Int J Obes. 2004;28(1):57-64.
9. Livingstone MBE, Pourshahidi LK. Portion Size and Obesity. Adv Nutr. 2014;5(6):829-34.
10. Rolls BJ, Roe LS, Meengs JS. Salad and satiety: Energy density and portion size of a first-course salad affect energy intake at lunch. J Am Diet Assoc. 2004;104(10):1570-6.
11. Fayet-Moore F, McConnell A, Cassettari T, Tuck K, Petocz P, Kim J. Discretionary intake among Australian adults: prevalence of intake, top food groups, time of consumption and its association with sociodemographic, lifestyle and adiposity measures. Public Health Nutr. 2019;22(9):1576-89.
12. Lal A, Peeters A, Brown V, Nguyen P, Tran HNQ, Nguyen T, et al. The Modelled Population Obesity-Related Health Benefits of Reducing Consumption of Discretionary Foods in Australia. Nutrients. 2020;12(3):649.
13. Fayet-Moore F, McConnell A, Cassettari T, Tuck K, Petocz P, Kim J. Discretionary intake among Australian adults: prevalence of intake, top food groups, time of consumption and its association with sociodemographic, lifestyle and adiposity measures. Public Health Nutr. 2019;22(9):1576-89.
14. Nearly 9 in 10 Australian adults eat packaged snacks in an average week. Roy Morgan; 2020. Contract No.: article 8272.
15. Kelly P, Murphy M, Mutrie N. The Health Benefits of Walking. Transport and Sustainability. 9: Emerald Publishing Limited; 2017. p. 61-79.
16. Bailey AW, Allen G, Herndon J, Demastus C. Cognitive benefits of walking in natural versus built environments. World Leisure Journal. 2018;60(4):293-305.
17. McDevitt J, Wilbur J. Exercise and people with serious, persistent mental illness: A group walking program may be an effective way to lower the risk of comorbidities. Am J Nurs. 2006;106(4):50-4.
18. Olafsdottir G, Cloke P, Schulz A, van Dyck Z, Eysteinsson T, Thorleifsdottir B, et al. Health Benefits of Walking in Nature: A Randomized Controlled Study Under Conditions of Real-Life Stress. Environ Behav. 2018;52(3):248-74.
19. McQueen MA. Exercise Aspects of Obesity Treatment. Ochsner Journal. 2009;9(3):140.
20. Baillot A, Mampuya WM, Comeau E, Méziat-Burdin A, Langlois MF. Feasibility and Impacts of Supervised Exercise Training in Subjects with Obesity Awaiting Bariatric Surgery: a Pilot Study. Obes Surg. 2013;23(7):882-91.
21. Wouters EJ, van Nunen AM, Vingerhoets AJ, Geenen R. Setting overweight adults in motion: the role of health beliefs. Obes Facts. 2009;2(6):362-9.

22. Greaves C, Poltawski L, Garside R, Briscoe S. Understanding the challenge of weight loss maintenance: a systematic review and synthesis of qualitative research on weight loss maintenance. Health Psychol Rev. 2017;11(2):145-63.
23. Lim S, Smith CA, Costello MF, MacMillan F, Moran L, Ee C. Barriers and facilitators to weight management in overweight and obese women living in Australia with PCOS: a qualitative study. BMC Endocr Disord. 2019;19(1):106.
24. Elfhag K, Rössner S. Who succeeds in maintaining weight loss? A conceptual review of factors associated with weight loss maintenance and weight regain. Obes Rev. 2005 Feb;6(1):67-85.
25. DiMarco ID, Klein DA, Clark VL, Wilson GT. The use of motivational interviewing techniques to enhance the efficacy of guided self-help behavioral weight loss treatment. Eat Behav. 2009;10(2):134-6.
26. Larose JG, Leahey TM, Hill JO, Wing RR. Differences in motivations and weight loss behaviors in young adults and older adults in the national weight control registry. Obesity. 2013;21(3):449-53.
27. O'Brien K, Venn BJ, Perry T, Green TJ, Aitken W, Bradshaw A, et al. Reasons for wanting to lose weight: different strokes for different folks. Eat Behav. 007;8(1):132-5.
28. MH. B. The Health Belief Model and personal health behavior. Health Education Monographs.1974.
29. Williams GC, Grow VM, Freedman ZR, Ryan RM, and Deci EL. Motivational Predictors of Weight Loss and Weight-Loss Maintenance. J Pers Soc Psychol. 1996 Jan;70(1):115-26.
30. Craig CL, Bauman A, Latimer-Cheung A, Rhodes RE, Faulkner G, Berry TR, et al. An Evaluation of the My ParticipACTION Campaign to Increase Self-Efficacy for Being More Physically Active. J Health Commun. 2015;20(9):995-1003.
31. Overweight and obesity: an interactive insight, What is overweight and obesity - Australian Institute of Health and Welfare [Internet]. Australian Institute of Health and Welfare. 2020 [cited 10 April 2020]. Available from: https://www.aihw.gov.au/reports/overweight-obesity/overweight-and-obesity-an-interactive-insight/contents/what-is-overweight-and-obesity.
32. Santos I, Sniehotta FF, Marques MM, Carraça EV, Teixeira PJ. Prevalence of personal weight control attempts in adults: a systematic review and meta-analysis. Obes Rev. 2017;18(1):32-50.
33. Levin ME, Potts S, Haeger J, Lillis J. Delivering Acceptance and Commitment Therapy for Weight Self-Stigma Through Guided Self-Help: Results From an Open Pilot Trial. Cogn Behav Pract. 2016.
34. Durso LE, Latner JD. Understanding self-directed stigma: Development of the weight bias internalization scale. Obesity. 2008;16(SUPPL. 2):S80-S6.
35. Tomiyama AJ, Carr D, Granberg EM, Major B, Robinson E, Sutin AR, et al. How and why weight stigma drives the obesity ‘epidemic’ and harms health. BMC Med. 2018;16(1):123.
36. Pearl RL. Weight Stigma and the “Quarantine-15”. Obesity. 2020;28(7):1180-1.

Chapter 9: Impact of COVID-19 Lockdown on Self-managed Weight Loss Journeys and Weight, Diet and Physical Activity Outcomes of Self-managed Weight Losers

9.1 Introduction

Beginning mid-March, the Australian Government began introducing measures to control the spread of the COVD-19 virus, and lockdown restrictions were progressively implemented. This occurred during the recruitment phase of the main and final research study of this thesis. For understanding of the impact of these restrictions on the weight loss journeys of our participants, ethics approval was obtained to distribute additional survey questions to existing participants (Appendix C5). The results of the qualitative analysis published in *Obesity Research & Clinical Practice* and titled ‘Impact of COVID-19 Lockdown on Self-managed Weight Loss Journeys’ are presented below.

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Research Letter

Impact of COVID-19 lockdown on self-managed weight loss journeys

With the arrival of the COVID-19 pandemic, Australia took a range of public health control measures including a lockdown which resulted in closures of 'non-essential' services and confined people to their homes. The impact of self-quarantine on weight-related behaviours has been examined by studies in general populations exposed to similar restrictions [1]. Other papers have described its specific impacts in clinically managed patients with obesity [2,3]. We had the opportunity to examine these issues within a group of adults involved in an existing study who were above the healthy weight range and were faced the additional challenge of trying to self-manage their weight during this period.

Between mid-January and mid-March 2020, we had recruited participants to a 12-week online follow-up survey study in self-managed weight loss. Due to the disruption caused by Covid-19 we took the opportunity to ask them additional questions on the impact of the 6-week lockdown on their weight loss journey. Of the 229 participants who had completed the initial survey, 58 responded to the additional COVID-19 impact survey. We assessed the representativeness of these 58 respondents by age, gender, education, and marital status, and thematically summarised the issues they described.

Participants had a good age distribution (18–39 years: 21%; 40–55 years 41%; 56 year and above: 38%), but were skewed towards higher education (45% had Bachelor degree or higher), English-speaking (88%), mostly women (81%), and married or living with partners (76%). Most participants had a self-reported weight above healthy ranges (82%), with most within the range of obesity (62%). The majority (60%) of the participants indicated that their diet strategy for weight loss had been impacted, and a little over half the participants (52%) said their exercise strategy had been impacted over this period. A thematic summary of issues is shown in Table 1.

Many of the issues raised by our participants were similar to those issues highlighted in the general population [1] as well as patients with obesity [2,3], with reports of high levels of 'stress eating' and 'eating out of boredom', followed by 'higher food consumption' 'more opportunities to eat', and 'higher consumption of junk foods'. The most common impacts to exercise reported in this sample were the 'lack of access to facilities' and the 'loss of social exercising'. Most experienced anxiety, depression, fear, loss of motivation and missed social life. Although less frequently reported, this sample described some positive impacts such as 'more time', 'home-cooked food' 'modified exercise regime', 'less stress'.

The pandemic has served to highlight the possibility of periods of physical distancing and quarantines – if not in relation to future waves of COVID-19, then in relation to other calamities or emerging diseases where there is no vaccine. While it's too early to estimate impact on individual and population level weight-gain, patients with obesity [3] as well as some of the general population [1] have shown increases in weight during the lockdown [1]. We also know from previous research that major life events such as marriage, pregnancy, stressful life events [4] and even seasonal holidays [5] disrupt the usual diet and exercise behaviours of people. These events affect ability to regulate our weight and subsequently have a profound effect on lifetime weight history. Therefore, the influences of lockdown periods on weight trajectories cannot be underestimated.

Table 1
Impact of COVID-19 lockdown on self-managed weight loss journeys.

	Diet	Exercise	Other
Negative impact	Stress eating	Lack of access to facilities (gym, swimming pool, dancing schools)	Anxiety, fear, depression
	Eating out of boredom	'Loss of social exercise' and social motivation	'Miss social life' meeting family and friends.
	Higher food consumption (frequency and portion size)	'Fear' of outdoor activity	Loss of motivation
	More opportunities to eat; temptation	'Reduced physical activity' because of work-from-home.	
	Higher consumption of 'junk foods'(long-life convenience food, nuggets, pies, rolls, chocolate, alcohol)		
	Lack of availability (rice, pasta, tuna, meats vegetarian)		
Positive Impact	'More time' to focus on healthy eating	'More time' for exercise	'More time' for self- reflection and introspection
	More home-cooked food	Modified exercise regimes 'Exercise with family'	Less stress

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Our sample of higher-educated participants are likely to be better equipped at maintaining appropriate weight-related behaviours having embarked on self-managed weight loss journeys – yet were overwhelmed in lockdown. This highlights a need to develop specific weight management guidelines that address the unique pressures brought about on people during lockdowns. Quarantine specific programs and resources should be in place, which can be immediately picked up and recommended during such situations by health professionals that are advising people with obesity. Practical suggestions [1], should be embedded in lifestyle guidelines and strategies during a quarantine. In the short term, this should include advice on types of foods to take to lock down, mindful meal preparation, eating regularity, and use of treat foods. There also needs to be a broader range of options available to people to exercise from home. Social exercising stands out as an important strategy for those trying to self-manage their weight. However, apart from online exercise classes, which are only really appealing to a certain segments of the population [6] - it is necessary to find novel approaches to maintain the social nature of exercise while physical distancing. However, in the longer term, detrimental responses to lifestyle stresses such as social distancing lockdowns will only be attenuated when the food and activity environments are improved to be more supportive of healthful eating and active living under a variety of circumstances.

Conflicts of interest

The authors declare that there is no conflict of interest.

Ethical statement

This research has been approved by the IRB at the University of Sydney

Contributorship

Both authors jointly conceived the study and developed the survey, analysed the data, and developed and edited the manuscript.

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References

[1] Zachary Z, Brianna F, Brianna L, Garrett P, Jade W, Alyssa D, et al. Self-quarantine and weight gain related risk factors during the COVID-19 pandemic. Obes Res Clin Pract 2020;14(3):210–6.
[2] Almandoz JP, Xie L, Schellinger JN, Mathew MS, Gazda C, Ofori A, et al. Impact of COVID-19 stay-at-home orders on weight-related behaviors among patients with obesity. Clin Obes 2020, http://dx.doi.org/10.1111/cob.12386 [Accessed 25 July 2020]. In press.
[3] Pellegrini M, Ponzo V, Rosato R, Scumaci E, Goitre I, Benso A, et al. Changes in weight and nutritional habits in adults with obesity during the "lockdown" period caused by the COVID-19 virus emergency. Nutrients 2020;12(7):2016.
[4] Palmisano GL, Innamorati M, Vanderlinden J. Life adverse experiences in relation with obesity and binge eating disorder: a systematic review. J Behav Addict 2016;5(1):11.
[5] Díaz-Zavala RG, Castro-Cantú MF, Valencia ME, Álvarez-Hernández G, Haby MM, Esparza-Romero J. Effect of the holiday season on weight gain: a narrative review. J Obes 2017;2017:2085136.
[6] Marcos B, Iman Khaghani F, Francisco I, Michela F, Daniele D, Fabio C. Effects of online group exercises for older adults on physical, psychological and social wellbeing: a randomized pilot trial. PeerJ (San Francisco, CA) 2017;5(4):e3150.

Divya Ramachandran*
Timothy Gill*
The Boden Collaboration, Charles Perkins Centre, Faculty of Medicine and Health, University of Sydney, NSW, Australia

* Corresponding authors at: The Boden Institute, Level 2, Charles Perkins Centre, D 17 Johns Hopkins Drive, Camperdown, NSW 2006, Australia.
E-mail addresses: divya.ramachandran@sydney.edu.au (D. Ramachandran), tim.gill@sydney.edu.au (T. Gill).

30 July 2020

This chapter provides more information on methods, as well as quantitative information on the summary of themes (not detailed in the published short report). In addition, outcomes at 12 weeks' follow-up in weight change, food consumption and physical activity are compared between participants who reported negative impacts and those who said they were unaffected.

9.2 Methods

Between mid-January and mid-March 2020, participants were recruited to a 12-week online follow-up survey study in self-managed weight loss.

After obtaining ethics approval, an additional set of questions was administered to the participants (*n* = 205) to examine impact of COVID-19 restrictions on their weight loss journeys. Those who had completed the 12-week follow-up survey received this as a separate additional survey, whereas for those who were still in the midst of the 12-week period, these questions were incorporated as a separate section within the follow-up survey. Participants were asked if their diet or exercise was affected (yes, no). Those that were affected were asked to describe how their diet or exercise had been affected. Participants were also asked if they wanted to share anything else about how the pandemic was affecting their weight loss journey. A copy of the survey questions is available in Appendix D4. Participants were assessed for representativeness, and their responses were analysed using qualitative content analysis.

Weight outcomes, and changes in diet (fruit and vegetable, and discretionary foods, consumption) and physical activity (walking, moderate and vigorous) were compared between those who:

- self-reported their diet (DI) or exercise (EI) was affected
- indicated diet (D0) or exercise (E0) was not affected.

Median and interquartile range were used for both diet and physical activity measures as the sample was very small and there was high variation in outcomes.

9.3 Results

Fifty-eight participant responses to the additional COVID-19 impact survey questions were received. Participant characteristics for this additional module are described in the included publication in this chapter. Only two participants reported positive impacts on their weight loss journeys, resulting from the public health actions pertaining to the COVID-19 pandemic. Their responses were included in the content analysis, but excluded for comparisons of weight, diet and physical activity outcomes, leaving 56 participants for analysis.

Table 9.1 shows participants reporting impacts of COVID-19 lockdown in their weight loss journeys. Most of the participants (40, 71%) reported that their diet or exercise or both had been negatively affected.

Table 9.1: COVID-19 impacts on diet, exercise or both

	n (%)
Diet	
No impact	22 (39.28)
Impact	34 (60.71)
Exercise	
No impact	26 (46.42)
Impact	30 (53.57)
Diet or exercise or both	
No impact	16 (28.57)
Impact	40 (71.42)

From the content analysis, eight diet-related, seven exercise-related and three other miscellaneous themes were identified. Tables 9.2, 9.3 and 9.4 show the frequencies of occurrence of each theme.

Table 9.2: Impacts of COVID-19 lockdown on diets of self-managed weight losers

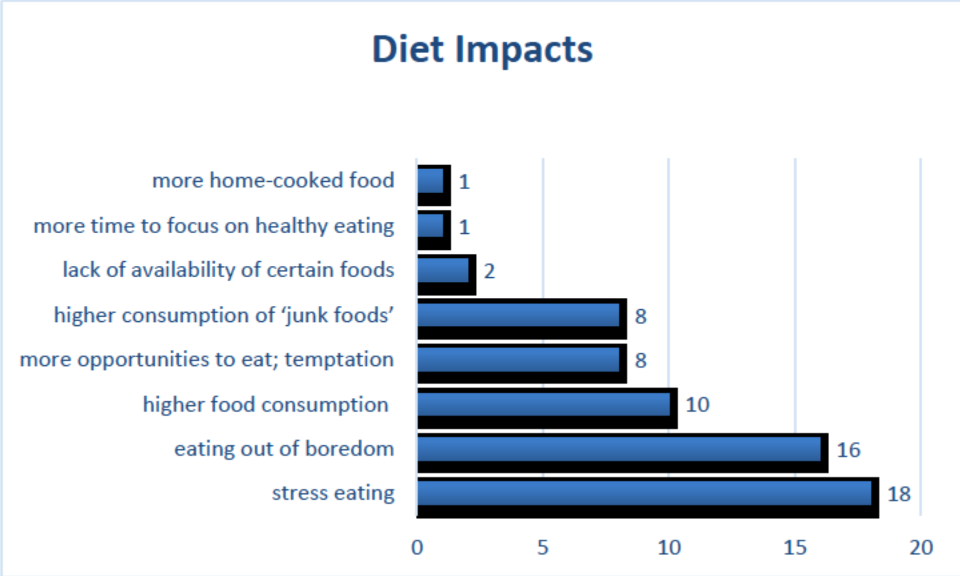

Table 9.3: Impacts of COVID-19 lockdown on exercise of self-managed weight losers

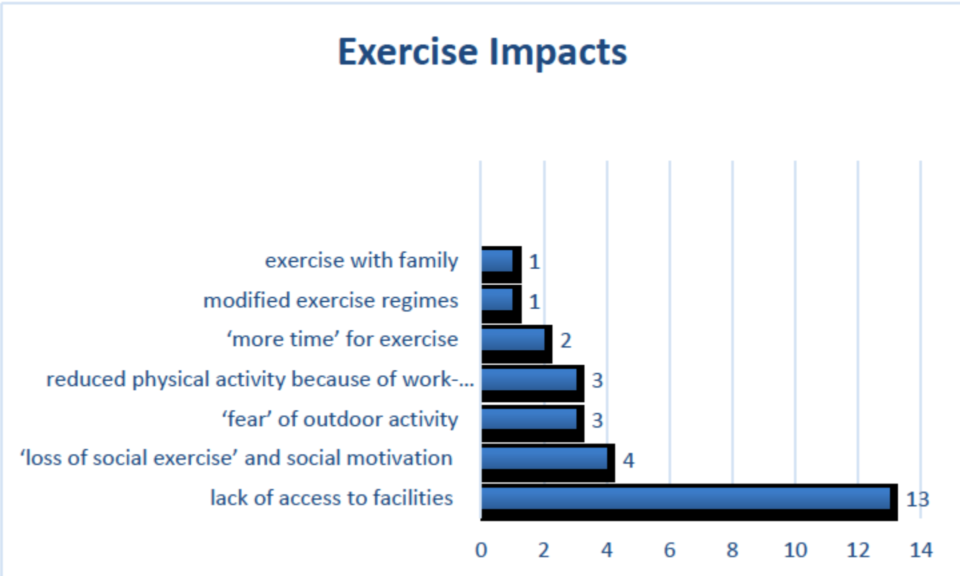

Table 9.4: Other impacts of COVID-19 lockdown on self-managed weight losers

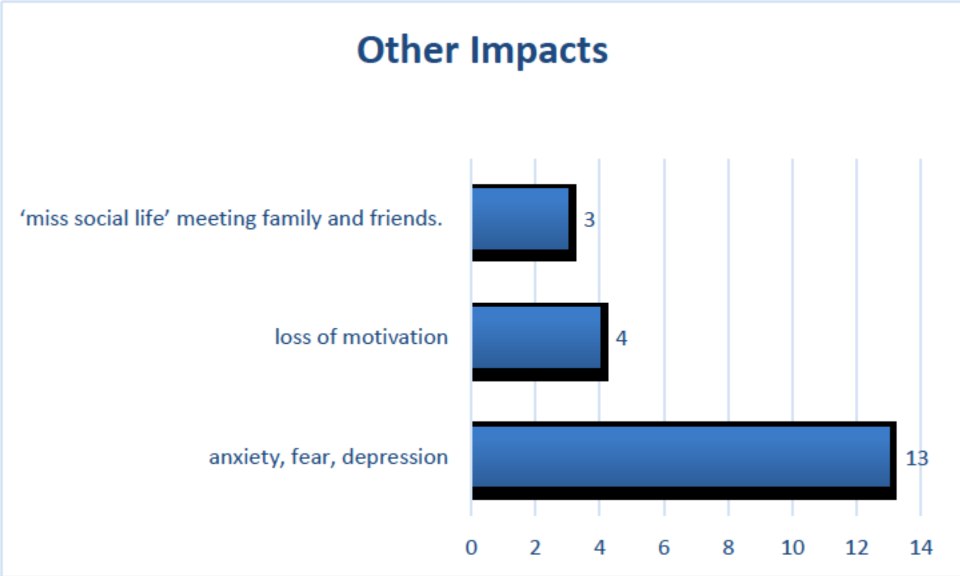

Table 9.5: Weight-related, diet and exercise outcomes

Outcomes	Total sample	Impact	No impact	Diet: impact	Diet: no impact	Exercise: impact	Exercise: no impact
Weight parameters							
Absolute weight loss (kg)	−1 (−3, 0)	−1.5 (−3, 0)	−1 (−4, 2)	0 (−3, .1)	−2 (−3, .1)	−1.5 (−3, .2)	−1.5 (−4, 0)
Successful weight loss (≥3% of body weight)	29%	28%	33%	24%	38%	29%	32%
Change in mean weekly food consumption score (median, IQR)							
Fruit and vegetables	0 (−3, 2)	.75 (0, 3.5)	0 (−3.5, .9)	0 (−3, 2)	0 (− 2, 2)		
Discretionary foods*	−.3 (−.85, .15)	−.25 (−.6, .13)	−.5 (−1.1, .2)	−.3 (−.6, .05)	−.35 (−1.1, .3)		
Change in physical activity minutes per week (median, IQR)							
Walking	10 (−14, 76)	30 (−37, 82)	0 (−11, 66)			30 (−65, 70)	9 (−2, 90)
Vigorous physical activity	0 (−37, 0)	0 (−34, 0)	0 (−11, 5)			−7 (−82, 0)	0 (−12.5, 10)
Moderate physical activity	0 (0, 0)	0 (−45, 0)	0 (0, 0)			0 (−60, 0)	0 (0, 0)

As shown in Table 9.5, a greater proportion of unaffected than affected participants were successful in losing weight (33% compared with 28%). There were no differences in fruit and vegetable consumption between the ‘diet impacted’ (DI) and the ‘diet unaffected’ (D0) groups, as indicated by median food consumption scores. Discretionary food came down in all groups by a very small amount. The median walking time increased by 10 minutes overall, but there was a decline of 7 minutes in vigorous activity, in the ‘exercise affected’ (EI) group. None of the results were statistically significant.

9.4 Discussion and Conclusion

The impacts of the COVID-19 lockdown restrictions on those who were attempting self-managed weight loss journeys were identified through a content analysis. High levels of fear, anxiety and depression appear to have been accompanied by stress eating and eating out of boredom among the participants, as identified in other studies as well.(1-4) Closures of gyms, swimming pools and other facilities were the most frequently recurring theme, followed by the loss of social exercising. These themes are similar to those reported in other population groups, as well as clinically managed patient groups.(1-3) Those reporting negative impact were less successful at weight loss, but no differences in reported dietary behaviours could be detected. Vigorous physical activity might have been reduced in those who reported impacts to their exercise routines. A global scoping review found weight gain was more common than weight loss as a result of the pandemic,(4) but among this group of self-managed weight losers, one in three still achieved weight loss ≥3% of their body weight. This was an opportunistic study and highly limited by sample size. Further in-depth exploration of themes for example through interviews were not possible through an online survey. However, the study highlights the need for practical guidelines and extra caution for managing weight during lockdowns.

9.5 References

1. Pellegrini M, Ponzo V, Rosato R, Scumaci E, Goitre I, Benso A, et al. Changes in Weight and Nutritional Habits in Adults with Obesity during the “Lockdown” Period Caused by the COVID-19 Virus Emergency. Nutrients. 2020;12(7):2016.
2. Zachary Z, Brianna F, Brianna L, Garrett P, Jade W, Alyssa D, et al. Self-quarantine and weight gain related risk factors during the COVID-19 pandemic. Obes Res Clin Pract. 2020;14(3):210-6.
3. Almandoz JP, Xie L, Schellinger JN, Mathew MS, Gazda C, Ofori A, et al. Impact of COVID -19 Stay-at-Home Orders on Weight-Related Behaviors Among Patients with Obesity. Clin Obes. 2020 Oct;10(5):e12386

4. Chew HSJ, Lopez V. Global Impact of COVID-19 on Weight and Weight-Related Behaviors in the Adult Population: A Scoping Review. Int J Environ Res Public Health. 2021;18(4):1876.

Section 5

Chapter 10

Chapter 10: Discussion and Conclusion

This chapter brings together the work undertaken in the thesis in relation to the research aims and objectives, and contributions to the literature. Detailed discussions of the findings for each individual study in the context of the literature are already presented in prior chapters. Therefore, an overall summation of the main findings and conclusions is provided here. The strengths and limitations of the thesis as a whole, along with directions for further research in self-managed weight loss, are also presented.

10.1 Thesis Aims and Summation of Main Findings

Many people self-manage their weight loss, and successfully lose weight on their own without formal weight management interventions from health and medical professionals. Self-managed weight losers have not been researched in-depth before because they have little or no direct contact with healthcare or research groups. There is very little understanding of the key characteristics of those who self-manage their weight, how successful they are, and what strategies they use to achieve weight loss. The aim of the thesis was to explore the domain of self-managed weight loss, and what lessons might be carried over to planning weight management strategies.

As this is an under-researched area, prior to answering questions about self-managed weight losers, there was the need to answer questions in relation to reach and recruitment of self-managed weight losers, and ascertaining what data are important to collect.

With this overarching line of enquiry, the key research questions for this thesis were:

1. What are the characteristics of people who self-manage their own weight loss?
2. How successful are they at weight loss?
3. What factors predict change in weight, diet and physical activity among self-managed weight losers?

To investigate these aims, we found it necessary to also address the following additional research questions:

1. What data are important to collect about self-managed weight loss?

2. Is Facebook a feasible mechanism to reach and recruit those attempting self-managed weight loss in the population?
3. Among those who self-manage their weight loss, what characteristics differentiate those who are completely unassisted and those who may still utilise some form of professional help?

The arrival of the pandemic and social restrictions occurred over the period of the study, and provided an opportunity to answer an additional research question:

1. What are the impacts of COVID-19 social restrictions on self-managed weight loss journeys?

The main findings, conclusions and recommendations from all the relevant sections of the thesis are presented in Table 10.1.

Table 10.1: Summary of key findings and conclusions from studies presented in this thesis

Research question	Chapter	Main findings	Conclusion and recommendation
What data are important to collect about self-managed weight loss?	Chapter 3: Standard baseline data collections in obesity management clinics: A Delphi study with recommendations from an expert panel	Obesity experts in Australia reached consensus on baseline patient data collection for recommended measures of demographic, anthropometric, biochemical, weight loss history, medication, medical history, and comorbidity data items using a 70% agreement threshold.	The first expert panel consensus on recommendations for a minimum and standard set of baseline patient data collections in obesity management services in Australia is presented. Implementation of these recommendations will facilitate data pooling for clinical audits and research collaborations across clinics seeking to improve the quality of specialist obesity care. Data important to collect from self-managed weight losers should include demographic, anthropometric, and weight loss history; comorbidity data should be included, along with other factors of theoretical importance identified through literature reviews and exploratory factors in this thesis.
Is Facebook a feasible mechanism to reach and recruit those attempting self-managed weight loss in the population?	Chapter 4: An exploration of recruitment through Facebook to an online survey on self-managed weight loss in Australia—Lessons learned	Paid advertisements yielded better results (*n* = 153) than free promotion through Facebook groups (*n* = 80), and costed on average AUD9.95 per completed survey, as did spreading budgets over a 7-day period. Raffle incentives and simplified online consent showed very minor improvement in completion rates (7% paid promotions, 4% free promotions). In preliminary analysis of data from the pilot study on self-management type, 61.5% of the participants were classified ‘unassisted’. Age, BMI category, weight gained as an adult, diet tracking and diet books seem to influence self-management type.	Facebook yielded promising results in reaching and recruiting self-managed weight losers. Use of paid mechanisms (to reduce selection bias), along with raffle incentives and a simplified online consent form, can be recommended for the main study. Identification of self-management type requires a modification of survey questions to provide clarity and differentiation.
What are the characteristics of people who self-manage their own weight loss?	Chapter 6: Characteristics of self-managed weight loss	88.0% had overweight or obesity. 52.9% reported having at least one chronic disease. 85.3% were unassisted.	This is the first study to describe self-managed weight losers, and a large range of characteristics have been described.

Research question	Chapter	Main findings	Conclusion and recommendation
		78% were female. 85% were English-speaking. 70% were married, in a de facto relationship or living with a partner. Age ranges: 31.4% 18–39 years 33.3% 40−55 years 35.3% 56 years and above. Four clusters of self-managed weight losers were identified: 'older, ill and stressed' (29.9%), 'younger aged and healthy, but poor and stressed' (28.9%), 'wealthy, but ill and stressed' (26.8%) and 'wealthy, relaxed and healthy' (14.4%). Cluster 4 'wealthy, relaxed and healthy' had the highest proportion of successful weight losers (6, 42.9%), whereas Cluster 2 'younger aged and healthy, but poor and stressed' had the least number of successful weight losers.	Four clusters of self-managed weight losers have been identified among self-managed weight losers. The clusters suggest that self-managed weight losers are not a homogeneous group. Replication with larger sample size can confirm existence of further clusters.
Are self-managed weight losers successful?	Chapter 6: Characteristics of self-managed weight loss	At the end of 12 weeks, self-managed weight losers lost 2.07 kg (95% CI = −3.06, −1.09). A third of participants (33, 32.4%) were 'successful' in losing 3% or more of their initial body weight. Nineteen participants (19, 18.6%) achieved clinically significant weight loss of 5% or more of their initial body weight. There were small reductions in consumption of discretionary foods, but also fruit.	At least a third of self-managed weight losers are successful, and for close to a fifth of them, the weight loss is clinically significant. These results were achieved at the peak of COVID-19 social restrictions across Australia, despite adverse impacts reported widely on weight and weight loss. Self-managed weight loss seems worthwhile to promote and support in the population.
Among those who self-manage, what characteristics differentiate those who are completely unassisted and those who may still utilise some form of professional help?	Chapter 6: Characteristics of self-managed weight loss	Most of the self-managed weight losers were completely unassisted (87, 85.3%). There were no statistically significant differences found in characteristics between unassisted and assisted groups.	A large majority of self-managed participants recruited through this study are unassisted. Self-managed weight losers can be compared with patients receiving obesity treatment to identify differences.

Research question	Chapter	Main findings	Conclusion and recommendation
		Low counts for the assisted group did not allow regression studies to assess factors that predicted unassisted and assisted groups.	
What factors predict weight and weight-related behaviour changes in self-managed weight losers?	Chapter 7: Factors predicting change in weight and weight-related behaviours among self-managed weight losers	Predictive of weight loss: • higher initial BMI (Model 9: B = −0.24, *p* = 0.022, 95% CI = −0.43, −0.04) • non-English speakers (Model 9: B = −4.2, *p* = 0.016, 95% CI = −7.95, −0.88) • cancer (Model 6: −7.85, *p* = 0.045, 95% CI= −15.53, −0.17) • use of weight loss products (Model 9: −2.39, *p* = 0.023, 95% CI = −4.438, −0.334) Predictive of weight gain: • increased consumption of discretionary foods (Model 9: B = 0.27, *p* = 0.01, 95% CI = 0.53, 0.045) Predictive of reduced fruit and vegetable consumption: • increase in discretionary foods consumption (Model 8: B = −0.628, *p* = 0.005, 95% CI = −0.628, 0.199) • increase in SSBs consumption (Model 3: B = −0.628, *p* = 0.005, 95% CI = −0.628, 0.199) Predictive of increased discretionary food intake: • reduced fruit and vegetable consumption (Model 3: B = −0.144, *p* = 0.005, 95% CI = −0.243, 0.046) Predictive of increased vigorous physical activity:	Some characteristics associated with weight loss success, and weight-related behaviours among self-managed weight losers, have been identified, and some agree with the literature on successful weight loss and weight maintenance. Results should be interpreted with caution because of the small sample size. Research with a large sample size is recommended.

Research question	Chapter	Main findings	Conclusion and recommendation
		• those who perceived their health as 'fair' (Model 4: B = 129.195, p = 0.018, 95% CI = 25, 233)	
What strategies are used by self-managed weight losers, and what are barriers to sustaining the weight loss?	Chapter 8: Strategies for weight loss and barriers for sustaining weight loss among self-managed weight losers in Australia—A thematic analysis	Results of thematic analysis are: • diet themes: snack management tactics, awareness of portion control, following specific diets and eating rules • exercise themes: many ways of walking; starting or increasing level of exercise; plans, routines, goals and monitoring • barriers to sustaining weight loss: health issues and state of mind and body, losing motivation, unconducive environments, unhelpful social situations • miscellaneous themes: 'I am trying', perpetual struggle.	Self-managed weight losers mainly use common diet and exercise strategies recommended by formal weight management programs. Self-managed weight losers report similar challenges and struggles as those reported by those who are formally managed. The themes identified can inform design of public health messages for those that self-manage their weight loss.
What was the impact of COVID-19 on self-managed weight losers?	Chapter 9: Impact of COVID-19 lockdown on self-managed weight loss journeys and Weight, Diet and Physical Activity Outcomes of Self-managed Weight Losers	72% of participants reported negative impacts to their weight loss attempt because of COVID-19 social restrictions. 53% reported exercise impacts, and 61% reported diet impacts. Most commonly reported issues were stress eating, eating out of boredom, and eating more. Gym closure and fear of catching COVID-19, and lack social exercising, affected exercise. Positive impacts were reported by only two participants. Those reporting negative impact were less successful at weight loss, but no differences in reported dietary behaviours could be detected. Vigorous physical activity might have been reduced in those who reported impacts to their exercise routines. Despite the range of issues, nearly a third of the participants in this sample achieved weight loss ≥3% of their body weight.	Even the sample of higher-educated participants, who are likely to be better equipped at maintaining appropriate weight-related behaviours, having embarked on self-managed weight loss journeys, were overwhelmed in lockdown. Detrimental responses to lifestyle stresses such as social distancing lockdowns will only be attenuated when food and activity environments are improved to be more supportive of healthful eating and active living under a variety of circumstances. The study highlights a need to develop specific weight management guidelines that address the unique pressures brought about on people during lockdowns.

10.1.1 Obesity in Australia and need to study self-managed weight loss

The dramatic increase in obesity over the last five decades has seen it become a major public health problem, affecting health at individual and population levels.(1) Australia is among the countries with the highest proportions of people who have overweight and obesity, with two out of three adults carrying excess weight.(2) Obesity is a health risk factor and contributes to various medical problems such as diabetes, heart disease, stroke, kidney disease, osteoarthritis and some cancers.(3) Obesity also increases severity and adverse outcomes in some cases, as seen in higher morbidity and mortality rates among COVID-19 patients who have obesity.(4)

Therefore, the impact of obesity translates to increased demands and pressures on healthcare services, raising capacity issues for adequate facilities, infrastructure, healthcare professionals, staff and treatments.(5) With the scale and trends of the problem in Australia, finding a range of effective weight management options that can also reduce dependency on healthcare services is of critical importance. Low-intensity behavioural management programs such as self-directed weight loss interventions,(6) if effective, can be scaled up and therefore warrant increased research focus.

Self-management is seen in many problems that are attributed to behaviours such drinking and gambling. For example, in the area of smoking cessation, although mediation and therapies are likely to improve success rates of smoking cessation, a majority of those who stop smoking permanently do so unassisted, and the volume of unassisted smoking quitters has been a key factor in reducing smoking prevalence rates.(7) The deficits in research of unassisted smoking cessation and inattention of the implications for policy have been highlighted.(8) Drawing parallels in the area of obesity, many in the population report attempting to lose or maintain their weight.(9) Although there is a growing body of research that examines interventions and components that are low-intensity or self-directed,(6, 10-17) currently there is limited research on the ‘self-directed’ aspect of weight loss, and the people who choose to manage their weight loss on their own have not been fully examined. There are many questions about this group that are still unexplored. There is still much to understand about who self-manage their weight loss, what techniques they use, and what their levels of success are, and if there are learnings for obesity management policies.

10.1.2 Gaps in prior research

A few of the gaps and issues in prior research are that, first, there is **no clear definition** of what self-directed weight loss is. In Australia, overweight/obesity is not defined as a disease, but viewed as a modifiable health risk factor,(18) and addressed from a preventive perspective. Only after certain thresholds of severity are reached are clinical treatments offered by health and medical professionals(19, 20). In studies that describe low-intensity clinical treatments, different terms are used, such as ‘self-help’(12, 15, 21) and ‘self-directed’.(10, 22, 23) The term ‘unassisted’(24) is widely used in the context of smoking cessation where people do so without any mediation or intervention from health services; however, this has not been used in the context of weight control. Second, research has not focused specifically on the self-directed nature of the weight loss process; rather, the majority of the research on self-directed weight loss is focused on specific intervention strategies, or approaches such as online programs, websites(25) apps(26) or other low-intensity interventions.(6, 10) Outcomes of studies have been restricted to weight loss, often taking success as significant weight loss that is sustained for long periods. In studies of success in weight loss, people have usually been recruited after their weight loss journey (27, 28), and identified for recruitment on the basis of extraordinary levels of weight loss(29); yet, it is established that modest weight loss(30, 31) and other outcomes(32, 33) associated with weight loss are also associated with improved health.

The design for this exploratory thesis was therefore conceived keeping in mind some of these issues. First, as this was an exploratory study, we avoided becoming too constrained by definitions, but focused on identifying and recruiting those in the population that identified themselves as attempting weight loss on their own, rather than those receiving obesity treatments or enrolled in any formal weight management interventions. We used the term ‘DIY weight loss’ in our recruitment to improve comprehensibility and attract the right participants from the general public. From the pilot study findings, the definitions for self-managed weight losers were then further evolved for the main study. Specifically, the pilot study revealed that although participants identified as ‘attempting weight loss on their own’, there were some that still accessed some form of support from professional or health services, although the extent of support was not clear. In management of chronic diseases, ‘self-management’ is an important concept and used to describe day-to-day management of chronic conditions over the course of an illness or disease.(34) Patients treated for diabetes, heart conditions and some cancers may ‘self-manage’ their condition with no or limited interaction with the healthcare system.

Likewise, those with a weight problem can 'self-manage' their weight loss, without accessing healthcare or treatment services for obesity. Those that enrol in commercial weight loss programs still do access support from professionals, although not from the health system. With high levels of chronic disease among people with obesity(35) and the popularity of commercial weight loss programs(36) in Australia, it was therefore found necessary to identify those who can self-manage their weight and to explore the differences between different forms of self-management. Within this thesis, the subgroup of self-managed weight losers who accessed professional or health supports were named **'assisted'**, whereas participants who did not access any such support were classified as **'unassisted'**. Second, the approach to the study was focused on 'people' rather than 'intervention', gathering data on a broad range of characteristics to explore the influence on the self-management process. The thesis therefore sought to study people from the general population, rather than recruit people who are provided with self-directed weight loss interventions from professional or health services. To ensure that responses were not influenced by the success or failure of their weight loss attempt, we recruited participants who had just commenced or were about to begin their weight loss journeys, and followed them longitudinally for 12 weeks. Participants were then assessed on a broad range of characteristics including demographics, weight history, motivations, lifestyle risks, eating and physical activity behaviours, psychosocial characteristics, and the strategies they used in their weight loss attempt. Quantitative and qualitative data were gathered to provide in-depth insights to self-managed weight loss journeys. For capturing even modest improvements in health status, a range of outcomes were measured, including absolute weight loss, 3% body weight lost, 5% body weight lost, changes in fruit and veg consumption, discretionary food and SSBs consumption, and changes in walking, moderate and vigorous physical activity.

10.1.3 Defining factors to be measured in self-managed weight loss journeys

Because self-managed weight loss journeys have not been well researched before, one of the first tasks of the thesis was to better define what factors should be measured when defining risk associated with weight and progress on weight loss journeys. Literature on factors in successful self-directed weight loss and weight maintenance informed the data that are important to collect from a theoretical perspective, as described in Chapter 1. Equally, it was important to understand current practice as well. Clinical and allied health professionals such as endocrinologists, bariatric surgeons, dietitians, exercise physiologists and psychologists work most closely with patients with obesity,(19) and therefore, the current practice of these professionals in the treatment of their patients provides the best guide to the best type of data to be collected about self-managed weight loss. However, this thesis identified another gap—although clinical practice guidelines are available in Australia and elsewhere,(20, 37-40) there are no standardised baseline patient data collections among obesity treatment professionals, with variation occurring even among the few multidisciplinary obesity clinics in public hospitals.(19) This variation prevents pooling of data for clinical audits, research collaborations or improving quality of care. This is a wider problem with health data in Australia, not limited specifically to obesity treatment.(41) This thesis could make a valuable contribution by addressing this gap through the consensus developed among the obesity experts across Australia on a standardised baseline data collection, to inform practice.(42) Although the number of health professionals in the study were small, those that participated are best qualified to provide expert opinion. Despite the high drop-out rate, consensus was achieved between at least two-thirds of the experts on all of the categories. Instead of further polling, the list of variables that did not make the final list – for example quality of life, any disability, PCOS and infertility were shared with participants, along with the final agreed list of baseline variables. The study provided valuable information on the categories of data to collect from self-managed weight losers, and apart from the clinical parameters that are specific for treatment of patients with clinical obesity, other data items that could be collected through survey were included in the questionnaire developed for this study.

10.1.4 The challenge of recruiting self-managed weight losers in the general community

After identification of data to collect, came the challenge of recruitment. Previously, studies have recruited participants from existing weight management programs and services—our challenge was to find ways of recruiting those living in the community and not interacting with weight management services provided by government or even commercial services. As Facebook is ubiquitous in reach, it seemed a potentially suitable avenue to reach and recruit participants. However, reports of success at using Facebook for research recruitment have varied widely in the literature according to the topic of the research and the target population.(43, 44) Reviews have suggested that Facebook is a promising platform to reach and recruit hard-to-reach groups.(45-49) Our strategy of using Facebook, as described in Chapter 4, seemed to work in the pilot study, but unfortunately did not yield the numbers we required in the final population study. Approaching Facebook groups(50) in the pilot study contributed to higher recruitment rates; however, this was not pursued in the longitudinal study in order to avoid potential selection bias. For example, a Facebook group with over 12,000 members that is described as a ‘supportive group for like-minded individuals’ for those using ‘Lite'n'Easy’(51) is likely to skew results for diet factors. Although this is not an official group promoted by Lite'n'Easy, participants within this group are likely to utilise calorie-restricted, pre-prepared meals as a part of their weight loss journey. Similarly, large community Facebook groups for ‘mums’ or people from certain geographic locations can create selection bias in the study, and therefore, free recruitment through Facebook groups was not pursued in the longitudinal study. While the near ubiquitous reach of Facebook(52) is a key reason for our choice of social media platform for recruitment, YouTube, Instagram, Twitter, LinkedIn and Pinterest have large audiences too.(52, 53) Recruitment through these tools is less reported in the literature, and potentially worth exploring to recruit diverse audiences.

10.1.5 Who are people who self-manage? What motivates them? What separates them? Can they be segmented easily?

Defining who is most likely to self-manage their own weight loss journey, who they are, what motivates them, how they are different from others, and if we can segment them easily is important to allow a better understanding of how their needs can be best served. Table 10.1 provides an outline of the findings from the different sections of this thesis; however, detailed descriptions of a comprehensive range of characteristics, spanning demographics, health status, weight history, lifestyle risks, diet, physical activities, motivation, psychosocial factors and eating behaviour related factors, are available in Chapter 6. Insights into why people were self-managing their own weight is an interesting question that was not explored in this thesis. A past qualitative study on those who managed weight by themselves showed that those that self-managed their weight loss successfully are people who have already attempted weight loss many times before. They leverage knowledge acquired from these attempts to shape their current weight loss attempt, and embedding the positive changes as part of their regular life style was the way to success.(54) Data were collected about these new exploratory factors in the longitudinal survey within this thesis, and how they influence weight loss success have been described as well.

As the challenge of obesity is complex, research often focuses on tailoring of interventions according to certain determinants such as age,(55-57) race and ethnicity,(58-60) health status,(61, 62) socio-economic status,(63) and other determinants.(64) Identifying clusters or groups of people with similar characteristics can be useful in tailoring targeted campaigns to improve acceptability and effectiveness.(65) More commonly used within market research,(66) cluster analysis is now being applied in obesity research(65, 67) and related health research(68, 69) as well. In this thesis, we wanted to assess if self-managed weight losers can be segmented easily. Therefore, cluster analysis was carried out, and subsequently, four homogeneous clusters that differed from each other in age, health and wealth, among other traits, were identified. Some of these clusters are similar to clusters generally identified among people with obesity.(65) Identifying clusters among self-managed weight losers can inform campaigns or segmented health messaging for obesity management.

10.1.6 Are self-managed weight losers successful?

A key research question of this thesis was to determine if self-managed weight losers are successful, especially when compared with those in more intensive programs. It is not meaningful to compare the results of self-managed weight loss programs with intensive treatments such as surgery.(70) However, at the end of 12 weeks, a third of the self-managed weight losers in this study lost an average of 2 kg, a third lost 3% of their initial body weight, and a fifth achieved clinically significant weight loss of 5% or more of their initial body weight.(71) Although it is possible that participants were beginning a weight-loss attempt and theoretically could be more motivated, it is important to note that these results were achieved even during the time when Australia was affected by severe restrictions and lockdowns due to the arrival of the COVID-19 pandemic. Globally, weight management was negatively affected by the pandemic, as is now evident from several reports,(72-76) as well as reported by the participants in this study.(77) Despite these adversities, many were successful with their weight loss attempt and some achieved clinically significant weight loss. It is generally posited that structured weight management programs provided by trained professionals are more effective than self-help mechanisms.(71, 78) While the results achieved by self-managed weight losers at 12 -weeks in this study cannot be directly compared with those of behavioural weight loss programs delivered through health services in the long term, the short-term results found in this thesis are very encouraging. For example, a meta-analysis on BWMPs in primary care showed a mean weight loss of 1.36 kg at 12 months(79), and another meta-analysis on the effectiveness of lifestyle-based weight loss interventions in patients with type 2 diabetes showed pooled results for six trials of 3.3 kg weight loss.(80) One meta-analysis found that compared with usual care, groups that received nutrition care from dietitians lost an additional 1.03 kg (95% CI:−1.40; −0.66, $p < 0.0001$) of weight and 0.43 kg/m^2 (95% CI:−0.59, −0.26; $p < 0.0001$) of

BMI. (81) Percentage of weight loss achieved at 12 months with some of the pharmacotherapy products range between 2.9% (Orlistat) and 5.4% (Liraglutide) These pharmacological agents have a range of side effects and require healthcare professional intervention for both prescription and ongoing monitoring.(82) The modest results achieved by self-managed weight losers, especially as they are not using intensive healthcare resources, can be very valuable as a part of a range of strategies to manage obesity. In this regard, despite just a third of self-managed weight losers achieving 3% body weight loss, overall, our studies suggest that self-managed weight loss can be successful in the short term and can be considered a legitimate intervention for individuals, alongside more professionally delivered behavioural weight management programs and even some pharmacological agents.

While successful weight loss provides some health benefits, sustaining this weight loss over the long term is important, but even more challenging than weight loss. There is a common perception that nobody succeeds in long-term weight loss maintenance. With about 20% of people able to lose over 10% of body weight and sustain that loss for one year, the US NWCR has proposed this as the definition for 'successful long-term weight loss'.(83) Given the time frames for this thesis, and the need for preliminary studies and the pilot, the main study focused only on the weight loss phase of the self-managed weight loss journey, and 1-year maintenance could not be included in the scope of this thesis.

10.1.7 Is self-managed weight loss appropriate, and what are implications for obesity management policy?

In the case of smoking cessation, there are no obvious detrimental effects or concerns evident if smokers choose to quit unassisted, rather than use health professional interventions. However, weight loss is considered differently, and concerns are sometimes raised about the possible consequences of unsupervised weight loss. For example, unhealthy weight loss practices are associated with body image issues, and impacts on mental health have been reported in adolescents.(84) Concern is also raised about the health effects of weight cycling, but the findings are inconsistent and evidence is still emerging.(85-87) In some populations, such as the older, weight loss may require careful balancing of risks and benefits.(88)

This then raises the key question if self-managed weight loss is appropriate or not—and should self-managed weight loss be acceptable and supported, or does weight loss require healthcare professionals to be actively intervening?

This thesis found that the vast majority of the participants followed generally accepted weight loss practices in their self-managed weight loss journey. Weight loss strategies used by these self-managed weight losers in our study are also reported in other population groups trying to lose weight. These include reducing portion size,(89) maintaining or increasing levels of exercise,(90) and goal setting and monitoring.(91, 92) Managing snacks was a priority for our self-managed weight losers, with strategies such as substituting with healthier foods, reducing size of portions and simply eliminating them. Snacking is common among Australians,(93) and therefore, it is a positive that self-managed weight losers have a keen focus on reducing snacks. While this focus could be created by the reported increased snacking during the pandemic,(76) it offers good lessons in managing discretionary foods in all times. The use of meal replacements is a common weight control practice,(89) and although generally not part of clinical guidelines to manage obesity, they have shown positive results in weight outcomes.(93, 94) In this study as well, use of weight loss products such as meal replacement shakes, bars and pre-prepared weight loss meals was relatively low but influenced weight loss positively. While the existence of the 'healthy migrant effect' suggest that people born overseas in general have better health,(95, 96) it is speculated that language barriers and other health inequities can hinder access to health information.(97) In our thesis, however, the self-managed non-English speakers (12.7%) were more educated, and were also likely to have better weight loss outcomes.

The only group that warranted concern was participants diagnosed with cancer. The fact that obesity is a risk factor for many cancers(98) is becoming common knowledge among the general population through health promotion programs.(99) With this condition, clinicians may be best suited to provide weight management advice to cancer patients.(100) It was also troubling to find that all four participants with cancer in this study were in the 'unassisted' group, rather than 'assisted', which suggests they lacked professional or health guidance. This group also had higher levels of weight loss. This suggests the need for health professionals managing cancer patients to proactively check and engage with their patients in their weight loss journey.

The next question is how are self-managed weight losers able to deal with the stresses of normal life and extraordinary events? The majority of the self-managed weight losers felt they had good coping skills, were supported by family and friends, and had access to the resources needed, and in general seemed efficacious. However, many reported susceptibilities to stress eating as well. Some had the same challenges reported by those in formal weight management programs,(101-104) such as loss of motivation or 'falling off the wagon', unhelpful social situations, and poor environments. The arrival of the COVID-19 pandemic exacerbated these barriers, with closures of exercising facilities and increased episodes of stress eating and eating from boredom.(72, 73, 75)

Whilst the survey did not explicitly ask participants if they were engaged in extreme weight loss practices, questions asked on smoking status, restrictive diets, fasting, diagnosis of eating disorders, psycho-social and eating behaviours, as well as ample opportunity with open ended questions for participants to volunteer information, the participants in general did not report engaging in risky practices. Despite the unique adversity of COVID-19 in the midst of their weight loss journey, the self-managed weight losers who completed the follow-up survey seemed to report approach and strategies that are likely to be recommended in BWMPs anyway. The fact that 30% (15% if you consider that all of those who were lost to follow-up did not achieve 3% body weight loss) were successful at achieving modest weight loss, and did so without accessing any intensive health resources or services, is noteworthy. Self-managed weight loss can therefore be a potentially valuable stream of contribution to alleviate pressures of obesity in Australia. Therefore, this thesis recommends self-managed weight loss be accepted as a legitimate obesity management strategy, within the suite of several categories of obesity management strategies, and actively encouraged and supported.

The fact remains that population BMI trends in our obesogenic environment continue to shift to the right. For individuals, it is not easy to lose weight—even with professional help. Similar to their counterparts accessing health services, self-managed weight losers report a 'constant battle' to keep their weight under control, and that when they lose motivation, they are susceptible to 'falling off the wagon' in times of stress. This suggests that they may benefit from a degree of support, although they may not be interested in attending regular sessions with a coach or even having low-intensity structured supports. The Get Healthy information and telephone-based coaching service in NSW(105) has been successful, with participants reporting improvements in weight, BMI and diet, and increased physical activities. While this intervention is a well-structured program and does require health resources, perhaps it may be valuable to make such a service available as an optional and credible point of reference for self-managed weight losers when they feel the need to access the encouragement needed to stay on track in their journey or clarify questions. In addition, health promotion and communication messages that offer practical advice on self-management of weight could be developed as an adjunct—for example, tactics to manage cravings for snacks, improving social desirability of walking as a form exercise, and better guidance and knowledge on portion control. Of course, the broader recommended public health supports—such as improving facilities for exercise, improving availability and reducing cost of fresh foods, reducing junk foods advertising, and eliminating weight stigma—will benefit self-managed weight losers as well.

10.2 Strengths and Limitations of the Studies within this Thesis

10.2.1 Strengths of the thesis

Self-managed weight losers in the general population have not been extensively researched before, and this thesis improves our understanding of some key issues around this group. Most past weight loss studies have focused on self-directed interventions, and include recruiting people attending obesity clinics or those enrolled in formal weight management programs. Such studies are also retrospective in nature, asking participants what worked or not after the weight loss process. In contrast, the main strengths of this thesis are the longitudinal nature of the main study, and the fact that participants in the community were recruited in the process or just as they were beginning their weight loss journey, and thereafter followed through at 12 weeks. A breadth of variables was collected on their journey, and outcomes measured included not only weight but also changes in diet and exercise to allow capture of improvements in health behaviours. The survey captured both quantitative and qualitative data to provide a holistic view of self-managed weight loss journeys.

Another key strength of the thesis is the design of the research, including the logic and rationale for the studies undertaken and the comprehensive execution. A range of complementary studies were undertaken to answer specific questions relating to issues around self-directed weight loss. To determine the best type of information that should be collected about people attempting weight loss and to ensure it was routed in practice as much as theory, we sought the views of health professionals who directly work with people with obesity. The gap identified in this area was then addressed through the Delphi study with obesity experts, and informed the type of data that were relevant to collect in the thesis.

A large pilot study was undertaken to assess the feasibility of the recruitment approach, acceptance and completion of questions. Existing and validated questions used in past studies within Australia were utilised where possible. Best practice online survey design was employed. Novel mechanisms for enhancing the online set-up, data collections and measurement of recruitment of different marketing schemes within Facebook were trialled, and the lessons learnt from the pilot were then addressed and improvements deployed for the main study.

Last, the threat of COVID-19 occurred during a critical phase of this thesis, influencing recruitment and affecting the weight loss journeys of participants. This adversity was converted to an opportunity to examine the influences of the pandemic on weight loss journeys of participants. This resulted in one of the early publications on impacts of COVID-19 on the topic.

10.2.2 Limitations of the thesis

Limitations of the individual studies comprising this thesis have been previously discussed in each study chapter. However, some general considerations hold true for this thesis as a whole.

The data collected in this thesis are self-reported by the participants and as such there isn't a way for validating what is reported. Inherent disadvantages of self-reported data such as socially acceptable answers, inaccuracies in measurements, recall bias in reporting hold true for this thesis as well. (106)

While considering the results in the thesis it is important to note measures and handling of some of the data. In this thesis, weight measures were collected in whole Kilograms or Stone and pounds (which were then converted into Kilograms), and height was collected to the nearest centimetre - therefore any fractional weight loss or gains are not factored into this study. (107) Food consumption data was collected as ranges of serves per day or week. These were then transformed into mean weekly food consumption scores – and used treated as continuous data in analysis. Regression results in the thesis must be seen in light of loss of precision in these methods.

All data collection for the study was completed online, and selection biases are inherent for online studies.(108) In addition, recruitment of participants was undertaken through one social media platform only. Although almost ubiquitous in reach, Facebook is shown to be preferred by middle-aged people, and can miss reaching younger aged participants who adopt other social media platforms.(52) Although some selection bias was mitigated in this thesis by avoiding recruitment through specific Facebook groups, the advertisement algorithms for Facebook keep changing, and it is evident that they are based on user profiling as well as advertiser attributes.(109)

One of the limitations of the study is the participants were overrepresented by married, English speaking women. Although the education levels were well distributed, degree and higher degree levels together accounted for half the participants. Thus, the sample was not necessarily representative of the population and due caution should be exercised in generalising the findings.

The largest limitation of the thesis was the small sample size achieved in the longitudinal study. Unfortunately, a large enough sample size could not be obtained to allow complete analysis of the range of data collected. The breadth of questions asked, while a strength, was also a limitation as insufficient detail was collected to adequately define some of the psychosocial characteristics. Indicator questions were used in this study, whereas detailed exploration usually requires larger instruments with 20 or more questions. The amount of data collected potentially imposed a burden of too many questions on participants, and questions on moderate and vigorous physical activity were not answered by a large proportion of participants. Although validated survey questions were used, the instruments have not been specifically trialled in different population groups, and are not validated among self-managed weight losers or for online formats.

The sudden arrival of the pandemic imposed unique circumstances, which might have affected recruitment and may also influence the generalisability of what we learned about self-management of weight loss to regular circumstances.

10.3 Conclusions and Recommendations

The staggering number of people with overweight and obesity in Australia is causing severe capacity issues for health services, and the few specialist weight management services available in public hospitals are grossly under-resourced to cater for even those with clinically severe obesity. There is an urgent need for sound obesity management strategies with multi-pronged solutions and a suite of weight control strategies for the population. A large number of the population engaged with managing their weight do so on their own without utilising any professional assistance from health services or commercial weight loss programs. This thesis recruited and examined people in the general community embarking on a weight loss attempt by themselves without accessing intensive resources. As this is a population group not researched in-depth before, a number of studies were undertaken to inform methods, test feasibility, and then conduct the longitudinal study, which was a 12-week follow-up study gathering data on a range of factors, and examining outcomes, to better understand self-managed weight loss. Table 10.1 provides a summary of key findings, conclusions and recommendations.

10.3.1 Conclusion 1

The main conclusion from this thesis is that a reasonable percentage of people who embark on a self-managed weight loss journey can be successful in losing a modest amount of weight, and even achieve weight loss that is clinically significant in the short-term. These weight outcomes were achieved in participants even under the adverse circumstances and the negative impacts to diet, exercise, and stress and anxiety created by COVID-19. Despite these adversities, the successful weight loss outcomes are comparable with those reported in more formal behavioural weight control interventions.

Recommendation 1: Self-managed weight loss should be considered a legitimate weight management strategy that individuals can pursue unless contraindicated. It should be included and supported within national and local weight management policies as part of a suite of solutions to address the issue of obesity. While the proportion that achieved successful weight loss may be lower than that achieved by more intense interventions, consideration of the high reach and low resource implications of this approach make this approach a potential valuable and significant contributor to addressing the high number of Australians with an existing weight problem.

10.3.2 Conclusion 2

Those who self-manage their weight are not necessarily a homogeneous group. Participants could be clearly segmented into four groups based on a range of demographic, health and behavioural characteristics, using cluster analysis.

Recommendation 2: Although four segments were identified among self-managed weight losers in our study, future research should replicate the cluster analysis with larger sample size to detect the existence of further logical clusters.

10.3.3 Conclusion 3

Self-managed weight loss appears to be safe and appropriate. Self-managed weight losers employed healthy weight loss mechanisms that are recommended by formal BWMPs. Snack management and walking were some of the key strategies employed by self-managed weight losers. Barriers of loss of motivation and challenges such as a constant struggle are the same reported by those in formally managed weight management programs.

Recommendation 3: Self-managed weight loss in the community should be encouraged and actively supported as part of formal and informal obesity management strategies. Support for those who choose this approach to weight management could be provided in the form of public health communications focusing on practical strategies to manage snacking, such as substitution with health snacks and moderating consumption. Social desirability and appeal of walking as a form of exercise should be made a focus of exercise campaigns. This is the most likely form of exercise to encourage those with obesity to commence an active lifestyle.

Unstructured coaching through telephone and online chats can be made available for self-managed weight losers through ad hoc consults, for example, when they feel the need for encouragement or motivation.

Support, especially public health communications, must be sensitive while encouraging self-management in order to not inadvertently exacerbate weight stigma among those who require or choose formal weight management.

10.3.4 Conclusion 4

COVID-19 had adverse impacts on weight loss journeys by affecting diet and exercise strategies and causing poor weight behaviours because of stress and anxiety. Even our sample of higher-educated participants felt overwhelmed in COVID-19 lockdowns, even though they were likely to be better equipped to maintain appropriate weight-related behaviours.

Recommendation 4: Detrimental responses to lifestyle stresses such as social distancing and lockdowns may be attenuated if food and activity environments are improved to support healthy eating and active living under a variety of circumstances. In addition, specific lifestyle and weight management guidelines and strategies that address unique pressures—such as lockdowns and quarantine—should be developed, and it is important to find novel methods to maintain the social nature of exercise while ensuring physical distancing.

10.3.5 Conclusion 5

The weight loss strategy of the majority of the participants in the longitudinal study was classified as 'unassisted'. The pilot study with a larger sample size showed 'assisted' and 'unassisted' self-managed participants may differ in some ways.

Recommendation 5: A qualitative study through interviewing participants with regards to perceive 'self-management', 'assisted' and 'unassisted' can further inform future work in this area. Furter, for understanding who can 'self-manage unassisted' and who require a level of professional assistance to manage their weight, comparing self-managed weight losers in the population with those receiving care in obesity clinics is recommended for future studies. Matching cases in the cohorts on demographic, health and BMI characteristics can bring out key differences, better informing who is likely to achieve success in which format. This will allow better targeting of healthcare resources.

10.3.6 Conclusion 6

The results of this study show a good level of agreement with past work on the characteristics associated with weight loss success (high BMI), weight gain (increased discretionary foods) and weight-related behaviours (inverse relations between fruit and veg, and discretionary food, consumption).

Recommendation 6: Results of the main longitudinal study in this thesis should be interpreted with caution because of the small sample size, and should be validated with adequately large sample sizes in future research.

10.3.7 Conclusion 7

A list of proposed standard and minimum baseline patient data collections in obesity management services in Australia was produced through an expert panel consensus for use in specialist obesity services. The panel consisted of surgeons, clinicians, allied health professionals (dietician, exercise physiologist and psychologist), a bariatric nurse and obesity researchers. There was also consideration of specific data items for patients referred for bariatric surgery.

Recommendation 7: Recommendations on baseline patient data collections need to be implemented across obesity treatment services within Australia. Having a common dataset will enable clinical audits and research collaborations across clinics to improve the quality of specialist obesity care.

10.3.8 Conclusion 8

Using Facebook to reach participants was successful in the pilot study; however, sufficient numbers could not be reached in the final study. The sample required better representation of younger age subjects, men and non-English-speaking people.

Recommendation 8: Recruitment of self-managed weight losers in the community precludes some traditional forms of recruitment, such as through obesity clinics; therefore, it is still recommended to pursue online methods. Future studies on recruitment feasibility should examine supplementing Facebook recruitment with recruitment on other social media such as Twitter, YouTube, LinkedIn, Instagram and TikTok to reach different populations. Budgets permitting, advertising through online news media should be piloted as well.

10.4 Other Considerations for Future Research

There are significant gaps in our understanding of self-managed weight loss, but many challenges arise in collecting quality data on this issue as evident from the strengths and limitations in this thesis. While this study captured data on a wide range of variables, it was not sufficient to explore all facets of self-managed weight loss in the depth that we would have liked. A particular concern was that weight loss maintenance could not be examined, given the time frames of the thesis. A period of a year (110) is generally accepted to examine weight-loss maintenance, therefore a follow-up of participants at 12 months can be conducted to provide insights on weight loss maintenance.

Further, there are some sociopsychological characteristics that we attempted to assess using indicator questions, for example, self-efficacy, eating behaviours, self-regulation and dichotomous thinking. These aspects are potentially important defining features of self-managed weight losers but are usually examined only through larger instruments of 20 or more questions. Thus, consideration needs to be given as to how these characteristics might be captured efficiently within the scope of an acceptable length questionnaire for participants. In addition, better instruments are needed for capturing daily physical activity data through online questionnaires. The trade-offs between how much can be asked of participants without increasing the burden of answering surveys, or risking large drop-out rates, is a constant challenge for researchers—even more so in new exploratory research addressing self-managed weight loss.

In view of the issues raised above, this thesis finally recommends that research for self-managed weight loss could be best served by establishing an Australian registry of people attempting weight loss. Weight control registries such as the NWCR in the US(29) have been successful in creating an important repository of data from engaged participants that allows important questions to be explored, and they are now seen in several countries.(111-114) Although some of these registries recruit only participants deemed successful at weight maintenance, we recommend a broader registry that can capture weight loss attempts in the population—regardless of the final weight outcome—in order to provide complete information about the process.

10.5 References

1. Obesity and overweight: WHO [updated June 2016]. Available from: http://www.who.int/mediacentre/factsheets/fs311/en/.
2. Australian Institute of Health and Welfare 2017. A picture of overweight and obesity in Australia 2017.
Cat. no.PHE 216. Canberra: AIHW.
3. Impact of overweight and obesity as a risk factor for chronic conditions. Australia: AIHW; 2017.
4. University of North Carolina: Obesity Linked With Higher Risk for COVID-19 Complications. Washington, D.C.: Targeted News Service; 2020.
5. Colagiuri S, Lee CMY, Colagiuri R, Magliano D, Shaw JE, Zimmet PZ, et al. The cost of overweight and obesity in Australia. Med J Aust. 2010 Mar 1;192(5):260-4.
6. Tang J, Abraham C, Greaves C, Yates T. Self-directed interventions to promote weight loss: A systematic review of reviews. J Med Internet Res. 2014;16(2).
7. Smith AL, Chapman S, Dunlop SM. What do we know about unassisted smoking cessation in Australia? A systematic review. Tob Control. 2015 Jan;24(1):18-27
8. Chapman S, MacKenzie R. The Global Research Neglect of Unassisted Smoking Cessation: Causes and Consequences. PLoS Med. 2010 Feb 9;7(2):e1000216
9. Santos I, Sniehotta FF, Marques MM, Carraça EV, Teixeira PJ. Prevalence of personal weight control attempts in adults: a systematic review and meta-analysis. Obes Rev. 2017;18(1):32-50.
10. Tang JCH, Abraham C, Greaves CJ, Nikolaou V. Self-directed interventions to promote weight loss: a systematic review and meta-analysis. Health Psychol Rev. 2016;10(3):358-72.
11. Overeaters Anonymous: a self-help group. Am J Nurs. 1981;81(3):560-3.
12. Andersen B. Nursing. Self-help for overweight persons. Sygeplejersken. 1991;91(21):8-10, 2.
13. Andersen E, Grimsmo A. Long-term results of treatment of overweight in self-help groups. Tidsskr Nor Laegeforen. 1999;119(1):14-7.

14. Bennett GA. An evaluation of self-instructional training in the treatment of obesity. Addict Behav. 1986;11(2):125-34.
15. Hartmann-Boyce J, Jebb SA, Fletcher BR, Aveyard P. Self-help for weight loss in overweight and obese adults: Systematic review and meta-analysis. Am J Public Health. 2015;105(3):e43-e57.
16. Binks M, Van Mierlo T. Utilization patterns and user characteristics of an ad libitum Internet weight loss program. J Med Internet Res. 2010;12(1).
17. Blomfield RL, Collins CE, Hutchesson MJ, Young MD, Jensen ME, Callister R, et al. Impact of self-help weight loss resources with or without online support on the dietary intake of overweight and obese men: The SHED-IT randomised controlled trial. Obes Res Clin Pract. Sep-Oct 2014;8(5):e476-87.
18. Overweight and obesity: an interactive insight, What is overweight and obesity - Australian Institute of Health and Welfare [Internet]. Australian Institute of Health and Welfare. 2020 [cited 10 April 2020]. Available from: https://www.aihw.gov.au/reports/overweight-obesity/overweight-and-obesity-an-interactive-insight/contents/what-is-overweight-and-obesity.
19. Atlantis E, Kormas N, Samaras K, Fahey P, Sumithran P, Glastras S, et al. Clinical Obesity Services in Public Hospitals in Australia: a position statement based on expert consensus: Expert consensus on clinical obesity services. Clin Obes. 2018;8(3):203-10.
20. Clinical Practice Guidelines for the Management of Overweight and Obesity in Adults, Adolescents and Children in Australia (2013) | National Health and Medical Research Council [Internet]. Nhmrc.gov.au. 2018 [cited 28 June 2018]. Available from: https://www.nhmrc.gov.au/guidelines-publications/n57.
21. Barron N, Eakins LI, Wollert RW. Fat group: a SNAP-launched self-help group for overweight women. Hum Organ. 1984;43(1):44-9.
22. Elbelt U, Schuetz T, Knoll N, Burkert S. Self-directed weight loss strategies: Energy expenditure due to physical activity is not increased to achieve intended weight loss. Nutrients. 2015;7(7):5868-88.
23. Hartmann-Boyce J, Boylan AM, Jebb SA, Fletcher B, Aveyard P. Cognitive and behavioural strategies for self-directed weight loss: systematic review of qualitative studies: Qualitative review of self-directed weight loss. Obes Rev. 2017;18(3):335-49.
24. Chapman S, MacKenzie R. The global research neglect of unassisted smoking cessation: causes and consequences. PLoS Med. 2010;7(2):e1000216.
25. Neve M, Morgan PJ, Jones PR, Collins CE. Effectiveness of web-based interventions in achieving weight loss and weight loss maintenance in overweight and obese adults: a systematic review with meta-analysis. Obes Rev. 2010;11(4):306-21.
26. Wang Y, Xue H, Huang Y, Huang L, Zhang D. A Systematic Review of Application and Effectiveness of mHealth Interventions for Obesity and Diabetes Treatment and Self-Management. Adv Nutr. 2017;8(3):449-62.
27. Bachar A, Hermoni D, Livshits G, Birk R. Late successful weight reduction and maintenance among overweight and obese adults—A two-year retrospective study. Diabetes Res Clin Pract. 2014;106(3):511-21.
28. Lih A, Pereira L, Bishay RH, Zang J, Omari A, Atlantis E, et al. A Novel Multidisciplinary Intervention for Long-Term Weight Loss and Glycaemic Control in Obese Patients with Diabetes. J Diabetes Res. 2015;2015:729567.

29. Klem ML, Wing RR, McGuire MT, Seagle HM, Hill JO. A descriptive study of individuals successful at long-term maintenance of substantial weight loss. Am J Clinical Nutr. 1997;66(2):239.
30. Blackburn G. Effect of degree of weight loss on health benefits. Obes Res. 1995;3 Suppl 2:211s-6s.
31. Healthy Weight, Nutrition, and Physical Activity: Centers for Disease Control and Prevention: Division of Nutrition, Physical Activity, and Obesity [Internet] National Center for Chronic Disease Prevention and Health Promotion. [cited 10 April 2020]. Available from: https://www.cdc.gov/healthyweight/index.html
32. Södergren M, Sundquist J, Johansson S-E, Sundquist K. Physical activity, exercise and self-rated health: a population-based study from Sweden. BMC Public Health. 2008;8:352-.
33. Milte CM, Thorpe MG, Crawford D, Ball K, McNaughton SA. Associations of diet quality with health-related quality of life in older Australian men and women. Exp Gerontol. 2015;64:8-16.
34. Grady PA, Gough LL. Self-management: a comprehensive approach to management of chronic conditions. Am J Public Health. 2014;104(8):e25-e31.
35. Risk factors to health, Causes of overweight and obesity - Australian Institute of Health and Welfare [Internet]. Australian Institute of Health and Welfare. 2020 [cited 10 April 2020]. Available from: https://www.aihw.gov.au/reports/biomedical-risk-factors/risk-factors-to-health/contents/overweight-and-obesity/causes-of-overweight-and-obesity.
36. Australians set to spend $6.6 billion to battle the bulge: IBIS World [cited 2017 21st April]. Available from: https://www.ibisworld.com.au/media/2013/10/31/australians-set-spend-6-6-billion-battle-bulge/.
37. Yumuk V, Tsigos C, Fried M, Schindler K, Busetto L, Micic D, et al. European Guidelines for Obesity Management in Adults. Obes Facts. 2015;8(6):402-24.
38. Welbourn R, Hopkins J, Dixon JB, Finer N, Hughes C, Viner R, et al. Commissioning guidance for weight assessment and management in adults and children with severe complex obesity: Weight assessment and management clinics. Obes Rev. 2018;19(1):14-27.
39. Lau DCW, Douketis JD, Morrison KM, Hramiak IM, Sharma AM, Ur E, et al. 2006 Canadian clinical practice guidelines on the management and prevention of obesity in adults and children [summary]. CMAJ. 2007;176(8):S1-S13.
40. Obesity: clinical assessment and management | Guidance and guidelines | NICE [Internet]. Nice.org.uk. 2018 [cited 27 September 2018]. Available from: https://www.nice.org.uk/guidance/qs127.
41. Productivity Commission 2017, Data Availability and Use, Report No. 82, Canberra
42. Ramachandran D, Atlantis E, Markovic T, Hocking S, Gill T. Standard baseline data collections in obesity management clinics: A Delphi study with recommendations from an expert panel. Clin Obes. 2019;9(3):e12301.
43. Kapp JM, Peters C, Oliver DP. Research Recruitment Using Facebook Advertising: Big Potential, Big Challenges. J Cancer Educ. 2013;28(1):134-7.
44. David J. Stillwell MK. myPersonality project: Example of successful utilization of online social networks for large-scale social research. 2004.
45. Researchers from King's College London Report Findings in Medical Internet Research (The Use of Facebook in Recruiting Participants for Health Research Purposes: A Systematic Review). NewsRX LLC; 2017. p. 132.
46. Arcia A. Facebook Advertisements for Inexpensive Participant Recruitment Among Women in Early Pregnancy. Health Educ Behav. 2014;41(3):237-41.

47. Choi I, Milne DN, Glozier N, Peters D, Harvey SB, Calvo RA. Using different Facebook advertisements to recruit men for an online mental health study: Engagement and selection bias. Internet Interv. 2017;8:27-34.
48. Thornton L, Batterham PJ, Fassnacht DB, Kay-Lambkin F, Calear AL, Hunt S. Recruiting for health, medical or psychosocial research using Facebook: Systematic review. Internet Interv. 2016;4:72-81.
49. Fenner Y, Garland SM, Moore EE, Jayasinghe Y, Fletcher A, Tabrizi SN, et al. Web-based recruiting for health research using a social networking site: an exploratory study. J Med Internet Res 2012;14(1):e20.
50. What are the privacy settings for groups? Facebook Help Center, https://www.facebook.com/help/220336891328465?helpref=about_content (2019 accessed 15 April 2019).
51. Lite n' Easy Support Group 2021 [Available from: https://www.facebook.com/groups/388956834462251.
52. Sensis. Social Media Report 2017. . 2017.
53. Australia's most popular social media sites 2021: Civic Web Media; 2021 [cited 2021 1/5/2021]. Available from: https://www.civicwebmedia.com.au/australias-most-popular-social-media-sites/.
54. Rafiei Z. Factors contributing to the success of self-directed weight loss [Thesis]. Sydney, NSW: University of Sydney; 2016.
55. Johnston CA, Moreno JP, Gallagher MR, Wang J, Papaioannou MA, Tyler C, et al. Achieving long-term weight maintenance in mexican-american adolescents with a school-based intervention. J Adolesc Health. 2013;53(3):335-41.
56. Moores CJ, Bell LK, Miller J, Damarell RA, Matwiejczyk L, Miller MD. A systematic review of community-based interventions for the treatment of adolescents with overweight and obesity. Obes Rev. 2018;19(5):698-715.
57. Witham MD, Avenell A. Interventions to achieve long-term weight loss in obese older people: A systematic review and meta-analysis. Age Ageing. 2010;39(2):176-84.
58. Perez LG, Arredondo EM, Elder JP, Barquera S, Nagle B, Holub CK. Evidence-based obesity treatment interventions for Latino adults in the U.S.: a systematic review. Am J Prev Med. 2013;44(5):550-60.
59. Burton WM, White AN, Knowlden AP. A Systematic Review of Culturally Tailored Obesity Interventions among African American Adults. Am J Health Educ. 2017;48(3):185-97.
60. Littlewood R, Canfell OJ, Walker JL. Interventions to prevent or treat childhood obesity in Māori & Pacific Islanders: a systematic review. BMC Public Health. 2020;20(1):725.
61. Spees CK, Braun AC, Hill EB, Grainger EM, Portner J, Young GS, et al. Impact of a Tailored Nutrition and Lifestyle Intervention for Overweight Cancer Survivors on Dietary Patterns, Physical Activity, Quality of Life, and Cardiometabolic Profiles. J Oncol. 2019;2019:1503195.
62. Rosas LG, Azar KMJ, Lv N, Xiao L, Goldhaber-Fiebert JD, Snowden MB, et al. Effect of an Intervention for Obesity and Depression on Patient-Centered Outcomes: An RCT. Am J Prev Med. 2020;58(4):496-505.
63. Luybli M, Schmillen H, Sotos-Prieto M. School-Based Interventions in Low Socioeconomic Settings to Reduce Obesity Outcomes among Preschoolers: A Scoping Review. Nutrients. 2019;11(7):1518.

64. Goodfellow J, Agarwal S, Harrad F, Shepherd D, Morris T, Ring A, et al. Cluster randomised trial of a tailored intervention to improve the management of overweight and obesity in primary care in England. Implementation Sci. 2016;11(1):77.
65. Green MA, Strong M, Razak F, Subramanian SV, Relton C, Bissell P. Who are the obese? A cluster analysis exploring subgroups of the obese. J Public Health (Oxf.)2016;38(2):258-64.
66. Kettenring JR. The Practice of Cluster Analysis. Journal of Classification. 2006;23(1):3-30.
67. Ogden LG, Stroebele N, Wyatt HR, Catenacci VA, Peters JC, Stuht J, et al. Cluster analysis of the national weight control registry to identify distinct subgroups maintaining successful weight loss. Obesity. 2012;20(10):2039-47.
68. Rundle-Thiele S, Kubacki K, Tkaczynski A, Parkinson J. Using two-step cluster analysis to identify homogeneous physical activity groups. Marketing Intelligence & Planning. 2015;33(4):522-37.
69. Bennasar-Veny M, Yañez AM, Pericas J, Ballester L, Fernandez-Dominguez JC, Tauler P, et al. Cluster Analysis of Health-Related Lifestyles in University Students. Int J Environ Res Public Health. 2020;17(5).
70. O'Brien PE, McPhail T, Chaston TB, Dixon JB. Systematic Review of Medium-Term Weight Loss after Bariatric Operations. Obes Surg. 2006;16(8):1032-40.
71. Heshka S, Greenway F, Anderson JW, Atkinson RL, Hill JO, Phinney SD, et al. Self-help weight loss versus a structured commercial program after 26 weeks: A randomized controlled study. Am J Med. 2000;109(4):282-7.
72. Almandoz JP, Xie L, Schellinger JN, Mathew MS, Gazda C, Ofori A, et al. Impact of COVID -19 Stay-at-Home Orders on Weight-Related Behaviors Among Patients with Obesity. Clin Obes. 2020 Oct;10(5):e12386
73. Janssen M, Chang BPI, Hristov H, Pravst I, Profeta A, Millard J. Changes in Food Consumption During the COVID-19 Pandemic: Analysis of Consumer Survey Data From the First Lockdown Period in Denmark, Germany, and Slovenia. Front Nutr. 2021;8(60).
74. Pellegrini M, Ponzo V, Rosato R, Scumaci E, Goitre I, Benso A, et al. Changes in Weight and Nutritional Habits in Adults with Obesity during the “Lockdown” Period Caused by the COVID-19 Virus Emergency. Nutrients. 2020;12(7):2016.
75. Zachary Z, Brianna F, Brianna L, Garrett P, Jade W, Alyssa D, et al. Self-quarantine and weight gain related risk factors during the COVID-19 pandemic. Obes Res Clin Pract. 2020;14(3):210-6.
76. Chew HSJ, Lopez V. Global Impact of COVID-19 on Weight and Weight-Related Behaviors in the Adult Population: A Scoping Review. Int J Environ Res Public Health. 2021;18(4):1876.
77. Ramachandran D, Gill T. Impact of COVID-19 lockdown on self-managed weight loss journeys. Obes Res Clin Pract. 2020;14(4):386-7.
78. Heshka S, Anderson JW, Atkinson RL, Greenway FL, Hill JO, Phinney SD, et al. Weight Loss with Self-help Compared with a Structured Commercial Program: A Randomized Trial. J Am Med Assoc. 2003;289(14):1792-8.
79. Booth HP, Prevost TA, Wright AJ, Gulliford MC. Effectiveness of behavioural weight loss interventions delivered in a primary care setting: a systematic review and meta-analysis. Fam Pract. 2014;31(6):643-53.
80. Terranova CO, Brakenridge CL, Lawler SP, Eakin EG, Reeves MM. Effectiveness of lifestyle-based weight loss interventions for adults with type 2 diabetes: a systematic review and meta-analysis. Diabetes Obes Metab. 2015;17(4):371-8.

81. Williams, L. T., Barnes, K., Ball, L., Ross, L. J., Sladdin, I., & Mitchell, L. J. (2019). How Effective Are Dietitians in Weight Management? A Systematic Review and Meta-Analysis of Randomized Controlled Trials. Healthcare (Basel). 2019 Feb 1;7(1):20.
82. Phong Ching Lee JD. Pharmacotherapy for obesity. Aust Fam Physician. 2017;Volume 46(7):449-544.
83. Wing RR, Phelan S. Long-term weight loss maintenance. Am J Clin Nutr. 2005 Jul;82(1 Suppl):222S-225S.
84. Paxton S. Body image dissatisfaction, extreme weight loss behaviours: suitable targets for public health concerns? Health Promot J Austr.2000 Apr: Vol. 10, No. 1, 2000 Apr: 15-9-9
85. Zou H, Yin P, Liu L, Duan W, Li P, Yang Y, et al. Association between weight cycling and risk of developing diabetes in adults: A systematic review and meta-analysis. Diabetes Investig. 2021 Apr;12(4):625-632.
86. Rhee E-J. Weight Cycling and Its Cardiometabolic Impact. J Obes Metab Syndr. 2017;26(4):237-42.
87. Miles-Chan JL, Isacco L. Weight cycling practices in sport: A risk factor for later obesity? Obes Rev. 2021;22(S2):e13188.
88. Kovač Blaž MA. Obesity in the elderly, weight loss yes or no? Clinical Nutrition ESPEN 14 (2016) 42e57 56 5.
89. Levy AS, Heaton AW. Weight control practices of U.S. adults trying to lose weight. Ann Intern Med. 1993;119(7 Pt 2):661-6.
90. Hartmann-Boyce J, Boylan AM, Jebb SA, Fletcher B, Aveyard P. Cognitive and behavioural strategies for self-directed weight loss: systematic review of qualitative studies. Obes Rev. 2017;18(3):335-49.
91. Burke LE, Swigart V, Turk MW, Derro N, Ewing LJ. Experiences of self-monitoring: Successes and struggles during treatment for weight loss. Qual Health Res. 2009;19(6):815-28.
92. Fayet-Moore F, McConnell A, Cassettari T, Tuck K, Petocz P, Kim J. Discretionary intake among Australian adults: prevalence of intake, top food groups, time of consumption and its association with sociodemographic, lifestyle and adiposity measures. Public Health Nutr. 2019;22(9):1576-89.
93. Craig J. Meal Replacement Shakes and Nutrition Bars: Do They Help Individuals With Diabetes Lose Weight? Diabetes Spectr. 2013;26(3):179.
94. Astbury NM, Piernas C, Hartmann-Boyce J, Lapworth S, Aveyard P, Jebb SA. A systematic review and meta-analysis of the effectiveness of meal replacements for weight loss. Obes Rev. 2019;20(4):569-87.
95. Jatrana S, Pasupuleti SS, Richardson K. Nativity, duration of residence and chronic health conditions in Australia: do trends converge towards the native-born population? Soc Sci Med. 2014;119:53-63.
96. Kennedy S, Kidd MP, McDonald JT, Biddle N. The Healthy Immigrant Effect: Patterns and Evidence from Four Countries. Journal of International Migration and Integration. 2015;16(2):317-32.
97. Australia's health 2018, Table of contents - Australian Institute of Health and Welfare [Internet]. Australian Institute of Health and Welfare. 2018 [cited 28 June 2018]. Available from: https://www.aihw.gov.au/reports/australias-health/australias-health-2018/contents/table-of-contents.
98. Brawer R, Brisbon N, Plumb J. Obesity and Cancer. Prim Care. 2009 Sep;36(3):509-31

99. Overweight, obesity and cancer: Cancer Council; [Available from: https://www.cancercouncil.com.au/1in3cancers/lifestyle-choices-and-cancer/overweight-obesity-and-cancer/.
100. Anderson AS, Caswell S, Wells M, Steele RJC. Obesity and lifestyle advice in colorectal cancer survivors – how well are clinicians prepared? Colorectal Dis. 2013;15(8):949-57.
101. Metzgar CJ, Preston AG, Miller DL, Nickols-Richardson SM. Facilitators and barriers to weight loss and weight loss maintenance: a qualitative exploration. J Hum Nutr Diet. 2015;28(6):593-603.
102. Lim S, Smith CA, Costello MF, MacMillan F, Moran L, Ee C. Barriers and facilitators to weight management in overweight and obese women living in Australia with PCOS: a qualitative study. BMC Endocr Disord. 2019;19(1):106.
103. Elfhag K, Rössner S. Who succeeds in maintaining weight loss? A conceptual review of factors associated with weight loss maintenance and weight regain. Obes Rev. 2005 Feb;6(1):67-85
104. Befort CA, Stewart EE, Smith BK, Gibson CA, Sullivan DK, Donnelly JE. Weight maintenance, behaviors and barriers among previous participants of a university-based weight control program. Int J Obes. 2008;32(3):519-26.
105. O'Hara BJ, Phongsavan P, Venugopal K, Eakin EG, Eggins D, Caterson H, et al. Effectiveness of Australia's Get Healthy Information and Coaching Service®: Translational research with population wide impact. Prev Med. 2012;55(4):292-8.
106. Althubaiti A. Information bias in health research: definition, pitfalls, and adjustment methods. Journal of Multidisciplinary Healthcare. 2016;:211.106. Bethlehem J. Selection Bias in Web Surveys. International Statistical Review / Revue Internationale de Statistique. 2010;78(2):161-88.
107. Cousineau D. How many decimals? Rounding descriptive and inferential statistics based on measurement precision. Journal of Mathematical Psychology. 2020;97:102362.
108. Bethlehem J. Selection Bias in Web Surveys. International Statistical Review / Revue Internationale de Statistique. 2010;78(2):161-88.
109. Ads Manager Basics Facebook for Business; n.d [Available from: https://www.facebook.com/business/help/415745401805534.
110. Wyatt HR, Grunwald GK, Mosca CL, Klem ML, Wing RR, Hill JO. Long-term weight loss and breakfast in subjects in the National Weight Control Registry. Obes Res. 2002 Feb;10(2):78-82. doi: 10.1038/oby.2002.13. PMID: 11836452.
111. Vieira PN, Teixeira P, Sardinha LB, Santos T, Coutinho S, Mata J, et al. [Success in maintaining weight loss in Portugal: the Portuguese Weight Control Registry]. Ciencia & saude coletiva. 2014;19(1):83-92.
112. Feller S, Müller A, Mayr A, Engeli S, Hilbert A, de Zwaan M. What distinguishes weight loss maintainers of the German Weight Control Registry from the general population? Obesity (Silver Spring). 2015;23(5):1112-8.
113. Karfopoulou E, Brikou D, Mamalaki E, Bersimis F, Anastasiou CA, Hill JO, et al. Dietary patterns in weight loss maintenance: results from the MedWeight study. Eur J Nutr. 2017;56(3):991-1002.
114. Soini S, Mustajoki P, Eriksson JG. Weight loss methods and changes in eating habits among successful weight losers. Ann Med. 2016;48(1-2):76-82.

Appendixes

Appendix A: Published paper: 'Food Trends and Popular Nutrition Advice Online—Implications for Public Health'

Appendix B: Results tables from statistical analysis in Chapter 7

- B1: Results of multiple linear regression for absolute weight change in kilograms. Models using initial body weight in kilograms instead of initial BMI (presented in the thesis)
- B2: Results of multiple binary logistic regression for absolute weight loss (all models)

Appendices C: Ethics approval letters

- C1: Project number 2017/755: Study of baseline data collected by weight management clinics in Australia
- C2: Project number 2018/526: Ethics approval letter for 'A Study of DIY Weight Loss in Australia' dated 30 July 2018
- C3: Project number 2018/526: Approval for modifications dated 21 August 2019
- C4: Project number 2018/526: Approval for modifications dated 17 December 2019
- C5: Project number 2018/526: Approval for modifications dated 6 May 2020

Appendix D: Survey questionnaires

- D1: Pilot study survey questionnaire: DIY weight loss in Australia
- D2: Baseline survey questionnaire: Australian self-managed weight loss survey
- D3: Follow-up survey questionnaire: Australian self-managed weight loss follow-up survey
- D4: Additional survey questions: Self-managed weight loss survey—COVID-19 impact

Appendix E: Study website

Appendix F: Study-specific online supplementary materials for publications

- F1: Published online supplementary material for 'Standard Baseline Data Collections in Obesity Management Clinics: A Delphi Study with Recommendations from an Expert Panel'

- F2: Online supplementary material for ‘An exploration of recruitment through Facebook to an online survey on self-managed weight loss in Australia—Lessons learned’ under review for publication

Appendix G: Paulette Isabel Jones PhD Completion Scholarship award letter

Appendix A: Published paper: ‘Food Trends and Popular Nutrition Advice Online—Implications for Public Health

Food Trends and Popular Nutrition Advice Online – Implications for Public Health

Divya Ramachandran*[1,2], James Kite[1], Amy Jo Vassallo[1], Josephine Y Chau[1], Stephanie Partridge[1,3], Becky Freeman[1], Timothy Gill[1,2]

1. Prevention Research Collaboration, Sydney School of Public Health and Charles Perkins Centre, Faculty of Medicine and Health, University of Sydney NSW, Australia

2. The Boden Institute of Obesity, Nutrition, Exercise & Eating Disorders, Sydney School of Public Health and Charles Perkins Centre, Faculty of Medicine and Health, University of Sydney NSW, Australia

3. Westmead Applied Research Centre, Faculty of Medicine and Health, University of Sydney NSW, Australia

Abstract

Objectives: Consumers routinely seek health and nutrition-related information from online sources, including social media platforms. This study identified popular online nutrition content to examine the advice and assess alignment with the Australian Guideline to Healthy Eating (AGHE).

Methods: We used Facebook page "likes" as an indicator of popularity to identify online nutrition and diet content. Websites and blogs associated with pages that had more than 100,000 Australian likes on 7th September 2017 were included. The dietary advice promoted was collected and compared with the AGHE across nine categories (Vegetables, Fruits, Legumes, Grains, Lean Meat, Dairy/Alternative, Fat, Sugar, Salt)

Results: Nine Facebook pages met the inclusion criteria. The four most-liked pages were hosted by celebrities. Only two pages and their associated websites had advice consistent with AGHE recommendations across all nine categories reviewed. The concept of "real food" was a popular theme online. While most sources advocated increasing vegetable consumption and reducing processed food, other advice was not evidence-based and frequently deviated from the AGHE.

Discussion: Health information seekers are exposed to a variety of online dietary information and lifestyle advice. While few public health goals are promoted, there are many contradictions, as well as deviations from the AGHE, which can create confusion among health information seekers. Public health organisations promoting AGHE on Facebook are few and not as popular.

Conclusion: Public health organisations need to be more engaged on popular internet platforms such as Facebook. The prevailing popular nutrition advice online may increase consumer confusion, scepticism and even avoidance of dietary advice. Proactive efforts are needed by public health organisations, in partnership social marketing experts, to create and share engaging and accurate nutrition content. Partnership with celebrities should be explored to improve reach and impact of evidence-based diet recommendations online.

Keywords: public health, health communication, diet fads, nutrition guidelines, social media, internet

Correspondence: Divya Ramachandran, MPH; The Boden Institute, Level 2, Charles Perkins Centre, D 17 Johns Hopkins Drive, Camperdown NSW 2006 Australia; Email: divya.ramachandran@sydney.edu.au

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Introduction

Optimal nutrition is important for improved health and wellbeing and reducing the risk of diet-related health conditions including chronic disease [1]. In Australia, the National Health and Medical Research Council (NHMRC) publishes the Australian Dietary Guidelines (ADG) and the Australian Guidelines to Healthy Eating (AGHE) for healthy eating based on the best available scientific evidence [2]. However, most Australians do not follow recommended guidelines for healthy eating [3]. Consumers have reportedly found dietary guidelines confusing [4]. This confusion is aggravated by exposure to conflicting and changing nutrition information [5]. The continuously evolving body of nutrition evidence and inaccurate news media reporting contributes to the public perception that "the science keeps changing" [6]. Exposure to these contradictions provokes negative responses ranging from consumer scepticism to anger and anxiety [7]. In some, it induces a sense of inaction and avoidance of all guidelines [5,6] or a backlash which can potentially deter intentions to adopt healthy lifestyle behaviours [5]. In others, it promotes an active search for 'truth' [7] or looking for information from sources perceived to be neutral and free from hidden agendas [8].

Online health and nutrition information seeking is a common phenomenon [9]. A national survey in the US reported that nearly 60% of all adults accessed health information online with over a quarter accessing it through social media [9]. Nearly 32% of US adults shared their perceptions and knowledge of health online, and 9% of social media users had started or joined a health-related group. Information on diet, nutrition, vitamins and supplement information has been reported as one of the more common reasons why people use the internet [10]. A similar phenomenon is evident in Australia, with a study in Western Australia showing a dramatic increase in online nutrition information seeking, from less than 1% in 1995-2001 to 33.7% of all adults in 2012 [11].

In order for public health organizations to address nutrition misinformation, it is essential to first understand the current online nutrition information landscape. This study aimed to identify popular online nutrition content in Australia and examine the dietary advice promoted and its alignment with the AGHE.

Methods

Study Design and Approach

Facebook is the most popular social media platform [12] and searching for health information on social media is a growing phenomenon [13]. We therefore, used Facebook "likes" as an indicator of popularity to identify most popular diet and nutrition content producers in Australia. The "About" section of Facebook pages provide a description of the page including links to associated websites and blogs. These websites or blogs contained the page hosts' food philosophy and diet advice. In order to do a contained study, we excluded analysing individual Facebook posts, but extracted relevant content from the "About section" of the Facebook page, and from the publicly available content on associated websites or blogs.

Sample Selection

Socialbakers [14], a social media analytics company, lists pages with most likes on their website. We used data available on Socialbakers on 7th September 2017 and identified the most "liked" Facebook pages in Australia that made recommendations on healthy eating. All categories of pages were examined, however only the categories "celebrities", "brands" and "lifestyle" under "communities" contained the pages of interest. Pages that had 100,000 Australian "likes" or more under these three categories were extracted (n =1304). We then excluded pages that were not related to food (n= 1120), food and beverage brands, industry groups, and food retailers (n = 136), recipe pages (n = 28), and news service pages that simply channelled health and nutrition news articles from various sources but did not develop original content (n=7), and thirteen pages remained. Three of these pages (Clean Eating Recipes, Just Eat Real Food, Fitness Recipes) catered to paleo, vegan, gluten-free, dairy-free lifestyles; and one page (Skinnytastes) promoted low-calorie eating. However, the content in these pages and associated websites did not contain explicit statements comparable with AGHE food groups, and so were subsequently excluded from the sample, leaving a final sample of nine pages for analysis.

Data Collection

We used a two-step approach to first, describe the popular Facebook pages, and second, to examine the dietary advice made by the authors of pages on their websites or blogs. Data recorded included Facebook page name, associated website/blog link, and the number of global and Australian page 'likes'. All websites had either main or sub-pages or blog posts that indicated author's food preferences and advice on what to eat or not.

Step 1 – Description of popular Facebook Pages

In order to describe the pages, we developed a unique coding scheme to categorise type of author, diet pattern or theme, references to dietary guidelines, using the definitions below.

Author type	**The type of page host, including 'Celebrities', 'Weight loss programs', 'Dietitians/nutritionists', or 'Other'**

Diet pattern or theme	Whether the page promoted a particular theme or pattern of diet, including: • 'Real food' (a diet consisting of organic whole foods that are as close to their natural state as possible, with an avoidance of processed foods); • 'Paleo' (consumption of foods presumed to have been the foods available to or consumed by humans during the Paleolithic era. Therefore, grains, dairy, oil, sugar, processed foods are all excluded) • 'Calorie-count' (diets that recommend tracking calories consumed in a day) • 'Raw' (diets that emphasize mostly raw food, rather than cooked) • 'Vegan' (diet based on plant-based foods, avoiding animal-based foods including dairy, eggs and honey) • 'Sugar free' (a diet that emphasizes elimination of almost all sugar from the diet) • Dairy free (a diet devoid of dairy products) • Gluten free (a diet devoid of wheat, wheat products and barley) • 'Other' (other diet themes – e.g. fruit and vegetables for children, protein powders, Gut and Psychology Syndrome or GAPs Diet)
Reference to dietary guidelines	Whether there was any reference or mention of alignment with any government-backed dietary guidelines.

Step 2 – Assessment of the dietary advice and alignment with AGHE

Data extraction for this step was guided by three questions:

1. Do the authors recommend eating, limiting, and/or avoiding food groups?
2. Do authors specify items to eat, limit, and/or avoid within the food groups?
3. Do authors prescribe the selection of food in any manner (for example: organic, grass-fed, pesticide-free, non-GMO, canned, frozen), or cooking technique (for example: soaking, fermenting).

The content extracted was recorded verbatim along with a link to the content.

Two reviewers (DR and AV) independently coded the content, and summarised diet advice using the three questions listed above as a guide. Where coding differences could not be reconciled between the two primary reviewers, they were referred to a third reviewer (JK). Examples of coding are available in the Appendix. We then assessed the coded summaries for alignment with the AGHE recommendations for each of the five food groups - vegetables, fruit, lean meat, grain, dairy/alternative; we coded legumes separately as they are included under vegetables as well as lean meat food groups in AGHE; and for fat, sugar and salt.

Results

Step 1 – Description of popular Facebook Pages

As described above, nine pages were found to meet the eligibility criteria for inclusion: Michelle Bridges 12 Week Body Transformation (12WBT), Jamie Oliver, Chef Pete Evans (Pete Evans), I Quit Sugar (IQS), The Healthy Mummy (Healthy Mummy), Super Healthy Kids (SHK), Quirky Cooking, Weight Watchers AUNZ (Weight Watchers), and Rebel Dietitian.

As shown in **Table 1,** these nine pages had nearly 16 million 'likes', with 2,967,788 'likes' from Australia. 12WBT had the highest number of Australian likes at 778,066, whereas Rebel had the least of those sites in our sample at 104,132 likes. The four most popular pages (12WBT, Jamie Oliver, Pete Evans and IQS) were hosted by celebrities. Two pages (SHK and Rebel Dietitian) were hosted by registered dietitians, two pages (Weight Watchers and Healthy Mummy) were commercial weight loss programs.

All pages except three (Healthy Mummy, SHK and Weight Watchers) promoted "real food"- or the shift to consuming organic whole foods that are as close to their natural state as possible, with an avoidance of processed foods. In addition, a variety of dietary patterns and themes such as paleo, gluten-free, sugar-free, raw, vegan and their variants were promoted. These niche diets were promoted as healthy ways of eating for everybody and not limited only to specific patient groups such as coeliac patients or those with allergies and intolerances. Six of the pages (12WBT, Jamie Oliver, IQS, Healthy Mummy, Weight Watchers, and SHK) quoted or referenced government-recommended dietary guidelines including those of Australia, UK and US. Two pages (12WBT and Weight Watchers) recommended tracking calories consumed.

Table 1. Top Nine Facebook Pages in Australia that provide nutrition advice (as on 7th September 2017)

Facebook Page	URL	Australian Likes	Total Likes	Author	Diet type / theme	Reference to Dietary Guidelines
Michelle Bridges 12 Week Body Transformation (12WBT)	https://www.12wbt.com/	728 214	778 066	celebrity	real food, calorie-count	Yes - Australian Dietary Guidelines [2]
Jamie Oliver	http://www.jamieoliver.com/	450 198	6 525 310	celebrity	real food	Yes - UK Guidelines [26]

Chef Pete Evans (Pete Evans)	http://www.thepaleoway.com	440 339	1 528 167	celebrity	paleo, real food	no
I Quit Sugar (IQS)*	https://iquitsugar.com/,http://www.sarahwilson.com	402 756	980 875	celebrity	sugar free, real food	Yes – Australian Dietary Guidelines [2]
The Healthy Mummy (Healthy Mummy)	https://www.healthymummy.com/	312 367	361 663	Other	Other –includes Healthy Mummy protein shakes	Yes – Australian Dietary Guidelines [2]
Super Healthy Kids (SHK)	http://www.superhealthykids.com	204 120	3 274 660	dietitian	Other – focus on fruit and vegetable intake for children	Yes – US Dietary Guidelines [27]
Quirky Cooking	https://www.quirkycooking.com.au/	198 340	267 268	Other	real food; paleo, dairy-free, gluten-free, other -GAPS Diet	no
Weight Watchers AUNZ (Weight Watchers)	https://www.weightwatchers.com/au/	127 322	160 867	weight loss program	calorie-count	yes – Australian Dietary Guidelines [2]
Rebel Dietitian (Rebel)	https://rebeldietitian.us	104 132	1 948 694	dietitian	real food, vegan, raw.	No

*Note: The IQS website was taken down May 31, 2018, however the Sarah Wilson website and blog as well as e-Books are still available online.

Step 2 – Assessment of the dietary advice and alignment with AGHE

Table 2 indicates alignment or deviation/ contradiction between advice of popular pages and the AGHE on what to eat or limit. Of the nine pages and associated websites reviewed, two (12 WBT, Weight Watchers) aligned with all nine AGHE categories. Three (Rebel Dietitian, Healthy Mummy and SHK) aligned with 8 AGHE categories; and one aligned with the AGHE on 5 (Quirky Cooking), 4 (Jamie Oliver), 3 (Pete Evans), and 2 (IQS) categories. Two (Jamie Oliver, SHK) deviated from the guidelines only due to insistence on organic versions. IQS deviated from the guidelines by an inappropriate focus on fructose elimination.

Table 2 – Alignment of popular online dietary advice with the Australian Guide to Healthy Eating

Page	Vegetables	Fruit	Legumes	Grains	Lean Meat	Dairy/ Alternative	Fat	Sugar	Salt
Michelle Bridges 12 Week Body Transformation (12WBT)	√	√	√	√	√	√	√	√	√
Jamie Oliver	X*	X*	√	√	X*	X*	X*	√	√
Chef Pete Evans (Pete Evans)	√	X	X	X	√	X	X	√	X
I Quit Sugar (IQS)	√	X	X	X	X	√	X	X**	X
The Healthy Mummy (Healthy Mummy)	√	√	√	√	√	√	X	√	√
Super Healthy Kids (SHK)	√	√	√	√	X	√	√	√	√
Quirky Cooking	√	√	√	√	X	√	X	X	X
Weight Watchers AUSNZ (Weight Watchers)	√	√	√	√	√	√	√	√	√
Rebel Dietitian	√	√	√	√	√	√	X	√	√

√ -aligned with AGHE.X-conflicting / contradictory to AGHE

* consumption advice aligns with AGHE but stipulates organic versions as healthier.
** consumption advice aligns with AGHE, but advice to eliminate fructose is not supported by evidence.

Table 3 provides the advice of popular online authors summarised by food groups. *Italics* have been used where:

1. the advice is directly contradictory to AGHE such as limiting fruit, dropping food groups, eating saturated fat; and
2. non-evidence-based advice that overstate the health benefits or harms of categories and sub-categories of food that deviates from government guidelines – for example

eating organic food, choosing Himalayan salt, replacing sugar with natural sugar or eliminating fructose.

Only two websites, 12WBTand Weight Watchers, were fully consistent with recommendations in the AGHE, across all food groups, fat, sugar and salt. Jamie Oliver was consistent on all nine AGHE recommendations; however, the advice on fruits, vegetables, lean meat and dairy goes beyond the guidelines by stipulating organic versions of are healthier. Similarly, the website of SHK too aligned on all nine categories, but promotes organic meat. The AGHE does not recommend organic varieties over conventionally grown foods, as there is no consistently proven nutritional advantage [15]. Further, Food Standards Australia and New Zealand (FSANZ) specify a maximum residual limit (MRL) for agricultural or veterinary chemical residue that is legally allowed for all food sold in Australia [16] ensuring conventionally grown food is safe for consumption. Thus, insisting on only organic versions as the healthier option may compromise attempts to increase fresh food consumption among all Australians due to the additional costs and lesser availability of organic produce. The Healthy Mummy and Rebel Dietitian were aligned with AGHE on all food groups, salt and sugar except in the promotion of saturated fats.

Pete Evans, Quirky Cooking, and IQS presented the most contradictions with AGHE, with advice including limiting fruit (Pete Evans, IQS) to going dairy-free (Pete Evans and Quirky Cooking) or gluten-free or dropping grains completely. All three promoted "real food" versions such as grass-fed meat, pastured and free-range poultry and eggs, wild caught fish and espoused consuming full-fat dairy, and saturated fats, including coconut oil. Although these websites limited sugar, IQS advice claimed only fructose elimination (component of fruits) was more important than addressing total added sugars. These websites also promoted Himalayan, Pink or Celtic varieties of salt.

Discussion and Conclusion

Our assessment revealed that the most popular nutrition information pages on Facebook are often hosted by celebrities, followed by dietitians, weight loss programs or other persons. Only two were fully aligned with government guidelines, while the rest deviated from AGHE in some way – either through direct contradiction on one or more categories, misinformation, or through overly-restrictive recommendations, exposing health information seekers to conflicting nutrition information. While some public health goals such as consumption of vegetables and avoiding 'junk' foods are prominent, the balance of the advice does not align closely with AGHE. The "real food" trend characterized by organic food choices is very popular online within our study sample. Public health organisations promoting AGHE on Facebook are few and have negligible likes compared with popular pages. Proactive efforts are needed by public health organizations in partnership with social media and social marketing experts to leverage Facebook to promote dietary guidelines. Partnering with celebrities may be a vehicle to boost reach of evidence-based nutrition information and countering misinformation, by improving quality and consistency of nutrition messaging.

Table 3 – Diet and Nutrition Advice of popular Facebook Pages / Websites

Page	Vegetables	Fruit	Legumes	Grains	Lean Meat, poultry, fish, eggs	Dairy/Alternative	Fats	Sugar	Salt
Michelle Bridges 12 Week Body Transformation (12WBT)	Eat all vegetables. Choose non-starchy vegetables. 5 serves a day.	Eat fruit. Choose seasonal, variety. Avoid dried fruit and juice	Eat legumes	Eat wholemeal or whole grain.	Eat meat, poultry, fish, eggs. Eat lean, grilled. 1 serve a day.	Eat dairy or alternatives. Choose low-fat option. Two serves a day	Limit butter/margarine Use unsaturated fat options. Avoid deep-frying	Eliminate soft drinks. Eliminate salt.	Chose low-sodium foods
Jamie Oliver	Eat vegetables. Choose variety of colours, seasonal, *organic.*	Eat fruit. Choose variety of colours, seasonal, *organic.*	Eat beans. Regularly.	Eat wholemeal or whole grain. Chose complex carbohydrates.	Eat. Quality over quantity. *Choose organic, free-range or higher-welfare, responsibly sourced.*	Eat dairy. Choose low fat, reduced saturated fat and reduced sugar. *Choose organic.*	Eat unsaturated fat. *Coconut oil (saturated fat) may be exception.*	Avoid added sugar.	Reduce salt.
Chef Pete Evans (Pete Evans)	Eat vegetables. Choose fibrous (non-starchy) vegetables and greens. *Choose cultured and fermented vegetables.*	*Limit fruit*	*avoid legumes*	*avoid grains*	Eat meat, poultry, fish and eggs. *Choose grass-fed meat, pastured and free-range poultry and eggs, wild caught fish*	avoid dairy	*eliminate vegetable oils. Use olive or nut oil unheated. use natural fats such as duck fat, tallow, pastured lard. use coconut oil.*	Eliminate refined sugar.	*Choose Himalayan and Celtic Sea salt*
I Quit Sugar (IQS)	Eat vegetables. Choose variety of colours. Plenty. Maximise green vegetables.	*Limit fruit.* Avoid dried fruit and juice	*Avoid legumes.* If eaten then soak / activate.	limit carbohydrates. *Choose Gluten-free.* Use fermented, sprouted, wholegrain.	Eat meat, poultry, eggs and fish. *Choose sustainable, organic, grass-fed, grain-fed (organic grain), free range*	*Eat full fat dairy. Eliminate low-fat products.*	*Eat saturated fats. Avoid polyunsaturated fatty acids.* Avoid omega 3 supplements. Get Omegas from food sources. Eliminate transfats.	*eliminate fructose. eat glucose, maltose and lactose in moderation.*	Eliminate refined table-salt. *Choose pink salt, whole food sources of salt.*

The Healthy Mummy (Healthy Mummy)	Eat vegetables	Eat fruit	Eat legumes and beans. Use dried or canned varieties.	Eat wholegrains. Try quinoa a *gluten-free* grain.	Eat. Choose less calorie, lean, low-fat, high protein like turkey.	Avoid high sugar dairy.	*Eat saturated fats, eat coconut oil* Avoid processed fats	Eliminate soft drinks	reduced salt or no salt
Super Healthy Kids (SHK)	Eat a variety of fresh, frozen, canned, dried, raw or cooked vegetables	Eat fresh, frozen, canned. Limit fruit juice. or dried fruit.	Eat legumes	Eat wholegrain	*Eat organic or hormone free*	Eat low fat/fat free dairy	Avoid trans fat		Salt – not too much
Quirky Cooking	Eat vegetables. *Eat organic.*	Eat fruits. Avoid fruits affected by pesticides. *Eat organic.*	Eat Legumes. Soaked.	*Eat grain free and/or gluten free/ low gluten* Pesticide free, soaked, sprouted, fermented grains	*Eat grass fed, free-range, organic meat*	*Avoid dairy, except for butter/ghee*	*Eat saturated fats. avoid polyunsaturated vegetable oils. choose macadamia oil, tallow, duck fat, or ghee.* Chose fats with high smoke point.	Avoid refined sugar. Replace with more natural sugars.	*Choose Himalayan or Celtic Salt*
Weight Watchers AUSNZ (Weight Watchers)	Eat vegetables. choose variety and in season	Eat fruit. Variety and In Season	Eat pulses as a meat replacement	Eat wholegrains	Eat lean meats	Eat low fat dairy	Eat vegetable, nut and seed oils	limit sugar	limit sugar
Rebel Dietitian	Eat a variety of vegetables	Eat a variety of fruit. Naturally dried fruit is ok	eat legumes. Minimally processed. Soaked.	Eat wholegrains Recommend soaking. Avoid processed grains	limit meat and processed meat. If eaten, choose organic. Avoid fish and shell-fish products - toxic contaminants.	Limit dairy	avoid animal sources of saturated fat. use unrefined and cold-pressed oils at room temperature *Sparingly use. saturated plant-based fat for cooking*	avoid added sugars, avoid processed sugars	Iodised salt

Note: Italicised text indicate non-evidence-based advice or those that deviate from AGHE.

Although the sources we reviewed were consistent with AGHE on increasing vegetable consumption and limiting sugar and 'junk foods,' food fads and misinformation were otherwise common. Promotion of 'niche' dietary patterns such as gluten-free and diary-free are concerning because they are promoted to everybody, and not limited only to special patient groups for whom they may be necessary. Equally, although some health benefits have been reported in small samples and for specific health conditions for the Paleo diet [17] there is no evidence around its long-term safety and efficacy within the general population. Paleo pages' advice to the general population to eat saturated fat, exclude grains and legumes, and exclude dairy not only directly contradict official dietary guidelines, but can potentially aggravate the problem of Australians not eating minimum recommended serves of several food groups [3]. While the government guidelines are evidence-based and promote balanced diets drawing on all food groups, diet trends such as promotion of coconut oil and pink salt, or arousing public fear of fructose, deviate from guidelines [18]. Such emphasis to consume or eliminate particular foods or food components, and the trend of dropping entire food groups, create fertile ground for contradictory nutrition messaging and may lead people to doubt dietary guidelines and health recommendations in general [5].

The "real food" trend is predominant online and promoted across popular Facebook pages. While there are no formal definitions for "real food," the pages in our study broadly refer to "real food" as organic and responsibly sourced whole foods, and exclusion of highly processed foods. Sustainability and sources of food appear to be important to Facebook followers of popular nutrition pages. This is consistent with findings from an earlier study on food beliefs and perceptions of Australians [18]. Public health organizations can learn much from popular pages on fostering public engagement by linking discussions on healthy eating with other values important to Australians, such as environmental sustainability and animal welfare.

The lack of Facebook pages dedicated to the promotion of government dietary guidelines amidst various popular pages was particularly striking. For example, pages of Nutrition Australia [19] and DAA [20] had less than 25,000 likes and seemed to be followed by professional nutritionists and dietitians, rather than by the general public. We also found a single post on Australian Dietary Guidelines on the page of Department of Health [21] which had less than 75,000 likes. An earlier study looking for Facebook presence of public health organizations also found only one nutrition-related page - that of Nutrition Australia [22]. It appears that current online dissemination of evidence-based dietary guidelines does not have a large reach in the general population and lacks a strong enough presence on Facebook to counter misinformation propagated by popular pages.

Our study finds a clear opportunity for public health organizations and health communicators to leverage Facebook to promote healthy eating guidelines. For example, public health organizations can create Facebook pages dedicated to promoting healthy eating, by disseminating evidence-based guidelines, and countering misinformation. Content should be tailored in light of popular online nutrition themes and broader food choice issues identified in this study and leveraged along with effective Facebook strategies identified in existing research [22]. Building a network and reaching audiences on Facebook is not easy. Celebrity-power, on the other hand, allows their pages to have vast following and social media influence. Positive influences that celebrities can have on public health has been highlighted before [23] and this is exemplified by popular and government response to Jamie Oliver's Ministry of Food [24] and the more recent Sugar Smart UK [25] campaigns. We recommend public health organizations explore partnerships with celebrities in promoting accurate healthy eating guidelines. We believe this can vastly improve reach and impact of nutrition and diet communication.

Study Limitations

As Facebook is the single largest social media platform, we used number of "likes" to extrapolate nutrition websites that are popular in Australia. It is possible that some popular dietary trends not promoted on Facebook or did not have more than 100,000 Facebook likes were not included in our study (for example intermittent fasting and ketogenic diets). We did not analyse data across all online and social platforms or quantify repetitions of themes within these platforms. Nonetheless, while not definitive, the approach taken may be a reasonable indicator of the predominant nutrition and food choice related themes trending, to inform public health agencies in approaching nutrition communication efforts. As a next step, research examining effectiveness of a dedicated evidence-based nutrition Facebook page, and countering misinformation is recommended. Celebrity partnership may be explored for such a page along with assessment of reach and impact.

Conclusion

Our study shows that that the popular diet and nutrition information websites are not fully aligned with evidence-based guidelines. Even those popular pages that reference government guidelines do so with their own interpretation and perceptions, which can create confusion among online health information seekers. A concentrated effort is required to promote healthy eating guidelines to the general public and counter the misinformation easily accessible online. Such online efforts may be well served by beginning with Facebook given its near universal popularity and reach.

References

1. Nutrition | National Health and Medical Research Council [Internet]. Nhmrc.gov.au. 2018 [Internet]. 2017 [cited 7 September 2017]. Available from: https://www.nhmrc.gov.au/health-topics/nutrition.

2. Nhmrc.gov.au. Australian Dietary Guidelines (2013) | National Health and Medical Research Council [Internet]. 2018 [cited 15 June 2015]. Available from: https://www.nhmrc.gov.au/guidelines-publications/n55.

3. 4364.0.55.012 - Australian Health Survey: Consumption of Food Groups from the Australian Dietary Guidelines, 2011-12 [Internet]. Abs.gov.au. 2018 [cited 12 June 2018]. Available from: http://www.abs.gov.au/ausstats/abs@.nsf/mf/4364.0.55.012.

4. Boylan S, Louie JCY, Gill TP. 2012. Consumer response to healthy eating, physical activity and weight-related recommendations: a systematic review. *Obes Rev.* 13(7), 606-17. PubMed https://doi.org/10.1111/j.1467-789X.2012.00989.x

5. Nagler RH. 2014. Adverse outcomes associated with media exposure to contradictory nutrition messages. *J Health Commun.* 19(1), 24-40. PubMed https://doi.org/10.1080/10810730.2013.798384

6. Goldberg JP, Sliwa SA. 2011. Communicating actionable nutrition messages: challenges and opportunities. *Proc Nutr Soc.* 70(1), 26-37. PubMed https://doi.org/10.1017/S0029665110004714

7. Vardeman JE, Aldoory L. 2008. A Qualitative Study of How Women Make Meaning of Contradictory Media Messages About the Risks of Eating Fish. *Health Commun.* 23(3), 282-91. PubMed https://doi.org/10.1080/10410230802056396

8. Ward PR, Henderson J, Coveney J, Meyer S. 2012. How do South Australian consumers negotiate and respond to information in the media about food and nutrition?: The importance of risk, trust and uncertainty. *J Sociol (Melb).* 48(1), 23-41. https://doi.org/10.1177/1440783311407947

9. Fox S. The Social Life of Health Information, 2011 [Internet]. Pew Research Center: Internet, Science & Tech. 2011 [cited 9 November 2015]. Available from: http://www.pewinternet.org/2011/05/12/the-social-life-of-health-information-2011/.

10. Pew Research Center. Internet, Science & Tech. Online Health Search [Internet]. 2006 [cited 9 November 2015]. Available from: http://www.pewinternet.org/files/old-media/Files/Reports/2006/PIP_Online_Health_2006.pdf.pdf.

11. Pollard CM, Pulker CE, Meng X, Kerr DA, Scott JA. 2015. Who Uses the Internet as a Source of Nutrition and Dietary Information? An Australian Population Perspective. *J Med Internet Res.* 17(8), e209. PubMed https://doi.org/10.2196/jmir.4548

12. Sensis Social Media Report 2017. 2017 [cited 30 August 2017]. Available from: https://www.sensis.com.au/asset/PDFdirectory/Sensis-Social-Media-Report-2017.pdf.

13. Shaw RJ, Johnson CM. 2011. Health Information Seeking and Social Media Use on the Internet among People with Diabetes. *Online J Public Health Inform.* 3(1). PubMed https://doi.org/10.5210/ojphi.v3i1.3561

14. Socialbakers.com. Social Media Marketing, Statistics & Monitoring Tools [Internet]. 2017 [cited 7th September 2017]. Available from: http://www.socialbakers.com/.

15. Is organic food better for my health? – Dietitians Association of Australia [Internet]. Daa.asn.au. 2018 [cited 15 June 2018]. Available from: https://daa.asn.au/smart-eating-for-you/smart-eating-fast-facts/healthy-eating/is-organic-food-better-for-my-health/.

16. Food Standards Australia New Zealand [Internet]. 2018 [cited 24 July 2018]. Available from: http://www.foodstandards.gov.au/consumer/chemicals/maxresidue/Pages/default.aspx.

17. Manheimer EW, van Zuuren EJ, Fedorowicz Z, Pijl H. 2015. Paleolithic nutrition for metabolic syndrome: systematic review and meta-analysis. *Am J Clin Nutr.* 102(4), 922-32. PubMed https://doi.org/10.3945/ajcn.115.113613

18. Dietitians Association of Australia – Hot Topics [Internet]. Daa.asn.au. 2018 [cited 24 May 2018]. Available from: https://daa.asn.au/voice-of-daa/hot-topics/.

19. Nutrition Australia [Internet]. Facebook.com. 2018 [cited 25 June 2017]. Available from: https://www.facebook.com/NutritionAustralia/.

20. Dietitians Association of Australia [Internet]. Facebook.com. 2018 [cited 25 June 2017]. Available from: https://www.facebook.com/dietitiansassociation/?ref=br_rs.

21. Australian Department of Health [Internet]. Facebook.com. 2018 [cited 25 June 2017]. Available from: https://www.facebook.com/healthgovau/.

22. Kite J, Foley BC, Grunseit AC, Freeman B. 2016. Please Like Me: Facebook and Public Health Communication. *PLoS One.* 11(9), e0162765. PubMed https://doi.org/10.1371/journal.pone.0162765

23. Chapman S. 2012. Does celebrity involvement in public health campaigns deliver long term benefit? Yes. *BMJ: British Medical Journal.* 345, e6364. PubMed https://doi.org/10.1136/bmj.e6364

24. The Good Foundation [Internet]. Jamie's Ministry of Food. 2018 [cited 13 May 2018]. Available from: https://www.jamiesministryoffood.com.au/the-good-foundation.

25. Welcome | Sugar Smart UK [Internet]. Sugarsmartuk.org. 2018 [cited 13 May 2018]. Available from: https://www.sugarsmartuk.org/

26. The Eatwell Guide [Internet]. GOV.UK. 2018 [cited 19 April 2018]. Available from: https://www.gov.uk/government/publications/the-eatwell-guide.

27. 2015–2020 Dietary Guidelines for Americans - health.gov [Internet]. Health.gov. 2018 [cited 19 April 2018]. Available from: https://health.gov/dietaryguidelines/2015/.

Appendix

Supplementary Material - Content Analysis

Examples of coding of popular diet advice

The examples below show how popular diet advice summarised in **Table 3** were derived. Of each piece of content, three questions were asked: 1. Do the authors recommend eating, limiting, and/or avoiding food groups? 2. Do authors specify items to eat, limit, and/or avoid within the food groups? 3. Do authors prescribe the selection of food in any manner (for example: organic, grass-fed, pesticide-free, non-GMO, canned, frozen), or cooking technique (for example soaking, fermenting).

Example 1: Fruit Recommendation

URL: https://www.12wbt.com/blog/nutrition/can-really-much-fruit/

> *Content:* "How Much Fruit is Enough? Finding the 'juicy' sweet spot is important for overall nutrition balance, BUT we need to keep in mind our energy requirements and our food intake for a whole day.
>
> *Aim to choose fruit in season and mix up your variety (berries, citrus, tropical, etc.) to not only get fabulous flavour and nutrient hits, but to keep costs down and support the local produce!*
>
> *It is important to note that it is very easy to overeat dried fruit and fruit juices – both of which can increase the risk of tooth cavities due to their acidity (juice) and ability to stick to teeth (dried fruit). So keep these in check!"*

Described as: Eat Fruit. Avoid dried fruit and fruit juice, Chose seasonal and variety.

Example 2: Fat Recommendation

URL: https://www.quirkycooking.com.au/substitutes-recipe-conversions/dairy/

> *Content:* "In addition to the specific benefits of Omega 3s found in natural foods, there is a massive benefit to gut health that is to be gained by switching from polyunsaturated vegetable oils to animal fats." "I now mostly use macadamia oil, tallow, duck fat, or ghee for shallow frying, as they have high smoke points. I used to use coconut oil, but you need to be very careful with frying with coconut oil as the smoke point is only 170C."

Described as*: Eat saturated fats; avoid polyunsaturated vegetable oils; choose macadamia oil, tallow, duck fat, or ghee;* Choose fats with high smoke point.

Appendix B: Results tables from statistical analysis in Chapter 5

Appendix B1: Results of multiple linear regression for absolute weight change in kilograms: Models using initial weight in kilograms instead of initial BMI

Model summary[j]

Model	R	R^2	Adjusted R^2	Std. error of the estimate	Change statistics				
					R^2 change	F change	df1	df2	Sig. F change
1	.107[a]	.011	-.006	5.21326	.011	.667	1	58	.417
2	.239[b]	.057	.007	5.18128	.046	1.359	2	56	.265
3	.374[c]	.140	.043	5.08651	.083	1.702	3	53	.178
4	.446[d]	.199	.073	5.00391	.059	1.882	2	51	.163
5	.546[e]	.299	.138	4.82701	.099	2.269	3	48	.092
6	.561[f]	.315	.140	4.81995	.017	1.141	1	47	.291
7	.611[g]	.373	.196	4.66270	.058	4.224	1	46	.046
8	.622[h]	.386	.177	4.71588	.014	.484	2	44	.619
9	.623[i]	.388	.140	4.82145	.001	.047	2	42	.954

Note: [a]Predictors: (constant), INITIAL BODY WEIGHT (kg).

[b]Predictors: (constant), INITIAL BODY WEIGHT (kg), age, gender.

[c]Predictors: (constant), INITIAL BODY WEIGHT (kg), age, gender, marital status, IRSD (low), language.

[d]Predictors: (constant), INITIAL BODY WEIGHT (KG), age, gender, marital status, IRSD (low), language, depression, cancer.

[e]Predictors: (constant), INITIAL BODY WEIGHT (kg), age, gender, marital status, IRSD (low), language, depression, cancer, change in discretionary food consumption, change in walking, change in fruit & veg consumption.

[f]Predictors: (constant), INITIAL BODY WEIGHT (kg), age, gender, marital status, IRSD (low), language, depression, cancer, change in discretionary food consumption, change in walking, change in fruit & veg consumption, diet tracking.

[g]Predictors: (constant), INITIAL BODY WEIGHT (kg), age, gender, marital status, IRSD (low), language, depression, cancer, change in discretionary food consumption, change in walking, change in fruit & veg consumption, diet tracking, OTC weight loss products (shakes, bars etc.).

[h]Predictors: (constant), INITIAL BODY WEIGHT (kg), age, gender, marital status, IRSD (low), language, depression, cancer, change in discretionary food consumption, change in walking, change in fruit & veg consumption, diet tracking, OTC weight loss products (shakes, bars etc.), have self-efficacy, stress eating.

[i]Predictors: (constant), INITIAL BODY WEIGHT (kg), age, gender, marital status, IRSD (low), language, depression, cancer, change in discretionary food consumption, change in walking, change in fruit & veg consumption, diet tracking, OTC weight loss products (shakes, bars etc.), have self-efficacy, stress eating, self-management type, newest no. of attempts=3.0.jDependent variable: absolute weight change in kilograms. [k]IRSD = Index of Relative Socio-economic Disadvantage

Coefficients[a]

Model		Unstandardised coefficients		Standardised coefficients			95.0% confidence interval for B	
		B	Std. error	Beta	*t*	Sig.	Lower	Upper
1	(constant)	.507	3.322		.153	.879	-6.142	7.157
	INITIAL BODY WEIGHT (kg)	−.028	.035	−.107	−.817	.417	−.098	.041
2	(constant)	.150	3.345		.045	.964	−6.550	6.850
	INITIAL BODY WEIGHT (kg)	−.026	.035	−.096	−.740	.462	−.095	.044
	Gender	2.924	1.892	.203	1.546	.128	−.866	6.714
	Age	−1.141	1.473	−.101	−.775	.442	−4.092	1.809
3	(constant)	−2.093	3.688		−.567	.573	−9.491	5.305
	INITIAL BODY WEIGHT (kg)	−.009	.036	−.034	−.252	.802	−.082	.063
	Gender	3.310	1.897	.229	1.745	.087	−.495	7.115
	Age	−.364	1.528	−.032	−.238	.813	−3.428	2.700
	Marital status	2.130	1.509	.186	1.412	.164	−.896	5.156
	Language	−2.376	1.892	−.172	−1.256	.215	−6.171	1.419
	IRSD (low)	−2.073	1.459	−.192	−1.420	.161	−5.000	.854
4	(constant)	−1.096	3.665		−.299	.766	−8.454	6.262
	INITIAL BODY WEIGHT (kg)	−.024	.037	−.091	−.655	.515	−.099	.050
	Gender	2.579	1.906	.179	1.353	.182	−1.247	6.405
	Age	.156	1.532	.014	.102	.919	−2.920	3.232
	Marital status	1.940	1.492	.170	1.300	.200	−1.057	4.936
	Language	−2.661	1.877	−.192	−1.417	.162	−6.430	1.108
	IRSD (low)	−1.086	1.524	−.100	−.713	.479	−4.145	1.973
	Cancer	−7.782	4.095	−.271	−1.900	.063	−16.002	.439
	Depression	1.756	1.655	.151	1.061	.293	−1.565	5.078

Coefficients[a]								
		Unstandardised coefficients		Standardised coefficients			95.0% confidence interval for B	
		B	Std. error	Beta	*t*	Sig.	Lower	Upper
5	(constant)	.613	3.674		.167	.868	−6.773	7.999
	INITIAL BODY WEIGHT (kg)	−.033	.037	−.125	−.903	.371	−.108	.041
	Gender	1.539	1.906	.107	.808	.423	−2.293	5.372
	Age	1.601	1.658	.142	.965	.339	−1.733	4.935
	Marital status	1.289	1.486	.113	.868	.390	−1.698	4.276
	Language	−3.322	1.836	−.240	−1.810	.077	−7.014	.369
	IRSD (low)	−1.654	1.575	−.153	−1.050	.299	−4.821	1.514
	Cancer	−5.857	4.162	−.204	−1.407	.166	−14.225	2.512
	Depression	1.311	1.617	.112	.810	.422	−1.941	4.563
	Change in discretionary food consumption	.262	.132	.263	1.991	.052	−.003	.527
	Change in walking	−.003	.005	−.085	−.636	.528	−.012	.006
	Change in fruit & veg consumption	−.074	.066	−.165	−1.122	.267	−.207	.059
6	(constant)	−.795	3.898		−.204	.839	−8.636	7.047
	INITIAL BODY WEIGHT (kg)	−.027	.037	−.100	−.712	.480	−.102	.049
	Gender	1.172	1.934	.081	.606	.547	−2.719	5.063
	Age	1.739	1.661	.155	1.047	.300	−1.602	5.080
	Marital status	1.305	1.483	.114	.880	.384	−1.680	4.289
	Language	−3.233	1.835	−.234	−1.762	.085	−6.925	.459
	IRSD (low)	−1.473	1.582	−.136	−.931	.357	−4.656	1.710
	Cancer	−6.643	4.221	−.231	−1.574	.122	−15.133	1.848
	Depression	1.281	1.615	.110	.793	.432	−1.968	4.531
	Change in discretionary food consumption	.296	.135	.297	2.188	.034	.024	.568

	Change in walking	−.003	.005	−.088	−.658	.514	−.013	.006
	Change in fruit & veg consumption	−.078	.066	−.174	−1.183	.243	−.211	.055
	Diet tracking	1.481	1.387	.144	1.068	.291	−1.309	4.271

Coefficients[a]

		Unstandardised coefficients		Standardised coefficients			95.0% confidence interval for B	
		B	Std. error	Beta	*t*	Sig.	Lower	Upper
7	(constant)	−1.063	3.773		−.282	.779	−8.658	6.532
	INITIAL BODY WEIGHT (kg)	−.011	.037	−.043	−.308	.759	−.086	.063
	Gender	1.485	1.877	.103	.791	.433	−2.294	5.263
	Age	1.821	1.607	.162	1.133	.263	−1.414	5.056
	Marital status	.842	1.453	.074	.579	.565	−2.082	3.766
	Language	−3.479	1.779	−.251	−1.955	.057	−7.060	.103
	IRSD (low)	−1.424	1.531	−.132	−.930	.357	−4.505	1.658
	Cancer	−6.981	4.086	−.243	−1.708	.094	−15.206	1.244
	Depression	1.704	1.576	.146	1.081	.285	−1.468	4.876
	Change in discretionary food consumption	.271	.131	.272	2.061	.045	.006	.536
	Change in walking	−.003	.005	−.083	−.637	.527	−.012	.006
	Change in fruit & veg consumption	−.064	.064	−.141	−.988	.328	−.193	.066
	Diet tracking	1.450	1.342	.141	1.081	.285	−1.250	4.150
	OTC weight loss products (shakes, bars etc.)	−2.828	1.376	−.262	−2.055	.046	−5.599	−.058
8	(constant)	1.155	4.453		.259	.796	−7.819	10.130
	INITIAL BODY WEIGHT (kg)	−.003	.038	−.012	−.081	.936	−.080	.074
	Gender	1.856	1.972	.129	.941	.352	−2.118	5.829
	Age	2.253	1.684	.200	1.338	.188	−1.141	5.647
	Marital status	1.424	1.584	.124	.899	.374	−1.768	4.616
	Language	−3.732	1.833	−.270	−2.036	.048	−7.426	−.038
	IRSD (low)	−2.011	1.666	−.186	−1.207	.234	−5.368	1.347

	Cancer	−4.480	4.870	−.156	−.920	.363	−14.294	5.335
	Depression	1.098	1.713	.094	.641	.525	−2.354	4.549
	Change in discretionary food consumption	.294	.137	.295	2.149	.037	.018	.570
	Change in walking	−.004	.005	−.119	−.871	.389	−.014	.005
	Change in fruit & veg consumption	−.075	.067	−.166	−1.120	.269	−.209	.060
	Diet tracking	1.761	1.398	.171	1.260	.214	−1.056	4.578
	OTC weight loss products (shakes, bars etc.)	−2.450	1.450	−.227	−1.690	.098	−5.372	.472
	Stress eating	−1.678	1.947	−.130	−.862	.394	−5.603	2.247
	Have self-efficacy	−1.216	1.783	−.097	−.682	.499	−4.810	2.377
9	(constant)	1.045	4.629		.226	.822	−8.296	10.387
	INITIAL BODY WEIGHT (kg)	−.006	.041	−.022	−.147	.884	−.088	.076
	Gender	1.824	2.019	.126	.903	.371	−2.250	5.897
	Age	2.238	1.723	.199	1.299	.201	−1.239	5.715
	Marital status	1.377	1.627	.120	.846	.402	−1.906	4.659
	Language	−3.819	1.899	−.276	−2.011	.051	−7.651	.013
	IRSD (low)	−1.890	1.803	−.175	−1.048	.301	−5.527	1.748
	Cancer	−4.636	5.236	−.161	−.885	.381	−15.203	5.931
	Depression	1.107	1.796	.095	.616	.541	−2.518	4.732
	Change in discretionary food consumption	.285	.144	.285	1.976	.055	−.006	.575
	Change in walking	−.004	.005	−.110	−.766	.448	−.014	.006
	Change in fruit & veg consumption	−.074	.068	−.164	−1.078	.287	−.212	.064
	Diet tracking	1.736	1.432	.168	1.213	.232	−1.153	4.625
	OTC weight loss products (shakes, bars etc.)	−2.579	1.580	−.239	−1.632	.110	−5.768	.609
	Stress eating	−1.484	2.097	−.115	−.708	.483	−5.716	2.748
	Have self-efficacy	−1.235	1.955	−.099	−.632	.531	−5.180	2.711
	Self-management type	.236	2.201	.015	.107	.915	−4.204	4.677
	Newest no. of attempts=3.0	.401	1.496	.039	.268	.790	−2.619	3.420

Note: [a]Dependent variable: absolute weight change in kilograms. [b]IRSD = Index of Relative Socio-economic Disadvantage

Appendix B2: Results of multiple binary regression for successful weight loss

Omnibus tests of model coefficients				
	Chi-square	df	*p*-value	Nagelkerke R^2
Model 1	0.59	1	0.440	0.01
Model 2	4.26	2	0.235	0.93
Model 3	6.03	6	0.419	0.13
Model 4	6.08	7	0.530	0.13
Model 5	10.43	10	0.403	0.22
Model 6	10.65	11	0.473	0.21
Model 7	10.67	12	0.557	0.22
Model 8	11.36	12	0.581	0.23
Model 9	11.64	15	0.706	0.24

Logistic regression

Dependent variable encoding	
Original value	Internal value
Not successful	0
Successful	1

Categorical variables coding		
		Frequency
Number of weight loss attempts=3.0	None	31
	I am always trying to lose weight	30
Depression	No depression	45
	Depression	16
Diet tracking	No	29
	Yes	32
Weight loss products (shakes, bars etc.)	No	40
	Yes	21
Have self-efficacy	Like me	48
	Unlike me	13
Self-management type	Unassisted	54
	Assisted	7
Gender	Female	52
	Male	9

Categorical variables coding

		Parameter coding
		(1)
Number of weight loss attempts=3.0	None	.000
	I am always trying to lose weight	1.000
Depression	No depression	1.000
	Depression	.000
Diet tracking	No	.000
	Yes	1.000
Weight loss products (shakes, bars etc.)	No	.000
	Yes	1.000
Have self-efficacy	Like me	.000
	Unlike me	1.000
Self-management type	Unassisted	.000
	Assisted	1.000
Gender	Female	1.000
	Male	.000

Model 1

Variables in the equation						
		B	SE	Wald	df	Sig.
Step 1[a]	Initial BMI	.027	.035	.592	1	.441
	Constant	−1.582	1.256	1.586	1	.208

Variables in the equation				
			95% CI for Exp(B)	
		Exp(B)	Lower	Upper
Step 1[a]	Initial BMI	1.028	.959	1.101
	Constant	.206		

Note: [a]Variable(s) entered on step 1: initial BMI.

Model 2

Variables in the equation

		B	SE	Wald	df
Step 1[a]	Initial BMI	.028	.036	.607	1
	Gender(1)	1.655	1.104	2.246	1
	Age range	.216	.341	.400	1
	Constant	-3.525	1.727	4.165	1

Variables in the equation

				95% CI for Exp(B)	
		Sig.	Exp(B)	Lower	Upper
Step 1[a]	Initial BMI	.436	1.029	.958	1.105
	Gender(1)	.134	5.232	.601	45.548
	Age range	.527	1.241	.636	2.420
	Constant	.041	.029		

Note: [a]Variable(s) entered on step 1: gender, age range.

Model 3

Variables in the equation

		B	SE	Wald	df
Step 1[a]	Initial BMI	.011	.042	.074	1
	Gender(1)	1.783	1.141	2.443	1
	Age range	.357	.366	.956	1
	Language	.604	.779	.600	1
	IRSD	-.450	.393	1.311	1
	Marital status	-.218	.691	.100	1
	Constant	-2.423	2.240	1.170	1

[b]IRSD = Index of Relative Socio-economic Disadvantage

Variables in the equation

				95% CI for Exp(B)	
		Sig.	Exp(B)	Lower	Upper
Step 1[a]	Initial BMI	.785	1.011	.932	1.098
	Gender(1)	.118	5.947	.636	55.608
	Age range	.328	1.430	.698	2.927
	Language	.439	1.829	.397	8.424
	IRSD	.252	.638	.295	1.377
	Marital status	.752	.804	.208	3.114
	Constant	.279	.089		

Note: aVariable(s) entered on step 1: language, IRSD, marital status. bIRSD = Index of Relative Socio-economic Disadvantage

Model 4

Variables in the equation

		B	SE	Wald	df
Step 1[a]	Initial BMI	.013	.042	.090	1
	Gender(1)	1.788	1.144	2.442	1
	Age range	.343	.372	.849	1
	Language	.579	.788	.541	1
	IRSD	-.451	.393	1.317	1
	Marital status	-.228	.694	.108	1
	Depression(1)	.143	.688	.043	1
	Constant	-2.537	2.308	1.208	1

[a]IRSD = Index of Relative Socio-economic Disadvantage

Variables in the equation

				95% CI for Exp(B)	
		Sig.	Exp(B)	Lower	Upper
Step 1[a]	Initial BMI	.764	1.013	.932	1.101
	Gender(1)	.118	5.979	.635	56.332
	Age range	.357	1.409	.680	2.922
	Language	.462	1.785	.381	8.357
	IRSD	.251	.637	.295	1.376
	Marital status	.742	.796	.204	3.101
	Depression(1)	.836	1.153	.300	4.441
	Constant	.272	.079		

Note: aVariable(s) entered on step 1: depression. bIRSD = Index of Relative Socio-economic Disadvantage

Model 5

Variables in the equation

		B	SE	Wald
Step 1[a]	Initial BMI	.015	.044	.112
	Gender(1)	1.581	1.169	1.828
	Age range	.401	.391	1.051
	Language	.633	.802	.622
	IRSD	-.544	.416	1.711
	Marital status	-.084	.745	.013
	Depression(1)	-.008	.733	.000
	Change in walking	.003	.002	2.231
	Change in fruit & veg consumption	.015	.029	.261
	Change in discretionary food consumption	-.061	.067	.837
	Constant	-2.556	2.379	1.155

[a]IRSD = Index of Relative Socio-economic Disadvantage

Variables in the equation

		df	Sig.	Exp(B)
Step 1[a]	Initial BMI	1	.738	1.015
	Gender(1)	1	.176	4.860
	Age range	1	.305	1.493
	Language	1	.430	1.882
	IRSD	1	.191	.580
	Marital status	1	.910	.919
	Depression(1)	1	.991	.992
	Change in walking	1	.135	1.003
	Change in fruit & veg consumption	1	.609	1.015
	Change in discretionary food consumption	1	.360	.941
	Constant	1	.283	.078

[a]IRSD = Index of Relative Socio-economic Disadvantage

Variables in the equation

		95% CI for Exp(B)	
		Lower	Upper
Step 1[a]	Initial BMI	.930	1.107
	Gender(1)	.491	48.090
	Age range	.694	3.216
	Language	.391	9.064
	IRSD	.257	1.312
	Marital status	.214	3.959
	Depression(1)	.236	4.173
	Change in walking	.999	1.007
	Change in fruit & veg consumption	.959	1.073
	Change in discretionary food consumption	.825	1.072
	Constant		

Note: aVariable(s) entered on step 1: change in walking, change in fruit & veg consumption, change in discretionary food consumption bIRSD = Index of Relative Socio-economic Disadvantage

Model 6

Variables in the equation				
		B	SE	Wald
Step 1[a]	Initial BMI	.012	.045	.071
	Gender(1)	1.540	1.178	1.709
	Age range	.387	.392	.976
	Language	.596	.806	.546
	IRSD	-.531	.417	1.626
	Marital status	-.108	.746	.021
	Depression(1)	-.028	.734	.001
	Change in walking	.003	.002	2.197
	Change in fruit & veg consumption	.016	.029	.326
	Change in discretionary food consumption	-.069	.070	.965
	Diet tracking(1)	-.299	.640	.219
	Constant	-2.238	2.488	.809

[b]IRSD = Index of Relative Socio-economic Disadvantage

Variables in the equation				
		df	Sig.	Exp(B)
Step 1[a]	Initial BMI	1	.790	1.012
	Gender(1)	1	.191	4.662
	Age Range	1	.323	1.473
	Language	1	.460	1.814
	IRSD	1	.202	.588
	Marital Status	1	.885	.898
	Depression(1)	1	.969	.972
	Change in Walking	1	.138	1.003
	Change in Fruit & Veg consumption	1	.568	1.017
	Change in Discretionary Food Consumption	1	.326	.934
	Diet Tracking(1)	1	.640	.741
	Constant	1	.368	.107

[b]IRSD = Index of Relative Socio-economic Disadvantage

Variables in the equation			
		95% CI for Exp(B)	
		Lower	Upper
Step 1[a]	Initial BMI	.926	1.106
	Gender(1)	.464	46.886
	Age Range	.683	3.177
	Language	.374	8.814
	IRSD	.260	1.330
	Marital Status	.208	3.876
	Depression(1)	.231	4.099
	Change in Walking	.999	1.007
	Change in Fruit & Veg consumption	.961	1.076
	Change in Discretionary Food Consumption	.814	1.071
	Diet Tracking(1)	.212	2.598
	Constant		

Note: aVariable(s) entered on step 1: diet tracking. bIRSD = Index of Relative Socio-economic Disadvantage

Model 7

Variables in the equation				
		B	SE	Wald
Step 1[a]	Initial BMI	.015	.048	.090
	Gender(1)	1.525	1.178	1.675
	Age range	.397	.398	.995
	Language	.598	.807	.549
	IRSD	-.530	.417	1.613
	Marital status	-.106	.747	.020
	Depression(1)	-.050	.748	.005
	Change in walking	.003	.002	2.218
	Change in fruit & veg consumption	.017	.029	.343
	Change in discretionary food consumption	-.069	.070	.980
	Diet tracking(1)	-.306	.642	.227
	Weight loss products (shakes, bars etc.)(1)	-.107	.745	.021
	Constant	-2.284	2.512	.827

[b]IRSD = Index of Relative Socio-economic Disadvantage

Variables in the equation				
		df	Sig.	Exp(B)
Step 1[a]	Initial BMI	1	.764	1.015
	Gender(1)	1	.196	4.595
	Age range	1	.318	1.488
	Language	1	.459	1.818
	IRSD	1	.204	.589
	Marital status	1	.887	.899
	Depression(1)	1	.946	.951
	Change in walking	1	.136	1.003
	Change in fruit & veg consumption	1	.558	1.017
	Change in discretionary food consumption	1	.322	.933
	Diet tracking(1)	1	.633	.736
	Weight loss products (shakes, bars etc.)(1)	1	.886	.898
	Constant	1	.363	.102

[b]IRSD = Index of Relative Socio-economic Disadvantage

Variables in the equation

		95% CI for Exp(B)	
		Lower	Upper
Step 1[a]	Initial BMI	.923	1.116
	Gender(1)	.456	46.266
	Age range	.682	3.247
	Language	.374	8.843
	IRSD	.260	1.333
	Marital status	.208	3.892
	Depression(1)	.219	4.121
	Change in walking	.999	1.007
	Change in fruit & veg consumption	.960	1.078
	Change in discretionary food consumption	.814	1.070
	Diet tracking(1)	.209	2.592
	Weight loss products (shakes, bars etc.)(1)	.209	3.866
	Constant		

Note: aVariable(s) entered on step 1: weight loss products (shakes, bars etc.). bIRSD = Index of Relative Socio-economic Disadvantage

Model 8

Variables in the equation				
		B	SE	Wald
Step 1[a]	Initial BMI	.012	.049	.061
	Gender(1)	1.486	1.187	1.568
	Age range	.318	.412	.598
	Language	.660	.807	.668
	IRSD	-.517	.418	1.534
	Marital status	-.190	.763	.062
	Depression(1)	.003	.758	.000
	Change in walking	.003	.002	1.968
	Change in fruit & veg consumption	.014	.030	.213
	Change in discretionary food consumption	-.083	.073	1.292
	Diet tracking(1)	-.381	.654	.339
	Weight loss products (shakes, bars etc.)(1)	-.087	.743	.014
	Have self-efficacy(1)	.634	.765	.686
	Constant	-2.129	2.526	.710

[b]IRSD = Index of Relative Socio-economic Disadvantage

Variables in the equation				
		df	Sig.	Exp(B)
Step 1[a]	Initial BMI	1	.806	1.012
	Gender(1)	1	.210	4.420
	Age range	1	.439	1.375
	Language	1	.414	1.934
	IRSD	1	.215	.596
	Marital status	1	.803	.827
	Depression(1)	1	.997	1.003
	Change in walking	1	.161	1.003
	Change in fruit & veg consumption	1	.644	1.014
	Change in discretionary food consumption	1	.256	.921
	Diet tracking(1)	1	.560	.683
	Weight loss products (shakes, bars etc.)(1)	1	.907	.917
	Have self -efficacy(1)	1	.407	1.885
	Constant	1	.399	.119

[b]IRSD = Index of Relative Socio-economic Disadvantage

Variables in the equation			
		95% CI for Exp(B)	
		Lower	Upper
Step 1[a]	Initial BMI	.920	1.114
	Gender(1)	.432	45.246
	Age range	.613	3.081
	Language	.398	9.408
	IRSD	.263	1.352
	Marital status	.185	3.690
	Depression(1)	.227	4.436
	Change in walking	.999	1.007
	Change in fruit & veg consumption	.956	1.076
	Change in discretionary food consumption	.798	1.062
	Diet tracking(1)	.189	2.464
	Weight loss products (shakes, bars etc.)(1)	.214	3.938
	Have self-efficacy(1)	.421	8.447
	Constant		

Note: aVariable(s) entered on step 1: have self-efficacy. bIRSD = Index of Relative Socio-economic Disadvantage

Model 9

Variables in the equation				
		B	SE	Wald
Step 1[a]	Initial BMI	.015	.050	.097
	Gender(1)	1.445	1.195	1.462
	Age range	.309	.415	.554
	Language	.659	.821	.645
	IRSD	-.526	.425	1.532
	Marital status	-.133	.777	.029
	Depression(1)	-.030	.778	.001
	Change in walking	.003	.002	1.906
	Change in fruit & veg consumption	.014	.030	.209
	Change in discretionary food consumption	-.082	.073	1.254
	Diet tracking(1)	-.356	.656	.295
	Weight loss products (shakes, bars etc.)(1)	-.143	.770	.035
	Have self-efficacy(1)	.764	.811	.886
	Self-management type(1)	-.565	1.084	.272
	Number of weight loss attempts=3.0(1)	.079	.671	.014
	Constant	-2.187	2.542	.740

[b]IRSD = Index of Relative Socio-economic Disadvantage

Variables in the equation				
		df	Sig.	Exp(B)
Step 1[a]	Initial BMI	1	.756	1.016
	Gender(1)	1	.227	4.242
	Age range	1	.457	1.362
	Language	1	.422	1.933
	IRSD	1	.216	.591
	Marital status	1	.864	.875
	Depression(1)	1	.969	.970
	Change in walking	1	.167	1.003
	Change in fruit & veg consumption	1	.647	1.014
	Change in discretionary food consumption	1	.263	.921
	Diet tracking(1)	1	.587	.700
	Weight loss products (shakes, bars etc.)(1)	1	.852	.866
	Have self-efficacy(1)	1	.347	2.146

	Self-management type(1)	1	.602	.568
	Number of weight loss attempts=3.0(1)	1	.907	1.082
	Constant	1	.390	.112

[b]IRSD = Index of Relative Socio-economic Disadvantage

Variables in the equation

		95% CI for Exp(B)	
		Lower	Upper
Step 1[a]	Initial BMI	.922	1.119
	Gender(1)	.408	44.148
	Age range	.604	3.069
	Language	.387	9.652
	IRSD	.257	1.359
	Marital status	.191	4.016
	Depression(1)	.211	4.460
	Change in walking	.999	1.007
	Change in fruit & veg consumption	.956	1.075
	Change in discretionary food consumption	.798	1.064
	Diet tracking(1)	.194	2.531
	Weight loss products (shakes, bars etc.)(1)	.191	3.920
	Have self-efficacy(1)	.437	10.527
	Self-management type(1)	.068	4.757
	Number of weight loss attempts=3.0(1)	.291	4.026
	Constant		

Note: aVariable(s) entered on step 1: self-management type, number of weight loss attempts=3.0. bIRSD = Index of Relative Socio-economic Disadvantage

Appendix C: Ethics approval letters

Appendix C1: Project number 2017/755: Study of baseline data collected by weight management clinics in Australia

THE UNIVERSITY OF SYDNEY

Research Integrity & Ethics Administration
Human Research Ethics Committee

Wednesday, 18 October 2017

Assoc Prof Timothy Gill
Boden Institute; Sydney Medical School
t.gill@sydney.edu.au

Dear Timothy,

The University of Sydney Human Research Ethics Committee (HREC) has considered your application.

After consideration of your response to the comments raised your project has been approved.

Approval is granted for a period of four years from **18/10/2017** to **18/10/2021**

Project title:	**Study of Baseline Data Collected by Weight Management Clinics in Australia**
Project no.:	**2017/755**
First Annual Report due:	**18/10/2018**
Authorised Personnel:	**Gill Timothy; Ramachandran Divya; Srinivasan Uma;**

Documents Approved:

Date Uploaded	Version number	Document Name
11/10/2017	Version 2	Recruitment email v2 - clean and final
11/10/2017	Version 2	Participant Information Form - clean and final
11/10/2017	Version 2	Online Participant Consent Form
03/07/2017	Version 1	Delphi - Round 1 questionnaire
03/07/2017	Version 1	Follow up Survey

Condition/s of Approval

- Research must be conducted according to the approved proposal.
- An annual progress report must be submitted to the Ethics Office on or before the anniversary of approval and on completion of the project.
- You must report as soon as practicable anything that might warrant review of ethical approval of the project including:
  - Serious or unexpected adverse events (which should be reported within 72 hours).
  - Unforeseen events that might affect continued ethical acceptability of the project.
- Any changes to the proposal must be approved prior to their implementation (except where an amendment is undertaken to eliminate *immediate* risk to participants).
- Personnel working on this project must be sufficiently qualified by education, training and experience for their role, or adequately supervised. Changes to personnel must be reported and approved.
- Personnel must disclose any actual or potential conflicts of interest, including any financial or other interest or affiliation, as relevant to this project.

THE UNIVERSITY OF SYDNEY

- Data and primary materials must be retained and stored in accordance with the relevant legislation and University guidelines.
- Ethics approval is dependent upon ongoing compliance of the research with the *National Statement on Ethical Conduct in Human Research*, the *Australian Code for the Responsible Conduct of Research*, applicable legal requirements, and with University policies, procedures and governance requirements.
- The Ethics Office may conduct audits on approved projects.
- The Chief Investigator has ultimate responsibility for the conduct of the research and is responsible for ensuring all others involved will conduct the research in accordance with the above.

This letter constitutes ethical approval only.

Please contact the Ethics Office should you require further information or clarification.

Sincerely,

[REDACTION]

Professor Mary Chiarella
Deputy Chair, Health Review Committee (Low Risk)

The University of Sydney HRECs are constituted and operate in accordance with the National Health and Medical Research Council's (NHMRC) National Statement on Ethical Conduct in Human Research (2007) and the NHMRC's Australian Code for the Responsible Conduct of Research (2007).

Appendix C2: Project number 2018/526: Ethics approval letter for 'A Study of DIY Weight Loss in Australia' dated 30 July 2018

THE UNIVERSITY OF SYDNEY

Research Integrity & Ethics Administration
Human Research Ethics Committee

Monday, 30 July 2018

Assoc Prof Timothy Gill
Boden Institute; Faculty of Medicine and Health
Email: t.gill@sydney.edu.au

Dear Timothy

The University of Sydney Human Research Ethics Committee (HREC) has considered your application.

After consideration of your response to the comments raised your project has been approved.

Approval is granted for a period of four years from **30 July 2018** to **30 July 2022.**

Project title: **A study of DIY Weight Loss in Australia**

Project no.: **2018/526**

First Annual Report due: **30 July 2019**

Authorised Personnel: **Gill Timothy; Ramachandran Divya;**

Documents Approved:

Date Uploaded	Version number	Document Name
13/07/2018	Version 2	Revise online survey form
13/07/2018	Version 2	Revised Participant Info Statement
06/06/2018	Version 1	Sample Facebook Advertisements
06/06/2018	Version 1	Study Website

Condition/s of Approval

- Research must be conducted according to the approved proposal.
- An annual progress report must be submitted to the Ethics Office on or before the anniversary of approval and on completion of the project.
- You must report as soon as practicable anything that might warrant review of ethical approval of the project including:
  - ➢ Serious or unexpected adverse events (which should be reported within 72 hours).
  - ➢ Unforeseen events that might affect continued ethical acceptability of the project.
- Any changes to the proposal must be approved prior to their implementation (except where an amendment is undertaken to eliminate *immediate* risk to participants).
- Personnel working on this project must be sufficiently qualified by education, training and experience for their role, or adequately supervised. Changes to personnel must be reported and approved.

Research Integrity & Ethics Administration
Level 2, Margaret Telfer Building (K07)
The University of Sydney
NSW 2006 Australia

T +61 2 9036 9161
E human.ethics@sydney.edu.au
W sydney.edu.au/ethics

ABN 15 211 513 464
CRICOS 00026A

THE UNIVERSITY OF SYDNEY

- Personnel must disclose any actual or potential conflicts of interest, including any financial or other interest or affiliation, as relevant to this project.

- Data and primary materials must be retained and stored in accordance with the relevant legislation and University guidelines.

- Ethics approval is dependent upon ongoing compliance of the research with the *National Statement on Ethical Conduct in Human Research*, the *Australian Code for the Responsible Conduct of Research*, applicable legal requirements, and with University policies, procedures and governance requirements.

- The Ethics Office may conduct audits on approved projects.

- The Chief Investigator has ultimate responsibility for the conduct of the research and is responsible for ensuring all others involved will conduct the research in accordance with the above.

This letter constitutes ethical approval only.

Please contact the Ethics Office should you require further information or clarification.

Sincerely

[REDACTION]

Dr Helen Mitchell
Deputy Chair, Human Research Ethics Committee (HREC 1)

The University of Sydney HRECs are constituted and operate in accordance with the National Health and Medical Research Council's (NHMRC) National Statement on Ethical Conduct in Human Research (2007) and the NHMRC's Australian Code for the Responsible Conduct of Research (2007).

Research Integrity & Ethics Administration
Human Research Ethics Committee

Monday, 30 July 2018

Assoc Prof Timothy Gill
Boden Institute; Faculty of Medicine and Health
Email: t.gill@sydney.edu.au

Dear Timothy

The University of Sydney Human Research Ethics Committee (HREC) has considered your application.

After consideration of your response to the comments raised your project has been approved.

Approval is granted for a period of four years from **30 July 2018** to **30 July 2022.**

Project title: **A study of DIY Weight Loss in Australia**

Project no.: **2018/526**

First Annual Report due: **30 July 2019**

Authorised Personnel: **Gill Timothy; Ramachandran Divya;**

Documents Approved:

Date Uploaded	Version number	Document Name
13/07/2018	Version 2	Revise online survey form
13/07/2018	Version 2	Revised Participant Info Statement
06/06/2018	Version 1	Sample Facebook Advertisements
06/06/2018	Version 1	Study Website

Condition/s of Approval

- Research must be conducted according to the approved proposal.
- An annual progress report must be submitted to the Ethics Office on or before the anniversary of approval and on completion of the project.
- You must report as soon as practicable anything that might warrant review of ethical approval of the project including:
  - Serious or unexpected adverse events (which should be reported within 72 hours).
  - Unforeseen events that might affect continued ethical acceptability of the project.
- Any changes to the proposal must be approved prior to their implementation (except where an amendment is undertaken to eliminate *immediate* risk to participants).
- Personnel working on this project must be sufficiently qualified by education, training and experience for their role, or adequately supervised. Changes to personnel must be reported and approved.

THE UNIVERSITY OF SYDNEY

- Personnel must disclose any actual or potential conflicts of interest, including any financial or other interest or affiliation, as relevant to this project.

- Data and primary materials must be retained and stored in accordance with the relevant legislation and University guidelines.

- Ethics approval is dependent upon ongoing compliance of the research with the *National Statement on Ethical Conduct in Human Research*, the *Australian Code for the Responsible Conduct of Research*, applicable legal requirements, and with University policies, procedures and governance requirements.

- The Ethics Office may conduct audits on approved projects.

- The Chief Investigator has ultimate responsibility for the conduct of the research and is responsible for ensuring all others involved will conduct the research in accordance with the above.

This letter constitutes ethical approval only.

Please contact the Ethics Office should you require further information or clarification.

Sincerely

[REDACTION]

Dr Helen Mitchell
Deputy Chair, Human Research Ethics Committee (HREC 1)

The University of Sydney HRECs are constituted and operate in accordance with the National Health and Medical Research Council's (NHMRC) National Statement on Ethical Conduct in Human Research (2007) and the NHMRC's Australian Code for the Responsible Conduct of Research (2007).

Appendix C3: Project number 2018/526: Approval for modifications dated 21 August 2019

THE UNIVERSITY OF SYDNEY

Research Integrity & Ethics Administration
HUMAN RESEARCH ETHICS COMMITTEE

Wednesday, 21 August 2019

Assoc Prof Timothy Gill
Boden Institute; Faculty of Medicine and Health
Email: t.gill@sydney.edu.au

Dear Timothy,

Your request to modify this project, which was submitted on 03 July 2019, has been considered.

After consideration of your response to the comments raised, this project has been approved to proceed with the proposed amendments.

Protocol Number: **2018/526**
Protocol Title: **A study of DIY Weight Loss in Australia**
Annual Report Due: **30 July 2020**

Documents Approved:

Date Uploaded	Version Number	Document Name
01/08/2019	Version 3	Follow up survey_PIS
03/07/2019	Version 1	Invitation Letter
09/07/2019	Version 1	Online Participant Consent Form
09/07/2019	Version 1	Participant Information Sheet

Special Condition/s of Approval

- *It is a condition of approval that the HREC approval number [2018/526] is inserted into both the 'Follow up survey_PIS' and 'Participant Information Sheet' documents prior to distribution*

Please contact the ethics office should you require further information.

Sincerely,

[REDACTION]

Dr Clifton Chan
Chair
Modification Review Committee (MRC 1)

The University of Sydney of Sydney HRECs are constituted and operate in accordance with the National Health and Medical Research Council's (NHMRC) National Statement on Ethical Conduct in Human Research (2007) and the NHMRC's Australian Code for the Responsible Conduct of Research (2007)

Research Integrity & Ethics Administration
Research Portfolio
Level 3, F23 Administration Building
The University of Sydney
NSW 2006 Australia

T +61 2 9036 9161
E human.ethics@sydney.edu.au
W sydney.edu.au/ethics

ABN 15 211 513 464
CRICOS 00026A

Appendix C4: Project number 2018/526: Approval for modifications dated 17 December 2019

THE UNIVERSITY OF SYDNEY

Research Integrity & Ethics Administration
HUMAN RESEARCH ETHICS COMMITTEE

Tuesday, 17 December 2019

Assoc Prof Timothy Gill
Boden Institute; Faculty of Medicine and Health
Email: tim.gill@sydney.edu.au

Dear Timothy,

Your request to modify this project was submitted on 04 November 2019. After consideration of your response to the comments raised, this project has been approved to proceed with the proposed amendments.

Protocol Number:	**2018/526**
Protocol Title:	**A study of DIY Weight Loss in Australia**

Documents Approved:

Date Uploaded	Version Number	Document Name
01/12/2019	Version 5	Participant Information Form - clean copy
01/12/2019	01/12/2019	Revised online survey
04/11/2019	04/11/2019	Examples of Advertisements on Social Media

Special Condition/s of Approval

Ethical research is respectful of participants' time and effort. If a project's methodology and analysis are appropriate to answer the research question then the research is ethical and can be approved. The committee recommend that the PhD supervisor/CI review the analysis plan with the HDR candidate and confirm that the proposed sample size is achievable and that is sufficient to answer the research question, as it is unlikely that further sample size modifications will be approved. You do not need to respond to the committee.

Please contact the ethics office should you require further information.

Sincerely,

[REDACTION] [redacted]

Associate Professor Mark Arnold
Modification Review Committee Chair (MRC 2)

The University of Sydney of Sydney HRECs are constituted and operate in accordance with the National Health and Medical Research Council's (NHMRC) National Statement on Ethical Conduct in Human Research (2007) and the NHMRC's Australian Code for the Responsible Conduct of Research (2007)

Research Integrity & Ethics Administration
Research Portfolio
Level 3, F23 Administration Building
The University of Sydney
NSW 2006 Australia

T +61 2 9036 9161
E human.ethics@sydney.edu.au
W sydney.edu.au/ethics

ABN 15 211 513 464
CRICOS 00026A

Appendix C5: Project number 2018/526: Approval for modifications dated 6 May 2020

Research Integrity & Ethics Administration
HUMAN RESEARCH ETHICS COMMITTEE

Wednesday, 6 May 2020

Assoc Prof Timothy Gill
Boden Institute; Faculty of Medicine and Health
Email: tim.gill@sydney.edu.au

Dear Timothy,

Your request to modify this project, which was submitted on 4 May 2020, has been considered.

This project has been approved to proceed with the proposed amendments.

Protocol Number: **2018/526**

Protocol Title: **A study of DIY Weight Loss in Australia**

Documents Approved:

Date Uploaded	Version Number	Document Name
04/05/2020	Version 3	Clean Copy - Revised Follow-Up Survey

Please contact the ethics office should you require further information.

Sincerely,

[REDACTION]

Associate Professor Michael Skilton
Chair, COVID-19 Modification Review Committee (Low Risk)

The University of Sydney of Sydney HRECs are constituted and operate in accordance with the National Health and Medical Research Council's (NHMRC) National Statement on Ethical Conduct in Human Research (2007) and the NHMRC's Australian Code for the Responsible Conduct of Research (2007)

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Research Portfolio
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NSW 2006 Australia

T +61 2 9036 9161
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Appendix D: Survey questionnaires

Appendix D1: Pilot study survey questionnaire: DIY weight loss in Australia

Confidential

DIY Weight Loss in Australia

Welcome to the survey on DIY weight loss in Australia. We are looking for participants who are 18 years or older, residing in Australia, and have either just begun their weight loss journey or plan to do so in the near future. We want to find out what makes you successful, as this information can motivate and help others who are thinking about beginning such a journey.

The survey will ask you short questions about yourself, your lifestyle and details about your weight loss journey. It may be a good idea to measure your height and weight before you begin the survey. The survey will take you about 25-30 minutes to complete. If you need to take a break in between, you can save your responses and you will be provided with a code to come back and continue the survey.

Do you currently reside in Australia?
(choose yes or no)

○ Yes ○ No

What is your post code?

____
(enter post code)

Are you over 18 years of age?

○ Yes ○ No

Are you currently trying to lose weight or are you planning to start in the near future?
(choose yes or no)

○ Yes ○ No

This is a research study, and the University of Sydney Human Research Ethics Committee approves and regulates all research studies conducted at USyd. The Participant Information Form attached below provides details of the study and seeks your consent before you are taken through the survey questions.

Participant Information Sheet

Please read the Participant Information Sheet and download a copy for your records.

[Attachment: "Participant Information Form - Unassisted Weight Loss Survey Version 0.1 -12072018.pdf"]

PARTICIPANT CONSENT FORM

I agree to take part in this research study.

In giving my consent I state that:

_ I understand the purpose of the study, what I will be asked to do, and any risks/benefits involved.

_ I have read the Participant Information Statement and have been able to discuss my involvement in the study with the researchers if I wished to do so.

_ The researchers have answered any questions that I had about the study and I am happy with the answers.

_ I understand that being in this study is completely voluntary and I do not have to take part. My decision whether to be in the study will not affect my relationship with the researchers or anyone else at the University of Sydney now or in the future.

_ I understand that I can withdraw from the study at any time up until completion of the questionnaire.

_ I understand that my questionnaire responses cannot be withdrawn once they are submitted, as they are anonymous and therefore the researchers will not be able to tell which one is mine.

_ I understand that personal information about me that is collected over the course of this project will be stored securely and will only be used for purposes that I have agreed to. I understand that information about me will only be told to others with my permission, except as required by law.

_ I understand that the results of this study may be published and that publications will not contain my name or any identifiable information about me.
(choose yes or no)

◯ Yes ◯ No

Intention to Lose Weight

What is your reason for attempting weight loss?
(select all that apply)

☐ For improved health
☐ To feel more energetic
☐ To feel more attractive
☐ To please others (eg. Family, friends, spouse)
☐ To have more confidence
☐ To fit into my favourite clothes
☐ To ease joint pain
☐ For other reasons

You chose "for other reasons". Please specify why you are attempting to lose weight.

Weight Loss History

Are you currently gaining weight without trying to?
(choose yes or no)

◯ Yes ◯ No

How much weight have you gained since your late teens or early twenties? Choose kilograms(kgs) or stone (st) and pounds (lbs) to provide your answer.

◯ kilograms(kgs) ◯ stone (st) and pounds (lbs)

provide weight gained in kilograms (kgs)

____

provide weight gained in stone (stn)

____

and pounds (lbs)

____

converting stones and pounds to Kgs (hidden field)

____

How many times have you tried to lose weight since you were in your late teens or early twenties?

◯ Never ◯ 1-3 times ◯ 4 times or more ◯ I am always trying to lose weight

In the past attempts have you used any of the following for weight loss purposes? (select all that apply)
(choose all that apply)

☐ General Practitioner ☐ Specialist Medical Professional (eg. Endorcrinologist) ☐ Dietitian
☐ Nutritionist ☐ Psychologist ☐ Exercise Physiologist ☐ Personal Trainer ☐ Health Coach
☐ Naturopath ☐ Commercial weight loss programs (e.g. Weight Watchers®, Lite n' Easy®, Sureslim®, Jenny Craig®) ☐ Diet book diets (e.g. Atkins, Zone, CSIRO diet, Liver Cleansing diet) ☐ Smart Phone Apps
☐ Diet alone ☐ Exercise alone ☐ Diet and Exercise ☐ Meal replacements shakes or bars (e.g. OPTIFAST®, Rapidloss®) ☐ Over the counter weight loss supplements available from a pharmacy
☐ Prescription weight loss medication ☐ Fasting (eg. 5 & 2 diet, intermittent fasting) ☐ Cut down on the size of meals or between meal snacks ☐ Cut down on fats and/or sugars ☐ Low glycaemic index diet
☐ None of the above

You chose "none of the above". Can you please specify how you lost weight previously?
(describe)

About you

How tall are you without shoes?

Please provide your height in

◯ centimetres (cms) ◯ in feet and inches

please give to the nearest cm ______________________________

converting cm to m ______________________________

feet ______________________________

inches ______________________________

Converting feet/inches to cms then to m ______________________________

About how much do you weigh? You can provide your answer in 'kilograms' (Kgs) or in 'stone (st) and pounds (lbs). (Choose kgs or st and lbs)

◯ kilograms (Kgs) ◯ stone (st) and pounds (lbs)

Please provide your answer in kilograms (Kgs) ______________________________

Please provide your answer in stone (st) ______________________________

and pounds (lbs) ______________________________

converting stones and pounds to Kgs ______________________________

BMI using kg/m2 ______________________________

What is your gender?

◯ male ◯ female ◯ other

What is your age range?

◯ 18-19 years ◯ 20-24 years ◯ 25-29 years ◯ 30-34 years ◯ 35-39 years ◯ 40-44 years
◯ 45-49 years ◯ 50-54 years ◯ 55-59 years ◯ 60-64 years ◯ 65-69 years ◯ 70-74 years
◯ 75-79 years ◯ 80+ years

Education and Language	
What is the level of the highest qualification that you have completed?	◯ a trade certificate ◯ diploma ◯ degree or higher degree ◯ other educational qualification
You chose "other educational qualification". Can you please list the qualification here?	
What is the highest year of primary or secondary school that you have completed?	◯ Year 12 or equivalent ◯ Year 11 or equivalent ◯ Year 10 or equivalent ◯ Year 9 or equivalent ◯ Year 8 or below ◯ Never attended school
Do you speak a language other than English at home?	◯ Yes ◯ No (choose yes or no)
Please list all the languages you speak at home.	

Smoking and Alcohol

Do you consider yourself a regular smoker?	◯ Yes ◯ No (choose yes or no)
About how many alcoholic drinks do you have each week? one drink = a glass of wine, middy of beer or nip of spirits (put "0" if you do not drink, or have less than one drink each week) __________________________________	
How many cigarettes do you smoke per day?	__________________________________
On how many days each week do you usually drink alcohol? __________________________________	

Family

What best describes your current situation?	◯ Single ◯ married ◯ de facto/living with a partner ◯ widowed ◯ divorced ◯ separated

Physical Activity

Think about all the VIGOUROUS activities that you did in the last 7 days. Vigorous physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time.

During the last 7 days, on how many days did you do VIGOUROUS physical activities like heavy lifting, digging, aerobics, or fast bicycling?

Enter 0 if you did not do VIGOUROUS physical activity.

____
(enter number of days per week)

How much time did you usually spend doing VIGOUROUS physical activities on one of those days? Please provide your answer in minutes. (For example 1.5 hours = 90minutes)

If you don't know / are not sure, please leave blank.

____
(enter number of minutes)

Think about all the MODERATE activities that you did in the last 7 days. Moderate activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time.

During the last 7 days, on how many days did you do MODERATE physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking.

Enter 0 if you did not do MODERATE physical activity.

____

How much time did you usually spend doing moderate physical activities on one of those days?

Please provide your answer in minutes. (For eg. 1 hours and 30 minutes = 90 minutes)

If you don't know / are not sure, please leave blank.

____
(enter number of minutes)

Think about the time you spent WALKING in the last 7 days. This includes at work and at home, walking to travel from place to place, and any other walking that you have done solely for recreation, sport, exercise, or leisure.

During the last 7 days, on how many days did you walk for at least 10 minutes at a time?

Enter 0 if you did not walk for at least 10 minutes at a time.

____
(enter number of days per week)

How much time did you usually spend walking on one of those days?

Please provide your answer in minutes. (For eg. 1 hours and 30 minutes = 90 minutes)

If you don't know / are not sure, please leave blank.

____
(enter number of minutes)

Dietary Intake - What food do you usually eat?
In the questions below, compare the amount you eat to the serving size, and then choose how many of these servings you normally eat in a typical day or week.

Vegetables (½ cup = 1 serve)	◯ never/occasionally ◯ 1-2 serves/week ◯ 3-5 serves/week ◯ 1 serve/day ◯ 2 serves/day ◯ 3 serves/day ◯ 4 serves/day ◯ 5 or more serves/day
Fruit (1 medium piece = 1 serve)	◯ never/occasionally ◯ 1-2 serves/week ◯ 3-5 serves/week ◯ 1 serve/day ◯ 2 serves/day ◯ 3 or more serves/day
Bread (2 slices = 1 serve)	◯ never/occasionally ◯ 1-2 serves/week ◯ 3-5 serves/week ◯ 1 serve/day ◯ 2 serves/day ◯ 3 or more serves/day
Cereal (1 cup porridge = 1 serve)	◯ never/occasionally ◯ 1-2 serves/week ◯ 3-5 serves/week ◯ 1 serve/day ◯ 2 serves/day ◯ 3 or more serves/day
rice, pasta, noodles (1 cup cooked = 1 serve)	◯ never/occasionally ◯ 1-2 serves/week ◯ 3-5 serves/week ◯ 1 serve/day ◯ 2 serves/day ◯ 3 or more serves/day
meat, fish, poultry (100grams = 1 serve)	◯ never/occasionally ◯ 1-2 serves/week ◯ 3-5 serves/week ◯ 1 serve/day ◯ 2 serves/day ◯ 3 or more serves/day
legumes and lentils (e.g. chickpeas, split peas, dried beans, green beans and peas) (½ cup = 1 serve)	◯ never/occasionally ◯ 1-2 serves/week ◯ 3-5 serves/week ◯ 1 serve/day ◯ 2 serves/day ◯ 3 or more serves/day

nuts and seeds (¼ cup = 1serve)	◯ never/occasionally ◯ 1-2 serves/week ◯ 3-5 serves/week ◯ 1 serve/day ◯ 2 serves/day ◯ 3 or more serves/day
Dairy and fortified milk substitutes: 1 serve = milk (1 cup), OR yoghurt (1 tub), OR cheese (2 slices)	◯ never/occasionally ◯ 1-2 serves/week ◯ 3-5 serves/week ◯ 1 serve/day ◯ 2 serves/day ◯ 3 or more serves/day
Oils, soft margarines (1 tablespoon = 1 serve)	◯ never/occasionally ◯ 1-2 serves/week ◯ 3-5 serves/week ◯ 1 serve/day ◯ 2 serves/day ◯ 3 or more serves/day
Cakes, biscuits, pies and pastries (1 serve = an average serve)	◯ never/occasionally ◯ 1-2 serves/week ◯ 3-5 serves/week ◯ 1 serve/day ◯ 2 serves/day ◯ 3 or more serves/day
Take away food (e.g. fried chicken or fish, chips, burgers from McDonalds, Hungry Jacks, Pizza Hut, KFC, Red Rooster, or local take-away places) (1meal = 1 servel)	◯ never/occasionally ◯ 1-2 serves/week ◯ 3-5 serves/week ◯ 1 serve/day ◯ 2 serves/day ◯ 3 or more serves/day
Drinks (sugary soft drink, juices, cordials or sports drink, such as lemonade or Gatorade) (1 glass = 1 serve)	◯ never/occasionally ◯ 1-2 serves/week ◯ 3-5 serves/week ◯ 1 serve/day ◯ 2 serves/day ◯ 3 or more serves/day
sausages, frankfurts, devon, salami, hamburgers, chicken nuggets, meat pies, bacon or ham (100g = 1 serve)	◯ never/occasionally ◯ 1-2 serves/week ◯ 3-5 serves/week ◯ 1 serve/day ◯ 2 serves/day ◯ 3 or more serves/day
hot chips, french-fries, wedges or fried potatoes (150g = 1 serve)	◯ never/occasionally ◯ 1-2 serves/week ◯ 3-5 serves/week ◯ 1 serve/day ◯ 2 serves/day ◯ 3 or more serves/day

What type of milk do you usually have?
(choose all that apply)

☐ Regular milk (whole or full cream/dairy/goats) ☐ Low /reduced fat milk (dairy/goat) ☐ Skim milk (dairy/goat) ☐ Evaporated or sweetened milk ☐ Other ☐ Don't have milk ☐ Soy/Almond/Rice/Oat milk ☐ Don't know

You chose "other". Can you list what type milk you have?

Weight Loss Strategy

What approach do you currently use or plan to use to lose weight or to control your weight?
(choose all that apply)

☐ General Practitioner ☐ Specialist Medical Professional (eg. Endocrinologist) ☐ Dietitian ☐ Nutritionist ☐ Psychologist ☐ Exercise Physiologist ☐ Personal Trainer ☐ Health Coach ☐ Naturopath ☐ Commercial weight loss programs (e.g. Weight Watchers®, Lite n' Easy®, Sureslim®, Jenny Craig®) ☐ Diet book diets (e.g. Atkins, Zone, CSIRO diet, Liver Cleansing diet) ☐ Smart Phone Apps ☐ Diet alone ☐ Exercise alone ☐ Diet and Exercise ☐ Meal replacements shakes or bars (e.g. OPTIFAST®, Rapidloss®) ☐ Over the counter weight loss supplements available from a pharmacy ☐ Prescription weight loss medication ☐ Fasting (eg. 5 & 2 diet, intermittent fasting) ☐ Cut down on the size of meals or between meal snacks ☐ Cut down on fats and/or sugars ☐ low carbohydrate/high fat diet (eg. paleo, ketogenic diet) ☐ Low glycaemic index diet ☐ None of the above

---

You chose 'none of the above'. Can you please describe what you are currently doing/plan to do to loose weight?

____
(describe)

Do you currently track or plan to track your diet as part of your weight loss strategy?
(choose yes or no)

◯ Yes ◯ No

Do you currently track or plan to track your exercise and physical activity as part of your weight loss strategy?

◯ Yes ◯ No

Do you currently track or plan to track your weight as part of your weight loss strategy?

◯ Yes
◯ No

Can you describe what you use or plan to use, to track and record your diet / exercise / weight data -

☐ Wearable Devices (eg. Apple Watch, FitBIt, Garmin etc.)
☐ Smart Phone App
☐ Pen and paper diary
☐ Other

You chose "other", Can you please describe what you use to track or monitor diet/exercise/weight data?

We have almost finished!

Is there anything else you want to share regarding your weight loss?

Where did you first find about this study?

☐ Facebook sponsored advertisement ☐ A post on a group on Facebook ☐ A post on a Facebook Page
☐ Shared by a friend on Facebook ☐ other

You chose "other". Can you share where you found out about this study?

Would you like to be contacted for future studies on your weight loss? ◯ Yes ◯ No

Please provide your email address where we can send you details about future studies. ______________________________

Appendix D2: Baseline survey questionnaire: Australian self-managed weight loss survey

Confidential

Australian Self-managed Weight Loss Survey

Welcome to the study on Self-managed Weight Loss in Australia.

We are looking for participants who are 18 years or older, residing in Australia, and have either just begun their weight loss journey or plan to do so in the near future. We want to find out what makes you successful, as this information can motivate and help others who are thinking about beginning such a journey.

The study consists of TWO parts:

1) The first online survey is available below for you to answer now.

2) A follow-up online survey will be emailed to you after three months.

This survey will ask you short questions about yourself, your lifestyle and details about your weight loss journey. It may be a good idea to measure your height and weight before you begin the survey. The survey will take you about 25-30 minutes to complete. If you need to take a break in between, you can save your responses and you will be provided with a code to come back and continue the survey.

Those completing both parts of the survey are eligible to enter a raffle draw to win WISH (Woolies) Giftcards: $200 (1 available), $100 (2 available), $20 (10 available)

Screening questions

Do you currently reside in Australia?
(choose yes or no)

○ Yes ○ No

What is your post code?

____
(enter post code)

Are you over 18 years of age?

○ Yes ○ No

Are you currently trying to lose weight or are you planning to start in the near future?
(choose yes or no)

○ Yes ○ No

This is a research study, and the University of Sydney Human Research Ethics Committee approves and regulates all research studies conducted at USyd. The Participant Information Form attached below provides details of the study and seeks your consent before you are taken through the survey questions.

Participant Information Sheet

Please read the Participant Information Sheet and download a copy for your records.

[Attachment: "Clean copy 29112019 Self-managed weight loss survey Participant Information Statement ver0.5.pdf"]

ELECTRONIC CONSENT FORM

Please select your choice below.

Clicking on the "yes" button below indicates that:
• you have read the Participant Information Statement attached above
• you voluntarily agree to participate

If you do not wish to participate in the research study, please decline participation by clicking on the "no" button.
(choose yes or no)

○ Yes ○ No

Please provide your email address, where you would like the follow-up survey sent. The follow-up survey will be sent to you after three months time.

Please take care and double check that you enter your email address correctly.

____

Weight management type

Read the statements below and chose the option that best describes the manner in which you plan to manage your weight loss?

- ◯ I plan to manage my weight-loss by myself without any direct assistance from health professionals or commercial weight loss programs.
- ◯ I plan to manage my weight loss with consultation or assistance from a health or medical professional (for eg. General Practitioner, Specialist Medical Professional such as an endocrinologist or bariatric surgeon; Dietitian, Nutritionist, Psychologist, Exercise Physiologist)
- ◯ I plan to manage my weight loss with the assistance of a structured commercial weight loss program or service (for eg. weight-loss coach, Weight Watchers®, Lite n' Easy®, Sureslim®, JennyCraig®etc)

If you had to choose one main reason why you are trying to lose weight, what would it be?

- ◯ I have to lose weight for medical reasons
- ◯ To please others (eg. family, friends, spouse)
- ◯ It is necessary for my job
- ◯ For general health and wellness
- ◯ For aesthetic reasons or to feel more attractive
- ◯ To have more confidence

Health

Compared to other people your age, how would you describe your general health?

- ◯ very good
- ◯ good
- ◯ fair
- ◯ bad
- ◯ very bad

Please select all the health conditions that a doctor or health professional has diagnosed.

- ☐ Diabetes
- ☐ Heart Disease
- ☐ Cancer
- ☐ Gall Bladder Disease
- ☐ Osteoarthritis
- ☐ Sleep Apnoea
- ☐ Depression
- ☐ Eating disorders
- ☐ Other
- ☐ None of the above

Please list other diagnosed conditions.

Can you remember a time when you felt comfortable with your weight and your well-being?

◯ Never felt comfortable ◯ Unsure ◯ yes - a long time ago ◯ yes - in recent times

Weight Loss History

Are you currently gaining weight without trying to?
(choose yes or no)

◯ Yes ◯ No

How much weight have you gained since your late teens or early twenties? Choose kilograms(kgs) or stone (st) and pounds (lbs) to provide your answer.

◯ kilograms(kgs) ◯ stone (st) and pounds (lbs)

provide weight gained in kilograms (kgs)

____

provide weight gained in stone (stn)

____

and pounds (lbs)

____

converting stones and pounds to Kgs (hidden field)

____

How many times have you tried to lose weight since you were in your late teens or early twenties?

◯ Never ◯ 1-3 times ◯ 4 times or more ◯ I am always trying to lose weight

What do you believe has been the main contributor to you developing a weight problem? Please choose one main reason.

◯ medical reasons
◯ genes / family trait
◯ poor diet
◯ insufficient exercise
◯ lack of time / resources
◯ lack of access/availability of healthy food

About you

How tall are you without shoes?

Please provide your height in

◯ centimetres (cms) ◯ in feet and inches

please give to the nearest cm ______________________

converting cm to m ______________________

feet ______________________

inches ______________________

Converting feet/inches to cms then to m ______________________

About how much do you weigh? You can provide your answer in 'kilograms' (Kgs) or in 'stone (st) and pounds (lbs). (Choose kgs or st and lbs)

◯ kilograms (Kgs) ◯ stone (st) and pounds (lbs)

Please provide your answer in kilograms (Kgs) ______________________

Please provide your answer in stone (st) ______________________

and pounds (lbs) ______________________

converting stones and pounds to Kgs ______________________

BMI using kg/m2 ______________________

What is your gender?

◯ male ◯ female

What is your age range?

◯ 18-19 years ◯ 20-24 years ◯ 25-29 years ◯ 30-34 years ◯ 35-39 years ◯ 40-44 years
◯ 45-49 years ◯ 50-54 years ◯ 55-59 years ◯ 60-64 years ◯ 65-69 years ◯ 70-74 years
◯ 75-79 years ◯ 80+ years

Education and Language

What is the level of the highest qualification that you have completed?	◯ I didn't go to school ◯ Year 10 or below ◯ Certificate I / II ◯ Year 12 or HSC ◯ Certificate III/IV ◯ Advanced Diploma / Diploma ◯ Graduate Diploma / Graduate Certificate ◯ Bachelor Degree ◯ Postgraduate Degree
Do you speak a language other than English at home?	◯ Yes ◯ No (choose yes or no)

Please list all the languages you speak at home.

Smoking and Alcohol

Do you consider yourself a regular smoker?

◯ Yes
◯ No
(choose yes or no)

About how many cigarettes do you smoke per day?

____
(enter number of cigarettes)

About how many alcoholic drinks do you have each week?

one drink = a glass of wine, middy of beer or nip of spirits

(put "0" if you do not drink, or have less than one drink each week)

____

On how many days each week do you usually drink alcohol?

____

Family

What is your current relationship status?	◯ Single ◯ married ◯ de facto/living with a partner ◯ widowed ◯ divorced ◯ separated

Walking

In the last week, how many times have you walked continuously, for at least
10 minutes, for recreation, exercise or to get to or from places?

If you did not walk for at least 10 minutes continuously at any time, please enter "0" below.

____
(enter how many times per week)

What do you estimate was the total time that you spent walking in this way in the last week?

Please provide your answer in minutes. (For eg. 1 hour and 30 minutes = 90 minutes)

____
(enter total number of minutes)

Vigorous Physical Activity

In the last week, how many times did you do any vigorous physical activity which made you breathe harder or puff and pant? (e.g. jogging, cycling, aerobics, competitive tennis, vigorous gardening, heavy work around the yard)

If you did not do any vigorous physical activity enter "0" below.

____
(enter how many times per week)

What do you estimate was the total time that you spent doing this vigorous physical activity in the last week?

Please provide your answer in minutes. (For eg. 1 hour and 30 minutes = 90 minutes)

____
(enter total number of minutes)

Moderate Physical Activity

In the last week, how many times did you do any other more moderate physical activities that you have not already mentioned? (e.g. gentle swimming, social tennis, golf)

If you did not do any more moderate physical activity enter "0" below.

____
(enter how many times per week)

What do you estimate was the total time that you spent doing these moderate physical activities in the last week?

Please provide your answer in minutes. (For eg. 1 hour and 30 minutes = 90 minutes)

____
(enter total number of minutes)

Thanks for coming this far - you're more than halfway through the survey.

Dietary Intake - What food do you usually eat?

In the questions below, compare the amount you eat to the serving size, and then choose how many of these servings you normally eat in a typical day or week.

Vegetables (½ cup = 1 serve)	◯ never/occasionally ◯ 1-2 serves/week ◯ 3-5 serves/week ◯ 1 serve/day ◯ 2 serves/day ◯ 3 serves/day ◯ 4 serves/day ◯ 5 or more serves/day
Fruit (1 medium piece = 1 serve)	◯ never/occasionally ◯ 1-2 serves/week ◯ 3-5 serves/week ◯ 1 serve/day ◯ 2 serves/day ◯ 3 or more serves/day
Grains, cereals, rice, bread, pasta, noodles (Bread 2 slices = 1 serve) (Porridge/cooked rice/cooked pasta 1 cup = 1 serve)	◯ never/occasionally ◯ 1-2 serves/week ◯ 3-5 serves/week ◯ 1 serve/day ◯ 2 serves/day ◯ 3 or more serves/day
meat, fish, poultry, eggs (100grams of meat / fish / poultry= 1 serve) (2 eggs = 1 serve)	◯ never/occasionally ◯ 1-2 serves/week ◯ 3-5 serves/week ◯ 1 serve/day ◯ 2 serves/day ◯ 3 or more serves/day
Milk, yoghurt, cheese and/or their alternatives (1 cup = 1serve) (cheese 2 slices = 1 serve)	◯ never/occasionally ◯ 1-2 serves/week ◯ 3-5 serves/week ◯ 1 serve/day ◯ 2 serves/day ◯ 3 or more serves/day
Oils, butter, margarine, ghee, and other fats (1 tablespoon = 1 serve)	◯ never/occasionally ◯ 1-2 serves/week ◯ 3-5 serves/week ◯ 1 serve/day ◯ 2 serves/day ◯ 3 or more serves/day

Dietary Intake - continued

In the questions below, compare the amount you eat to the serving size, and then choose how many of these servings you normally eat in a typical day or week.

Cakes, biscuits, pies and pastries (1 serve = an average serve)	◯ never/occasionally ◯ 1-2 serves/week ◯ 3-5 serves/week ◯ 1 serve/day ◯ 2 serves/day ◯ 3 or more serves/day
Take away food (e.g. fried chicken or fish, chips, burgers from McDonalds, Hungry Jacks, Pizza Hut, KFC, Red Rooster, or local take-away places) (1meal = 1 serve)	◯ never/occasionally ◯ 1-2 serves/week ◯ 3-5 serves/week ◯ 1 serve/day ◯ 2 serves/day ◯ 3 or more serves/day
Drinks (sugary soft drink, juices, cordials or sports drink, such as lemonade or Gatorade) (1 glass = 1 serve)	◯ never/occasionally ◯ 1-2 serves/week ◯ 3-5 serves/week ◯ 1 serve/day ◯ 2 serves/day ◯ 3 or more serves/day
sausages, frankfurts, devon, salami, hamburgers, chicken nuggets, meat pies, bacon or ham (100g = 1 serve)	◯ never/occasionally ◯ 1-2 serves/week ◯ 3-5 serves/week ◯ 1 serve/day ◯ 2 serves/day ◯ 3 or more serves/day
hot chips, french-fries, wedges or fried potatoes (150g = 1 serve)	◯ never/occasionally ◯ 1-2 serves/week ◯ 3-5 serves/week ◯ 1 serve/day ◯ 2 serves/day ◯ 3 or more serves/day
In the past month, how often did you eat something not prepared at home? Please include eating at restaurants, take-aways, ready to eat meals from the supermarket, and home delivery.	◯ never/rarely ◯ one to three times per month ◯ one to two times per week ◯ three to four times per week ◯ five to six times per week ◯ one or more times per day

Weight Loss Strategy

Imagine that you were chatting casually about your weight-loss diet with someone you met in an elevator. Would you use any of the following terms to describe your diet?

It's okay if your diet doesn't 100% match what these diets are "supposed to be." Please choose the one that best matches what you would say, or select "Other diet" if you follow/plan to follow a diet that is not listed here.

◯ No particular diet. I don't follow/plan to follow any diet
◯ No particular diet. but I try to eat healthy
◯ Mediterranean-type diet
◯ Paleolithic-type diet
◯ Ketogenic diet
◯ Vegan diet
◯ Raw vegan diet
◯ Vegetarian diet
◯ Pescatarian diet (vegetarian but includes fish)
◯ Gluten-free diet
◯ Whole / Real food diet
◯ Whole / Real food, plant-based diet
◯ Locavore / local food diet
◯ Weston A. Price diet or GAPS Diet
◯ High-protein diet
◯ Low-carb diet
◯ Low-fat diet
◯ Low-carb High Fat Diet
◯ Dairy-free
◯ low sugar / sugar-free diet
◯ Low-GI (glycaemic index)diet
◯ Fasting (eg. 5 & 2 diet, intermittent fasting)
◯ calorie-restricted diet
◯ Doctor/practitioner recommended (diabetic sugar-free diet, DASH, low-calorie, or other)
◯ Commercially prepared meal program (eg Lite and Easy)
◯ Other diet (the diet I follow / plan to follow s not listed here)
◯ Prefer not to answer

Can you describe the diet you follow/plan to follow?

Can you describe what exercise/physical activity regime you follow/plan to follow for your weight loss?

Do you plan to use any of the following weight-loss products?

- Over the counter supplements available from the pharmacy,
- weight loss shakes / bars,
- protein powder,
- calorie-controlled prepared meal (eg Lean Cuisines, McCain Healthy Choice, Supermarket weight loss meals etc)

◯ Yes ◯ No

Do you plan to follow any diet books or websites?

◯ Yes ◯ No

Do you plan to follow any smartphone app diet programs?

◯ Yes ◯ No

Which is the main source of diet or nutrition-related information in your weight-loss attempt?

◯ blogs, social media
◯ news media, radio/televisions shows, documentaries
◯ nutritionist, dietitian, GP, other health professionals
◯ commercial weight-loss programs/services
◯ books /apps
◯ other

please describe what is your main source of diet and nutrition information?

Do you currently track or plan to track your diet as part of your weight loss strategy? (choose yes or no)

◯ Yes ◯ No

Do you currently track or plan to track your exercise and physical activity as part of your weight loss strategy?

◯ Yes ◯ No

Do you currently track or plan to track your weight as part of your weight loss strategy?

◯ Yes
◯ No

Can you describe what you use or plan to use, to track and record your diet / exercise / weight data -

☐ Wearable Devices (eg. Apple Watch, FitBlt, Garmin etc.)
☐ Smart Phone App
☐ Pen and paper diary
☐ Other

You chose "other", Can you please describe what you use to track or monitor diet/exercise/weight data?

We have almost finished. These are the last sets of questions!

Please read the statements below and select the answer that indicates the frequency with which you find yourself feeling or experiencing what is being described in the statements below.

"I eat whatever I want, whenever I want."

◯ Like me to a large extent
◯ somewhat like me
◯ Very little like me
◯ Not at all like me

"I feel hungry almost all the time"

◯ Like me to a large extent
◯ somewhat like me
◯ Very little like me
◯ Not at all like me

"I find myself eating if I am stressed/anxious/sad/lonely"

◯ Like me to a large extent
◯ somewhat like me
◯ Very little like me
◯ Not at all like me

"I continue eating binges even though I am not hungry"

◯ Like me to a large extent
◯ somewhat like me
◯ Very little like me
◯ Not at all like me

"I am able to limit food and still able to avoid feelings tight restrictions or of deprivation"

◯ Like me to a large extent
◯ somewhat like me
◯ Very little like me
◯ Not at all like me

"I feel supported by my family/ friends in my weight loss efforts"

◯ Like me to a large extent
◯ somewhat like me
◯ Very little like me
◯ Not at all like me

"I feel I have the capacity to deal with challenges and cope with stressful or adverse situations"

◯ Like me to a large extent
◯ somewhat like me
◯ Very little like me
◯ Not at all like me

"I believe that I have the ability to follow my weight loss plan and achieve my weight loss goal"

◯ Like me to a large extent
◯ somewhat like me
◯ Very little like me
◯ Not at all like me

"I think of things in "black and white" terms. For example, I think of food as either "good" or "bad" or I think of myself as doing things either very well or very badly"

◯ Like me to a large extent
◯ somewhat like me
◯ Very little like me
◯ Not at all like me

"I have stability in my life - personal and professional."

◯ Like me to a large extent
◯ somewhat like me
◯ Very little like me
◯ Not at all like me

Weight Bias

In your day-to-day life, in relation to your weight status, how often have any of the following things happened to you:

1. you are treated with less respect or courtesy
2. you receive poorer service than other people in restaurants and stores
3. people act as if they think you are not clever
4. you are threatened or harassed
5. you receive poorer service or treatment than other people from doctors or hospitals.

◯ Never
◯ Rarely
◯ Sometimes
◯ Frequently
◯ Almost always

Is there anything else you want to share regarding your weight loss journey?

Appendix D3: Follow-up survey questionnaire: Australian self-managed weight loss follow-up survey

Australian Self-managed weight loss follow up survey

Welcome to the Follow-Up Survey on Self-managed weight loss in Australia!

Three months earlier you took part in our survey and told us about your weight loss attempt. With the global pandemic affecting all aspects of our lives, we do understand it may have affected your weight-loss journey.

In this follow-up survey, there are few more questions about your weight loss journey, strategies you used, challenges that you may have faced, or aspects that facilitated your weight loss. Your inputs and insights are very valuable and can help others who are thinking about beginning such a journey.

The survey is shorter than the initial survey will take you about 10 - 12 minutes to complete. If you need to take a break in between, you can save your responses and you will be provided with a code to come back and continue the survey.

The University of Sydney Human Research Ethics Committee approves and regulates all research studies conducted at USyd. The Participant Information Form attached below provides details of the study and seeks your consent before you are taken through the survey questions. HREC approval number [2018/526]

Read the statements below and chose the option that best describes the manner in which you managed your most recent weight loss?

- ◯ I managed my weight-loss by myself without any direct assistance from health professionals or commercial weight loss programs.
- ◯ I managed my weight loss with assistance from a health or medical professional (for eg. General Practitioner, Specialist Medical Professional such as an endocrinologist or bariatric surgeon; Dietitian, Nutritionist, Psychologist, Exercise Physiologist)
- ◯ I managed my weight loss with the assistance of a structured commercial weight loss program or service (for eg. weightloss coach, Weight Watchers®, Lite n' Easy®, Sureslim®, JennyCraig®etc)

Health

Compared to other people your age, how would you describe your general health?

○ very good
○ good
○ fair
○ bad
○ very bad

Weight Change

How much do you currently weigh?

You can provide your answer in 'kilograms' (Kgs) or in 'stone (st) and pounds (lbs).
(Choose kgs or st and lbs)

◯ kilograms (Kgs)
◯ stone (st) and pounds (lbs)

provide current weight in kilograms (kgs)

____

provide current weight in stone (stn)

____

and pounds (lbs)

____

Do you feel you have achieved your weight loss goal in your most recent weight loss attempt?

◯ yes
◯ somewhat
◯ no

How satisfied were you with your weight loss attempt?

◯ Very satisfied
◯ Moderately satisfied
◯ Neither satisfied nor dissatisfied
◯ Moderately dissatisfied
◯ Very dissatisfied

Weight Change

Since you completed the first survey three months ago, have you:

◯ lost weight ◯ gained weight ◯ or is your weight stable?

How much weight have you lost since you completed the first survey three months ago?

You can provide your answer in 'kilograms' (Kgs) or in 'stone (st) and pounds (lbs).
(Choose kgs or st and lbs)

◯ kilograms (Kgs)
◯ stone (st) and pounds (lbs)

provide weight lost in kilograms (kgs)

____

provide weight lost in stones (stn)

____

and pounds (lbs)

____

How much weight have you gained since you completed the first survey since late 2018?

You can provide your answer in 'kilograms' (Kgs) or in 'stone (st) and pounds (lbs).
(Choose kgs or st and lbs)

◯ kilograms (Kgs)
◯ stone (st) and pounds (lbs)

provide weight gained in kilograms (kgs)

____

provide weight gained in stones (stn)

____

and pounds (lbs)

____

Diet

Imagine that you were chatting casually about your weight-loss diet with someone you met in an elevator. Would you use any of the following terms to describe what you typically eat?

It's okay if your diet doesn't 100% match what these diets are "supposed to be." Please choose the one that best matches what you would say, or select "Other diet" if you follow a diet that is not listed here.
(choose all that apply)

◯ No particular diet / I haven't followed any diet
◯ No particular diet, but I have tried to eat healthy
◯ Mediterranean-type diet
◯ Paleolithic-type diet
◯ Vegan diet
◯ Raw vegan diet
◯ Vegetarian diet
◯ Pescatarian diet
◯ Gluten-free diet
◯ Whole / Real food diet
◯ Whole / Real food, plant-based diet
◯ Locavore / local food diet
◯ Weston A. Price diet or GAPS Diet
◯ High-protein diet
◯ Low-carb diet
◯ Low-fat diet
◯ Dairy-free
◯ low sugar / sugar-free diet
◯ Low-GI (glycaemic index)diet
◯ Fasting (eg. 5 & 2 diet, intermittent fasting)
◯ calorie-restricted diet
◯ Doctor/practitioner recommended (diabetic sugar-free diet, DASH, low-calorie, or other)
◯ Commercially prepared meal program (Lite and Easy)
◯ Other diet (the diet I have followed is not listed here)
◯ Prefer not to answer

Can you please describe the diet you followed for your weight loss?

Dietary Intake - What food do you usually eat?

In the questions below, compare the amount you eat to the serving size, and then choose how many of these servings you normally eat in a typical day or week.

Vegetables (½ cup = 1 serve)	◯ never/occasionally ◯ 1-2 serves/week ◯ 3-5 serves/week ◯ 1 serve/day ◯ 2 serves/day ◯ 3 serves/day ◯ 4 serves/day ◯ 5 or more serves/day
Fruit (1 medium piece = 1 serve)	◯ never/occasionally ◯ 1-2 serves/week ◯ 3-5 serves/week ◯ 1 serve/day ◯ 2 serves/day ◯ 3 serves/day
Grains, cereals, rice, bread, pasta, noodles (Bread 2 slices = 1 serve) (Porridge/cooked rice/cooked pasta 1 cup = 1 serve)dles	◯ never/occasionally ◯ 1-2 serves/week ◯ 3-5 serves/week ◯ 1 serve/day ◯ 2 serves/day ◯ 3 or more serves/day
meat, fish, poultry, eggs (100grams of meat / fish / poultry= 1 serve) (2 eggs = 1 serve)	◯ never/occasionally ◯ 1-2 serves/week ◯ 3-5 serves/week ◯ 1 serve/day ◯ 2 serves/day ◯ 3 or more serves/day
Milk, yoghurt, cheese and/or their alternatives (1 cup = 1serve) (cheese 2 slices = 1 serve)	◯ never/occasionally ◯ 1-2 serves/week ◯ 3-5 serves/week ◯ 1 serve/day ◯ 2 serves/day ◯ 3 or more serves/day
Oils, butter, margarine, ghee, and other fats (1 tablespoon = 1 serve)	◯ never/occasionally ◯ 1-2 serves/week ◯ 3-5 serves/week ◯ 1 serve/day ◯ 2 serves/day ◯ 3 or more serves/day

Dietary Intake - continued

In the questions below, compare the amount you eat to the serving size, and then choose how many of these servings you normally eat in a typical day or week.

Sausages, frankfurts, devon, salami, hamburgers, chicken nuggets, bacon or ham	◯ never/occasionally ◯ 1-2 serves/week ◯ 3-5 serves/week ◯ 1 serve/day ◯ 2 serves/day ◯ 3 or more serves/day
Cakes, biscuits, pies and pastries (1 serve = an average serve)	◯ never/occasionally ◯ 1-2 serves/week ◯ 3-5 serves/week ◯ 1 serve/day ◯ 2 serves/day ◯ 3 or more serves/day
Take away food (e.g. fried chicken or fish, chips, burgers from McDonalds, Hungry Jacks, Pizza Hut, KFC, Red Rooster, or local take-away places) (1meal = 1 servel)	◯ never/occasionally ◯ 1-2 serves/week ◯ 3-5 serves/week ◯ 1 serve/day ◯ 2 serves/day ◯ 3 or more serves/day
Drinks (sugary soft drink, juices, cordials or sports drink, such as lemonade or Gatorade) (1 glass = 1 serve)	◯ never/occasionally ◯ 1-2 serves/week ◯ 3-5 serves/week ◯ 1 serve/day ◯ 2 serves/day ◯ 3 or more serves/day
sausages, frankfurts, devon, salami, hamburgers, chicken nuggets, meat pies, bacon or ham (100g = 1 serve)	◯ never/occasionally ◯ 1-2 serves/week ◯ 3-5 serves/week ◯ 1 serve/day ◯ 2 serves/day ◯ 3 or more serves/day
hot chips, french-fries, wedges or fried potatoes (150g = 1 serve)	◯ never/occasionally ◯ 1-2 serves/week ◯ 3-5 serves/week ◯ 1 serve/day ◯ 2 serves/day ◯ 3 or more serves/day

Dietary changes to support weight loss

Can you describe any key changes that you have made to your diet to support your weight loss journey?

Walking

In the last week, how many times have you walked continuously, for at least
10 minutes, for recreation, exercise or to get to or from places?

If you did not walk for at least 10 minutes continuously at any time, please enter "0" below.

____
(enter how many times per week)

What do you estimate was the total time that you spent walking in this way in the last week?

Please provide your answer in minutes. (For eg. 1 hour and 30 minutes = 90 minutes)

____
(Enter total time in minutes)

Vigorous Physical Activity

In the last week, how many times did you do any vigorous physical activity which made you breathe harder or puff and pant? (e.g. jogging, cycling, aerobics, competitive tennis, vigorous gardening, heavy work around the yard)

If you did not do any vigorous physical activity enter "0" below.

____
(enter how many times per week)

What do you estimate was the total time that you spent doing this vigorous physical activity in the last week?

Please provide your answer in minutes. (For eg. 1 hour and 30 minutes = 90 minutes)

____
(enter total number of minutes)

Moderate Physical Activity

In the last week, how many times did you do any other more moderate physical activities that you have not already mentioned? (e.g. gentle swimming, social tennis, golf)

If you did not do any more moderate physical activity enter "0" below.

____
(enterhow many times per week)

What do you estimate was the total time that you spent doing these moderate physical activities in the last week?

Please provide your answer in minutes. (For eg. 1 hour and 30 minutes = 90 minutes)

____
(enter total number of minutes)

Can you describe key changes that you may have made to your physical activity/exercise in order to support your weight loss journey?

Lifestyle

How likely are you to continue any changes that you have made to your diet and/or exercise that help you lose weight, as a regular part of your lifestyle?

◯ Very likely ◯ Moderately likely ◯ Neither likely nor unlikely ◯ Moderately unlikely
◯ Very unlikely

Do you foresee any issues or barriers in sustaining your weight loss? Can you please describe them?

Please read the statement below and indicate how true the following statement is in relation to your recent weight loss attempt?

"I was able to use the knowledge obtained from my previous weight loss experiences to shape my approach to my most recent weight loss attempt"

◯ Strongly agree ◯ moderately agree ◯ neither agree nor disagree ◯ moderately disagree
◯ strongly disagree

COVID-19 restrictions - impact questions

These questions relate to social effects due to pandemic (eg. restrictions, physical distancing, isolation, quarantines, availability of foods of choice etc) and how they may have affected your weight loss journey.

Has your diet strategy for weight-loss been impacted because of the recent restrictions and social effects of the pandemic?

○ Yes ○ No

Can you please describe how your diet has been impacted because of the pandemic? For example, are you consuming different foods, are there changes in the portion sizes, or frequency of eating or eating behaviours such as stress eating?

Has your physical activity or exercise strategy for weight-loss been impacted because of the recent restrictions due to the restrictions of the pandemic?

○ Yes ○ No

Can you please describe how your physical activity or exercise plans have been impacted? For example, has there been a change in how much you exercise or have you modified the way in which you exercise?

Do you want to share anything else regarding how the pandemic is affecting your weight-loss plan?

Open questions

Do you have anything further to tell us about your weight loss journey?

Would you like to be contacted for future studies on your weight loss?	◯ Yes ◯ No
Please provide your email address where we can send you details about future studies.	__________________

Appendix D4: Additional survey questions: Self-managed weight loss survey—COVID-19 impact

Confidential

Self-Managed Weight Loss Survey - COVID-19 Impact

Dear Participant,

Early this year you had completed Part 1 of a survey study on Self-Managed Weight Loss in Australia. However, you may have missed completing part 2 of the survey study, even as the COVID-19 pandemic overtook the world.

These are very unusual times, and there are widespread impacts on life as we know it. We do understand that these impacts may or may not have affected your weight-loss journey in some manner.

Would you please consider answering the three questions in this survey? It will not take more than 5 -7 minutes of your time. Your answers will be helpful in understanding the impact of the pandemic on weight management.

Note: If you would still like to complete Part 2 of the survey - please check your mails for the invitation and unique link sent to your mail from "Boden Research". If you choose to complete Part2, then you do not need to complete this short survey again.

Thank you once again, and we wish you the very best in your health journeys. Stay safe and take care!

Here is the COVID Impact survey link below.

Thank you!

COVID-19 Social Impact Questions

These questions relate to the social effects due to pandemic (eg. restrictions, physical distancing, isolation, quarantines, availability of foods of choice etc) and how they may have affected your weight-loss journey.

Has your diet strategy for weight-loss been impacted because of the recent restrictions and social effects of the pandemic?

○ Yes ○ No

Can you please describe how your diet has been impacted because of the pandemic? For example, are you consuming different foods, are there changes in the portion sizes, or frequency of eating or eating behaviours such as stress eating?

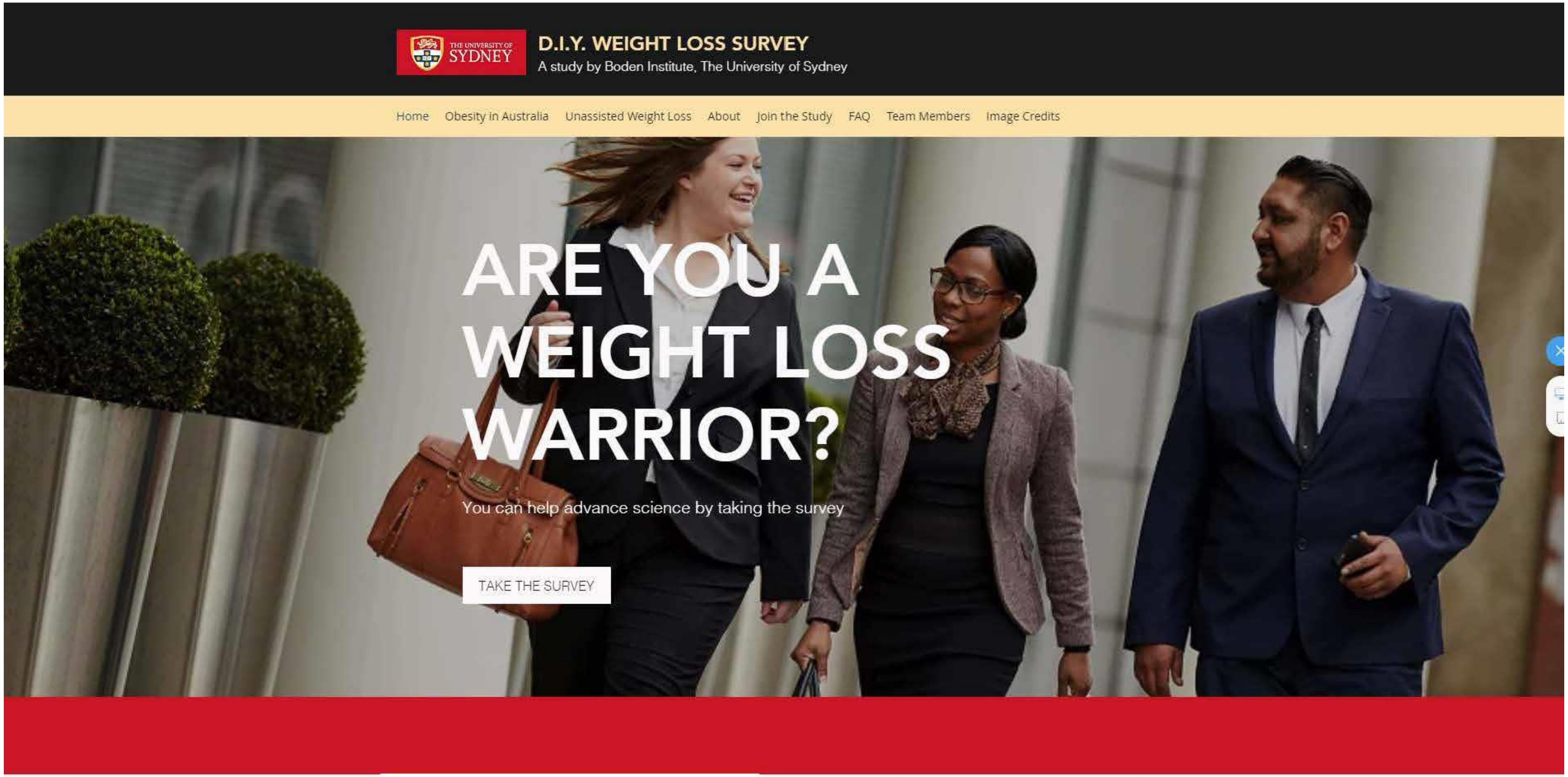
Has your exercise-strategy for weight-loss been impacted because of the recent restrictions due the pandemic?

○ Yes ○ No

Can you please describe how your exercise plans have been impacted? For example, has there been a change in how much you exercise or have you modified the way in which you exercise?

Do you want to share anything else regarding how the pandemic is affecting your weight-loss plan?

Appendix E: Study Website


THE UNIVERSITY OF SYDNEY
D.I.Y. WEIGHT LOSS SURVEY
A study by Boden Institute, The University of Sydney
Home
Obesity in Australia
Unassisted Weight Loss
About
Join the Study
FAQ
Team Members
Image Credits
ARE YOU A WEIGHT LOSS WARRIOR?
You can help advance science by taking the survey
TAKE THE SURVEY

D.I.Y. WEIGHT LOSS SURVEY

A study by Boden Institute, The University of Sydney

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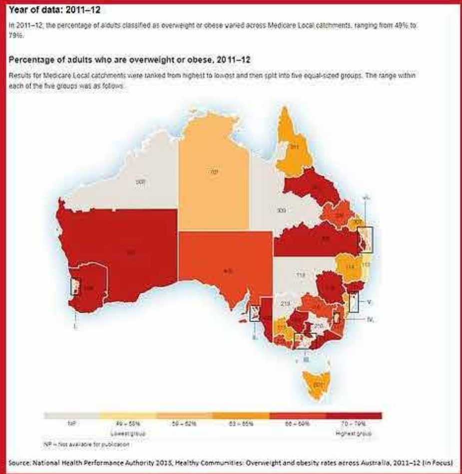

OBESITY IN AUSTRALIA

Over 11 million Australians are overweight or obese. That is nearly 64% of the population.

Obesity is a risk factor for a variety of chronic conditions including diabetes, hypertension, high cholesterol, stroke, heart disease, certain cancers and arthritis.


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MOST AUSTRALIANS ARE ALREADY ATTEMPTING WEIGHT-LOSS!
Many do it the D.I.Y. (do it yourself) way, and own without any outside help.
"I started playing basket ball thrice a week."
"I reduced carbs, upped my protein and started eating more fresh fruit and vegetables."

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"I started playing basket ball thrice a week."

"I reduced carbs, upped my protein and started eating more fresh fruit and vegetables."

"I started cycling every morning"

"I joined a dance class. I enjoy dancing and its helped me loose weight "

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ABOUT D.I.Y. WEIGHT LOSS STUDY

We know little about those who decide to loose weight by themselves without the help of physicians or dietitians or through or a formal weight management program. What makes such DIY weight losers successful. What are the enablers and barriers?

Studying those from the general population who loose weight on their own will provide valuable insights. Such insights can inform on how to motivate more and more Australians to reach and maintain a healthy weight, reducing risk of chronic disease.

Researchers at the Boden Institute, The University of Sydney have already begun preliminary research in this area, and are currently looking to recruit participants for the study.


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JOIN THE STUDY
make a difference
Sparkling
Soya, almond or
coconut milk

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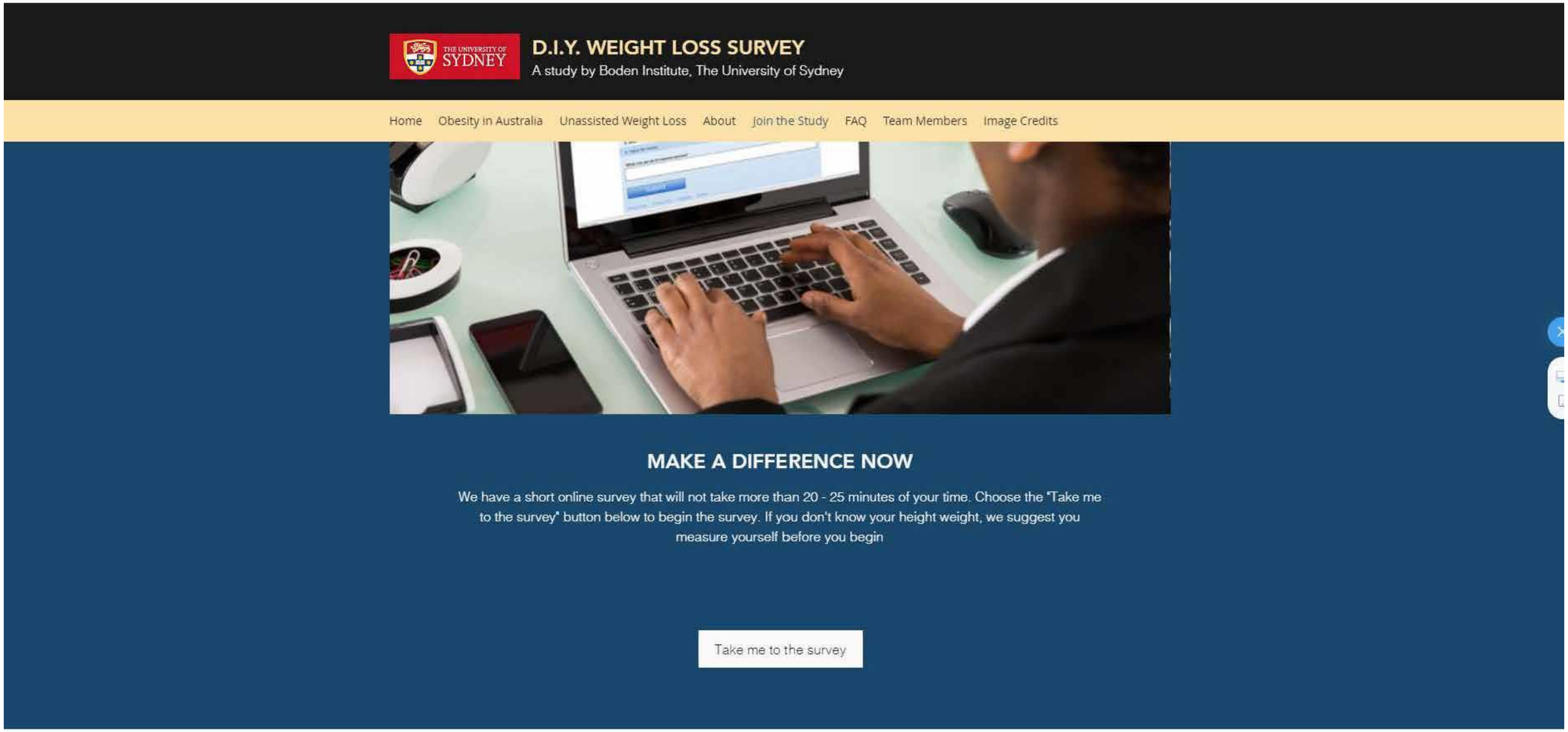
ELIGIBILITY CRITERIA

If you are between 18 and 65 years of age, live in Australia and have either just begun your weight loss journey or planning to start in the next few weeks, you are eligible to take part in the study survey. For more information and to know what is involved please look at the FAQs, or read the Participant Information Sheet available on clicking the link to the survey in the section below.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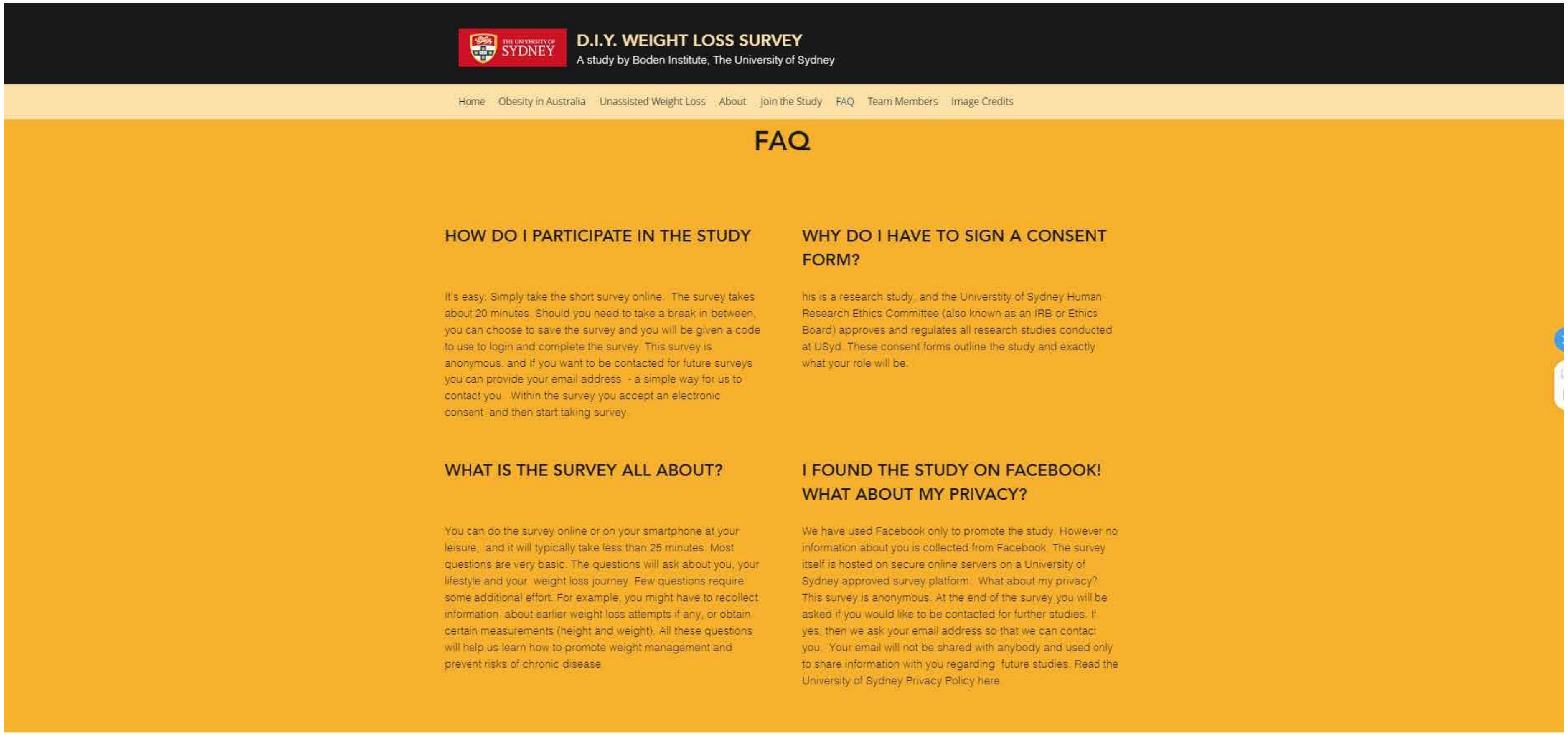
MAKE A DIFFERENCE NOW
We have a short online survey that will not take more than 20 - 25 minutes of your time. Choose the "Take me to the survey" button below to begin the survey. If you don't know your height weight, we suggest you measure yourself before you begin
Take me to the survey



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FAQ

HOW DO I PARTICIPATE IN THE STUDY

It's easy. Simply take the short survey online. The survey takes about 20 minutes. Should you need to take a break in between, you can choose to save the survey and you will be given a code to use to login and complete the survey. This survey is anonymous. and If you want to be contacted for future surveys you can provide your email address - a simple way for us to contact you. Within the survey you accept an electronic consent and then start taking survey.

WHY DO I HAVE TO SIGN A CONSENT FORM?

his is a research study, and the Universtity of Sydney Human Research Ethics Committee (also known as an IRB or Ethics Board) approves and regulates all research studies conducted at USyd. These consent forms outline the study and exactly what your role will be.

WHAT IS THE SURVEY ALL ABOUT?

You can do the survey online or on your smartphone at your leisure, and it will typically take less than 25 minutes. Most questions are very basic. The questions will ask about you, your lifestyle and your weight loss journey. Few questions require some additional effort. For example, you might have to recollect information about earlier weight loss attempts if any, or obtain certain measurements (height and weight). All these questions will help us learn how to promote weight management and prevent risks of chronic disease.

I FOUND THE STUDY ON FACEBOOK! WHAT ABOUT MY PRIVACY?

We have used Facebook only to promote the study. However no information about you is collected from Facebook. The survey itself is hosted on secure online servers on a University of Sydney approved survey platform. What about my privacy? This survey is anonymous. At the end of the survey you will be asked if you would like to be contacted for further studies. If yes, then we ask your email address so that we can contact you. Your email will not be shared with anybody and used only to share information with you regarding future studies. Read the University of Sydney Privacy Policy here.

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RESEARCH TEAM

Contact us if you need further information

PROFESSOR TIMOTHY GILL

Director, Boden Institute of Obesity, Nutrition, Exercise & Eating Disorders, Sydney Medical School

Professor Timothy (Tim) Gill is an academic, researcher and public health policy advisor on nutrition, obesity, and chronic disease prevention. He is experienced in varied aspects of obesity prevention and management including public policy development and tailoring communication messages around weight management. Professor Gill is past Scientific Secretary for the International Obesity Taskforce (IOTF), London, UK where he coordinated and helped implement IOTF projects worldwide, established formal IOTF links with the Commonwealth of Nations and major UN organisations, and was a regular advisor to WHO consultations on obesity and chronic disease. Professor Gill has helped develop polices and guidelines on obesity and public health nutrition-related issues for the EU and the UK Government and authored key reports on obesity for Australian Federal and State government departments. He is a member of the Scientific and Technical Advisory Committee, Public Health and Policy, World Obesity Federation.

Email: tim.gill@sydney.edu.au, Phone: +61 2 86271863

SYDNEY

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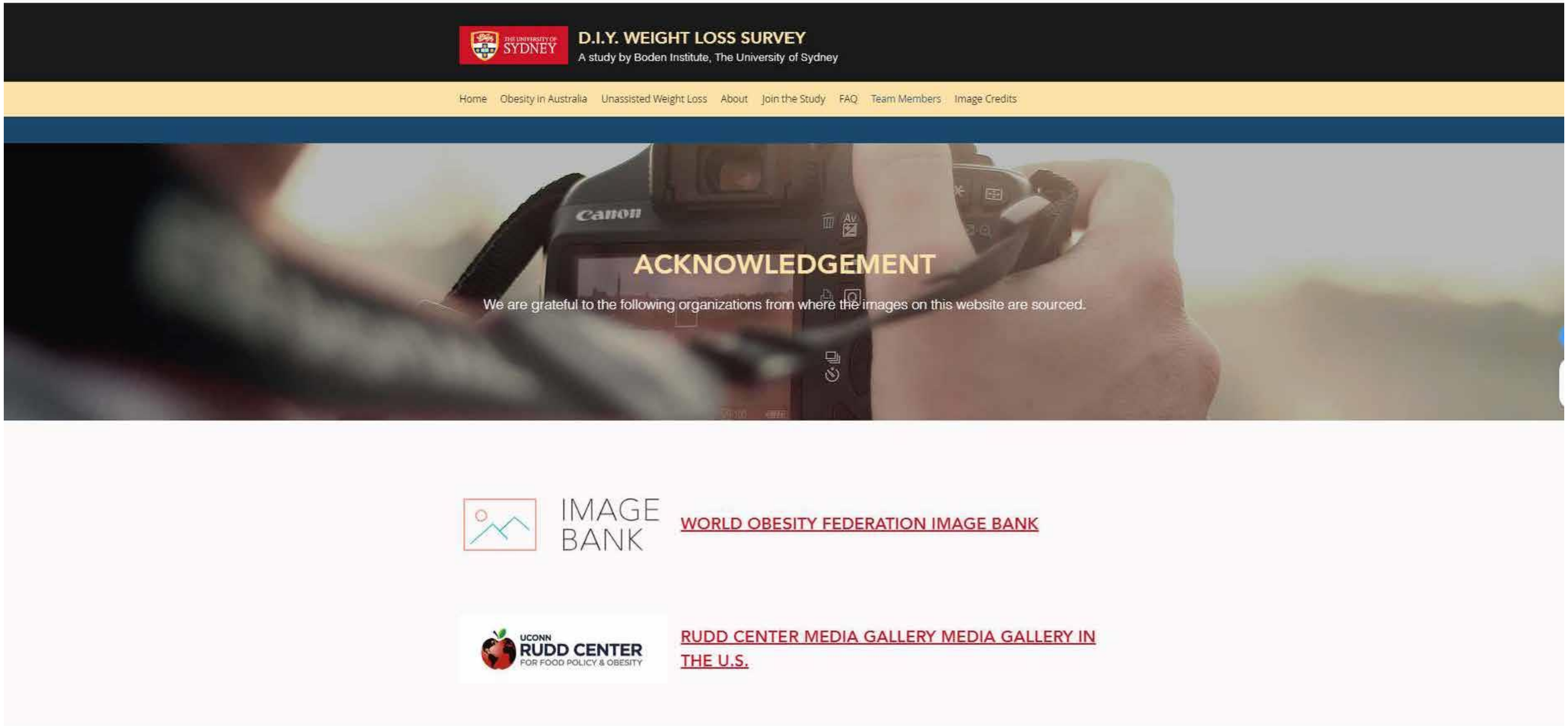
DIVYA RAMACHANDRAN

M.Phil candidate, Boden Institute of Obesity, Nutrition, Exercise & Eating Disorders, Sydney Medical School. Health Research Analyst, CMCRC

Divya has completed a Masters in Public Health and has a keen interest in chronic disease prevention, and using social media for health promotion. She cares about empowering individuals in taking control of their own health – whether by managing their lifestyle risk factors or by making educated healthcare choices. Prior to pursuing her interest in public health, Divya has held leadership and managerial positions in employee learning and development with technology multinationals IBM and GE.

Email: divya.ramachandran@sydney.edu.au, Phone: +61 2 86271863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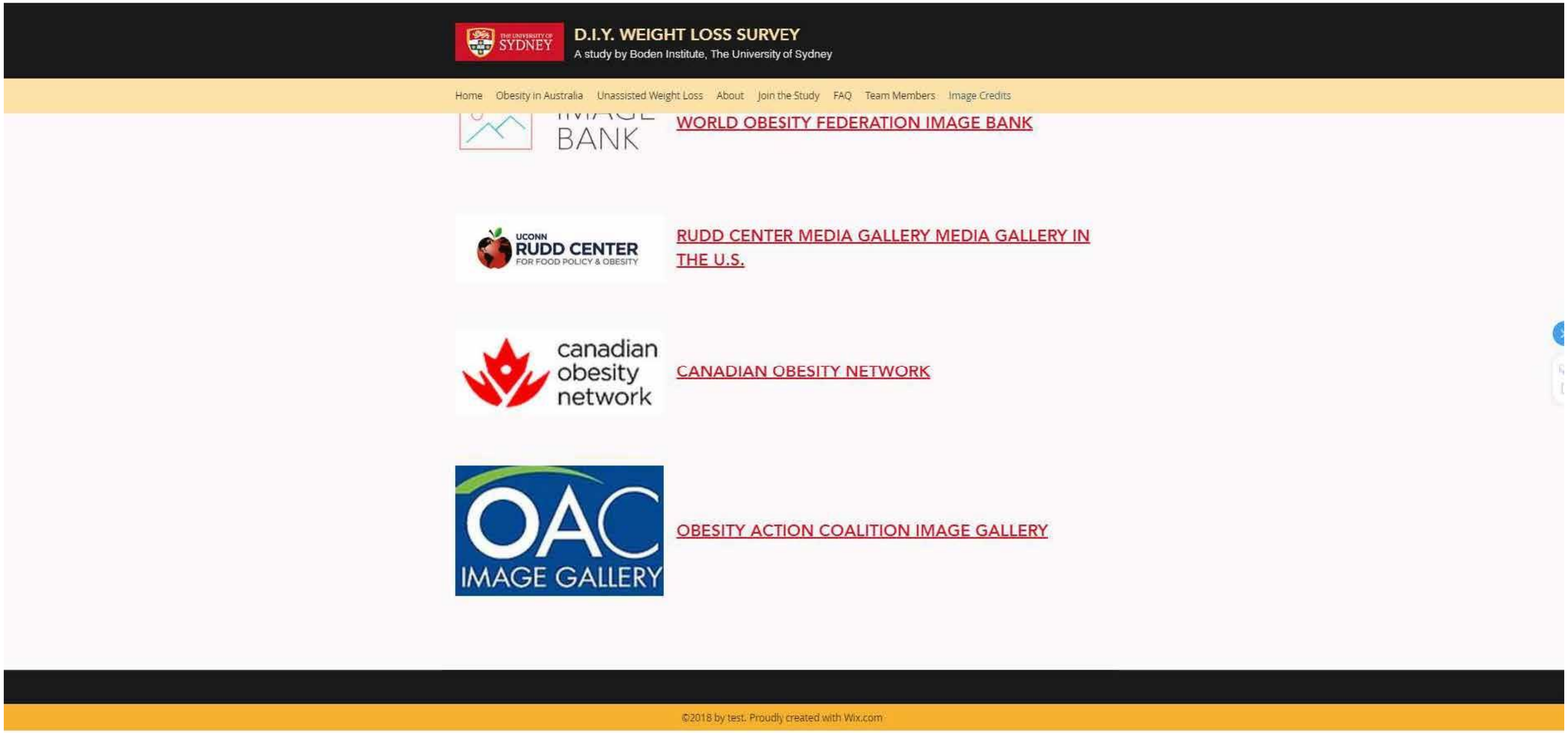
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Appendix F: Online supplementary materials with study-specific publications

Appendix F1: Published online supplementary material for 'Standard Baseline Data Collections in Obesity Management Clinics: A Delphi Study with Recommendations from an Expert Panel'

Title: Standard baseline data collections in obesity management clinics: A Delphi study with recommendations from an expert panel.

Supporting Information

Appendix S1 - Delphi Survey Round 1 Questionnaire

Welcome to Round 1 of the Delphi study titled 'Baseline Data Collections at Weight Management Clinics.

Dear Participant,

Thank you for agreeing to participate in this Delphi Survey.

This is Round 1 of the Delphi Survey to establish the baseline data items that should be collected upon patient registration at weight management clinics (accessible by the general public) across Australia.

This questionnaire round is the first of two and up to three rounds of the Delphi survey. Please try to answer all questions with as much detail as you understand. You will have the opportunity to refine your answers with subsequent rounds of the survey. Main categories of data are provided; you can list specific items of data to be collected under each area but space is also provided so that you can include any further categories as necessary. In formulating your responses, you are not expected to assess the feasibility or cost of data collection. Once we have received responses from all panellists, we will collate and summarise the findings and repost them for your review. We assure you that your participation in the survey and your individual responses will be strictly confidential to the research team and will not be divulged to any outside party, including other panellists.

One the Delphi survey is completed, we will mail you the summary of results.

Section 1

1.Are you a surgeon, medical or allied health professional?

(choose one that best describes your profession)

Yes

No

What is your discipline?

2.Do you undertake obesity or weight management research?

Yes

No

If yes, what is your main area of research?

3.Which of these best describe your work environment/s?

(choose all that apply)

Public Hospital

Private Hospital

Specialist Clinic

General Practice Medical Centre

Research Institute

Other

4.What are your professional qualifications?

Section 2

What do you believe is the essential baseline data that should be collected by all weight management clinics upon patient registration to ensure best patient care? List specific data items under relevant categories below. There is no limit to the number of data items you specify provided you feel they are essential. You can list as many additional categories as you feel necessary. If you don't have an input for a particular category please enter 'NA'.

2A Please list the demographic data (eg. age, ethnicity) that you believe should be collected from all weight management patients.

(List all the demographic data items that you consider essential. Type 'NA' if you have no data items to list.)

2B. Please list the anthropometric data (eg. weight, height) that you believe should be collected from all weight management patients.

(List all the anthropometric data items that you consider essential. Type 'NA' if you have no data items to list.)

2C. Please list the biochemical measures (eg. serum lipids, inflammatory markers, HbA1c) that you believe should be collected about all weight management patients.

(List all the biochemical measures that you consider essential. Type 'NA' if you have no data items to list.)

How should you assess medical history and comorbidities (eg. diabetes mellitus, hypertension, psychiatric history)?

2D What data do you believe should be collected that would help assess medical history of weight management patients?

(List all the medical history and comorbidities data that you consider essential. Type 'NA' if you have no data items to list.)

2E How should you assess weight loss history, and what data would you collect to assess weight loss history from weight management patients?

(List weight loss history data that you consider essential. Type 'NA' if you have no data items to list.)

2F What medications that maybe taken by weight management patients are of particular concern, and should be known on patient admission? Please list them below.

(List medication data that you consider essential. Type 'NA' if you have no data items to list.)

2G What lifestyle risk behaviours (eg. diet, physical activity, smoking, alcohol consumption) should be assessed and how? Please list the data that should be collected from all weight management patients.

(List lifestyle risk behaviour data that you consider essential. Type 'NA' if you have no data items to list.)

2H Are there any other categories and data items that you believe should be collected from weight management patients upon admission. Please list them below.

(List any other categories and data that you consider essential. Type 'NA' if you have no data items to list.)

Appendix S2 – Summary from Delphi Round 1

Summary of findings from Round 1 of the Delphi study titled 'Baseline Data Collections at Weight Management Clinics.

In Delphi Survey Round 1, we sought your responses to what baseline data you believe should be collected at weight management clinics upon patient enrolment. There were sixteen responses to Round 1 where participants listed data items across few different categories. The summary of the responses is provided below.

We have aggregated and classified the variables as **'core'**, **'important'** and **'others'** based on proportion of participants listing them. Unaggregated de-identified data can be made available on request.

Core Variables: 50 % - 100% of participants (8 – 16 participants)

Important Variables: 30% - 49% of participants (5 – 7 participants)

Other Variables: 20% - 29% of participants (1 - 3 participants)

Demographic Data

Age, gender, ethnicity indicators, and some socio-economic status indicator such as such as postcode, work status or education were listed by all participants. Only three participants listed relationship status, and three listed dependants.

Core Variables: Age, gender, ethnicity and socio-economic status

Important Variables: NIL

Others: relationship status, dependants, referring doctor, insurance status

Anthropometric Data

All participants listed weight, height and waist measurements. Only one participant listed body mass composition variables. Blood pressure was among the other variables listed.

Core Variables: weight, height, waist circumference

Important Variables: NIL **Other Variables:** hip circumference, body fat, muscle mass, bioelectrical impedance, blood pressure, heart rate, pulse, oxygen

Biochemical Measures

Lipids, glucose control, liver function, renal function and a general health indicator through a full blood test were the most commonly listed biochemical measures. This was followed by insulin, Iron studies, thyroid function, Vitamin D, various sex hormones and nutrition indicators of B12 and folate. Two persons or less listed Vitamin A, calcium, thiamine and copper. Listed below are the main groups of biochemical measures along with the most commonly listed tests for each group in parenthesis.

Core Variables:

Lipids (Total Cholesterol, LDL, HDL, triglycerides), **Glucose control** (HbA1c, fasting glucose), **Liver function** (LFT, ALT, AST), **Renal function** (EUC or creatinine, eGFR), **General** (FBC),

Important Variables: Insulin (fasting insulin, C-peptide), **Iron studies, Thyroid function** (TSH), **Vitamin D** (25-0H VitD, PTH) **Sex hormones** (testosterone, SHBG, LH, FSH, E2), **Nutrition**: (folate, B12,)

Other Variables: Calcium, Vitamin A, Copper, Thiamine

Medical History and Comorbidities

Existence of diabetes was the most commonly listed disease followed by hypertension and sleep apnoea. Cardiovascular diseases, eating disorders and other obesity related comorbidities such as dyslipidaemia, liver abnormalities and dyspepsia were important. Mental and psychiatric disorders were listed by several participants; however, majority of responses did not drill down into nature of disorders or diagnosis data that should be collected.

Core Variables: diabetes, hypertension, sleep apnoea, mental and psychiatric disorders

Important Variables: cardiovascular diseases, eating disorders, dyslipidaemia, liver abnormality, dyspepsia

Other Variables: any disability, arthritis, back pain, thyroid issues, current and previous malignancy, PCOS infertility, menstrual issues, addictions, food allergies and intolerances, dysphagia, deep vein thrombosis, pulmonary embolism, stress incontinence, Cushing's syndrome, previous surgeries, quality of life, systems reviews.

Weight Loss History

Previous weight loss attempts was most commonly listed, and some participants listed out different weight loss methods tried, what worked or not, and amount of weight lost. Weight history over different time periods, age of onset and duration of obesity was also commonly listed with some participants detailing stages such as childhood, early adulthood, adulthood and so on. Family history of obesity was another important item listed.

Core Variables: Previous weight loss attempts, weight over lifespan, age of onset of obesity,

Important Variables: Family history of obesity

Other Variables: psycho-social triggers for obesity

Medication

Majority of participants indicated that data about all medication taken should be collected. Main categories of drugs listed were diabetes medication, weight-loss medication, anti-psychotics and anti-depressants, and blood thinners. Insulin and steroids were also important. Anti-hypertensive drugs were among others.

Core Variables: diabetes medication, weight-loss medication, anti-psychotics and anti-depressants, blood thinners

Important Variables: Insulin, steroids

Others Variables: Anti-hypertensive drugs, immunosuppressants, analgesics, cardiac medication, statins, anti-inflammatory drugs

Lifestyle Risk Behaviours

Almost unanimously participants listed diet, smoking, alcohol intake, physical activity and exercise. However, the method of assessing or measuring these variables varied widely (eg. Food frequency questionnaire, food dairy for diet. Number of cigarettes or yes/no status for smoking etc). Only three participants listed sleep and three others listed drug use.

Core Variables: Diet, smoking, alcohol intake, physical activity and exercise

Important Variables: NIL

Other Variables: sleep, drug use

Other Data

Three participants listed social history, and two others wanted to know reasons for wanting to lose weight and expectations from treatment.

Core Variables: NA

Important Variables: NA

Other Variables: social history, reasons for losing weight, expectations from treatment.

Appendix S3 – Delphi Round 3 Questionnaire

Delphi Round 2

Welcome to Round 2 of the Delphi study titled 'Baseline Data Collections at Weight Management Clinics.

Dear Name,

Thank you for participation in Delphi Survey Round 1, and providing your responses to what baseline data you believe should be collected at weight management clinics upon patient enrolment.

In this brief follow up survey we request you comment on your agreement with core and important variables listed.

Demographic Data

Core Variables:

Age

Gender

Ethnicity (or languages spoken at home)

Socio-economic status (by postcode of residence)

Important Variables:

NIL

Question 1: Do you agree with the variables listed as core and important? Yes No

Question 2: Do you have any comments or changes?

Anthropometric Data

Core Variables:

Weight (Kgs)

Height (cms)

Waist Circumference (cms)

Important Variables:

NIL

Question 1: Do you agree with the variables listed as core and important? Yes No

Question 2: Do you have any comments or changes?

Biochemical Measures

Core Variables:

Lipids (Total Cholesterol, LDL, HDL, triglycerides), **Glucose control** (HbA1c, fasting glucose), **Liver function** (LFT, ALT, AST), **Renal function** (EUC or creatinine, eGFR), **General** (FBC),

Important Variables:

Insulin (fasting insulin, C-peptide), **Iron studies, Thyroid function** (TSH), **Vitamin D** (25-0H VitD, PTH)

Sex hormones (testosterone, SHBG, LH, FSH, E2), **Nutrition**:B12, folate

Question 1: Do you agree with the main groups of biochemical measures listed as core and important? Yes No

Question 2: Do you have any comments or changes?

Question 3: Do you agree with the tests or indicators listed for each main group of biochemical measures Yes No

Question 4: List the most appropriate test or indicator in your opinion for a particular group.

Medical History and Comorbidities

Core Variables:

Diagnosis of a history of:

Diabetes

Hypertension

Sleep apnoea

Mental and Psychiatric disorders

Important Variables:

Diagnoses of a history of:

Cardiovascular diseases

Eating disorders

Dyslipidaemia

Liver abnormality

Dyspepsia

Question 1: Do you agree with the variables listed as core and important? Yes No

Question 2: Do you have any comments or changes?

Weight Loss History

Core Variables:

Previous weight loss attempts

Weight over lifespan

Age of onset of obesity,

Important Variables:

Family history of obesity

Question 1: Do you agree with the variables listed as core and important? Yes No

Question 2: Do you have any comments or changes?

Medication

Core Variables:

Diabetes medication

Weight-loss medication

Anti-psychotics and anti-depressants

Anticoagulants

Important Variables:

Insulin

Steroids

Question 1: Do you agree with the variables listed as core and important? Yes No

Question 2: Do you have any comments or changes?

Lifestyle Risk Behaviours

Core Variables:

Diet (multiple methodologies proposed)

Smoking status

Alcohol intake (amount/day or week)

Physical Activity and Exercise – including sedentary behaviours (multiple methodologies proposed),

Important: NA

Question 1: Do you agree with the variables listed as core and important? Yes No

Question 2: Do you have any comments or changes?

Question 3: Do you feel there is a need for a standard methodology for collecting:

a. Diet yes no – if yes please define
b. Physical activity

Other Data

Core: NA

Important: NA

Question 1: Question 1: Do you agree with the variables listed as core and important? Yes No

Question 2: Do you have any comments or changes?

Thank you for completing Round 2 of the Delphi survey.

Appendix S4 - Summary of Findings from Delphi Round 2

Delphi study titled 'Baseline Data Collections at Weight Management Clinics:

Summary of Findings

Thank you for your participation in the Delphi process to agree what baseline data should be collected at weight management clinics upon patient enrolment.

There were sixteen responses **to Round 1** where participants listed data items across a few different categories The summary of the responses was aggregated and variables were classified as **'core'**, **'important'** and **'others'** based on proportion of participants listing them as follows:

Core Variables: 50 % - 100% of participants (8 – 16 participants)

Important Variables: 30% - 49% of participants (5 – 7 participants)

Other Variables: 20% of participants (1 - 3 participants)

In Round 2, the summary from Round 1 was sent back for consensus and comments. There were nine responses to Round 2. The responses were synthesised to produce the final table below. All variables that were agreed upon by 70% or more were included in the baseline. Additionally, if there were specific suggestions in Round 2 by two or more experts to include or change ranking – they were implemented to produce the final table below. Bariatric surgeons suggested a separate baseline for bariatric patients which are also indicated in the final able.

Unaggregated de-identified data can be made available on request.

Core and Important Variables to be collected by weight management clinics on patient admission – Delphi survey Round 2 results

Category	Core Variables	Important Variables	Changes from Round 1
Demographic Data	age, gender, ethnicity socio-economic status,		100% agreement - No change
Anthropometric Data	weight, height, waist circumference, blood pressure		100% agreement Changes: i) 30% (n=3) additionally suggested BP added as core variable.
Biochemical Measures	**Lipids** (Total Cholesterol, LDL, HDL, triglycerides) **Glucose control** (HbA1c, fasting glucose) **Liver function** (LFT, ALT, AST, GGT) **Renal function** (EUC or creatinine,	**Insulin** (fasting insulin, C-peptide) **Iron studies** **Thyroid function** (TSH), **Vitamin D** (25-0H VitD, PTH) **Sex hormones** (testosterone, SHBG, LH, FSH, E2) **Nutrition**: (folate, B12,)	70% agreement Changes: i) 20% (n = 2) - FBC moved from core to important variables We separated out a baseline based

	eGFR) ***In case of bariatric surgery patients:*** **Calcium** **Vitamin D** (25-0H VitD, PTH), **Iron** studies **Nutrition:** (B12)	**General** (FBC)	on recommendations for bariatric surgery patients: ii) 20% (n=2) - Baseline for bariatric surgery should include calcium, vitamin D, PTH, iron studies, B12 as core variables
Medical History and Comorbidities	diabetes, hypertension, sleep apnoea, mental health and	cardiovascular diseases, dyslipidaemia, liver abnormality,	70% agreement

	psychiatric disorders, musculoskeletal disease and joint disorders (arthritis, back pain), eating disorders	dyspepsia, addictions and substance abuse ***In case of bariatric surgery patients:*** surgical history, fertility issues, addictions, dysphagia, thromboembolic disease, GORD history	Changes: i)40% (n=4) - musculoskeletal disease and joint disorders (arthritis, back pain) added to core variables ii) 30% (n=3) - eating disorders moved to core variables
Weight Loss History	Previous weight loss attempts, weight over lifespan, age of onset of obesity,	Family history of obesity	80% agreement – no change Note: N=1 disagreed - recommended that eating disorders moved to core. This

			is included above.
Medication	All medications, but attention to diabetes medication, weight-loss medication, anti-psychotics and anti-depressants, anti-coagulants, anti-hypertensive drugs	steroids	70% agreement Changes: 20% (n=2) Insulin is a diabetes medication so not listed separately. 20% (n=2) Anti-hypertensive drugs moved to core.
Lifestyle Risk Behaviours	Diet, smoking, alcohol intake, physical activity and exercise	Sleep	100% agreement – no change Note: No consistency in measurement tools to use. Would like standardised measures.

Variables that were listed as others in Round 1, and suggestions in Round 2 that did not meet the required numbers were not included in the final baseline. They are listed below for reference.

Demographic data: employment, disability support, relationship status, mobility/carer, dependants, referring doctor, insurance status, housing type (eg group home), cooking skills

Medical History and Comorbidities: Asthma, infertility, thyroid issues, current and previous malignancy, menstrual issues, addictions, food allergies and intolerances, dysphagia, deep vein thrombosis, pulmonary embolism, stress incontinence, Cushing's syndrome, quality of life, systems reviews. Depression, Anxiety and Substance abuse are 'core' and other mental illnesses and psychiatric disorders are 'important'.

Weight Loss History: highest and lowest weight, psycho-social triggers for obesity

Medication: Anti-hypertensive drugs, immunosuppressants, analgesics (including narcotics), cardiac medication, lipid lowering treatment, statins, anti-inflammatory drugs, anti-reflux (GORD),

Lifestyle Risk Behaviours – sleep

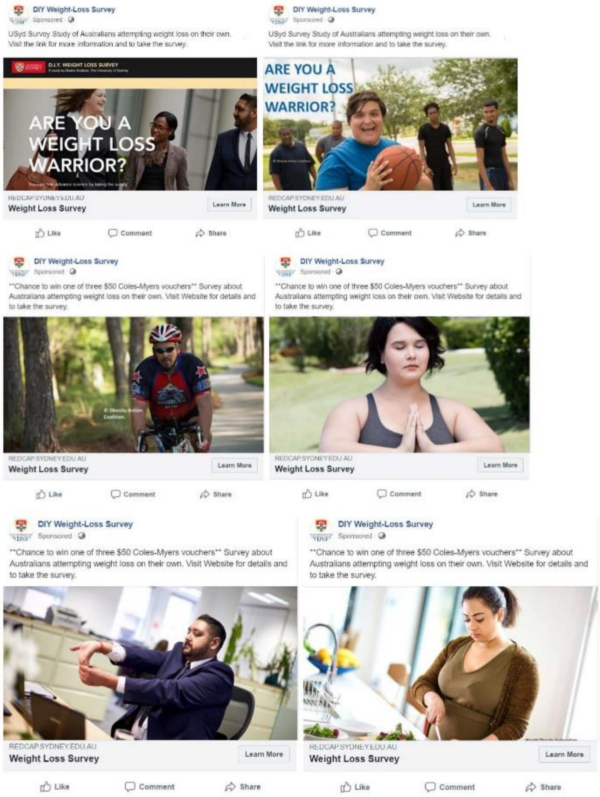
Others: social history, reasons for losing weight, expectations from treatment

Appendix F2: Online supplementary material for “An exploration of recruitment through Facebook to an online survey on self-managed weight loss in Australia—Lessons learned” under review for publication

15

Appendix 1

Example advertisements on Facebook



Appendix 2

Original Consent Form

This is a research study, and the University of Sydney Human Research Ethics Committee approves and regulates all research studies conducted at USyd. The Participant Information Form attached below provides details of the study and seeks your consent before you are taken through the survey questions.

Participant Information Sheet

Please read the Participant Information Sheet and download a copy for your records.
[Attachment: "Participant Information Form - Unassisted Weight Loss Survey Version 0.1 -12072018.pdf"]

PARTICIPANT CONSENT FORM

I agree to take part in this research study.

In giving my consent I state that:

- I understand the purpose of the study, what I will be asked to do, and any risks/benefits involved.
- I have read the Participant Information Statement and have been able to discuss my involvement in the study with
  the researchers if I wished to do so.
- The researchers have answered any questions that I had about the study and I am happy with the answers.
- I understand that being in this study is completely voluntary and I do not have to take part. My decision whether to
  be in the study will not affect my relationship with the researchers or anyone else at the University of Sydney now or
  in the future.
- I understand that I can withdraw from the study at any time.
- I understand that my questionnaire responses cannot be withdrawn once they are submitted, as they are

anonymous and therefore the researchers will not be able to tell which one is mine.

- I understand that personal information about me that is collected over the course of this project will be stored
- securely and will only be used for purposes that I have agreed to. I understand that information about me will only be
- told to others with my permission, except as required by law.
- I understand that the results of this study may be published and that publications will not contain my name or any
- identifiable information about me.

(choose yes or no)

Yes No

Revised Consent Form

The Participant Information Form attached below provides details of the study and seeks your consent before you are taken through the survey questions. This research study, has been reviewed and approved by the University of Sydney Human Research Ethics Committee

Participant Information Sheet

Please read the Participant Information Sheet and download a copy for your records.
[Attachment: "Participant Information Form - Unassisted Weight Loss Survey Version 0.1 -12072018.pdf"]

ELECTRONIC CONSENT: Please select your choice below.

Clicking on the "agree" button below indicates that:

• you have read the Participant Information Statement attached above

• you voluntarily agree to participate

If you do not wish to participate in the research study, please decline participation by clicking on the "disagree" button.

agree disagree

Appendix G: Award letter for Paulette Isabel Jones PhD Completion Scholarship

From: Scholarships Office <scholarships.office@sydney.edu.au>
Sent: Friday, 27 November 2020 3:52 PM
To: Divya Ramachandran <divya.ramachandran@sydney.edu.au>
Subject: The Paulette Isabel Jones PhD Completion Scholarship - Offer

Divya Ramachandran
SID: [REDACTION]

Dear Divya,

We are pleased to advise you have received a scholarship offer from the University of Sydney for the Paulette Isabel Jones PhD Completion Scholarship.

Your Acceptance Form and Scholarship Offer Letter, which contain further details, are attached. Please read both documents carefully.

Accepting your scholarship

1. Read the terms and conditions. If you would like to accept the scholarship initial each page and sign the form.
2. Return the entire signed form (6 pages) as a pdf attachment by **replying to this email by 9 December 2020**.
3. We recommend you keep a copy of the scholarship terms and conditions for future reference.

Congratulations on your offer.

Kind Regards,

Scholarships Office

Scholarships Office | Student Administration Services

THE UNIVERSITY OF SYDNEY
Jane Foss Russell | The University of Sydney | NSW | 2006
E scholarships.office@sydney.edu.au **W** sydney.edu.au/scholarships/

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