TITLE PAGE

Eating and Weight Problems in the Community: Prevalence, Implications for Mental Health and Community Beliefs

Thesis submitted by

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It is a pleasure to thank those people who made this thesis possible. The production of this piece of work has been both a difficult and extremely rewarding journey, the people who supported me along the way have been integral part of its successful completion and for that I owe you my deepest gratitude.

I feel incredibly fortunate to have worked with a truly great team of supervisors, Professor Phillipa Hay, Associate Professor Frances Quirk and Associate Professor Jonathan Mond.

Phillipa Hay has greatly inspired me with her own work in the eating disorder field, and showed such generosity in sharing her encouragement, wisdom, intellectual property, and a gentle push when required. This was always done with amazing promptness; in spite of what I know is Phillipa's tremendous work load of academic, clinical and administrative work. Thank-you Phillipa for the time and in helping me develop an amazing foundation of research and academic skills which I will be able to apply for the rest of my career.

Jonathan Mond, who will always tell it like it is, an amazing intellect and writer in the field. Jonathan and I worked in the same academic team, before we even had the chance to meet each other. From very early on, Jonathan was able to both support and challenge me with my academic development, with rapidly produced emails, full of intellectual advice, humour and encouragement, sent from various locations around the world. Despite only sharing a building for a relatively small amount of time, Jonathan has continued this support an unwavering manner.

Frances Quirk who stepped in at James Cook University when it seemed everyone else, including me, was physically locating elsewhere. Frances was able to help me maintain a stable

PREFACE

When I completed my undergraduate degree in nutrition and dietetics in 2003, I had gained a general understanding of causes, consequences and treatment for obesity and underweight. I also had an understanding of the various eating disorders and accompanying mental health problems. However, it did not dawn on me until I started practicing as a clinician and working in research, that there was considerable overlap between these disorders. Disordered eating, weight problems and poor mental health do co-exist, however, research to understand the relationship between them is still relatively new, and many questions remain. The broad scope of the following thesis is to further the understanding of co-morbid eating and weight problems in the community, examine their impact on psychological health and explore community beliefs regarding these problems.

The findings reported in this work pertain to three different research samples. 1) A population sample of young women from the Australian Capital Territory (ACT), 2) A longitudinal follow up sub-sample of women identified with disordered eating who were drawn from this population in the ACT, and 3) a population sample of adults aged 15 years or more from South Australia. I was fortunate enough to be working as a research officer in a team of academics under the direction of Prof Phillipa Hay at the time these research samples were being recruited and the projects were being designed and carried out. As such I was able to provide intellectual input, be involved in carrying out the studies, and in managing and analysing the data and commenced producing the following thesis. A full statement of my contribution and the contribution of others to the work can be found on page 8.

The thesis has three sections. **Part 1,** provides an introduction to the topic and builds up a detailed picture of the current literature. It goes on to outline the overall aims, hypothesis, and methods of the research. **Part 2**, the body of the thesis is comprised of 5 chapters or manuscripts, of which 4 have been published in peer-reviewed journals and one which is

submitted and under review for publication. **Part 3,** provides a detailed discussion on the outcomes of the research. The discussion elaborates on the brief discussions provided in the individual manuscripts and pulls together the findings to explore the overall implications for prevention, treatment and future research in the weight and eating disorder field.

STATEMENT OF ACCESS

I, the undersigned, author of this work, understand that James Cook University will make this thesis available for use within the University Library and, via the Australian Digital Theses network, for use elsewhere. I understand that, as an unpublished work, a thesis has significant protection under the Copyright Act and I do not wish to place any further restriction on access to this work.

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STATEMENT OF SOURCES

DECLARATION

I declare that this thesis is my own work and has not been submitted in any form for another degree or diploma at any university or other institution of tertiary education. Information derived from the published or unpublished work of others has been acknowledged in the text and a list of references is given.

2nd October 2012

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Signature   Date

STATEMENT OF CANDIDATES CONTRIBUTION AND THE CONTRIBUTION OF OTHERS

This thesis involves epidemiological research projects with published chapters which would not have been feasible for a student to fully design, obtain funding, conduct, analyse and publish on their own. The thesis work was embedded in a number of cross sectional and longitudinal studies. The research in chapters 2 and 3 was designed by other collaborators, the candidate was able to apply her own new hypotheses and analyse in previously un-examined ways. The research in chapters 4, 5 and 6 was designed and conducted by a number of collaborators, with intellectual input and assistance from the candidate. Funding support for the projects came from a range of sources. The details of these contributions can be found below.

Candidates Contribution

- Development of new aims and hypothesis for this thesis and its individual manuscript chapters which were previously not under investigation by the research team.

- Intellectual input in the design of vignettes and items (in conjunction with Phillipa Hay) used to assess Mental Health Literacy in chapters 4 and 5 of the thesis.

- Intellectual input into changes necessary in the longitudinal research survey in chapter 6 e.g. formatting, addition of questions known to impact on weight i.e. pregnancy and nutritional intake (nutritional intake not reported as part of this thesis).

- Data entry for a part of the Health and Well-Being of Female ACT Residents Study (chapter 2 and used to obtain participants for chapter 6).

- Senior Research Officer responsible for recruitment, retention and data collection for the longitudinal study reported in chapter 6 (postage, phone calls, interviews, participant

newsletters, database entry and data management) together with Junior Research Assistants, Jodi Lorenz and Carolyn Clark.

- Supervision and training of Junior Research Assistants in the management of above tasks, the use/ scoring of survey tools and in the conduct of the Eating Disorder Examination interview.

- Preparation for the Eating Disorder section of the 2005 South Australian Health Omnibus survey chapters 3- 5. This involved writing and preparing for use the survey questions and vignettes to be used by Harrison Health Research employees.

- Data analysis for the all work in this thesis; some assistance received- please refer to statistical support.

- Preparation with assistance of collaborators of ethics applications and reports pertaining to the research undertaken work.

- Assistance and input into grant applications for the longitudinal study reported in chapter 6.

- Preparation of manuscripts (chapters 2-6) for publication, with guidance and feedback from Supervisory team and minimal feedback from other collaborators- see below.

- General introduction and literature review.

- Discussion, including implications for and novel new directions for health promotion, clinical treatments and research.

- Preparation of the thesis, with guidance and feedback from the Supervisory team.

<u>Thesis & Research Supervision</u>

Phillipa Hay, Jonathan Mond, Frances Quirk, provided guidance, support and feedback to the Candidate for this body of work.

Design and Conception of Studies

The design and conduct of the research in chapter 2, the Health and Well-Being of Female ACT residents Study was designed and conducted by Jonathan Mond, Bryan Rodgers, Cathy Owen and Phillipa Hay. The candidates' involvement is described above.

The initial design and grant funding for the longitudinal study in chapter 6 was obtained by Phillipa Hay, Jonathan Mond, Susan Paxton and Frances Quirk. The candidates' contribution to this study is described above.

Phillipa Hay was the Principal Investigator who obtained funding for the research pertaining to Eating Disorders in the South Australian Health Omnibus Survey- chapters 3-5. The 1995 portion of the research in chapter 3 was conducted without any input from the candidate; however she was able to use this data for her own unique hypothesis. The 2005 portion of this research chapter 3-5 was conducted with intellectual input and practical research management from the candidate, see above.

Statistical support

The supervisory team provided guidance to the candidate in the statistical analysis for the thesis.

Professor Petra Buttner, a statistician conducted the more advanced statistical analysis, namely the multinominal (polytomous) logistic regression in chapter 3. She also provided advice and feedback on the statistical analysis of the longitudinal data in chapter 6.

Other Collaborators

Phillipa Hay, Jonathan Mond and Frances Quirk, provided thesis supervision and shared intellectual property with the candidate as described above.

Professor Bryan Rodgers- Was involved in the design and funding application for the research in chapter 2. Following data analysis and the preparation of chapter 2 by the candidate he also read over the manuscript and provided opinion on the text and statistical analysis.

Professor Cathy Owen- Was involved in design and funding application for the research in chapter 2. Following data analysis and the preparation of chapter 2 by the candidate she also read over the manuscript and provided opinion on the text.

Professor Susan Paxton- Was involved in design and funding application for the longitudinal research in chapter 6. Following data analysis and preparation of chapter 6 by the candidate she also read over the manuscript and provided opinion on the text.

Professor Lee Kennedy- Was the principal investigator in a research collaboration which received funding at JCU, these monies supported the employment of Jonathan Mond, during part of his time invested in supervising the candidate, at the time when work in chapter 3 and 6 was conducted.

<u>Funding</u>

The candidates role of Research Officer (Discipline of Psychiatry), where she worked for part of the research, was supported James Cook University, School of Medicine.

For work pertaining to Chapter 2:

- A research training fellowship for Jonathan Mond was provided by the NSW Institute of Psychiatry.
- A funding grant was also received from the Australian Capital Territory Department of Health and Community Care

For work pertaining to chapters 3-5:

2nd October 2012

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DECLARATION OF ETHICS

The research presented and reported in this thesis was conducted within the guidelines for research ethics outlined in the National Statement on Ethics Conduct in Research Involving Humans (1999) the Joint NHMRC/ AVCC Statement and Guidelines on Research Practice (1997), the James Cook University Policy on Experimentation Ethics. Standard Practices and Guidelines (2001) and the James Cook University Statement and Guidelines on Research Practice (2001).

The thesis work was embedded in a number of cross sectional and longitudinal study carried out by the Candidates Supervisors Phillipa Hay, Jonathan Mond and Frances Quirk and thus there were a number of ethical clearances associated with the project.

Ch 2: Relates to data collected in the Health and Well-Being of Female Residents ACT. Ethics approval for this study was granted to Principal Investigator Jonathan Mond from the ACT Human Health Research Ethics Committee

Ch 3 through to 5: Relates to data collected in the South Australian Health Omnibus Survey in 1995 and 2005. Ethics approval for the questions used was granted to Principal Investigator Phillipa Hay by the South Australian Department of Health

Ch 6   Relates to data collected in a study on mediating factors and effects of health literacy in course and outcome of common eating disorders: a longitudinal study. Ethics approval was granted to Principal Investigator Phillipa Hay by JCU ethics committee (H2039) and ethics monitoring and processes later changed to University of Western Sydney (H6696).

2nd October 2012

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LIST OF ABBREVIATIONS

AN Anorexia Nervosa

BDI Beck Depression Inventory

BE Binge Eating

BED Binge Eating Disorder

BES Binge Eating Scale

BMI Body Mass Index

BN Bulimia Nervosa

BWL Behavioural Weight Loss

CBT Cognitive Behavioural Therapy

CIDI Composite International Diagnostic Interview

chEDE Children's Eating Disorder Examination Questionnaire

DEBQ Dutch Eating Behaviour Questionnaire

DSM Diagnostic and Statistical Manual of Eating Disorders

ED Eating Disorder

EDE Eating Disorder Examination

EDE-Q Eating Disorder Examination Questionnaire

EDNOS Eating Disorder Not Otherwise Specified

EI Eating Inventory

GP General Practitioner

IDI-10 International Classification of Diseases 10th Revision

K10 Kessler 10 item distress scale

LOC Loss of Control

MHL Mental Health Literacy

OBE Objective bulimic episodes

PCSC Perceived Competence Scale for Children

RCT Randomised Control Trial

RiBED Risk behaviour for Eating Disorders- 8 items

SBE Subjective Bulimic Episodes

SCID Structural Clinical Interview for the DSM

SCL-90 Psychological Symptom Checklist 90

SED Survey for Eating Disorders

SPIKE Structural Psychopathological Interview and Rating Scale of Social Consequences

TAS 20 Toronto Alexithymia Scale

WHO World Health Organisation

THESIS ABSTRACT

Eating and Weight Problems in the Community: Prevalence, Implications for Mental Health and Community Beliefs.

Anita Star: James Cook University, PhD candidate

Background and Study Aims: Whilst often regarded as distinct, problems with eating and problems with weight have many common characteristics, including dietary restriction, binge eating, poor body image and psychosocial difficulties. Furthering our understanding of these commonalities may lead to improvements in prevention and treatment efforts for eating disorders (EDs), obesity and mental health.   The goal of this thesis was to examine the prevalence, relationships between and impact on psychological health, of co-morbid eating and weight problems, while also exploring public knowledge and beliefs regarding these problems.

First, this thesis sought to determine the prevalence of ED behaviour and cognitions in obese and non-obese women and to elucidate time trends in the population prevalence of co-morbid ED behaviour and obesity. Second, the thesis examined how ED behaviour relates to psychological distress in obese and non-obese women and how ED behaviour and psychological distress impact on weight over time, in community women with ED symptoms. Third, the thesis explored community knowledge and beliefs regarding the nature and treatment of eating problems occurring in sufferers of differing body weights.

Method: These issues were addressed in various community-based samples, namely: 1) a large, general population sample of young women from the Australian Capital Territory (ACT), 2) a two year longitudinal follow up sample of women with ED symptoms identified from the larger sample; and 3) general population samples (1995 and 2005) of adults aged 15 years or

more from South Australia recruited, independently, in 1995 and 2005. Anthropometric measures included self-reported height and weight, used to calculate Body Mass Index (BMI), categorical weight status i.e. underweight, normal weight, overweight and obese, and change in weight over time. Self-report surveys were used to assess ED behaviours, shape concern, weight concern, eating concern and dietary restraint. General psychological distress was measured via the Kessler (10- item) Psychological Distress Scale (K10). Community beliefs and attitudes regarding ED recognition, treatment, stigma and regard for symptoms, were modelled on previous, community-based studies of ED 'mental health literacy'. These surveys presented participants with a vignette describing a sufferer of an ED and then asked them to answer a range of questions addressing recognition, treatments, stigma and favourable regard. A range of univariate and multivariate data analysis were performed using the SPSS software.

Results: In 2005 ED behaviours affected approximately 1 in 5 obese persons in the Australia population and young obese women were particularly likely to have ED symptoms. Increases over time from 1995 to 2005, in the prevalence of co-morbid obesity and ED behaviour were more rapid than increases in the prevalence of obesity or ED behaviour alone. Specific aspects of ED psychopathology, namely, the cognitive aspects of weight, shape and eating concerns and dietary restraint, were associated with psychological distress in obese women, whereas for non-obese women ED behaviours were additionally associated. Overall better psychological health was associated with weight stability in community women with EDs of various weight categories. A sizable minority of individuals in the community expressed a favourable regard for the weight and shape control aspects of ED behaviour, despite the adverse impacts on mental health. Obese participants, younger participants and those with existing ED psychopathology were more likely to express positive regard for ED. Obese persons were more likely to highly regard the weight loss seen in Anorexia Nervosa. Community stigma towards individuals with an ED was high, and both obese and underweight sufferers of EDs were more often perceived as being likely to experience discrimination when compared with a normal-weight ED sufferer. Mental health literacy relating to underweight individuals with ED

symptoms was satisfactory in that the features of anorexia nervosa were generally recognised and both primary care physicians and mental health professionals were favourably regarded as potential treatment providers.

Conclusion: This research has contributed to the literature and the collective understanding of co-morbid eating and weight problems. There was a strong relationship between ED, obesity and psychological distress, a concerning increase in the prevalence of comorbid ED behaviour and obesity, and community beliefs regarding ED behaviour characterised by both stigma and favourable regard, particularly among obese persons. These observations have important implications for the prevention and treatment of eating and weight problems and for future research. In particular, it adds further support to calls for an integrated approach to obesity and ED prevention. It suggests that improving body image and changing attitudinal aspects of eating and dieting, may improve the psychological health of sufferers of co-morbid disordered eating and obesity, which may in turn promote weight stability. Furthermore reducing weight based and ED stigma, whilst simultaneously reducing positive regard for ED behaviours, may assist in reversing the rising prevalence of co-morbid obesity and EDs in the community.

PART ONE

CHAPTER ONE – LITERATURE REVIEW

EPIDEMIOLOGY OF ED'S &WEIGHT PROBLEMS IN THE COMMUNITY

Weight problems (underweight and obesity) and EDs are associated with high burden of disease, poor quality of life for sufferers, and extensive health spending[1-4]. Improving our understanding of the epidemiology of these health problems, their interaction with each other, as well as their interaction with various other socio-demographic and health outcome variables, and understanding changing patterns of disorder over time is important for a number of reasons:-

1) It may help inform governments and other organisational health spending on appropriate health promotion and prevention strategies.

2) It may assist public health departments and organisations evaluate the effectiveness of previous population health promotion and prevention strategies.

3) It may assist services to be developed which are targeted towards the needs of the population.

4) It can assist medical and allied health clinicians better understand complex interactions between various health problems and socio-demographic profiles thus allowing them to adjust and trial new treatment approaches to better meet the needs of their patients.

There have been a number of large epidemiological studies, which have aimed to examine the prevalence and incidence of eating and weight disorders; these have occurred in different populations, age groups and regions of the world. It is difficult to compare rates and conclude overall prevalence rates, however, due to the differences in sample methodology, the use of different methods to assess symptoms and particularly the differences relating to the criteria

used to define cases of the disorders of interest. The following paragraphs discuss the more recent epidemiological studies, their findings and limitations. This section then goes on to summarise the findings and discuss gaps in the epidemiological literature. This discussion is limited to large studies (i.e. sample size n > 1000), conducted with community dwelling adults (excluding university student samples) in western countries, and those published in the last 10 years, as these studies are the most relevant to this body of work.

Eating Disorders

A number of research papers examining the epidemiology of EDs is eviewed in the section of the thesis. To aid comparison a summary of these papers is presented in Table 1 pg.31-33

Between 2001 and 2003 the ESEMeD-WMH investigators conducted a population cross sectional survey of 4139 adults age 18 years of more, across 6 European countries (Belgium, France, Germany, Italy, the Netherlands and Spain). A two phase interview procedure was used. The first phase contained the diagnostic assessment of mood and anxiety disorders. Those who met a predetermined number of symptoms in this phase and a random 25% of other participants went on to complete a second phase in depth interview to assess other mental disorders. The survey utilised a revised version of the World Health Organization Composite International Diagnostic Interview (CIDI). The Diagnostic and Statistical Manual of Mental Disorders (DSM) IV criteria were used to define ED cases. Lifetime estimated prevalence of Anorexia Nervosa (AN) was 0.48%, Bulimia Nervosa (BN) was 0.51%, Bing Eating Disorder (BED) was 1.12%, sub threshold binge ED 0.72%, and any binge eating (BE) was 2.15% (all participants reporting binge eating included i.e. those who also met diagnosis for other EDs as well as those who did not). They reported that the 12-month prevalence of AN was 0%, BN 0.15%, BED 0.31%, sub threshold BED 0.09%, any BE 0.54%. This was a very well designed study of European adults, however it did assume that the first phase interview captured all EDs (and no comment was made regarding a comparison between those who meet phase one criteria, and the random 25% of other phase two participants). The authors also stated other important

limitations, being the relatively small sample size of those in the high risk age group for AN of 18-25 years (approximately 100 people per country) and not including those under 18 years, the CIDI items on ED not exactly matching the DSM IV criteria and the retrospective nature of the assessment of lifetime symptoms [5].

In 2001-2003, a representative household survey in the USA was conducted with 9282 persons aged 18 years or more. This research showed lifetime prevalence of AN as 0.6%, BN as 1.0%, BED as 2.8%, sub-threshold BED as 1.2%, and any BE 4.5% (this included persons meeting criteria for other EDs). The reported 12 month prevalence for AN was 0%, BN was 0.3%, BED was 1.2%, sub threshold BED was 0.6%, and any BE 2.1%. The methodology used in this survey was very similar to that in the European study reported by Preti et al 2009, i.e. it was a two part survey design, the first measuring mood, anxiety and substance disorders, and the second phase was conducted with persons who had indicated a phase one disorder over their lifetime. The second phase assessed EDs using the CIDI, and DSM-IV criteria used to define ED. Thus the same limitations as above apply. The prevalence of EDs overall reported in this US sample compared to that reported in the European study are much higher and may reflect cultural and environmental differences between countries which impact on the development of ED symptomatology in individuals [6].

Wells et al [7] reported on the prevalence of EDs across New Zealand in 2003-2004. The Survey was conducted on a nationally representative sample of people aged 16 years and over. Interviews used a modified version of the CIDI. Similar to the methodology reported by Preti et al in Europe, and Hudson et al in US, the survey consisted of two parts. If respondents met criteria for depression, mania or anxiety disorders, had ever had a planned or attempted suicide, or had been hospitalised for a psychiatric condition identified in the first section, or were randomly selected from other phase one participants, they went on to part two which included items relating to ED diagnosis (n=7435). Wells et al reported the 12-month prevalence of DSM-

IV AN as < 0.1%, BN as 0.4% and Any ED as 0.5%. The lifetime prevalence of AN was 0.6%, BN was 1.3% and any ED was 1.7%.

In Australia, Hay et al.[8] reported on the prevalence of EDs in 2005, and also compared ED behaviours over time from 1995 to 2005. The general population household samples consisted of 3001 (1995) and 3047(2005) persons aged over 15 years in the state of South Australia. Unlike the above mentioned studies the interview was designed by the author and modeled on the Eating Disorder Examination interview (EDE). Oxford Criteria were used to assess current regular ED behaviours. The difference between this and the DSM-IV criteria, is that the Oxford Criteria consider at least weekly frequency of the behaviour over the past three months as meeting threshold, whereas the DSM-IV criteria states the behaviour must occur at least twice a week over three months to reach the threshold level required for an ED diagnosis. Current point prevalence of BN was 0.9%, BED was 2.3%, and other Eating Disorder Not Otherwise Specified (EDNOS) was 1.9%. The survey was not designed to detect cases of AN, however it was noted that 0.3% of persons surveyed had low weight BMI< 17.5 and moderate or higher shape or weight concerns. From 1995 to 2005 significant increases were found in BE behaviour from 3.1% to 7.2%, and strict dieting and fasting from 1.6% to 4.6%, however the increase in purging behaviour from 0.7% to 1.5% was not significant for the whole population.

A random sample of women (n= 1501) aged 20-40 years residing in Montréal Quebec Canada were surveyed via telephone in 2002-2003[9]. The study utilised an adapted Eating Disorder Examination Questionnaire (EDE-Q). Although the items on this questionnaire do not necessarily translate easily into DSM diagnostic criteria, the authors provided details on frequency of behaviours and cognitions meeting clinical level symptomatology vs. levels considered sub-threshold for diagnosis. Diagnostic categories were based on the DSM-IV criteria. The data used were weighted using comparison with census data to ensure the survey represented all women in this age group across the Montréal territories.   The weighted prevalence of AN binge-purge subtype was <0.1, AN restricting subtype <0.1 %, BN purge

subtype was 0.2%, BN non-purge subtype was 0.4%, BED was 3.8%, EDNOS (which excluded BED) was 14.9%, and 0.6% for purging disorder. The prevalence of ED of any kind (including their sub threshold ED symptoms) was very high at 19.8% of the population.

Ghaderi & Scott[10] reported a prospectively designed population study of 1157 females in Sweden aged 18-30, from year 1997- 1999. They used the DSM-IV criteria to diagnose ED, based on symptoms reported in a self-report questionnaire, a modified version of the Survey for Eating Disorders (SED). The prevalence of total EDs was 3.15%: where the breakdown was AN at 0.12%, BN at 1.33%, BED at 1.21%, and EDNOS at 0.48%. The two year first time incidence was 0.01%. There was an increase of total ED's from time one at 2.56%, to time two at 3.15%, which the authors report may be due to statistical fluctuation when measuring point prevalence in relatively small population or an actual increase in ED. Limitations of this study include the use of a self-report questionnaire and the relatively small sample size. Slightly higher rates of BN are likely due to the younger age group and gender of the sample

A study in Finland[11] examined AN prevalence in 2881 twins participating in the "FinnTwin 16" study, longitudinal cohort study of health behaviors in twins and their families. Live twin births between 1975 and 1979 from the central population registry of Finland were sent baseline questionnaires at age 16 and follow up sent at age 17-18 and between ages 22 and 28 years. A screening questionnaire was used to identify potential cases of EDs and then diagnostic interviews using the short version of the Structured Clinical Interview for the DSM-IV (SCID) conducted via telephone were used to establish AN cases. The authors also examined levels of what they term broad AN which included cases using the DSM-IV criteria and atypical AN as defined by International Classification of Diseases 10th Revision (ICD-10) which includes cases without amenorrhea or with less than 15% of weight loss, so long as they had low weight (BMI <19), and undue influence of body weight on self-evaluation, or intense fear of weight gain. Participation rate in the interview was 85.2%. The lifetime prevalence of AN was 2.2% using the DSM-IV criteria, and 4.2% for broad AN. The incidence of AN for women aged 15-19

years was 270 per 100,000 person-years, and of broad AN 490 per 100,000 person-years. The 5 year clinical recovery rate was 67% for AN and 69% for broad AN.

The "FinnTwin" studies also examined the incidence and prevalence of BN using the same sample and methodology as discussed above. Again two definitions of BN were used, the first based on the DSM-IV definition and the second the authors termed "BN broad" included cases were the frequency of binge eating to meet diagnostic BN was reduced to once per week over the past three months. They found the lifetime prevalence of BN was 1.7%, whereas BN broad was 2.3%. Only 38% of BN and 32% of BN broad cases had been detected by a health care professional. The incidence of BN in the 10-24 year age group was 100 per 100000 person-years, the incidence of BN in the 16-20 year age group was 200 per 100000 person years, the incidence of BN in 15-19 year age group was 210 per 100000 person years. The 5 year recovery rate from BN was 57%, from BN broad 55%[12].

Another twin study examining ED prevalence was conducted in Australia by Wade et al[13] during the period 2001-2003. This study used a modified version of the EDE interview via telephone which was modified to assess the occurrence of lifetime diagnosis. The DSM-IV was used to define ED criteria. A total of 1002 female twins aged 28-39 were assessed. They found lifetime prevalence of AN was 1.9%, partial AN (absence of amenorrhea) was 2.4%, BN was 2.9%, BED was 2.9%, and EDNOS purging type unaccompanied by binge eating 5.3%. Wade et al reported that 11 women with a lifetime ED had a current ED i.e. 1.09% of total sample.

TABLE 1.   RECENT LITERATURE ON PREVALENCE OF EATING DISORDERS

Paper Reference	Study Design	Participants	Survey and Definition of ED and Obesity	Prevalence Rates
Preti *et al* **2009**[5]	Data Collection occurred between years 2001 and 2003. Two phase design. *Phase one:* Cross sectional population survey examining mood and anxiety disorders *Phase 2:* Interview of those meeting pre-determined number of symptoms from phase 1 + 25% of all other participants	*Number:* 4139 *Age:* Adults 18+ years *Region:* European- Representative of 6 countries, Belgium, France, Germany, Italy, Netherlands, Spain	Interview: Revised CIDI ED defined as per DSM IV plus additional categories of sub-threshold ED and any BE	*Lifetime:* AN 0.48% BN 0.51% BED 1.12% Sub-threshold ED 0.72% Any BE 2.15% *12 month:* AN 0% BN 0.15% BED 0.31% Sub threshold BED 0.09% Any BE 0.54%
Hudson *et al* **2007**[6]	Data Collection occurred between years 2001 and 2003. Two phase design. *Phase one:* Cross sectional population survey examining mood, anxiety and substance use disorders *Phase 2:* Interview of those meeting phase 1 disorder	*Number:* 9282 *Age:* Adults 18 + years *Region:* Representative USA population	Interview: Revised CIDI ED defined as per DSM IV plus additional categories of sub-threshold ED and any BE	*Lifetime:* AN 0.6% BN 1.0% BED 2.8% Sub-threshold BED 1.2% Any BE 4.5% *12 month:* AN 0% BN 0.3% BED 1.2% Sub threshold BED 0.6% Any BE 2.1%
Wells *et al* **2006**[7]	Data Collection between 2003-2004 Two phase design. *Phase one:* Cross sectional population survey examining mood and anxiety disorders. *Phase 2:* Interview of those met criteria for depression, mania or anxiety disorders, who had ever planed or attempted suicide, or who had ever been hospitalised for a psychiatric condition, or part of a random selection of other participants. .	*Number:* 7435 *Age:* 16 + years *Region:* Representative New Zealand population	Interview: modified CIDI ED defined as per DSM IV	*Lifetime:* AN 0.6% BN 1.3% Any ED 1.7% *12 month:* AN < 0.1% BN 0.4% Any ED 0.5%

Paper Reference	Study Design	Participants	Survey and Definition of ED and Obesity	Prevalence Rates
Hay *et al* 2008[8]	Data collected in 2005 General population interview	*Number:* 3047 *Age:* 15 + years *Region:* Representative of the State of South Australia	Interview: Interview questions modelled on the EDE ED defined by the Oxford criteria, regular engagement in ED behaviours also examined, Survey not designed to detect AN	*Point prevalence:* BN: 0.9% BED 2.3% EDNOS 1.9% Regular BE 7.2% Regular purging 1.5% Regular Strict dieting and fasting 4.6%
Gauvin et al 2009[9]	Data collected in 2002-2003 Cross sectional population survey Telephone interview	*Number:* 1501 *Age:* 20- 40 years *Region:* Representative of women in Montreal Canada Females only	Interview: Adapted EDE-Q ED defined by DSM-IV criteria	*Point prevalence* AN binge purge subtype <0.1% AN restricting subtype <0.1% BN purge subtype 0.2% BN non purge subtype 0.4% BED 3.8% EDNOS (excluding BED) 14.9% Any kind of ED including sub-threshold ED symptoms total 19.8%
Ghaderi & Scott 2001[10]	Data collected 1197-1999 Prospective population follow up Self report questionnaire	*Number:* 1157 *Age:* 18-30 years *Region:* Sweden Females only	Self report questionnaire- adapted from SED ED defined by DSM-IV criteria	*Point prevalence in 1999* AN 0.12% BN 1.33% BED 1.21% EDNOS 0.48% Any ED total 3.15% *Two year first time incidence* Any ED 0.01%
Keski-Rahkonen 2007 & 2009 [11-12]	Prospective twin study Twin births between 1975-1979 sent questionnaires at age 16 years, with follow up between 17-18 years, and again between age 22-28 years	*Number:* 2881 *Age:* 16-28 years *Region:* Finland	Interview- short version of SCID ED defined by DSM-IV, with additional categories broad AN and broad BN. Broad AN included cases not meeting DSM-IV classification but did meet ICD-10 Broad BN included cases were the frequency of binge eating was reduced to 1/week	*Life time prevalence* AN 2.2% Broad AN 4.2% BN 1.7% Broad BN 2.3% *Incidence in 15-19 year age group* AN 270 per 100,000 person/ years Broad AN 490 per 100,000 person/ years BN 210 per 100,000 person/ years

Paper Reference	Study Design	Participants	Survey and Definition of ED and Obesity	Prevalence Rates
Wade 2006[13]	Cross sectional twin study	*Number:* 1002 *Age:* 28-39 *Region:* Australia	Telephone interview- EDE modified to assess the occurrence of lifetime diagnosis ED defined by DSM-IV criteria, they also described partial AN which included cases with the absence of amenorrhea	*Life time prevalence* AN 1.9% Partial AN 2.4% BN 2.9% BED 2.9% EDNOS purge type unaccompanied by BE 5.3% *Point prevalence* Any ED 1.09%

Weight Problems

Recent data released by the Australian Bureau of Statistics[14] reported on BMI categories for a population sample representative of Australian Adults aged 18 years and over in the 2007-2008 National Health Survey (n= 11 245). This data was then compared to a population sample studied in the 1995 National Nutrition Survey (n= 13 020) to examine changing prevalence over time. Height and weight were measured by the interviewer, and BMI index calculated. Data was compared using percentages and basic graphs and tables. Statistical testing and resulting confidence intervals and statistical significance were not reported. Despite this serious limitation, it does appear that the levels of overweight and obesity are increasing, and possibly the number of underweight men is also increasing. In 1995 underweight (BMI<18.5) was found in 0.6% of men and 2.3% of women, vs. in 2007-2008 found in 1.2% of men and 2.7% of women. Levels of those considered normal weight (BMI 18.5 to <25) fell from 34.5% of men and 48.2% of women in 1995, to 31% of men and 43% of women in 2007-2008. The proportion of participants who were overweight (BMI 25 to <30) seemed static for women 30.3% in 1995 vs 30.9% in 2007-2008 and there was a slight decrease for men from 45.9% in 1995 to 42.5% in 2007-2008, however, obesity prevalence (BMI $\geq$ 30) increased for both genders 19% of men and 19.1% of women in 1995 vs. 25.3% men and 23.4% of women in 2007-2008.

Del Grande et al [15] examined self-report height and weight data from the South Australian Health Omnibus Survey, which was representative (weighted data to reflect census) of the South Australian population aged 18 years or more in 1991 (n=3121) and 2003 (n=2713). They found the proportion of underweight (BMI < 18.5) participants did not change between 1991 at 3.3.% and 2003 at 2.9%. The proportion of normal weight (BMI 18.5- 24.9) individuals significantly decreased from 57.1% in 1991 to 43.3% in 2003. The proportion of overweight (BMI 25.0-29.9) participants increased from 28.8% in 1991 to 34.2% in 2003, as did the proportion of participants who met the criteria for obesity (BMI>30) from 10.8% in 1991 to 19.6% in 2003. Due to the self-report nature of the survey the authors acknowledge that the rates of overweight and obesity are likely underestimated.

Consistent with both the ABS and the Dal Grande work, Cameron et al [16] reported on rates of obesity in an Australian adult cross sectional survey. Participants (n= 11 247) in 1999-2000 were representative of Australian adults aged ≥ 25 years of age (data weighted to match age and sex distribution). The survey interviewers measured height and weight directly. Obesity was indicated in 19.3% of men and 22.2% of women.

Flegal et al [17] reported on obesity levels in the US from the 2007-2008 National Health and Nutrition Examination Survey (NHANES) and examined changes over time from consecutive NHANES surveys conducted from 1999 to 2006. Participants were aged 20 years or older, and pregnant women were excluded from this report. Weight and height were measured and BMI calculated. Overweight was defined as a BMI of 25.0 to 29.9 and obesity was defined as a BMI of 30 or higher. The prevalence of obesity was found to be 32.3% for men, and 35.5% for women. When the number of overweight persons was added to numbers of obese persons, it was found that 64.1% of women and 72.3% of men were either overweight or obese. The authors noted previously reported rising rates of obesity from 1976 through to 2000. However found the prevalence have stabilised, with no significant changes over the 10 year period from 1999 to 2008 for women, and no significant differences in obesity levels for men were observed from the period 2003-2008.

In 2008 Berghöfer et al[18] published a review on obesity prevalence across Europe. They included surveys that used direct measurement of weight and height (as opposed to self-report), that were conducted on adults and at least included subjects between the ages of 25 and 65 years, that they determined were representative of the countries adult population, and that were published between 1990- 2008. They found huge variations across different regions of Europe; however, due to lack of high quality studies, they did not comply with their stated selection criteria. Examples include the Roche study from France which was based on self-report measures only, a number of studies which were based on small regions within a country only,

and a number of studies on samples which did not include the whole age range specified. This is problematic as it is hard to compare obesity rates across countries, if, for example a study in the Czech Republic based on 45 to 69 year olds conducted in 2002-2005, is compared to an Irish study of 18 to 64 year olds conducted in 1997-1999. Whilst they do acknowledge these limitations, the results are oversimplified with a shaded map, which implies for example that Czech Republic has a much higher rate of obesity compared to Ireland. Or as another example that France has a lower rate of obesity compared to Norway when the French study was based on self-report data of a 15 years or older age group, whilst the Norwegian study was based on direct measures of 29-75 year olds. The review does give a comprehensive summary table of all the individual studies and corresponding obesity rates, which vary from as low as 4% of men and 6.2% of women in a French regional self-report survey of 1169 individuals aged 30-77 years, to levels of 22% of men and 36.5% of women in a Polish regional study of 35 to 64 year olds whose weight and height were directly measured. Results from a large UK nationally representative sample (n=14 836) of those age 16 years or older, again using direct measure technique indicated 22.2% of men and 23% of women met the criteria for obesity.

Ali and Lindstrom[19] reported on determinates of BMI for young women aged 18-34 and compared BMI categories based on age. Data was collected from a Swedish public health survey (n= 13 715) of randomly selected persons aged between 18-80 years of which n= 1967 were young women. They used self-report height and weight data. Their results found the prevalence of underweight (BMI <18.5) was particularly high in young women (5.8%) compared to males of the same age group 1.6%, and both genders of all other age groups including the elderly 65-80 year age group of which 1% of males and 2.7% of females were underweight. The overall prevalence of BMI categories is not reported but broken down by age and gender. For obesity (BMI>30) 7% of young women aged 18-34 were obese and 6.9% of young men. For the 35-44 year old age group 7.9% of women and 11.4% of men were found to be obese, for the 45-54 year old age group 9.8% of women and 9.7% of men were obese, for the 55-64 year age group 11.9% of women and 13.6% of men were obese and for 65-80 year olds

9.8% of women and 11.2% of men were overweight or obese. The prevalence of obesity therefore would be considerably lower than the prevalence rates found in Australia, the UK and the US.

Epidemiology of co-morbid EDs or ED Behaviours and Obesity

In the US report on ED epidemiology by Hudson [6] (described above) the association of ED diagnosis with BMI was investigated. A lifetime diagnosis of AN was significantly associated with a lower prevalence of current underweight (BMI <18.5) (OR 5.6, 95% CI 0.2-5.3), whilst lifetime BED was significantly associated with severe obesity (BMI$\geq$40) (OR 4.9, 95% CI 2.2-11.0). The 12 month prevalence of ED and association with BMI categories was not reported. The work by Hay et al[8] indicated that increased ED behaviours from 1995 to 2005 was associated with BMI. The mean BMI among participants who reported strict dieting and fasting increased from 25.3 in 1995 to 28.4 in 2005. However the distribution of those with ED behaviours based on weight categories and time trends of this interaction is not reported.

Masheb and White investigated BN in overweight and normal weight community adult women (n= 1964) in USA[20]. Although this was a convenience sample, not representative of the population, due to recruitment via internet advertisements to participate in research on dieting and eating, the findings indicate overweight is a common co-morbidity with bulimia nervosa. The EDE-Q was used to make diagnosis based on DSM IV. Overall there were 6.9% of the women meeting BN diagnostic criteria. The overweight and normal weight categories did not differ in their rates of BN. However BN sufferers who were also overweight reported increased restraint, and increased scores of over evaluation of body weight/ shape in how they judged themselves as a person, they also had less binge eating compared to normal weight BN sufferers. Higher degree of BMI was also associated with higher levels of depression as measured by the Beck Depression Inventory (BDI) in the overweight BN sufferers, but not in the normal weight BN sufferers.

There is only one large nationally representative population study to my knowledge which examines changing prevalence rates for diagnostic ED and obesity co-morbidity. Zachrisson et al [21] published a report in 2008 which compared the prevalence rates for these disorders in two nationally representative Norwegian female surveys (aged 18 to 65 years) in 1991 (n= 1537) and 2004 (n=1467). The survey included self-report measures of height and weight and ED symptomatology using the Survey of Eating Disorders. The ED diagnoses were made using the DSM IIIR criteria with an additional category made for BED which was based on BN without purging. There was a significant increase in obesity (BMI >30) with 4.1% of the population obese in 1991 and 8.8% in 2004. The prevalence of EDs did not significantly increase with the exception of lifetime BN diagnosis which increased from 2% in 1991 to 4.1% in 2004. The prevalence of the other EDs in 2004 were AN lifetime prevalence of 0.2%, AN point prevalence of 1%, BN point prevalence of 1.8%, BED lifetime prevalence of 0.7%, BED point prevalence of 0.3%, EDNOS lifetime prevalence of 5.0%, and EDNOS point prevalence 1.8%. Obese participants were more likely to report an ED compared to normal weight individuals both in 1991 (lifetime ED diagnosis- OR 6.29, 95%CI 3.40-11.65, point ED diagnosis- OR 4.27%, 95% CI 1.8-10.15) and in 2004 (Lifetime ED diagnosis- OR 3.36, 95% CI 2.05-5.54, point ED diagnosis- OR 4.93, 95% CI 2.46-9.88). However neither the proportion of obese individuals having an ED, nor the overall prevalence of ED increased despite increased rates of obesity. This work is of interest as it is opposing much research suggesting obesity is a risk factor for EDs and ED behaviours discussed in detail in the next section. However, the relatively low prevalence of obesity compared to other countries and consistently low ED prevalence, in addition to a relatively small sample for a population study may have contributed to the findings. It also maybe that obesity is associated with sub-threshold ED behaviours, rather than a diagnostic ED as defined by the DSM IIIR.

Another smaller study by Waaddegaard et al[22] also examined obesity and prevalence of risk behaviour for EDs and examined time trends between 2000 and 2005 in two cross sectional surveys of young women aged 16 to 29 years. Data were weighted to be representative of

Danish women in this age group. Although this paper did not meet previously set criteria of more than 1000 people (n= 409 in 2000, & n= 487 in 2005), as there is limited information from adult population samples on co-morbid obesity and EDs and less examining prevalence over time, it has been included in this review. The interview utilised the Risk Behaviour for Eating Disorders- 8 items (RiBED-8) survey and self-reported height and weight, with BMI categories as follows, underweight BMI <20, normal weight BMI 20-24.9, overweight BMI 25-29.9, obese $\geq$ 30. A cut-off of three on the RiBED-8 was used to categorise women with risk behaviours for EDs, the paper outlines the 8 items and the critical responses used to score the screening instrument. The behaviours assessed in the 8 items include dieting, various eating concerns, self-induced vomiting, binge eating and feeling out of control with desire to lose weight. They found no significant differences in BMI distribution between 2000 and 2005. This likely explains why they found no significant differences in prevalence of obese women meeting the risk for ED cut offs between 2000 and 2005. In 2005, 22% were underweight, 58% were normal weight, 15% were overweight and 5% were obese. In 2005 they reported 19% of women experience at risk of ED behaviours. The odds of women having an at-risk ED behaviour was increased with increasing BMI categories i.e. for those with obesity the OR was 2.77 with a 95% CI of 1.39-5.53. There appeared there may be some increases over time in prevalence of at-risk ED behaviours for particular age groups (i.e. in the 20-29 age group 14%, 95% CI 10.5- 18.4 had at risk ED behaviours in 2000 v.s. 19. 2%, 95% CI 15.5 - 23.5 in 2005) and BMI groups (i.e. in the obese group 27.8% , 95% CI 12.5- 50.9 had at-risk ED behaviours in 2000 v.s. 37.7%, 95% CI 21.4-57.5 in 2005) however, these were not significant in a logistic regression examining the interaction between these variables and year of survey. A limitation of this study is the relatively small sample and small proportion of women with obesity; this may have impacted on the non-significant findings in results, and is indicated by the large confidence intervals.

Epidemiological summary and gaps in the literature

Of the most recent studies we can estimate that over a lifetime AN affects <1% of the population, BN around 0.5- 1.5%, BED 1- 3% and other EDNOS and sub-threshold ED behaviours may affect many more persons up to 8% of the population in a western country. Whilst the prevalence of formal ED diagnosis is seemingly stable over time, there is evidence of increasing rates of ED behaviours in Australia.

Regarding weight status it could be estimated approximately a quarter of the populations in the western world now meet the criteria for obesity; however rates vary greatly from one country to the next. It is clear that the prevalence of obesity in adults has been increasing over the last 30 years, with Australia appearing to be on a continuing upward trend. Whilst in the US the rates of obesity are higher, there is some stabilisation in rates over time, particularly for women in the last 10 years. There is little discussion of the prevalence of underweight in the literature in adults in western societies, however of those studies which do examine this problem, it can be estimated to affects less than 3% of the population, and has been stable overtime.

ED's are associated with weight status, and occur more frequently in individuals also suffering from obesity. However, there is limited research examining time trends in the interaction of these problems. Of the two Scandinavian research reports that examine this issue, both samples have relatively low rates of obesity compared to the Australian population. One suggests no increase in the proportion of obese individuals suffering from EDs, and no increase in diagnostic ED, despite increasing prevalence of obesity; in this study sub- threshold ED behaviours in relation to obesity were not examined. The other study finds no increase in either obesity or ED behaviours, and no significant change in the proportion of ED sufferers based on weight category. How this compares to the Australian or other western populations, where there are higher rates of obesity and evidence of both increasing rates of obesity and ED behaviours remains unclear.

THE RELATIONSHIP BETWEEN DISORDERED EATING, BODY WEIGHT AND PSYCHOLOGICAL DISTRESS.

Underweight, obesity and EDs have a range of implications for physical and mental health, resulting in poor quality of life for sufferers, high cost for health care providers and reduced productivity for the economy[1-4 23 24]. Evidence indicating increased prevalence of obesity[14-16], ED behaviours[8], and anxiety[25] and depression[26] in Australia, is therefore of major concern. These fields have commenced gaining the public, government and health sector attention it deserves. However, the rising prevalence of adult obesity in Australia[15 27] is perhaps indicative of limited success in broad health promotion messages and other public health initiatives that have targeted adults in reducing this risk factor for disease[28]. Furthermore findings on the cost efficiency and clinically effectiveness of obesity treatment are mixed, and although weight loss is achievable, many persons will regain weight in longer term follow up[29 30 28 31] . In the ED field, whilst effective treatment for bulimic EDs are well established[32]; access to effective treatment and help seeking is low, with many sufferers more likely to seek treatment for a real or perceived weight problem, rather than their eating disorder[2 3 33]. Compared to obesity, there have been fewer attempts at universal health promotion messages or public health interventions aimed at reducing disordered eating pathology in adults, and ED prevention efforts have been found to be more effective when targeted towards at risk individuals[34]. Public funding for depression and anxiety treatments (which are well established in terms of effectiveness[35]) and public health initiatives for psychological distress have increased in the past 10 years[26], although arguably still very under funded. Depression health promotion strategies have largely targeted reducing community stigma, improving recognition and helping sufferers access effective treatments; evaluation of these programs have been mixed[26]. This section of the literature review will focus on what is currently known about the relationship between ED behaviours, weight, and psychological distress. Improving and disseminating our understanding the complexities of these relationships is likely to lead to new innovative and holistic treatments; and improved public health initiatives aimed not just at raising awareness and treatment seeking, but in preventing these problems. The following pages review the research

which examines these relationships in various population groups. A summary of the research studies conducted in community or school samples can be found in Table 2 pg 79. A summary of the research studies conducted in clinical samples can be found in Table 3 pg 86.

Understanding the Relationship: Literature with a Focus on Psychological Distress

It has been well established that EDs are associated with high levels of psychiatric co-morbidities including depression, anxiety, and personality disorders[23] [36-38]. In contrast cross sectional research findings pertaining to the relationship between weight status and depression has been mixed[39] [40]. In summary these cross sectional studies indicate a clear relationship between underweight and depression[41] [42]; most cross sectional studies have indicated a relationship in depression and obesity [43] [42], however others have not [41] [44], or only found weak associations[45]. The relationship between depression and obesity seems to be moderated by gender, with women showing a much clearer associations between obesity and depression [41] [42] [40] [43] [45]. Other subgroups within the obese population are also at high risk of depression including those with severe levels of obesity [42] [40] [45], those suffering BE[46] , and those with lower levels of educational attainment [41]. Luppino et al[47] completed a meta-analysis of 15 studies which examined the relationship between obesity and depression longitudinally (greater than 1 year follow up) and found a bidirectional association between depression and obesity, with obese persons more likely to become depressed at follow up (pooled adjusted OR 1.57, 95% CI 1.23-2.01) and depressed persons more likely to become obese at follow up (pooled adjusted OR 1.40, 95% CI 1.15-1.71). Gender differences were not discussed or accounted for in this paper. In another larger review (but not meta-analysis), Faith et al[39] examined 25 studies which reported on longitudinal associations between depression and obesity. They indicated 8 out of 10 studies which examined obesity as a predictor of depression, found obesity or increased BMI was associated an elevation of depression scores over time, or with onset of clinical depression. Whereas only 5 out of 15 studies which examined if depression was a significant predictor of obesity, found that depression was related to increasing BMI over time or obesity onset, and 3 of the 15 studies found depressed participants had a lower incidence of obesity at follow up.

However one of these studies indicated that depressed participants gained more weight if initially heavy and less if initially lean; and another was in a relatively small sample of 6th grade students followed for only 1 year. The other 7 of the 15 studies found depression was not related to weight over time.

There is much less work on anxiety disorders and obesity, however most studies which have examined this association have found a clear relationship, not confounded by socio-demographic variables[41 42 48]. A recent meta-analysis of stress (perceived stress, life events, work stress, caregiver stress, childhood adversity) in 14 longitudinal studies, concluded that stress is a risk factor for degree of adiposity over time (a stronger risk for males than females), however the effects were very small[49].

Hasler et al[46] conducted one of the prospective studies which was included in the above reviews on depression and anxiety. In a 20 year prospective study which followed 591 (62% completion rate) nineteen year olds until the age of 40 years. These participants were recruited from within a representative sample of the population of Zurich Switzerland. They were selected to over-represent cases at risk of psychiatric syndromes based on scores in the psychological Symptom Checklist (SCL-90). Measures included self-report height and weight, and a psychological diagnostic interview (Structured Psychopathological Interview and Rating of Social Consequences SPIKE). They found in that atypical depression was associated with increased odds for been overweight in both males (OR 2.0, CI 1.0-4.2) and females (OR 2.9, CI 1.3-6.5), however major depression, recurrent brief depression and minor depression were not associated. Generalized anxiety disorder was associated with decreased odds for overweight in males (OR 0.3, CI 0.1- 0.9) but was not found in females. BE (classified as at least 4 objective binge episodes associated with distress in a one year period) also increased the odds for overweight more than threefold in both males (OR 3.6, CI 1.3-10), and female subjects (OR 3.8, CI 1.7-8.8).

In a population study in Finland [50] of 2312 men and 2674 women aged 25-74 years, there were associations between adiposity (measured via BMI, waist circumference and percentage body fat as determined by electronic bioelectrical impedance analysis device) and depression (determined by 20 item Centre for Epidemiological Studies- Depression Scale). However these became insignificant in structural equation models which included emotional eating (using the emotional eating scale of the revised 18 item Three Factor Eating Questionnaire) and the Physical Activity Self Efficacy Scale (devised by the authors). Thus the link between depression and adiposity was mediated by emotional eating and physical activity self-efficacy. In the tools utilized emotional eating included 3 items addressing eating and/or overeating in relation to negative emotions (i.e. anxiousness, feeling blue and loneliness). Items assessing physical activity self-efficacy addressed the participant's confidence in overcoming emotional and other barriers in maintain physical activity behaviours. In this study elevated depressive scores were associated with both higher emotional eating and lower physical activity self-efficacy scores (which were inversely correlated with each other) for both men and women. Adjustment for age, gender, educational status, and chronic disease status did not change the role of emotional eating or physical activity self-efficacy, in explaining the relationship between depression and adiposity. The authors acknowledge that due to the cross sectional nature of the study conclusions about direction or causality cannot be made, however the findings are consistent with a number of other studies which indicate the relationship between weight and depression is in part or in total due to the presence of eating disorder behaviours or cognitions [51] [52].

Friedman et al[52] reported that body image partially mediates the relationship between obesity and psychological distress. The study involved 80 women and 30 men at a baseline assessment at a residential weight loss facility. The study was not representative of the general population of obese persons, or even of obese persons seeking treatment, as the cost of attending a residential facility meant that participants were mostly from the middle to upper classes and largely in professional occupations. Nonetheless, the results showed in a regression analysis that

BMI accounted for 14% of the variance in depression scores, and of this 14%; 24% was due to the effect of Appearance Evaluation and 28% due to the effect of a Body Areas Satisfaction Score. The Appearance Evaluation score and Body Area's Satisfaction scores were measured via two subscales in the Multidimensional Body-Self Relations Questionnaire.

Dide & Fitzgibon investigated if degree of obesity was a factor in the psychological distress experienced by adult patients seeking help for BED (n=96, 84 female and 12 male). The sample was grouped by weight category, and it was found that general psychological distress, depressive symptoms and ED psychopathology did not differ between the groups. The authors concluded but did not test that it was not level of obesity, but erratic eating patterns or weight gain which caused the levels of distress experienced by patients with BED[51].

Colles et al conducted a study to explore what behavioral features of BED are the most strongly related to psychological distress[53]. The sample were recruited from multiple sources including bariatric surgery candidates (n=180), a non-surgical weight loss support group (n=93), and community members responding to advertisements placed in a metropolitan hospital and an Australian University (n=158). The bariatric surgery patients had the highest rate of BE, 18% meeting diagnostic BED and a further 13% experiencing LOC over what the interviewer felt was not a large amount of food (subjective LOC). This compared to 3% of the weight loss support group meeting BED criteria, and a further 11% experiencing subjective LOC; and 2% of community respondents meeting BED criteria and a further 8% experience subjective LOC. Items measuring a range of behavioural variables pertaining to eating, and feelings around eating were based on the BED criterion and designed by the authors. Data were examined in linear regression models. Higher ratings of emotional distress related to LOC, and level of upset by overeating (i.e. how emotional disturbed they were at "eating more than you think is best for you") were the best predictors of depression measured by the BDI accounting for 23% of the variance in the model. The authors did not include scores of body image distress as measured by the Multidimensional Body Self-Relations Questionnaire, or scores on the Three Factor Eating Questionnaire measuring restraint, disinhibition and hunger, even though these were

assessed in the study, as potential predicting variables of depression. They re-ran the model examining predictors of body image distress, finding again that emotional distress related to LOC, and level of upset by overeating were the best predictors accounting for 34% of the variance in the model. These same variables in addition to frequency of objective BE episodes also predicted poorer mental component scores in the Short Form-36 (SF-36) health-related quality of life tool, accounting for 12% of the variance in the model.

Telch and Agras[54] examined how obesity, BE and psychopathology were related in a sample of 107 obese female patients, in USA. Women were recruited via advertisement to a BED and overweight treatment intervention trial. The selection criteria for the study included BMI$\geq$ 27, at least twice weekly BE episodes, absence of purging behaviours, no current use of antidepressant medications and aged between 18-65 years of age. The results from this report are cross sectional and only pertain to the baseline assessment. The main finding was that ED psychopathology, in this case BE, accounted for the observed relationship between obesity and psychopathology (as measured by the BDI, SCL-90, and Rosenberg Self Esteem Scale). This was due to the finding that level of BE (measured via Binge Eating Scale) related the measures of psychopathology, but level of obesity or weight as a continuous variable did not.

Pinaque et al[55] examined BED in relation to eating behaviours, alexyithymia and depression in 169 women aged 18 to 60 years in outpatient obesity treatment in Toulouse and Strasbourg France. Inclusion criteria included BMI >25 and < 60, not following a diet 2 months prior to the study, and not taking psychotropic drugs or undergoing psychotherapy. Of the 169 women, 40 were identified as having BED using a French version of the Questionnaire for Eating and Weight Patterns. Women suffering from BED were of comparable age, BMI and other demographic features, but were more likely than the non-BED participants to report the onset of obesity in childhood, 58% vs. 34% respectively. The Dutch Eating Behaviour Questionnaire was used to assess eating behaviour, overweight BED and overweight non BED women had comparable levels of restriction, however BED subjects had significantly higher scores for the

emotional eating subscale and the external eating subscale. Participants with BED also had higher depression scores on the BDI, higher trait but not state anxiety scores on the State- Trait Anxiety Inventory, perceived stress measured using the Stress Perceived Scale and higher alexithymia scores on the Toronto Alexithymia Scale-20 (TAS-20). In regards to the TAS-20 scale BED suffers had higher scores on the subscales measuring difficulty in distinguishing feeling from bodily sensations and inability to describe feelings, but did not differ in the subscale measuring externally oriented thinking. Women with BED were significantly more likely to meet the cutoff scores to be categorised as alexithymic then women without BED, 63% vs 50% respectively. In multiple regression analysis, perceived stress and emotional eating emerged as significant predictors of BED; depression, anxiety, alexithymia, dietary restraint and external eating did not emerge as significant predictor variables. To examine predictors of emotional eating in both BED and non-BED participants separate multiple regressions were completed for the two groups. In sufferers of BED, alexithymia emerged as the only significant predicting variable of emotional eating, whereas in women without BED perceived stress and depression scores emerged as the independent predictors of emotional eating.

A similar study comparing women suffering from obesity and BE and women suffering from obesity without BE was conducted by Nauta et al[56] in Maastricht, The Netherlands. Women were recruited via advertisement offering university based treatment of eating problems and the study conducted as part of the baseline assessment. The focus of the study was to evaluate differences in cognitions around eating, shape and weight and negative self- schemas between the two groups. A total of 74 women aged between 21 and 49 years, and with a BMI from 27 to 45, of which 37 women meet the DSM IV criteria for BED and 37 women did not (ascertained by a structured clinical diagnostic interview conducted by a psychologist experienced in eating disorders) were enrolled in the study. Women who were aged > 50 years, had BMI< 27, were pregnant, in another treatment for weight loss, or had a DSM diagnosis of psychosis, drug abuse or alcoholism were excluded from the study. Women completed the BDI, the Rosenberg Self- Esteem Scale, the weight, shape and eating concern subscales of the EDE-Q and a semi-

structured exploratory interview aimed at detecting thoughts regarding shape, weight and eating and underlying related schemas. Classification of cognitions and content analysis of the interviews were then completed. Interviewers were blind to clinical diagnosis. The study found among obese women suffering from BE, negative self-schemas were more likely to be significantly related to rejection and unworthiness, whereas obese non-BEs were more likely to have negative self-schemas related to lack of willpower. Both groups of women frequently reported automatic thoughts regarding shape, weight and eating. Obese BEs were also more likely to be depressed and have higher weight, shape and eating concerns. Women whose cognitions around eating shape and weight were dominated by negative self-schemas, were more likely to be depressed and have lower self-esteem, regardless of BE category, compared to those women whose cognitions were dominated by automatic thoughts. The EDE-Q subscale measures did not differ between the two groups. This was a unique study, and although the interview used to assess cognition had not been used in other research, it was described in detail in the paper. When this interview was combined with the other validated measures of eating, weight and shape concerns from the EDE-Q, it was able to provide a much enriched picture of underlying cognitions faced by obese women with and without BE. The authors did not however assess or report on other functional and dysfunctional dieting, eating and weight control behaviours, as in much of the earlier research regarding obesity and disordered eating behaviour, it seemed BE was often seen as the key relevant behaviour and other behaviour overlooked.

Stice et al[57] examined the role of body image and eating disturbances in the development of major depression in adolescent females. A total of 1124 adolescents were recruited from Californian high schools, aged from 13 to 17 years old at baseline. They were followed up annually for 4 years. At baseline 100 students meet lifetime diagnosis of major depression and were excluded from further analysis. A further 80 students developed major depression over the 4 year course of the study. Cox proportional hazards regression analysis showed initial level of depressive symptoms, elevation in body dissatisfaction, dietary restraint and bulimic symptoms

each individually prospectively predicted a greater hazard for the onset of depression. However in a multivariate model considering all of the variables simultaneously, initial depressive symptoms and body dissatisfaction fell out of the model, with only dietary restraint and bulimic symptoms predicting depression onset.

In sum, both eating disorders and weight disorders are related to depression, anxiety and psychological distress. In particular obese persons are at high risk developing depression over time. There are mixed results regarding if depression will also lead to obesity and elevated eating disorder behaviours. However it is likely a dual relationship, but one which is mediated by a range of other variables, thus causing results to differ depending on the occurrence of the mediating variables in the study group or subgroups. These mediating variables include BE and emotional eating, body image dissatisfaction, gender (females more likely to show this relationship), level of distress and upset with overeating, physical activity self-efficacy and negative self-schema's around eating and body image.

Understanding the Relationship: Literature with a Focus on Weight Stability and Weight Change

A number of population studies have focused on ED behaviours and psychological health in relation weight change and obesity onset. The Australian Longitudinal Study on Women's Health examined longitudinal predictors of weight change (maintenance within 5% of baseline BMI, loss and gain) over 4 years in 8726 young (aged 18-23 years at baseline) healthy women representative of Australian Population in this age group[58]. Women with known health conditions likely impacting on weight during the survey (pregnancy, cancer, HIV, long term illness or disability) were excluded from analysis. The study used a self-report survey of height and weight, and measured a variety of factors impacting on weight. These included physical activity, sedentary behaviour, eating behaviours including self-reported dieting, unhealthy weight loss behaviours (BE, self-induced vomiting, fasting, laxative and diuretic misuse), takeaway food consumption, smoking, alcohol consumption, number of births and socio-

demographics. Standardized validated tools were not employed; however the items are well described. The items used to measure what the authors term unhealthy weight loss behaviours align closely with eating disorder behaviours. The survey was conducted at baseline and again at 4 years. The results only include information from these two time points. At baseline 47% were in the healthy weight category, 23% underweight, 14% overweight and 6% obese. Over the 4 years 44% of women were considered to have maintained their weight, 41% gained weight and 15% lost weight. Weight maintainers were more likely to be in managerial or professional occupations, to have never been married, to be still studying and not to be mothers. Logistic regression adjusted for occupation, student status, marital status and parity was performed to assess predictive factors of weight maintenance and therefore protection from weight gain (thus weight losers were omitted from the analysis). It was found that been in the healthy weight range at baseline, low levels of sedentary activity, and not eating takeaway food were significantly predictive of weight maintenance. Smoking status, dieting history, BE and unhealthy weight loss behaviours did not significantly contribute to the model. Similar logistic regression techniques were not employed to see which of these factors predicted weight loss or weight gain. However from the univariate chi-square and F –statistic analysis it appears that weight gainers had a higher mean BMI at baseline, were more likely than maintainers and losers to report restrictive dieting, hazardous levels of alcohol consumption and current smoking, and more likely than losers but not necessarily maintainers to report high levels of sedentary activity, and current BE. However the chi square tests are difficult to interpret as post hoc tests were not completed to statistically confirm the apparent ways the three groups differed, and as they were univariate in nature could not account for demographic and other potential confounding affects.

Serder et al[59] examined the disordered eating and psychiatric correlates of weight instability in a cross sectional study of adults in the Virginia USA twin registry. A total of 1510 females and 1111 males participated in the study. The survey included self-report measures of height and weight, weight instability (measured using change in silhouettes that the participant felt

represented their body size at different ages), body dissatisfaction and drive for thinness scales of the Eating Disorder Inventory, abbreviated version of the three factor eating questionnaire (measuring dietary restraint, disinhibition and susceptibility to hunger), dichotomous questions on ever dieted and ever binged, an adapted version of the structured clinical interview (SCID-I) to assess ED and other psychiatric diagnosis, health satisfaction, days out of role to illness and the Rosenberg self-esteem scale. A number of logistic regression analyses were completed separately for men and women to see what variables were associated with weight instability. The findings indicated that both men and women suffering from weight instability had increased likelihood of suffering low self-esteem and higher body dissatisfaction. For women weight instability was also associated with higher disinhibition scores, BE, a greater likelihood of major depressive disorder, generalized anxiety disorder, and occurrence of any type of eating disorder. However the association with generalized anxiety disorder became non-significant once life time BE was accounted for. For men weight instability was not associated with measures of disordered eating or psychiatric diagnosis, but was additionally related to lower levels of health satisfaction. In neither gender was weight instability related to drive for thinness, restraint, hunger, health limitation or sick days out of ordinary role. In the regression models to see which variables predicted weight instability, there was no attempt to put all of the demographic, and eating and psychological variables, or all of the correlating variables in the one model together, and therefore no knowledge of which variables were the best predictors of weight instability in the sample. The cross sectional design of the study cannot imply any cause or effect, and it is possible retrospective recall of body shape (not weight which would be also difficult) to measure weight instability, may be influenced by current low self-esteem or body satisfaction, rather than an accurate representation of weight fluctuations over the lifetime.

A number of studies[60][61][62] have examined disordered eating cognitions and behaviours, and psychological factors associated with successful weight loss for obesity, or with weight maintenance or relapse in the period following active obesity treatment. These studies have found body dissatisfaction, eating disorder behaviours and poorer psychological health are

associated poorer outcome of obesity treatment. Byrne et al[61] completed a qualitative study on women from the community in England. The women were either obese (or formally obese) but had lost weight and maintained their new low weight for 1 year n= 28; or were obese and had regained weight after weight loss n=28; or were in the healthy weight range and weight stable. Maintainers reported continued adherence to a relatively low fat diet, regular exercise and frequent weight/ shape monitoring. In contrast most regainers did not sustain these behaviours. Maintainers also reported responding very quickly to counteract any detected weight gain by altering food intake and increasing physical activity. The majority of regainers reported feeling dissatisfied with their weight following weight loss, and were less likely to report feeling they had satisfactorily achieved other weight loss goals such as improved health, appearance or self-esteem. They tended to be dichotomous or black and white in their thinking about what was success or failure in terms of eating, weight and shape. They were also more likely to show an undue influence of shape and weight in their overall self-worth as a person and more pre-occupation with shape and weight. Whilst both regainers and maintainers reported stressful life events, regainers reported habitual overeating in response to stress.

In a very similar study Kaymen et al[60] compared 30 formally obese women who had lost and maintained a new low weight, with 44 obese women who had regained weight after successful reduction, with 34 average weight women. The women were recruited from a survey given to women entering medical offices in California. The participants were interviewed by an open ended questionnaire developed by the authors, following a pilot open interview with 12 subjects. It was found that although those who regained and those who maintained weight used similar strategies to lose weight, the maintainers used strategies that they felt were specific to their lifestyle and chosen by themselves – not set by a health practitioner or a specific weight loss class. They set small goals and persisted until new eating patterns were established. They did not completely restrict their favorite foods. In contrast those who regained weight were more likely to take appetite suppressants, fast, take diet formulas, go on unsustainably restrictive diets and went to weight control groups and programs many times. They were less

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likely to exercise and did not permit themselves foods they enjoyed when dieting. Women who regained weight were more likely than the other two groups to both skip breakfast and eat a greater number of snacks per day. Those who regained weight were more dissatisfied with their body, with 70% reported they felt fat or ugly. Although all groups reported stressful issues in their lives, women who regained weight were more likely to report emotion focused or avoidant coping strategies such as eating, sleeping or wishing the problem would go away. Many women experiencing weight relapse reported regaining weight in response to a negative life event that made it impossible for them to prepare their special foods or exercise. In contrast women who were always a healthy weight reported coping strategies involving relaxation techniques, exercise and working more. Both maintainers and the always healthy weight group were more likely to report problem solving and directly confronting problems compared to the regaining group.

Foster et al[63] examined the clinical correlates of the Eating Inventory (EI) in obese women enrolled in 6 month obesity treatment trials between 1987 and 1996 at the University of Pennsylvania USA (n=223, mean age = 41 years, SD 8.8). The treatment trials involved various levels of dietary energy restriction (involving a liquid meal replacement very low calorie diet 925 Kcal/day diet and a food based 1200kcal/day diet) combined with cognitive behavioral therapy. They found that cognitive dietary restraint was positive symptom for these women as pre-treatment higher restraint was related to lower body weight and BMI, lower levels of depressive symptomatology (measured via the BDI) and lower levels of BE (measured on the BES). Increases in restraint levels during treatment were associated with greater weight loss during treatment. Disinhibition (dysregulation of eating in response to cognitive or emotional cues) was weakly but significantly correlated with higher body weight and BMI, and significantly positively correlated with depression and BE. Hunger scores were not associated with anthropometry but were associated with both BE and depression. Of the three subscales of the eating inventory, restraint was the most strongly related to weight loss during treatment in regression analysis. As fairly extreme diet restraint (i.e. approximately less than 50% of

average daily energy requirements in this population group[64]) was a key component to the treatment approach used, thus it is understandable that restraint which would likely doubled as a treatment adherence measure, was associated with greater weight loss in this setting.

Hainer e t al[62] examined psychological and eating behaviors variables associated with 12 month weight loss outcomes in a Randomised Control Trial (RCT) of sibutramine in obesity treatment. Both groups were prescribed a low energy diet (5-6MJ per day) and prescribed activity (minimum 30 min walk 5 days per week, the intervention group also received sibutramine medication. A total of 80 obese women completed the study and also completed the Eating Inventory Tool measuring dietary restraint, disinhibition and perceived hunger, a food diary to examine energy and macronutrient intake, as well as the BDI. Weight and height were measured at monthly clinic visits. The women lost a significant amount of weight on average 11.9kg in the placebo group, and 12.9kg in the sibutramine group (non-significant between group differences). Multiple regressions were utilised to determine predicting variables of BMI at 4 months, and 12 months. At 4 months only being in the treatment group with sibutramine and diet restraint predicted less weight loss; and at 12 months high scores for depression, dietary restraint and energy intake predicted less weight loss. The finding that patients with high scores for dietary restraint were less likely to lose weight at both 4 and 12 months follow up is inconsistent with other obesity studies[63] and the authors hypothesize the reason could be higher dietary restraint may have related to weight loss prior to the commencement of the study. However the finding is consistent with community studies showing restraint leads to weight gain not weight loss[58 65 66]. It is likely those differences in the how dietary restraint predicts weight outcome in different studies maybe due to the sample, the strategies employed by the individual attempting to lose weight, whether emotional eating or BE urges were managed in the weight control strategies employed, and the tools used to assess dietary restraint.

Tanofsky-Kraff et al[67], examined disordered eating behaviours in relation to weight gain in children aged 6-12 years, prospectively over 4.5 years (SD 1.9 years). The children, were

considered at high risk of adult obesity by way of their baseline overweight status (BMI for age and sex > 95th percentile) or their parents overweight (BMI>25) status. The children were a convenience sample recruited from physician referrals, mailed notices and advertisements in Washington USA[68]. A relatively small sample of 143 children (76% retention rate) were followed up over the course of the study, in which clinic visits obtaining anthropometric measurements were obtained annually, and demographic data, subjective and objective BE, restraint, eating, weight and shape concern was collected at baseline in the form of Children's EDE (ChEDE). The children's BMI throughout the study was higher in those who were older, had higher restraint scores, and higher weight concern scores at baseline. The rate of change of BMI over time was not associated with age, restraint, weight, eating or shape concern, however was associated with loss of control of eating in a mixed linear multiple regression. In regard to conflicting findings regarding previous findings on dietary restraint the authors discuss two possibilities; a) that the ChEDE measures both actual dietary restraint and perceived cognitive restraint therefore leading to variable findings, and b) that reported dieting maybe a marker rather than cause of overweight and weight gain.

In contrast to Fosters[63] and Tanofsky kraff[67] findings that dietary restraint was not related to weight change or that dietary restraint was a positive variable for weight loss, various other studies[20] [21] [65] examining risk factors for weight gain and obesity onset has shown dietary restraint to be one of the predicting variables. Stice et al[65] conducted a prospective study over 4 years on adolescent girls (n=496) recruited from middle schools in a metropolitan area of the USA. In a multivariate model examining high fat intake, BE, exercising, dietary restraint, compensatory behaviours (self-induced vomiting, laxative and diuretic use for weight loss purposes), depressive symptoms and perceived parental obesity; only dietary restraint, compensatory behaviours, depressive symptoms and perceived parental obesity significantly increased the risk of obesity onset. There were several strengths of this research, its prospective design, assessments completed using well validated tools and direct measures of height and weight. Weaknesses include self-report measures of diet intake, exercise and perceived parental

obesity.   Much of the above work of Stice[65] was confirmed in a much larger prospective study of adolescents conducted by Neumark- Sztainer et al[66].   Male and Female adolescents (n= 2516, a response rate of 53%) from Minnesota in junior and senior high were surveyed in 1998-99 and 5 years later in 2003-2004. The authors examined weight, height and BMI (self report), healthy dieting (e.g. ate more fruits and vegetables, ate less high fat foods, ate fewer sweets, exercised) unhealthful weight control behaviours (fasted, ate very little food, skipped meals, used food substitute, smoked more cigarettes, took diet pills, self-induced vomiting, laxative and diuretic misuse) and also examined BE and self-reported ED diagnosed by a doctor i.e. "has a doctor ever told you have an ED…". For females those with healthful dieting alone and those with additional unhealthful weight control behaviours at time one were significantly more likely to have a greater increase in BMI and tendency to become or stay overweight (three times the odds of becoming overweight compared to non-dieters) at time 2. In males only unhealthful weight control behaviours at time 1 predicted greater increase in BMI and tendency to become or stay overweight (three times the odds of becoming overweight compared to non-dieters). As both healthful and non-healthful weight control behaviours in females at time 1, and unhealthful weight control behaviours in males at time 1, was associated with around six times increased odds for BE with loss of control at time 2, this may in part explain the weight gain amongst dieters. The authors also discuss the short term mindset "of going on a diet" which may be detrimental to long term sustainable behavior change, and above average positive energy balance when not on the diet. The research also found female dieters at time one were also more likely to have extreme weight control behaviours and more likely to report an ED at time 2. It is unclear from the paper if the dieters at time 1 were also more likely to be heavier and overweight in the initial phase of the study.

Savege et al[69] conducted a 6 year longitudinal study examining the interactions between restrained eating (self-reported dieting), cognitive control of eating (measured by the dietary restraint subscale of the Eating Inventory), disinhibited eating (defined as tendency to overeat in the presence of palatable foods or other disinhibiting stimuli such as emotional stress measured

via the disinhibition subscale of the eating disorder inventory) and weight change. This study was conducted with 163 adult women participants[69]. Data were collected at two year intervals through the study. The study was based on white married women identified through marketing information, i.e. they were not a representative population sample. The study found higher levels of baseline disinhibition were associated with higher levels of baseline weight and greater weight gain over time. The EI dietary restraint scale was not related to baseline weight or change in weight over time, however self-reported dieting at baseline was related to both higher weight at baseline and greater weight gain over time. This was somewhat complicated as self-reported dieting at each occasion of follow up was predictive of lower current weight, and within person changes in restraint subscale levels showed on average a negative relationship with weight however this was not true for all participants. Thus current and consistent dieting was related to low weight, but previously un-sustained dieting was related to greater weight gain then those who had never dieted. Changes in disinhibition over time were positively associated with weight. Using multilevel growth curve models, the authors reported that self-reported dieters at baseline who had low restraint and high disinhibition, weighed the most over time; whereas dieters with low restraint and low disinhibition at baseline weighed the least over time. In examining self-report non-dieters, they found those with high restraint and high disinhibition weighed the most over time, and those with high restraint and low disinhibition weighed the least overtime. High restraint levels moderated the impact of disinhibited eating on weight gain in self-reported dieters. If we assume disinhibited eating is correlated to BE, this is at perhaps at odds with Stice's work in adolescents indicating high restraint is correlated with higher levels of BE and greater weight gain.

Other community studies have examined weight change over time in relation to a range of bulimic EDs. Thomas et al[70] completed an 8 year prospective study on 496 adolescent girls in the USA, aged 12 to 15 years at baseline. They tracked BMI measured by interviewers and eating pathology via an ED Diagnostic Interview adapted from the EDE annually. Participants were pooled into three groups based on weight change, those who showed a 10% decrease in

age adjusted BMI in any of the five 12 month intervals (n= 84, of which n=76 could be included in further analysis due to study attrition 2 years post the weight loss), those who showed 10% increase in age adjusted BMI (n=92, of which n= 86 could be included in further analysis considering study attrition 2 years post the weight gain) and weight stable participants who did not experience any more than a 5% age adjusted BMI across the 8 year study (n= 85, note to be included in this group participants were required to participate in all 8 annual reviews). The weight loss group started significantly heavier then the weight stable group, they lost weight down to the same mean weight as the weight stable group, and in the two years post the weight loss gained weight significantly more rapidly, with their BMI ending up significantly higher then the weight stable group at both of the two year time points post their weight loss i.e. they regained weight lost. The weight gain group commenced at a BMI no different to their weight stable counterparts, in the year following their 10% weight gain, there was an overall non-significant weight decrease, although BMI still significantly higher than the weight stable group, in the following year weight stabilized but BMI remained significantly higher than the weight stable group. Weight change was related to development of an ED. Participants in the weight loss (8.1%), and weight gain groups (8.2%), were significantly more likely to develop threshold or sub-threshold BN compared to the weight stable group (1.2%). After diagnosis with bulimic pathology the females experiencing this problem gained comparable weight to those not experiencing bulimic pathology. Thus in this study, it could be said that the occurrence of extreme weight control behaviours in these adolescent girls was successful in weight management, for a least a couple of years post the development of the disorder i.e. preventing further rapid weight gain or continued suppression of weight to a level at least in line with that of their peers. Weight stability itself maybe protective of BN, or it may be any or a combination of the eating behaviours, lifestyle and psychological characteristics of weight stable participants that are protective of BN. Susceptibility to weight gain (given the weight loss group commenced at a higher BMI to their peers) may make women susceptible to bulimic EDs.

An earlier cross sectional study by members of the same team (to Thomas et al discussed above) examined weight suppression (which they defined as discrepancy between self-reported highest ever and current weight) and desire to lose weight in relation to BE[71]. This study was conducted in adult women (n= 182) enrolled in a treatment study for diagnosed BN (as per the DSM III) at the baseline time point. The mean weight suppression reported by the group was 9.2kg (SD 9.5kg, minimum 0, maximum 53.6kg). Weight suppression was positively associated with frequency of OBE episodes, and the EDE restraint subscale was negatively associated with frequency of OBEs (BE as defined in the DSM-IV). BMI, weight and shape concern subscales from the EDE were not related to frequency of OBEs. Participants with lower desire for weight loss, experienced greater frequency of OBE compared to those with a higher desire for weight loss. What was not explored in this study is weight discrepancy that occurs between lowest ever adult weight and current weight. As Fairburn et al reported[72] in a 5 year prospective study on the natural course of BN (n= 102) and BED (n=48) in adult women in England, the tendency of women with bulimic EDs is to gain weight (not successfully suppress weight) over time. On average the BN participants gained 3.3kg (SD 10.1kg) and BED participants on average gained 4.2kg (SD 9.8kg)[72]. Therefore frequent BE maybe as important to explore as weight suppression in adults with diagnosed bulimic ED.

In summary, weight and change in weight is strongly associated with ED behaviours and cognitions and there is some evidence it is associated with depression. Weight instability and in particular weight gain has been associated with decreased self-esteem, depression, decreased body satisfaction and weight and shape concerns and a number of eating behaviours. Poorer psychological health, body dissatisfaction, tendency to evaluate self as a person based on shape and weight, and the tendency to emotionally eat rather than use more adapted responses to negative emotions and stressful life events, are all linked to weight regain following obesity treatment. The relationship between particular eating behaviours and weight change is more difficult to interpret. BE and disinhinited eating lead to weight gain and obesity in most but not all population groups. The relationship between dieting and dietary restraint and weight change

is very unclear and differs widely from one study to the next. The research indicates a number of possible models:

a) Current sustained dieting and diet restraint leads to current low body weight and improved weight maintenance.

b) High restraint leads to increased weight

c) High restraint and dieting is associated with increased BE or disinhibited eating which is in turn associated with weight gain

d) Dieting and high restraint moderates the impact of BE and disinhibited eating on weight gain

e) Sustained dieting but not complete restraint of favorite foods leads to maintained weight loss following obesity treatment.

It is possible that one model does not hold the answer, but differs for individuals based on age, current or life history of eating disorders, susceptibility to BE, current weight status and weight history, level of psychological distress, and the nature and sustainability of the diet strategies employed. Also the findings may differ in each of the studies used based on tool to measure dietary restraint. The difficulties and differences in tools to assess dietary restraint, dieting and energy intake have been noted in the literature, with cognitive restraint not correlating well with actual dietary restriction in a number of studies[73-75]. It maybe important in the future that a new tool is developed which can adequately measure a wider range of different dieting domains including; cognitive restraint, energy restriction, levels of sustainability and discontinuity in the diet approach, dichotomous thinking and behaviour toward eating, nutritional intake and balance, emotional eating and BE.

Literature with a Focus on Body Image, Body Weight and ED behaviours

There have been several population studies examining dietary restraint and body image in relation to weight, socio-demographic variables and psychological health in the community. Dewberry et al [76] found amongst British adults (n= 533, age 18-65) that women had higher levels of dietary restraint compared to men, and highly restrained subjects of both genders were

more likely to report eating or overeating when under stress, when depressed and when tired. Highly restrained subjects were also more likely to overestimate their body weight.

Across the European Union rates of body dissatisfaction have been found to be high[77]. A research project was conducted in adults representative of the population aged 15 years or more, across 15 member nations of the EU (n= 15, 239). It used self-reported height and weight and a body image silhouette matching tool, to examine perceived body shape, and ideal body shape. They found only 39% of participants (31% of females, 46% of males) were satisfied with their current body weight with the vast majority wishing they were lighter. BMI was related to satisfaction with weight. Underweight females (58%) and normal weight males (66%) were the most likely to be satisfied with their weight. Twenty percent of underweight females wanted to be even lighter whilst46% of underweight males were "content" with their body. Of those underweight males 49% wanted to be heavier vs. 22% of underweight females. For women the numbers content with their weight decreased with increasing BMI category (58% of underweight, 37% normal weight, 14% overweight and 5% obese). Men who were overweight (29%) and obese (10%) were also less likely to be satisfied with their weight, compared to normal weight men (66%). Diet was the most commonly reported method of trying to achieve a lighter body shape particularly amongst women, and whilst diet was also the top reported method by males, exercise was a close second and more likely reported as a method by males rather than females. The report did not discuss or measure extreme weight control or ED behaviours to lose weight, and did not consider impact on general psychological health or other behaviours such as BE.

In Australia, Kenardy et al[78], found in young women (n= 14686, age 18-23) that although 67% were in the healthy weight range (BMI 18.5 to < 25), only 25% were happy with their weight, and the majority of women wanted to weigh less (68% of those with a BMI<25; 95% of those with a BMI >25; and 25% of those with a BMI < 18.5). Almost half the women reported dieting to lose weight in the 12 months prior to the survey, with overweight women significantly more

likely to diet (67% of women with a BMI >25 had dieted in previous 12 months). However, even among underweight women, 21% had dieted in the previous 12 months, reflecting their dissatisfaction with current body weight. A total of 12% of women reported yo-yo dieting stating they had dieted 5 times or more in a 12 month period. Frequent dieting (defined 5 or more reported diets in previous 12 months) was associated with poorer mental health as measured by the mental health component of the Quality of Life tool the SF36. Frequent dieters (controlling for BMI, life stress, exercise and smoking) had increased odds for depression (OR 1.45, 95% CI 1.33-1.58) and a range of ED behaviours (e.g. BE OR 2.38, 95% CI 3.55- 4.34, purging OR 3.92, 95% CI 3.55-4.34) and cognitions (e.g. high weight dissatisfaction OR 3.22, 95% CI 2.96-3.51). Reported early onset of dieting i.e. less than 15 years of age, was similarly associated with increased risk of depression and a range of ED behaviours and cognitions. The authors did not however provide the weight category breakdown of those women reporting frequent dieting or early onset of dieting.

Higher body dissatisfaction and related ED behaviours have also been found among overweight and obese children and adolescents in comparison to their normal weight peers[79 80 81 82]. In a study of very young children Lamerz et al [81] examined the prevalence of obesity, BE and night eating and the influence of disturbed parental eating, in six year old children (n= 1979 of a total of 2020) attending their obligatory health exam prior to school entry in the city of Aachen, Germany. Even in this very young age group BE was found in 2% of the total children surveyed, and night eating in 1.1%. A total of 9% of the sample had a BMI above the 90th %ile. BE occurred in 6.3% of children above the 90th %ile for BMI, significantly more than children in the other weight categories. A similar association was shown in mothers (with BE affecting 17% of those mothers suffering from obesity, significantly more than 8.7% of binge eaters in the healthy weight group) and in fathers (with BE affecting 8.8% of fathers suffering from obesity, significantly more than the 2.6% of binge eaters in the healthy weight group). Night eating was not associated with the child's or maternal weight, but was associated with paternal weight. A clear history of dieting was found in 0.8% of children, 30% of mothers and 12% of

fathers. There was a positive association between a child's BMI and dieting. Children of mothers who suffered from BE had six times the risk of BE themselves than children of mothers who did not BE, even after adjustment for the child's BMI, maternal BMI, gender, native language and mothers education level. This paper did not report on parental dieting and impact on child weight and BE behaviour which would have been of considerable interest. A further limitation of the study was the lack of existence of validated tools to measure eating behaviours in this very young age group; however the authors carefully detailed the items created for the study.

Braet and Van Strien[80] compared eating behavior in overweight (n=145) and non-overweight (n=147) children, aged between 9-12 years old, in Belgium. Overweight was defined as greater than 20% of ideal body weight, though the method for determining ideal body weight was not reported. The majority of overweight children in the study were recruited in a baseline assessment for a weight control treatment program. The other participants were recruited via school physicians, the overweight randomly from patient rosters and three normal weight were selected from each class of overweight child. Overweight children both in the treatment seeking and non-treatment seeking samples, had higher scores on the emotional eating (overeating in response to emotions), external eating (eating in response to external stimuli, regardless of internal states of hunger and satiety) and restrained eating (attempts to refrain from eating) scores of the Dutch Eating Behaviour Questionnaire (DEBQ) compared to normal weight children. There were no gender differences, however the treatment seeking group did score higher on all three measures compared to the non-treatment seeking group. Regression analysis adjusted for age and gender indicated emotional eating was related to lower physical competence score from the Perceived Competence Scale for Children (PCSC), higher scores across the Child Behaviour Checklist, as well as external and restrained eating. Emotional eating was not related to cognitive competence, social competence or overall self-worth measured by the PCSC or locus of control. External eating was related to lower scores on the physical competence scale and overall self-worth of the PCSC, higher scores across the Child

Behaviour Checklist and higher scores for restrained eating, Finally restrained eating was related to lower physical competence scores in the PCSC.

In a cross sectional study of 526 elementary school children in USA aged 9 or 11 years old, Vander Wal & Thelen reported obese (BMI > 85th per%) children were more likely than average weight children to diet, have concerns about being or becoming overweight, have more body image dissatisfaction and higher levels of dietary restraint. Girls and older children were at greater risk of scoring highly across several of these variables. Measures included the Body Image and Eating Questionnaire for Children, The Body Image Scale and investigator measured height and weight [82].

Similar results have been found in cross sectional studies of high school students in the USA. Neumark-Sztainer et al[83] reported on weight related concerns and behaviours in 4746 adolescents in Minnesota USA. The participants were recruited from 31 public middle and high schools in the St Paul and Minneapolis areas. The participants were equally divided by sex, came from a variety of cultural backgrounds and were predominantly from high school 66% v.s. 34% in junior high school (mean age was 14.9 years SD 1.7). The project EAT authors developed their own survey to assess a range of factors relevant to nutrition and obesity among adolescents guided by focus groups with youth, a review of literature and reviews by professionals and adolescents. The results indicated healthy weight control behaviours (defined as exercising, eating more fruit and vegetables, and/or eating less high fat food or sweets) were common, practiced by 85% of the adolescent females and 70% of the adolescent males; however unhealthy weight control practices (defined as fasting, eating very little food, using a food substitute, skipping meals, and/or smoking more cigarettes) were also frequent reported by 57% of females and 33% of males. The use of extreme weight control behaviours (defined as self-induced vomiting, diet pill, laxative and diuretic use) were practiced by 12% of females and 5% of males. The differences between genders were significant, with females much more likely to engage in both healthy and unhealthy weight control practices. After adjusting for school

level, race and socio-demographic status odds ratios comparing this risk of weight related concerns and behaviours between overweight (BMI greater than 85 percentile for age on the Center for Disease Control and Prevention (CDC) growth charts) or obese (BMI greater than 95 percentile for age on CDC growth chart) adolescents, relative to their normal weight peers, were calculated. Overweight and obese adolescents were significantly more likely to have the desire to weigh less than their current self-reported weight, have low body satisfaction scores, engage in frequent dieting over the previous year, report more BE, and report both healthy, unhealthy and extreme weight control behaviours.

Another US based study examined weight control behaviours in 8330 adolescents in Connecticut[79]. Participants were recruited from public schools in the seventh, ninth and eleventh grade. The study was designed to be both geographically and socio-demographically representative of youths in public schools throughout the state. Self-reported height and weight was used to calculate BMI and then weights were classified as overweight (>85 percentile) or obese (> 95 percentile). The items in the survey were derived from a number of other surveys and measures including weight control behaviours over the week prior to the survey (dieting i.e. eating less or differently, exercise, vomiting, diet pills, laxatives and diuretics), healthful eating behaviour (assessed by frequency of eating 4 specific types of food, low fat milk or yoghurt, fruits, vegetables, and bread, rice pasta, cereal and bagels), breakfast consumption, and frequency of vigorous physical activity. The definition of dieting was very broad and lacked detail. There were no measures of BE or emotional eating and no rationale provided for the choice of items used to assess healthful eating patterns. It was unusual that all food groups were included with the exception of meat or meat alternatives which are important source of key nutrients in the age group[84]. Furthermore whilst older research suggests low fat dairy is more healthful, there is now a growing amount of evidence, especially as more of the population consume low fat dairy, that the benefits of low fat milk *vs*. full fat milk are questionable and there maybe some detriments[85][86][87]. Consistent to the work in Minnesota reported above[83], obese adolescents were more likely to report a range of disordered eating behaviours including

dieting, self-induced vomiting, and use of diet pills and laxatives. However unlike the Minnesota study they were less likely to report what could be deemed as healthy weight control, or healthy lifestyle practices (although the definition of this differed between the two studies) including breakfast consumption, intake of more than 1 serve of low fat dairy, grains and vegetables, and greater than 3 occasions of vigorous exercise over the week, compared to their healthy weight peers. Adolescents, who were overweight but not obese, did not differ to their normal weight peers in as many of the disordered eating and healthy weight control variables mentioned above in relation to obese adolescents. Whilst overweight adolescents were less likely than their normal weight peers to consume breakfast, eat more than one serve low fat dairy per day, and report greater than 3 occasions of vigorous exercise over the week, they were more likely to report exercise to lose weight and also to report self-induced vomiting.

A wide range of studies with mixed results have examined factors (including the variables of body image, weight, eating behaviour, psychological distress of interest to this project) acting a predictors of EDs in cross sectional studies, or associated with the emergence of EDs longitudinally. Studies can be broken down into 3 areas, early childhood and family experiences, dieting and body image dissatisfaction which is often but not always related to actual weight problems, and depressive symptoms.

There is evidence that disordered eating behaviours and dieting can commence very early in life and relate to the eating behaviours and physique of family members. As previously discussed the Lamerz et al study in Germany found BE affected 2% of 6 years olds and greatly increased risk was associated with both obesity and maternal BE behaviours[81]. Similarly Anschutz et al[88] found in a cross sectional study of 7 to 10 year old children (again recruited from school classes), in The Netherlands, found association with maternal behaviour and childhood eating behaviours. Perceived maternal weight concern, maternal dieting and maternal encouragement for their child to be thin, from the point of view of the child, was related to childhood eating behaviour (rather than BE this study focused on restrained eating) and body image concerns.

Specifically maternal weight concern and dieting was related to child's restrained eating but not with body dissatisfaction; however maternal encouragement to be thin was related to both childhood body dissatisfaction and restrained eating.

As well as a mothers own eating habits, maternal practices around feeding their child have also been found to contribute to their child's eating habits but perhaps not in the way they intend. A research study by Birch et al[89] followed 182 girls and their parents on 3 occasions across 4 years. The families were recruited in Pennsylvania USA via advertisements into a study of health and development of young girls. At baseline the girls were 5 years of age. Weight, height and BMI were measured, mothers completed a child feeding questionnaire which assessed how much mother controlled quantity, timing and type of foods the girls ate, as well as assessed maternal concern about their child's weight, and perceived risk of becoming overweight. The girls were also provided access to a large lunch followed by a range of snack foods to assess level of overeating. Girls with mothers with higher restrictive feeding styles ate more than others at age 7. At age 9 girls with mothers with the highest restrictive style and who were also overweight ate the most in the test meal.

In addition Fairburn et al, have reported in studies aimed at establishing risk factors for both BN and BED that childhood obesity and family eating behaviour was often an important factor[90][91]. Specifically amongst a range of risk factors, women with BN (n=102) were significantly more likely to report childhood obesity, parental obesity, any family member dieting, parental ED diagnosis, and critical comments about weight and shape from family members, prior to the onset of their disorder (retrospective interview), compared to both women in a healthy control group (n= 204) and women in a general psychiatric control group (n=102). These women were recruited from community general medical practices in England[90]. In a separate paper but involving the same participants, plus an additional 52 female participants with BED recruited in the same manner, Fairburn reported women with BED[91] were more likely to suffer from childhood obesity and critical comments about weight and shape from family members. Likely

related to childhood obesity, Rubinstien et al[92] found childhood weight loss attempts, were associated with higher odds of BED and unhealthy weight loss behaviours such as fasting or crash dieting, self-induced vomiting and the use of diet pills, in overweight adults (n= 588) recruited to a weight loss intervention in New York.

In 1998 Stice[93] tested a number of longitudinal models to see the impact on restraint and negative affect on bulimic pathology over time. The study was conducted in the USA in a general community (recruited from high school) sample of 218 adolescent females aged 16 to 18 years. Measures of restraint (using the Dietary Intent Scale), negative affect (the sadness, guilt, hostility and fear/anxiety subscales from the Positive and Negative Affect Scale-Extended) and bulimic pathology (using the Bulimia Test-Revised and the Eating Attitudes Test-26) were taken at baseline and 9 months follow up. He examined the data using a number of structural models, however in this sample and with this choice of tools; he found no support for the restraint theory (as baseline dietary restraint did not predict bulimic pathology at follow up). In contrast it was found that bulimic symptoms at baseline predicted a relative increase in dietary restraint at follow up. In addition there was no support for the theory that negative affect would lead to bulimic pathology (baseline negative affect failed to predict bulimic pathology at follow up and vise versa). A further study by Stice in 2001[94] aimed to test the dual-pathway model of bulimic pathology. This model states that

> *'that internalization of the thin ideal espoused for women contributes to body dissatisfaction because this ideal is virtually unattainable. It also hypothesizes that elevated pressure to be thin from family, peers and the media fosters body dissatisfaction, because repeated messages that one is not thin enough likely promote discontent with one's body. Theoretically this increased body dissatisfaction, in turn, fosters dieting and negative affect, which consequently increases the risk for bulimic pathology'*[94] page 125.

The findings in this study, which was based on 231 younger (age 13 to 17 years) high school students in the USA, followed up over 20 months did find support for this model. The study

used random regression statistical models and differing tools to measure the variables of interest; pressure to be thin (Perceived Sociocultural Pressure scale), thin-ideal internalisation (Ideal-Body Stereotype Scale-Revised), body dissatisfaction (Satisfaction and Dissatisfaction with Body Parts Scale), dieting (The Dutch Restrained Eating Scale), negative affect (Emotionality Scale), BMI (calculated from self-reported height and weight) and Bulimic Symptoms (using the items assessing the diagnostic criteria for BN in the EDE-Q). The model explained 23% of the variance in growth of Bulimia Nervosa over the course of the study. It should be noted that both of these studies by Stice have relatively small samples and the second study was from 2 private high schools, so the socio-demographics are not likely to be comparable to the wider adolescent population in the USA or elsewhere in the western world. It is difficult to say if the differing results to the earlier study can be explained by the younger age group, or the relative stability of bulimic pathology in individual participants in the earlier (older age group) study, which may have also been related to the length of the prospective follow up. Alternatively results may have differed due to the differing survey tools used to measure the variables of interest [93] [94].

A further paper by Stice et al in 2002[95] examined a broad range of risk factors for the onset of BE prospectively over 20 months in adolescent females. This paper was based on the same study/ sample described in the previous paragraph[94], however a range of additional risk factors were explored in logistic regression analysis. The findings showed that higher BMI, dieting, lower body satisfaction, appearance over-evaluation, pressure to be thin, depressive symptoms, poorer self-esteem, emotional eating, modeling of eating disturbances, and lower peer social support significantly predicted the onset of BE. Anxiety, anger and lack of parental social support did not add to the model.

Huon[96] examined dieting, BE, discrepancy between actual weight and desired weight and other methods of weight control in 440 high school students in Australia and looked at predictors of BE. There are several problems in this study. Firstly the students were recruited from 3 private

high schools in Sydney, and socio-demographic details were not reported, however, one would assume a very high level of affluence, and likely large differences in socio-demographic profiles compared to other Australian's of the same age group, making the results hard to generalise. Secondly the reporting of overweight is inaccurate. Overweight was reported as a BMI of 25 or more, this is true for adults according to World Health Organization (WHO), however does not correspond well to what is generally considered overweight in adolescents e.g. above the 85th percentile on BMI for age growth charts, and likely to underestimate overweight in the 15 to 18 year olds studied in project[97]. Thirdly, the authors report on predictors of BE, but only considered dieting, discrepancy between weight and ideal weight and Ponderal Index (not mentioned in the methods and rarely used in this age group as a measure of adiposity) as possible variables. Other methods of weight control (including exercise, laxative use and vomiting, or level of preoccupation with weight were measured in the study, but not considered in the regression analysis. Nonetheless, the study showed that in this sample 13% of the participants had severe BE problem, and a further 35% moderate BE problem as per the Binge Eating Scale. In total 31% of participants wanted to weigh less by more than 7kg, and 35% of participants reported that they were very much preoccupied by their weight, yet the rate of overweight (in terms of BMI>25) was relatively low at 6%. Regarding weight control methods, 25% of the participants reported that they were mostly or always dieting, 36% reported exercise, 11% the use of purgatives, 6% reported vomiting. In the regression analysis examining predictors of BE, frequency of dieting and discrepancy between weight and ideal weight (a type of measure of body dissatisfaction) came out as significant predictors but not ponderal index. Thus there were both similarities and differences in the findings compared to the work of Stice[93-95].

Indeed the relationship between body weight, dietary restraint, depressive symptoms and the onset of BE, or other ED, has proven difficult to clarify in the literature, with a wide range of different results depending on the characteristics of the study sample. In a later and much larger 1 year prospective study of 1177 adolescents girls, age 13 to 15 years, Johnson and Wardle[98]

did not find support for the dual pathway model of bulimic pathology. The participants were recruited from secondary schools in England. The survey tools varied to that of other studies, the Dutch Eating Behaviour Questionnaire, the Body Satisfaction Questionnaire, the bulimia subscale of the Eating Disorder Inventory, the Centre for Epidemiological Studies Depression Scale, the Rosenberg Self-Esteem scale, Cohen's Perceived Stress Scale were chosen to measure the variables of interest. The findings showed that when controlling for baseline age and BMI both dietary restraint and body dissatisfaction were both related to the onset of bulimia and disordered eating longitudinally, however when they were entered into a logistic regression model simultaneously, body dissatisfaction came out as a significant predictor of bulimia and psychological distress but dietary restraint did not[98].

Tanofsky-Kraff [99] examined reported age of onset dieting, loss of control over eating, and overweight, as well as current ED cognitions and behaviours, depressive and anxiety symptomatology, current body composition, in 6-13 year old overweight children (n=105) in the USA. A subset of the children had historical growth chart data collected from their primary care provider (n=25) to compare objectively onset of overweight with subjective recall about onset of overweight. A limitation was the cross sectional design which asked very young children to retrospectively recall the onset of symptoms. This was evidenced by the subset of participants who had objective growth data, which indicated poor correlation between reported age of overweight onset and the age at which BMI either exceeded to 85th percentile or 95th percentile. The findings therefore need to be interpreted cautiously, especially in regard to the order of onset of symptoms. The findings indicate showed 60% of children reported attempting to lose weight by dieting at least once in their past and 30% had experienced loss of control of eating. Children who had experienced dieting had significantly higher scores of ED cognitions on the ChEDE compared to other overweight children but did not have increased scores for depression or anxiety. Children who had previously experienced loss of control of eating had both significantly higher scores for ED cognitions and higher ineffectiveness and negative self esteem scores on the Children's Depression Inventory and Externalizing score on the children's

behaviour checklist. Of the 63 dieters, 50 reported becoming overweight before dieting, 3 reported dieting before becoming overweight and 10 children could not recall. Of the 31 children who reported LOC eating, 21 reported becoming overweight before LOC eating, 6 reported LOC eating before becoming overweight, and 4 could not recall. A total of 27 children had reported a history of dieting and LOC eating, of these 18 reported overweight before either LOC eating or dieting, 9 reported dieting before LOC eating, and 18 reported LOC eating before dieting. Another limitation of this work is the relatively small sample size.

A paper by Neumark-Sztainer et al [100] examined overweight adolescents from the same sample (n= 412) described earlier in the focus on weight section of the review [66]. Additional items in the survey that were not previously described examine a range of risk and protective factors for EDs in these overweight adolescents. Of the 232 female adolescents 30.8% engaged in disordered eating behaviours at time 1, and 40% at time 2. Of those female adolescents engaged in disordered eating at time 1, half were still engaging in these behaviours at time 2. Of those engaged in disordered eating at time 2, 89% reported use of at least one extreme weight loss behaviour, and 32% reported BE. For males (n=180), 13% engaged in disordered eating at time 1, which increased to 20% at time 2. Of those males engaged in disordered eating at time one, 38% continued to engage in these behaviours at time 2. The majority of males with ED behaviours 78%, reported the use of at least one extreme weight control behaviour, 31% reported BE. For both males and females time 1 items that predicted both prevalence and incidence (new cases) of EDs at time 2 were exposure to magazines on weight loss, and unhealthy weight control behaviours at time 1. For males, lower family connectedness, high weight importance in how one feels about them self, depressive symptoms, and high serves of sugar beverages per day at time 1 also predicted both incidence and prevalence of ED at time 2. For females, in addition to weight loss magazines and unhealthy weight control practices at time 1, weight concern, dieting, lower frequency of lunch and dinner meals, and increased levels of moderate to vigorous physical activity predicted incidence of disordered eating. Some additional items were related to prevalence only. Of note is that depressive symptoms at time 1

in females was not related either prevalence or incidence of disordered eating at time 2. Other factors including perceived parental dieting or encouragement of the adolescent to diet to control weight, peer dieting, family or peer weight teasing (in contrast to the work of Fairburn[90] [91]) at time one were not found to be related to disordered eating at time 2 for either males or females. The influence of parental overweight/ obesity status or parental BE was not assessed, although this would have been very difficult to ascertain in this survey which was based on the child's perception/ self report only.

Sinton and Birch[101] found in a prospective study of preadolescents that at ages 5 and 7; high BMI (10% of variance in hierarchical regression model), depression (5% of variance), self competence (6% of variance), and the marital relationship of her parents (measured via a Relationships questionnaire completed by the parents;4% of variance), predicted dieting at age 9. They also found that higher weight status exacerbated the influence of other variables, showing that those with high weight status and depression were even more likely to display dieting at age 9 (additional 4% of variance in model), those with both high weight status and low self-competence predicted higher emergence of dieting (additional 12% of variance in model), and those with high weight status and whose mother also restricted food access or had greater concern about their child's future weight status also had greater likelihood of displaying dieting at age 9 (accounting for 3% of the model). The study was conducted in Pennsylvania in the USA and was relatively small involving 183 children and their parents and only white families. It used measured heights and weights and validated tools to asses dieting, psychological health, feeding practices and marital relationships.

There have also been a number of studies examining the relationship between eating behaviour, body dissatisfaction and psychological distress in obese women. Gagnon-Girouard et al attempted to prove how the dual pathway model of bulimic symptoms leads to bulimic EDs in overweight and obese women[102], however the findings were mixed. The study participants were overweight premenopausal women in Quebec Canada (n= 153). It found body dissatisfaction

(as measured by the body esteem scale) did not significantly relate to restraint (as measured by the three factor eating questionnaire), and restraint did not significantly relate to negative affect. Other parts of the model were proven, in that body dissatisfaction did relate to negative affect which in turn related to overeating, and restraint was significantly related to overeating. They also added to the model showing a direct link between body dissatisfaction and overeating. The authors postulate on this point that in response to body dissatisfaction some overweight women develop a sense of carelessness and abandon effort to control their eating, thinking that as they are dissatisfied with their body, there is no need to even try to regulate what they eat.

French et al[103] examined the prevalence of BE in 817 women involved in a weight gain prevention program in USA and looked how weight, eating and exercise behaviours and psychological variables were associated with BE. The program was an intervention trial, however the mail based information intervention had no impact on weight, eating or behaviours compared to the no intervention control group. The women were recruited via advertisement. Inclusion criteria were, female, aged 20-45 years, not pregnant in the 12 months preceding recruitment, did not have serious medical or psychological condition requiring treatment, were not following a physician- prescribed special diet and were willing to participate in the study for 3 years duration. Of the women 53% were described as normal weight, non-binge eaters, 5% were normal weight binge eaters, 33% were overweight non-binger eaters and 9% were overweight binge eaters. Participants classified as binge eaters gained more weight over three years compared to non-binge eaters, as did overweight women compared to the normal weight women. Overweight and binge eaters reported a greater number of lifetime episodes of intentional weight loss and overweight binge eaters had the greatest number of intentional weight gain episodes. Restrained eating did not differ amongst groups- it must be noted, however, that these women were self-selected due to interest in a weight gain prevention trial. Binge eaters and overweight women were more likely to engage in both healthy (e.g. eat more fruit and vegetables) and unhealthy (e.g. laxative and diuretic use) dieting practices. Overweight women were more likely than normal weight women (regardless of BE status) to report less

physical activity, more television viewing, more fast foods and greater energy intake. Overweight women and women with BE were more likely to report that their weight or shape was the most important thing in evaluating themselves as a person and had higher scores on the BDI. Binge eaters (regardless of weight classification) were also more likely to have lower self-esteem and higher number of reported life events. In a multivariate model examining predictors of BE, depression scores, frequency of intentional weight loss episodes and importance of shape or weight in self-evaluation predicted BE status.

Clinical studies have highlighted differences in the general psychopathology and weight loss outcome of obese persons with ED behaviours and cognitions. Hsu et al [104] examined binge ED in obese patients undergoing bariatric surgery for weight reduction in the Tufts New England Medical Centre, Boston USA. Of 37 patients (aged 22-58 years), 4 (11%) meet the full BED criteria, 5 (14%) meet partial BED criteria, and 28 (75%) were classified as non-BEs. The BE and non- BE group did not differ in age, gender, anthropometry or DSM IV Axis I diagnosis including lifetime major depression. However they scored significantly higher on eating and shape concerns and bulimia subscales of the EDE, significantly higher on the disinhibition subscales of the three factor eating questionnaire and significantly poorer in role physical, role emotional and social functioning scores of the SF-36 (Short Form health status survey). Although underpowered for statistical significance this small study was notable as the first of its kind to examine these issues in bariatric surgery patients.

A few studies have examined the impact of structured dieting/ weight loss programs on the development of ED in overweight/ obese persons. Although from the community studies we can ascertain that dieting impacts negatively on both weight outcome and psychological distress; there is evidence that carefully structured lifestyle behavioral change and educational programs involving healthy eating and exercise recommendations (or specific diets) conducted by dietitians, psychologists and physicians specialising in obesity treatment do not negatively impact upon BE or psychological distress in the long term [105-107]. These studies are from three

diverse samples of overweight/ obese treatment seekers, including 108 children between 10 and 17 years in Belgium[107], 123 women in the USA (note this study only included otherwise healthy obese women as it excluded obese women with co-morbid depression, BE, and a wide range of common psychiatric and physical co-morbidities e.g. diabetes mellitus and heart disease)[106], and 500 men and women aged between 25 and 65 years, from 25 obesity medical centers (using a range of obesity treatment approaches) in Italy[105]. The study in Belgian children showed that after 6 years follow up, children who completed the obesity treatment program had lower scores for eating concern (EDE) and drive for thinness, bulimia and body dissatisfaction scores (on the Eating Disorder Inventory) compared to their baseline score, and were less likely to report LOC with eating (21% of participants at 6 years and 31% at baseline). The presence of BE at the 6 years follow up was related to BE and depression scores at baseline but not to BMI, change in weight, restraint, or eating, weight or shape concerns[107]. In the Italian study, the follow up occurred at 12 months following the commencement of treatment (which was intensive in the first 3-6 months and then with less frequent 2-4 month follow up), it showed significant reductions in weight (68% of males and 60% of females lost >5% of body weight), in BE (on the BE Scale), and psychological distress (measured via the Symptom CheckList-90R general symptom index). Participants who lost greater than 5% of body weight had greater reductions in BE and psychological distress. In the US study participant were followed up for 65 weeks following an intensive treatment approach involving weekly visit for the first 20 weeks. Similarly to the Italian study depressive symptoms were reduced but only in the two arms (meal replacement and balanced deficit diet) of the study which achieved greater than 5% of weight loss (a non-dieting approach achieved minimal loss only). In the US study all participants were free from OBEs (as measured by the EDE) at baseline, and the non-dieting, and balanced energy deficit treatment protocols did not induce new BE episodes with the exception of one participant in the balanced energy deficit diet. However at week 28 of follow up 5 participants in had experienced OBE episodes in the meal replacement arm of the study, although for 4 participants these had remitted by week 65. The commonality of these 3 studies was an intensive treatment, conducted by health professionals specialising in obesity treatment[105-107].

Addressing ED behaviours and to a lesser degree psychological health were a part of the US and Belgian treatment studies[106 107], but not part of the Italian study[105]. Throughout the studies the approach used were mostly in keeping with theories that would not worsen these behaviours and cognitions. In the one instance where this was questionable (i.e. in the use of a Very Low Calorie Diet meal replacement approach) this did increase BE in the short term (week 28 follow up) even in women without prior psychological or BE co-morbidities[106]. Combined with the evidence from community studies indicating the bidirectional relationships between dieting/ ED behaviours and weight gain and depression, it is plausible that obesity treatments programs could be improved by increased awareness of these relationships and directly targeting depressive and ED symptoms in obese persons with these behaviours. Furthermore education and promotion of eating/ lifestyle approaches and strategies to promote healthy cognitions regarding eating and body image need dissemination in order to decrease likelihood of these symptoms developing.

In summary levels of body dissatisfaction and dieting are high in adolescents and amongst women in the community, most people wish they were lighter than they are currently (the thin ideal). Body dissatisfaction and disordered eating behaviours do impact upon weight and psychological distress, and conversely weight and psychological distress does impact upon body dissatisfaction and disordered eating behaviour. Childhood obesity, parental obesity, parental eating behaviour and feeding practices toward their child, family weight based teasing and childhood weight loss attempts, may all predict future increases in ED behaviours in childhood, adolescence and adulthood. Increased BMI and body dissatisfaction are related to increased depression and dietary restraint (but not in all populations), which in turn is related to BE. Body dissatisfaction may also be directly related to BE or emotional eating, and BE can also predict future dietary restraint. In research examining the etiology of EDs in obese children, the occurrence of overweight, BE and dieting can occur in any order. Obese adults with ED behaviours have poorer quality of life than obese persons without EDs, and although dieting is associated with weight gain and poor outcome for ED and psychological health,

carefully structured obesity treatments with successful weight loss can improve psychological health and decrease symptoms of BE.

Gaps in the literature regarding the relationship between weight, ED psychopathology and psychological distress.

There are a number of complex relationships between weight, ED psychopathology and psychological distress. Whilst much of the research has focused on predictors of one or the other based on the authors clinical and research interest, it is likely that these relationships are bidirectional in nature and fluctuate in relation to the other variables, and depend on the context of the individual e.g. life stage and external variables (such as family eating behaviour and weight teasing). Much of the work completed to date on these relationships has been in children and adolescents and treatment seeking ED and obesity samples. There are a few notable exceptions; however there is limited Australian population based research and limited research in community dwelling adults with a range of existing disordered eating behaviours. It is important to understand these variables in adults and in the Australian context for a number of reasons. Firstly differences between countries in ED and obesity prevalence exist, likely due to varying cultural attitudes toward food and body shape, as well as genetic differences in population groups. Therefore, the relationship between these variables may also vary by nation, and change in the context of the Australian population. Secondly, as discussed in the review, there were a number of differences depending on the age group of the study participants, findings in adolescents may not translate well to adults, especially adults who have likely experienced a range of ED behaviours and cognitions over a considerable period. Finally there has been considerable public investment in ED, obesity and depression treatment and prevention, and yet ongoing Australian population increases in these health problems continue. Therefore improving our understanding of the relationship between these variables may lead to innovations in the prevention and treatment of these disorders, which ultimately will improve physical and mental health outcomes.

TABLE 2.

Summary of key literature exploring relationships between disordered eating body weight and psychological distress in community and school samples.

Reference	Participants	Study Design	Relevant Aim	Key Relevant Findings on the Relationship between Disordered Eating, Weight and Psychological distress
Luppino et al[47]	Varied samples, male and female, total n= 48739	Meta-analysis of 15 longitudinal studies ≥ 1 year follow up	Determine how obesity and depression relate to each other longitudinally	Bidirectional relationship between obesity and depression longitudinally, with obese persons more likely to become depressed longitudinally (OR 1.57, 95% CI 1.23-2.01) and depressed persons more likely to become obese (OR 1.40, 95% CI 1.15-1.71).
Faith et al[39]	Varied samples children and adults, male and female	Review of 25 longitudinal studies	Review literature of longitudinal studies exploring relationship between depression and obesity	8/10 studies found increased BMI or obesity associated with increased depression scores or onset of clinical depression 5/15 studies found clear relationship between depression and weight gain or obesity onset over time, whereas 7/15 studies clearly concluded depression not related to weight or obesity onset over time.
Hasler et al[46]	Population sample *Number:*591 completed *Age:* 19 years at baseline *Region:* Representative sample of Zurich, Switzerland	20 year prospective study	Determine longitudinal relationship between depression, anxiety and binge eating symptoms with overweight	For males the following were associated with increased odds of overweight overtime: Atypical depression (OR 2.0 CI 1.0-4.2) Binge Eating (OR 3.6 CI 1.3-10.0) For Females Atypical depression (OR 2.9 CI 1.3-6.5) Binge Eating (OR 3.8 CI 1.7-8.8) In males Generalised Anxiety disorder was associated with decreased odds of overweight (OR 0.3CI 0.1-0.9) but no associated in females. There was no associated in males or females between major depression, recurrent brief depression and minor depression and overweight longitudinally.
Konttinen[50]	Population sample *Number:* 2312 men 2674 women *Age:* 25-74years *Region:* Finland	Cross sectional study	Explore associations between adiposity and depression, disordered eating an physical activity self efficacy	The relationship between depression and adiposity is mediated by emotional eating and physical activity self efficacy. Adjustments for age, gender, educational status and chronic disease status did not change the role of emotional eating or physical activity self efficacy in explaining the relationship between depression and degree of adiposity.
Stice[57]	Females recruited from high schools	4 year prospective	Examine the role of body image	80 (8%) of students developed depression over the 4 years.

Reference	Participants	Study Design	Relevant Aim	Key Relevant Findings on the Relationship between Disordered Eating, Weight and Psychological distress
	Age: 13 - 17 years at baseline. *Number:* 1124 of which 100 meet lifetime diagnosis of major depression at baseline and were excluded *Region:* USA	study	and eating disturbances in the development of major depression	In a multivariate model dietary restraint and bulimic symptoms predicted depression onset, whereas initial level of depressive symptoms and body dissatisfaction (although related) were not found to be predictive variables.
Ball et al[58]	Representative population sample of young women *Age:* 18- 23 years at baseline *Number:* 8726 *Region:* Australia	4 year prospective population study	Examined longitudinal predictors of weight maintenance (with 5% of baseline at 4 year time point). As well as factors associated with weight gain. Variables of dieting and BE were considered.	44% of women maintained their weight, 41% gained weight and 15% lost weight. Logistic regression adjusted for occupation, student status, mariatal status and parity found been in the healthy weight range, low levels of sedentary behaviours and not eating takeaway foods were significantly predictive of weight maintenance. Smoking, BE, dieting history and unhealthy weight loss behaviours did not add to the model. Regression analysis was not used to explore predictors of weight gain. However univariate analysis indicate higher BMI at baseline, reported restrictive dieting, hazardous alcohol consumption, current smoking, sedentary activity and BE were associated with weight gain.
Serder et al[59]	Twin registry *Age:* adult *Number:* 1510 females, 1111 males *Region:* USA	Cross sectional survey	Examine disordered eating and psychiatric correlates of weight instability.	Men and women suffering from weight instability (change in body shape reported retrospectively at different ages) were more likely to suffer from low self-esteem and higher body dissatisfaction. For women weight instability was associated with higher disinhibition, BE, major depressive disorder, generalised anxiety disorder and any type if ED. In men weight instability was not associated with disordered eating or psychiatric diagnosis. In neither gender was weight instability related to drive for thinness, restraint or hunger.
Tanofsky-Kraff et al[67]	Convenience sample of children at high risk of adult obesity (were overweight children, or had overweight parents) recruited from physician referrals, mailed notices and advertisements. *Age:* 6-12 years at baseline *Number:* 143 *Region:* USA	Prospective study over 4.5 years	Examined disordered eating behaviours in relation to weight gain	Baseline restraint and weight concerns was related to BMI However rate of change of BMI was not associated with restraint, weight, eating or shape concerns. Rate of change of BMI was related to BE in a mixed linear multiple regression.
Stice[65]	Middle school sample *Age:* 11-15 years at baseline *Number:* 496 *Region:* USA	Prospective study of 4 years	Examined risk factors for obesity onset	In a multivariate model examining high fat intake, BE, exercise, dietary restraint, compensatory behaviours (SIV, laxative & diuretic misuse), depressive symptoms and perceived parental obesity; only dietary restraint, compensatory behaviours, depressive symptoms and perceived

Reference	Participants	Study Design	Relevant Aim	Key Relevant Findings on the Relationship between Disordered Eating, Weight and Psychological distress
				parental obesity increased the risk of obesity onset.
Neumark-Sztainer et al[66]	Junior and senior high school sample *Age*: ~12years junior high or ~16 years senior high at baseline *Number:* 2516 *Region:* USA	Prospective study over 5 years	Examined outcomes of dieting	Females with both healthful dieting alone and those with un-healthful weight control behaviours were more likely to have a greater increase in BMI and greater tendency to become overweight, they were also more likely to commence BE behaviours. In males those with un-healthful weight control behaviours were more likely to have greater increase in BMI and greater tendency to become overweight, and commence BE behaviours.
Savege[69]	Convenience sample of adult women identified through marketing information. *Age:* adult *Number:* 163 *Region:* USA	Prospective study with 6 year follow up	Interactions between self-reported dieting, dietary restraint (EDI) and disinhibited eating (EDI) with weight change	Baseline disinhibition was associated with higher levels of baseline weight and greater weight gain over time. Changes in disinhibition were positively associated with weight. Dietary restraint was not related to baseline weight or change in weight over time, however self-reported dieting at baseline was related to both higher weight at baseline and greater weight gain over time. This was somewhat complicated as self-reported dieting at each occasion of follow up was predictive of lower current weight, and within person changes in restraint subscale levels showed on average a negative relationship with weight. Thus current and consistent dieting was related to low weight, but previously unsustained dieting was related to greater weight gain then those who had never dieted.
Thomas et al[70]	School sample *Age:*12-15 years at baseline *Number:* Participants pooled into three groups: those who showed a 10% decrease in age adjusted BMI in any of the five 12 month intervals n= 76, Those who showed 10% increase in age adjusted BMI n= 86 Weight stable participants who did not experience any more than a 5% age adjusted BMI change across the 8 year study n= 85. *Region:* USA	Prospective study with 8 year follow up	Examine relationship of weight change to the development of BN	The weight loss group was heavier than the weight stable group at baseline. They lost weight down to the mean weight of the weight stable group, and in the two years post the weight loss gained weight significantly more rapidly, their BMI ending up significantly higher than the weight stable group at both of the two year time points post their weight loss. The weight gain group commenced at a BMI no different to the weight stable group, in the year following their 10% weight gain, they had an overall non-significant weight decrease, although BMI still significantly higher than the weight stable group, in the following year weight stabilized but BMI remained significantly higher than the weight stable group. Weight change was related to development of an ED. Participants in the weight loss (8.1%), and weight gain groups (8.2%), were significantly more likely to develop threshold or sub-threshold BN compared to the weight stable group (1.2%).
Dewberry[76]	Representative population sample *Age:* 18-65	Cross sectional survey	Understand the effects of dietary restraint	Women had higher levels of dietary restraint then men Highly retrained subjects reported overeating when under stress,

Reference	Participants	Study Design	Relevant Aim	Key Relevant Findings on the Relationship between Disordered Eating, Weight and Psychological distress
	Number: 533 *Region:* UK			depressed and tired Highly restrained subjects more likely to overestimate body weight
McElhone et al[77]	Representative population sample *Age:* 15 years or more *Number:* 15 239 *Region:* Europe- Sample representative of population of 15 EU nations	Cross sectional survey	Examine levels of body image and weight concerns	39% of participants (31% of females, 46% of males) were satisfied with current body weight – most wishing they were lighter. Underweight females (58%) and normal weight males (66%) were the most likely to be satisfied with their weight. 20% of underweight females wanted to be even lighter and 22% wanted to be heavier. 49% underweight males wanted to be heavier For women the numbers content with their weight decreased with increasing BMI category (58% of underweight, 37% normal weight, 14% overweight and 5% obese). Men who were overweight (29%) and obese (10%) were also less likely to be satisfied with their weight, compared to normal weight men (66%). Diet and exercise were the most commonly reported method of trying to achieve weight loss. The report did not discuss or measure extreme weight control or ED behaviours to lose weight.
Kenardy et al[78]	Young women general population sample *Age:* 18-23 years *Number:* 14,686 *Region:* Australia	Cross sectional survey	Examine weight dissatisfaction and dieting behvaiours in relation to EDs and mental health	67% of participants in the healthy weight range 25% were happy with their weight The majority wanted to weigh less (68% of those with a BMI<25; 95% of those with a BMI >25; and 25% of those with a BMI < 18.5). Almost half the women reported dieting to lose weight in the 12 months prior to the survey, A total of 12% of women reported frequent dieting stating they had dieted 5 times or more in a 12 month period. Frequent dieters (controlling for BMI, life stress, exercise and smoking) had increased odds for depression (OR 1.45, 95% CI 1.33-1.58) and a range of ED behaviours (e.g. BE OR 2.38, 95% CI 3.55- 4.34, purging OR 3.92, 95% CI 3.55-4.34) and cognitions (e.g. high weight dissatisfaction OR 3.22, 95% CI 2.96-3.51). Reported early onset of dieting i.e. less than 15 years of age, was similarly associated with increased risk of depression and a range of ED behaviours and cognitions.
Lamerz et al[81]	School entry obligatory health exam *Age:* 6 years *Number:* 1979 *Region:* Germany	Cross-sectional health exam	Assess prevalence of BE, night eating, obesity and influence of parental BE	BE found in 2% of sample, night eating in 1.1%. A total of 9% of the sample had a BMI above the 90th %ile. BE occurred in 6.3% of children above the 90th %ile for BMI, significantly more than children in the other weight categories. Association between obesity and BE also shown in mothers (with BE affecting 17% of those mothers suffering from obesity, and 8.7% in the

Reference	Participants	Study Design	Relevant Aim	Key Relevant Findings on the Relationship between Disordered Eating, Weight and Psychological distress
				healthy weight group) and in fathers (BE affecting 8.8% of fathers suffering from obesity, and 2.6% in healthy weight group). Night eating was not associated with the child's or maternal weight, but was associated with paternal weight. A clear history of dieting was found in 0.8% of children, 30% of mothers and 12% of fathers. There was a positive association between a child's BMI and dieting. Children of mothers who suffered from BE had six times the risk of BE themselves compared to other children No report on parental dieting and impact on child weight and BE
Anschutz[88]	School sample *Age:* 7-10 years *Number:* 501 *Region:* Netherlands	Cross sectional survey	Assess relationship between maternal weight concern and encouragement to be thin as perceived by the child, to child s diet restraint and body dissatisfaction.	Perceived maternal weight concern and dieting was related to child's restrained eating but not to body dissatisfaction. Perceived maternal encouragement to be thin was related to both childhood body dissatisfaction and restrained eating.
Birch et al[89] Sinton and Birch[101]	Female girls and mothers. Convenience sample- newspaper advertisements used to recruit into a childhood health and development study. *Age:* 5 years at baseline *Number:* 182 *Region:* USA	Prospective study over 4 years	Assess the relationship between mothers feeding practices and concern about her child's weight with food intake in a test meal. Examine predictors of dieting over time	Girls with mothers with higher restrictive feeding styles (greater control over quantity, timing and type of foods the girls ate, concern about their child's weight) ate more than others at age 7. At age 9 girls with mothers with the highest restrictive style and who were also overweight ate the most in the test meal. High BMI, depression, self competence, and the marital relationship parents, predicted dieting at age 9. Those with high weight status and depression were even more likely to display dieting at age 9, Those with high weight status and low self-competence were even more likely to display dieting at age 9 Those with high weight status and whose mother also restricted food access or had greater concern about their child's future weight status also had greater likelihood of displaying dieting at age 9.
Vander Wal & Thelen[82]	School sample *Age:* 9 or 11 years *Number:* 526 *Region:* USA	Cross \sectional survey	Compare eating behaviours in obese vs. average weight children	Obese children more likely than average weight children to diet, have concerns about being or becoming overweight, have more body image dissatisfaction and higher levels of dietary restraint. Girls and older children were at greater risk of scoring highly across several of these variables.
Neumark-Sztainer et al[66]	Middle and senior high school sample *Age:* mean 15 years	Cross sectional survey	Examine weight related concerns and behvaiours in relation to body weight.	Healthy weight control behaviours (exercising, eating more fruit and vegetables, and/or eating less high fat food or sweets) were practiced by 85% of females and 70% of males.

Reference	Participants	Study Design	Relevant Aim	Key Relevant Findings on the Relationship between Disordered Eating, Weight and Psychological distress
	*Number:*4746 *Region:* USA			Unhealthy weight control practices (defined as fasting, eating very little food, using a food substitute, skipping meals, and/or smoking more cigarettes) were reported by 57% of females and 33% of males. The use of extreme weight control behaviours (defined as self-induced vomiting, diet pill, laxative and diuretic use) were practiced by 12% of females and 5% of males. Overweight and obese adolescents were more likely to have the desire to weigh less than their current self-reported weight, have low body satisfaction scores, engage in frequent dieting over the previous year, report more BE, and report both healthy, unhealthy and extreme weight control behaviours compared to their normal weight peers.
Boutelle et al[79]	School sample *Age:* Adolescent - from 7th, 9th and 11th grade. *Number:* 8330 *Region:* USA	Cross sectional survey	Assess weight control practices and relationship to weight status in adolescents.	Obese adolescents were more likely to report a range of disordered eating behaviours including dieting, self-induced vomiting, and use of diet pills and laxatives; however they were less likely to eat breakfast, have more than 1 serve of low fat dairy, grains and vegetables per day, and exercise on 3 occasions per week compared to normal weight adolescents.
Stice et al [93]	School sample *Age:* 16-18 years *Number:* 218 *Region:* USA	Prospective study over 9 months	Assess impact of restraint and negative affect on bulimic pathology over time	Found no support for the restraint theory- baseline dietary restraint did not predict bulimic pathology at follow up. Bulimic symptoms at baseline predicted a relative increase in dietary restraint at follow up. No support that negative affect would lead to bulimic pathology- baseline negative affect failed to predict bulimic pathology at follow up.
Stice et al [94] & Stice et al [95]	School sample *Age:* 13-17 years *Number:* 231 *Region:* USA	Prospective study over 20 months	Assess impact of restraint and negative affect on bulimic pathology over time. Assess a range of risk factors on the development of BE over time	Dietary restraint and body dissatisfaction was associated with increase in bulimic pathology over time. Higher BMI, dieting, lower body satisfaction, appearance over-evaluation, pressure to be thin, depressive symptoms, poorer self-esteem, emotional eating, modelling of eating disturbances, and lower peer social support significantly predicted the onset of BE. Anxiety, anger and lack of parental social support did not add to the model.
Huon[96]	School sample *Age:* 15-18 years *Number:* 440 *Region:* Australia	Cross sectional study	Assess prevalence of disordered eating in the sample and examine relationship of dieting, weight status and desired weight to BE	13% of the participants had severe BE problem, and a further 35% moderate BE problem. In total 31% of participants wanted to weigh less by more than 7kg, and 35% of participants reported that they were very much preoccupied by their weight. 6% of participants actually overweight. 25% of the participants reported mostly or always dieting, 36% reported exercise to lose weight, 11% the use of purgatives, 6% reported vomiting. In the regression analysis examining predictors of BE, frequency of dieting and discrepancy between weight and ideal weight (a type of

Reference	Participants	Study Design	Relevant Aim	Key Relevant Findings on the Relationship between Disordered Eating, Weight and Psychological distress
				measure of body dissatisfaction) came out as significant predictors
Johnson & Wardle[98]	School sample *Age:* 13-15 years *Number:* 1177 *Region:* UK	Prospective study over 1 year	Assess impact of restraint and negative affect on bulimic pathology over time.	Dietary restraint and body dissatisfaction related to the onset of bulimia and disordered eating. However when entered into a logistic regression model simultaneously, body dissatisfaction came out as a significant predictor of bulimia and psychological distress but dietary restraint did not.
Tanofsky-Kraff[99]	Convenience sample of overweight children recruited via notices sent to the families of school children and family physicians asking for participation in a study on metabolism. *Age:* 6-13 years *Number:* 105 *Region:* USA	Cross sectional study	Examine age of onset of dieting, LOC of eating, overweight, ED psychopathology, depression and anxiety (retrospectively recalled).	60% of children reported attempting to lose weight by dieting at least once in their past and 30% had experienced LOC of eating. Children who dieted had significantly higher scores of ED cognitions but did not have increased scores for depression or anxiety. Children who had previously experienced LOC of eating had both significantly higher scores for ED cognitions and higher ineffectiveness and negative self esteem scores on the Children's Depression Inventory and Externalizing score on the children's behaviour checklist. Of the 63 dieters, 50 reported overweight before dieting, 3 reported dieting before overweight and 10 children could not recall. Of the 31 children who reported LOC eating, 21 reported becoming overweight before LOC eating, 6 reported LOC eating before becoming overweight, and 4 could not recall. A total of 27 children reported dieting and LOC eating; of these 18 reported overweight before either LOC eating or dieting, 9 reported dieting before LOC eating, and 18 reported LOC eating before dieting.
Neumark-Sztainer et al [100]	Overweight adolescent identified from a broader cross sectional middle and senior high school study *Age:* mean 15 years at baseline *Number:* 412 (232 female, 180 male) *Region:* USA	Prospective study over 5 years	Examine risk and protective factors for EDs in overweight adolescents	31% of females engaged in disordered eating behaviours at time 1 and 40% at time 2. 13% of males engaged in disordered eating at time 1 and 20% at time 2. For males and females time 1 items that predicted prevalence and incidence (new cases) of EDs at time 2 were exposure to magazines on weight loss, and unhealthy weight control behaviours. For males, lower family connectedness, high weight importance in how one feels about them self, depressive symptoms, and high serves of sugar beverages also predicted both incidence and prevalence of ED at time 2. For females, weight concern, dieting, lower frequency of lunch and dinner meals, and increased levels of moderate to vigorous physical activity additionally predicted incidence of disordered eating at time 2.

TABLE 3.

Summary of key literature exploring relationships between disordered eating body weight and psychological distress in treatment settings.

Reference	Participants	Study Design	Relevant Aim	Key Relevant Findings on the relationship between disordered eating, weight and psychological distress
Friedman[52]	Clinical Obesity, residential weight loss facility, middle to upper class due to associated costs. *Age:* Adults *Number:* 80 women, 30 men *Region:* USA	Pre-treatment cross sectional survey	Explore relationship between BMI, depression, appearance evaluation and body satisfaction.	In regression analysis, BMI accounted for 14% of the variance in depression scores, and of this 14%, 24% was due to the effect of appearance evaluation and 28% due to the effect of a body areas satisfaction score.
Dide & Fitzgibon[51]	Clinical BED treatment clinic *Age:* Adults *Number:* 84 female, 12 male *Region:* USA	Pre-treatment cross sectional survey	To test if levels of psychological distress and eating pathology were dependant on weight severity.	No difference between normal/ overweight group, the obese group, and severely obese group, in terms of levels of psychological distress and eating pathology in these patients seeking help for BED.
Colles et al[53]	Varied adult population Including bariatric surgery candidates n= 180, non-surgical weight loss support group n=93, community members recruited from advertisements in a hospital and university n= 158 *Region:* Australia	Pre- treatment cross sectional survey	Explore behavioral features of BED that relate to depression	18% of bariatric surgery patients, 3% of weight loss support group and 2% of community participants suffered from BED. Emotional distress related to LOC and level of upset at overeating were the best predictors of depression. However despite been measured items relating to body image distress, restraint, disinhibition and hunger were not entered into the model and thus not considered as potential predictor variables.
Telch and Agras[54]	Overweight and obese females recruited into a BED treatment trial. *Age:* 18-65 years *Number:*107 *Region:* USA Note: exclusion criteria included current use of antidepressant medication.	Pre-treatment cross sectional survey	Explore how obesity, BE and psychopathology were related.	BE accounted for observed relationship between obesity and psychopathology; i.e. depression, self-esteem and other psychological symptoms.
Pinaque[55]	Women in an outpatient overweight/ obesity treatment trial Age: 18-60 years *Number:*169	Pre-treatment cross sectional survey	Examine how BED relates to eating behvaiours, alexithymia and depression	40 (24%) women had BED. Women suffering from BED had comparable age, BMI, restriction levels. However they were more likely to report the onset of obesity in childhood, had higher levels of emotional eating, external eating, depression, trait

Reference	Participants	Study Design	Relevant Aim	Key Relevant Findings on the relationship between disordered eating, weight and psychological distress
	Region: France Note: Inclusion criteria BMI> 25 and <60, not following diet in previous 2 months, not taking psychotropic drugs, and not in psychological treatment.			anxiety, perceived stress and alexitheymia. In regards to the alexitheymia scale women with BED had more difficulty distinguishing feeling from bodily sensations and were less able to describe feelings, they did not differ in the subscale measuring externally orientated thinking. Perceived stress and emotional eating emerged as predictors of BED in a multiple regression (depression, anxiety, alexithymia, dietary restraint and external eating did not emerge as significant predictor variables).
Nauta et al[56]	Overweight and obese (BMI >27 and <45) women recruited to an eating problem clinic. *Age:* 21-49 years *Number:* 74 *Region:* Netherlands	Pre-treatment cross sectional survey.	Compare eating and body image cognitions and negative self-schemas between women with and without BED	37 (50%) suffered from BED. They were more likely to depressed and have higher weight shape and eating concerns. They were also more likely to have negative self-schemas related to rejection and unworthiness, whereas non BE more likely to have negative self- schemas related to lack of will power. Women whose cognition around eating and weight were dominated by negative self-schemas were more likely to be depressed regardless of BE category, compared to women whose cognitions were dominated by automatic thoughts.
Byrne et al[61]	Community women recruited from newspaper advertisements *Age:* Adult *Number:* Obese women who had lost weight and maintained new weight for 1 year n=28; Obese women who had regained weight after weight loss n= 28 Weight stable, healthy weight n=20 *Region:* UK	Qualitative study	Explore behaviours associated with weight loss maintenance and regain following obesity treatment	Maintainers of lost weight reported adherence to low fat diet regular exercise, and frequent weight and shape monitoring and responding quickly to any detected weight gain by altering food intake and activity. Women who had regained weight reported feeling dissatisfied with their weight following weight loss, were less likely to report that they had achieved weight loss goals, had dichotomous thinking about what was success or failure in regard to eating, weight or shape, had an undue influence of shape and weight in their evaluation of self-worth and reported habitual overeating in response to stress.
Kaymen et al[60]	Women recruited from medical offices. *Age:* adult *Number:* 30 formally obese women 44 obese women who had regained weight after successful reduction 34 average weight women *Region:* USA	Mixed method (qualitative and quantitative) interview survey	Explore behavioural differences in those with successful weight loss, weight relapse and among those who were always healthy weight	Women who had lost weight and maintained used weight loss strategies they felt specific to their lifestyle and chosen by themselves, they set small goals and persisted until they were achieved, they did not completely restrict their favourite foods. Compared to women who had maintained a new low weight, women who had regained weight were more likely to undertake unhealthy weight loss behaviours i.e. fast, take diet formulas, go on unsustainably restrictive diets, take appetite suppressants, they were less likely to exercise and did not permit themselves foods they enjoyed when dieting. They were more likely to skip breakfast and eat greater number of snacks per day. They were more dissatisfied with their body and the majority reported feeling fat or ugly. They were also more likely to use emotion focused coping strategies such as eating, sleeping and wishing the problem would go away.

Reference	Participants	Study Design	Relevant Aim	Key Relevant Findings on the relationship between disordered eating, weight and psychological distress
				Women who were always healthy weight were more likely than both groups to use the coping strategies of relaxation techniques, exercise and working more, they were more likely to report problem solving and directly confronting problems.
Foster et al[63]	Women enrolled in obesity treatment involving very low calorie meal replacement, or food based low calorie diet and CBT *Age:* adult *Number*: 223 *Region*: USA	Non- randomised clinical trial	To assess the clinical correlates (weight outcome and depression) of the eating inventory (measuring restraint, disinhibition, BE, hunger) in an obesity trial	Pre-treatment restraint was related to lower body weight, less BE, lower depression scores, and during treatment was associated with greater weight loss.
Hainer et al[62]	Women in an outpatient obesity treatment trial Note exclusion criteria included eating disorders, psychiatric illness and common physical comorbidities such as Type 2 diabetes mellitus and CVD *Age:* 18-65 *Number:* 80 *Region:* Czech Republic.	RCT Treatment involved prescribed low energy diet & activity for all. Sibutramine medication was additionally provided to intervention group.	Examined psychological and eating behaviour variables associated with weight loss outcome at 12 month follow up.	At 12 months higher diet restraint and higher depression scores were related to less weight loss.
Thomas et al[71]	Women enrolled in a BN treatment trial *Age:* adult *Number:* 182 *Region:* USA	Pre-treatment cross sectional survey	Examined the relationship of weight suppression (discrepancy between highest ever and current weight) and desire to lose weight with BE	The mean weight suppression of the group was 9.2kg Weight suppression positively related to OBEs EDE-Q restraint scale negatively associated with OBEs Participants with lower desire for weight loss, experienced greater frequency of OBEs
Fairburn et al[72]	Women recruited from general practice. *Age:* young adult mean 24 years for BN, and 25 years for BED group *Number:* 102 participants with BN, 48 with BED *Region:* UK	Prospective study over 5 years on the natural course of BN and BED	Examined weight outcome as one of variables measured	BN participants gained on average 3.3kg over the 5 years BED participants gained on average 4.2kg over the 5 years
Fairburn et al[90] & Fairburn et al[91]	Women recruited from general practice. *Age:* young adult *Number:* BN n=102 BED n=52 Healthy Control n=204	Cross sectional	Examine risk factor for BN and BED	Amongst a range of risk factors identified women with BN were more likely to report childhood obesity, parental obesity, any family member dieting, parental ED diagnosis, and critical comments about weight and shape from family members, prior to the onset of their disorder, compared to healthy control and psychiatric groups Women with BED were more likely to suffer from childhood obesity and

Reference	Participants	Study Design	Relevant Aim	Key Relevant Findings on the relationship between disordered eating, weight and psychological distress
	Psychiatric Control n=102			critical comments about weight and shape from family members
Braet & Van Strien[80]	Overweight children majority recruited weight control treatment program and others via school physicians *Age:* 9-12 years *Number:* Overweight- 145 non-overweight- 147 *Region:* Belgium	Cross sectional survey (occurred pre-treatment for weight control program participants	Compared eating behaviour in overweight and non-overweight children	Overweight children had higher emotional eating, external eating scores and restrained eating scores The treatment seeking overweight group did score higher on all three measures compared to the non-treatment seeking overweight group. Regression analysis indicated emotional eating was related to lower physical competence scores, higher scores across the Child Behaviour Checklist, higher external and restrained eating. Emotional eating was not related to cognitive competence, social competence or overall self-worth. External eating was related to lower scores on the physical competence scores and overall self-worth, and higher scores for restrained eating, Restrained eating was related to lower physical competence scores.
Rubinstien[92]	Overweight adults in a weight loss intervention. *Age:* adult *Number:* 588 *Region:* USA	Cross sectional pre-treatment survey	Assess relationship between childhood weight loss attempt and disordered eating	Childhood weight loss attempts, were associated with higher odds of BED and unhealthy weight loss behaviours such as fasting or crash dieting, self-induced vomiting and the use of diet pills
Gagnon-Girouard[102]	Overweight/ obese women recruited to an treatment trial *Age:* Premenopausal *Number:* 153 *Region:* Canada	Baseline cross sectional results of RCT	Test dual pathway model of bulimic symptoms in overweight women	Body dissatisfaction did not significantly relate to restraint did not significantly relate to negative affect. Other parts of the model were proven i.e. body dissatisfaction did relate to negative affect which in turn related to overeating, and restraint was significantly related to overeating. They also added to the model showing a direct link between body dissatisfaction and overeating.
French et al[103]	Recruited via advertisement of a weight gain prevention program. Exclusion criteria included serious medical or psychological condition requiring treatment *Age:* 20-45 years *Number:* 817 *Region:* USA	RCT- written intervention, however intervention vs. control had no impact on weight, eating or exercise behaviours. Prospective follow up over 3 years	Examine how weight, eating behaviours, exercise and psychological variables were associated with BE overtime	53% of women normal weight non-BEs 5% were normal weight BE 33% were overweight non-BEs 9% were overweight BEs BEs gained more weight over three years compared to non-BE, as did overweight women compared to the normal weight women. Overweight and BEs reported a greater number of lifetime episodes of intentional weight loss and overweight BEs had the greatest number of intentional weight regain episodes. Restrained eating did not differ amongst groups. BEs and overweight women were more likely to engage in both healthy (e.g. eat more fruit and vegetables) and unhealthy (e.g. laxative and diuretic use) dieting practices.

Reference	Participants	Study Design	Relevant Aim	Key Relevant Findings on the relationship between disordered eating, weight and psychological distress
				Overweight women were more likely than normal weight women (regardless of BE status) to report less physical activity, more television viewing, more fast foods and greater energy intake. Overweight women and women with BE were more likely to report that weight or shape was the most important thing in evaluating themselves as a person and had higher depression scores. In a multivariate model examining predictors of BE; depression scores, frequency of intentional weight loss episodes and importance of shape or weight in self-evaluation predicted BE status.
Hsu et al[104]	Obese patients undergoing bariatric surgery *Age:* 22-58 *Number:* 37 *Region: USA*	Pre treatment survey	Examine BE in patients undergoing bariatric surgery.	4 (11%) meet the full BED criteria, 5 (14%) meet partial BED criteria, and 28 (75%) were classified as non-BEs.
Goossens et al[107]	Childhood obesity treatment program *Age:* 10-17 years *Number:* 108 *Region:* Belgium	Prospective treatment outcome follow up over 6 years	Assess impact of weight loss program on the ED symptoms	Children who completed the obesity treatment program had lower scores for eating concern, drive for thinness, bulimia and body dissatisfaction scores at 6 years compared to their baseline score. They were less likely to report LOC with eating (21% of participants at 6 years and 31% at baseline). The presence of BE at the 6 years follow up was related to BE and depression scores at baseline but not to BMI, change in weight, restraint, or eating, weight or shape concerns
Wadden et al[106]	Female obesity treatment program, exclusion criteria co-morbid depression, BE, wide range of psychiatric and physical (e.g. Type 2 diabetes mellitus) co-morbidities. *Age:* adult *Number:* 123 *Region:* USA	RCT follow up for 65 weeks following intensive treatment	Assess impact of weight loss program on the OBE	All participants were free from OBEs at baseline, and the non-dieting, and balanced energy deficit treatment protocols did not induce new BE episodes with the exception of one participant in the balanced energy deficit diet. However at week 28 of follow up 5 participants in had experienced OBE episodes in the meal replacement arm of the study, although for 4 participants these had remitted by week 65.
Dalle Grave et al[105]	From 25 obesity treatment programs across Italy *Age:* 25-65 *Number:* 500 *Region*: Italy	Prospective treatment outcome follow up for 12 months after the commencement of treatment	Assess impact of weight loss program on the ED symptoms	Significant reductions in weight (68% of males and 60% of females lost >5% of body weight), in BE, and psychological distress. Participants who lost greater than 5% of body weight had greater reductions in BE and psychological distress.

UNDERSTANDING COMMUNITY BELIEFS AND STIGMA REGARDING EATING AND WEIGHT DISORDER

Research has indicated a rising prevalence of disordered eating behaviours in Australia, particularly amongst obese persons [8,108]. It is relevant to increase our understanding of community beliefs regarding eating and weight problems at a population level for several reasons.

a) Community understanding of these problems and appropriate treatments is likely to influence individual sufferers of eating and weight problems recognize the problem and seek appropriate help[109-112].

b) Conversely stigma and discrimination may prevent appropriate help seeking[109,112].

c) Despite the impact on psychological health, there may be a positive regard for these behaviours, particularly due to their association in some people with weight loss[113,114]. This may be a contributing factor to the increase prevalence of ED behaviours.

d) Stigma and discrimination may exacerbate ED symptoms[115,116]

e) To inform public health campaigns about deficits in, or dysfunction, in attitudes and beliefs about eating and weight problems, which if changed may alter behaviour.

The majority of ED suffers do not receive help for their ED, with sufferers more likely to seek help for a real or perceived weight problem[2,33,112]. A lack of knowledge about treatments and fear of stigma and discrimination, have been identified as important barriers to help seeking[109,112,117]. For sufferers of AN it is common for them to see their illness as a part of their identity, use the illness as a coping strategy and be in denial about the disease. Thus accepting treatment to recover can be particularly challenging[118]. In a study on pathways to help seeking in BN and BE problems, Hepworth and Paxton[109] reported that self-recognition of a problem in ED sufferers is often aided by comments from friends about changes they observe which reinforce the sufferers awareness of internal changes. They also reported that the first person that sufferers confided in regarding their eating problem was most usually a friend or family

member. Thus community mental health literacy (MHL) defined by Jorm as "knowledge and beliefs about mental disorders which aid their recognition management or prevention"[119], may be important in AN and other EDs to assist sufferers, their family and friends recognise the problem and have knowledge about where to go to receive effective treatments.

In population samples in the UK[120] and the USA[121], it has been reported that ED stigma is high, with many people reporting difficulty talking to and empathising with people with EDs, and a general perception that EDs are 'self-inflicted', or that sufferers 'have only themselves to blame' and 'could pull themselves together'. Studies in a number of high school and university samples have also found stigmatising attitudes toward EDs, with students perceiving ED sufferers as self-centered, fragile, and likely to use their disorder to gain attention. The majority of students reported that they would be unwilling or have mixed feelings about interviewing an ED sufferer for a job, or in considering them as a dating partner[113 114 122 123]. However, some participants in community and student studies have shown a more compassionate attitude, indicating that AN and BN are severe distressing conditions which warrant sympathy[113 121 124]. Women with ED symptoms have reported higher rates of perceived discrimination against a BN sufferer, compared to asymptomatic women[125].

Hunt and Rothman examined beliefs about AN and BN in college students[126]. They found that most participants could accurately identify at least one behavioural characteristic (e.g. restricting food) of AN when asked to describe the problem, however only about 60% of participants mentioned any psychological (e.g. distorted body image) or physical (thinness) characteristics. The amount of information participants were able to provide did not differ by ED type or by participant gender. When participants were asked to list treatments for AN the majority listed counselling or therapy (83%), 30% listed hospitalisation and 17% listed medication. Participant' perceptions on the helpfulness of interventions were not reported. Research by Smith et al[123], and Stumey[127] on high school and college students also found psychotherapy and counselling were the better regarded treatments for AN whilst drug therapies

were less acceptable. Smith et al.[123] found that 71% of his participants could correctly define AN, however unlike the later work of Hunt and Rothman[126] recognition of AN was greater than that of BN. Similarly research by Holliday et al[128] on a sample recruited from university students, university staff and the general public in the UK (n=80) found that about 45% correctly described AN as an ED involving excessive dieting, about 37% mentioned that sufferers have disturbed body image, however only 14% of women and 8% of men made any reference to AN been a psychological condition.

College and university students may have higher MHL due to a generally higher educational attainment overall. However similar results have been found in general community samples. In 1992 Turnham and Hume–Wright[129], found in 168 lay community members the most frequently endorsed 'cures' for AN were psychotherapeutic treatments especially those designed to increase insight and confidence, whilst drug therapies and strict behavioural regimes tended to be rejected by the subjects. They also found that participants were in agreement with statements about AN which were broadly similar to clinical descriptions of the disorder, indicating a reasonable degree of MHL in regard to AN.

O'Grady and El-Sobky[130] examined the beliefs of 160 health centre attendees compared to psychiatrists concerning diagnosis and treatment of AN. They found that there was generally good agreement between the two groups, however the public thought a general practitioner would be the best professional to treat the problem, whereas psychiatrists endorsed the psychiatry profession as the most helpful.

Recent work by Mond et al aimed at understanding BN MHL in a number of samples including community women[124 131 132], university students[125], and women with BN symptoms[117], has found consistently that participants had poor recognition of EDs, most commonly believing that the main issue in a vignette describing a sufferer of BN was one of low self-esteem/ confidence or one of depression, rather than any type of ED. They also found primary care practitioners,

family and friends are favored over mental health specialists in the treatment of the ED and whilst specific psychotherapies are recognised as helpful, non-evidence based approaches such as 'just talking', 'finding new hobbies' and complementary or alternate medicines were frequently endorsed. Antidepressant medication was often not believed to be helpful.

A later study by Mond and Hay[133] examined community recognition and beliefs about treatment for a sufferer of BED and obesity. The study participants were a representative population sample of Australian adults. The findings were consistent with that of BN in that low self esteem/ self confidence (28%) and depression (29%) were most likely perceived as the main problem in the vignette, whilst BED was recognized by 12% of the population as the main problem and 7% thought the main problem was obesity. In regards to treatments and treatment providers, 'a behavioral weight loss and exercise program' was considered the most helpful treatment, followed closely by 'getting information about the problem and available services' and 'just talking about the problem'. Consistent with the work on BN, non-mental health specialists including General Practitioners (GPs) and dietitians were considered the most helpful treatment providers.

In 2009 Bannon et al.[134] examined the differences in the way undergraduate psychology students responded to a written scenario describing two obese women, one with and one without BE behaviours. The majority of students reported the obese woman with BE was less attractive, less comfortable to be around, and more likely to blame for her weight compared to the non-BE obese female. In addition they thought that women suffering from obesity and co-morbid BE had a more severe problem, which would require more treatment, would be less curable and associated with high treatment dropout compared to women with obesity alone [134].

In general weight discrimination has been found to be increasing, Andreyeva et al.[31], found in a US population sample that the prevalence of weight discrimination increased from 7% in 1995–1996 to 12% in 2004–2006 [135]. Weight bias and obesity stereotypes are common in Western

countries. These include the belief that overweight and obese persons are lazy, unmotivated, lacking in self-discipline, less competent and noncompliant. Weight based discrimination has been found to occur in employment settings, health-care facilities, and educational institutions[136].

An increase in weight bias is relevant to the disordered eating field as it is significantly associated with body dissatisfaction, poor self-esteem and emotional or binge eating in weight discrimination victims or in those who internalize obesity stigma[115,116]. Farrow and Tarrant[115] examined the relationship between weight based discrimination, emotional eating and body dissatisfaction in undergraduate university students in England. They found females and overweight participants were more likely to experience weight based discrimination, emotional eating and body dissatisfaction, and in a hierarchal regression controlling for weight and gender, weight based discrimination significantly contributed to emotional eating and body dissatisfaction. Puhl et al.[116] found among overweight women recruited from a weight loss organization, that the 37% of women believed a range of stereotypes regarding obese persons (e.g. obese persons are lazy) were true or sometimes true, also reported significantly more frequent BE and refusal to diet in response to stigma experiences, compared to women who reported the stereotypes to be false 63%.

Messages regarding the obesity epidemic in the media and from health agencies have in recent times placed the onus on individual responsibility for weight loss. Australian qualitative research has found that many obese persons consider there is an emerging culture of blame against obese people and obesity stigma is heightened by the simplicity of public health messages. These messages often imply for example, that it is easy to exercise more, eat healthier and be thin, which does not match with obese persons own experience of the complexity and difficulty in trying to lose weight [137,138].

Evidence from the work of Goldney et al, suggests that a public health promotion initiative designed to improve MHL and reduce stigma in relation to depression in Australia has indeed lead to improved understanding and recognition of symptoms at the population level and a corresponding increase in the use of health services among individuals with symptoms [110]. As research on pathways to help seeking for BN has found an important barrier is a lack of knowledge about the problem and available treatments[109], theoretically improved ED MHL is likely to also improve help seeking for ED.

However, whilst MHL may improve help-seeking, it is unlikely to be effective at preventing illness, and may possibly have adverse effects. More recent work by Goldney et al[26] in relation to MHL and depression, found in repeat representative population cross sectional surveys in South Australia in 1998, 2004 and 2008 that there was increasing prevalence of major depression between 6.8% and 10.3%. Increases were observed in young males aged 15 to 29 years, and females aged 30-49 years. Over the same period there were significant improvements in MHL in the population including these specific groups; however participants with poor/ fair mental health literacy were 37% less likely to be classified with major depression. During this period of time in Australia there had been considerable funding and broad focused public health promotion efforts which publicised the common symptoms of major depression, appropriate management and aimed to reduce stigma with help seeking, there was also increased funding to mental health care providers to increase accessibility to depression treatment. Due to the cross sectional nature of the repeated studies one cannot confer causality, it may have been that those who the MHL campaign reached effectively, had improved MHL and willingness to disclose depression symptoms, and that the depression rate increased over this period for other unrelated unmeasured reasons. However, it must be said that the public health campaigns including those aimed at increasing MHL have not achieved their goal of reducing depression rates in the community. This is consistent with work in ED prevention. A review of ED prevention programs, has found targeted ED prevention efforts with a psycho-educational focus were less effective at preventing ED[139].

Some studies have also indicated poorer outcome with improved knowledge or health literacy regarding obesity and its impact on EDs. For example Jones et al.[140] report that misconception about degree of overweight in obese adults (n=173, of which 50.9% incorrectly classified their weight as overweight *vs.* obese) protected from ED psychopathology i.e. those with an inaccurate perception of their medically defined obesity status reported significantly lower levels of eating, weight and shape concern, fewer OBEs, less distress regarding overeating and less distress regarding LOC of eating compared to participants who accurately reported themselves as obese. There were also trends for them to spend less time dieting. Inaccurate *vs.* accurate obese reporters did not differ in scores on the BDI or Rosenberg Self Esteem Scale although the depression score was approaching significance (p=0.07). The authors point to the difficulties for public health programs targeting obesity, that whilst increasing the communities' awareness of obesity may lead to appropriate weight management and appraisal of health risk, it may also lead to disordered eating and body image issues. The challenge is therefore to raise awareness in a way that also promotes body image esteem, and safe and healthy lifestyle practices that will assist in weight management and psychological health, whilst demoting extreme dietary practices.

A favourable regard for weight loss in AN has been found in surveys of university and college students[113][114] and friends and family of AN sufferers[141]. Furthermore, there is a perception that other people are likely to imitate the disordered eating behaviours of a person suffering from AN or BN[114]. This is a concern as it may lead to an uptake in dieting and lead to other ED behaviours[142][143] that are associated with poor quality of life[144], weight gain and obesity onset over time[65][66]. In addition, the weight loss strategies in AN and BN are desired by women with EDs, possibly reflecting a focus on the perceived positive symptoms of the disorders e.g. weight loss, whilst either ignoring or having poor MHL in regards to how the weight losing symptoms of EDs, may lead to other symptoms such as vomiting, poor self-esteem, low mood, BE and physical effects of starvation[113][124][125].

Whilst improving community ED MHL, may or may not be helpful at decreasing ED behaviours, it is likely to be helpful at increasing appropriate help seeking and reducing stigma. To our knowledge there has been no previous study of AN MHL in a large population sample; and no previous study of AN MHL in Australia. Work has been completed in Australia on community BN and BED MHL and therefore AN-MHL represents an important gap in the literature. Furthermore, there has been no work within Australia on stigma and positive regard for AN, EDNOS and BED. Comparing stigma and positive regard between ED of varying symptoms and weight status, and assessing how participants' demographic and other characteristics, namely, their age, gender, level of education, body weight and ED features, relate to stigma and positive regard, will help clarify information about which segments of the community it may be important to target in any MHL program. It addition an examination of associations between perceptions of discrimination and treatment difficulty may add to the literature on how stigma relates to poor treatment seeking.

OVERALL SCOPE, SIGNIFICANCE AND AIMS OF THE THESIS

Scope

The broad scope of the thesis is to further understanding of co-morbid eating and weight problems in the community, examine the impact on psychological health and explore community attitudes and beliefs regarding these problems

Significance

Eating and weight disorders and their resulting co-morbidities place considerable burden on sufferers and the health care system. Gaining a better understanding of the relationship between EDs, weight disorders, psychological distress, and community beliefs and attitudes towards these disorders will allow for more informed prevention, early intervention and treatment efforts.

Specific aims

1. To examine the occurrence of disordered eating behaviours and cognitions in obese and non obese Australian community dwelling adults.

2. To examine how the prevalence of co-morbid disordered eating and obesity has changed in the Australian population over time (1995-2005).

3. To gain an understanding of how disordered eating cognitions and behaviours impact upon psychological distress in obese and normal weight women with disordered eating.

4. To gain an understanding of how disordered eating behaviours/ cognitions and psychological distress impact on weight over time, in community dwelling women, with existing eating disorders.

5. To further our understanding on community attitudes and beliefs in regards to ED sufferers of various weight status i.e. underweight, normal weight and obese.

CHAPTER ONE – REFERENCES

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PART TWO

CHAPTER TWO – DISORDERED EATING BEHAVIOURS AND COGNITIONS IN YOUNG WOMEN WITH OBESITY: RELATIONSHIP WITH PSYCHOLOGICAL STATUS

Disordered Eating Behaviours and Cognitions in Young Women with Obesity: Relationship with Psychological Status.

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ABSTRACT

Objective: To examine levels of eating disorder behaviours and cognitions of young women with obesity in the Australian Capital Territory Australia, and assess the impact upon psychological status.

Design: General population cross sectional survey.

Subjects: A total of 4891 young women from the community aged 18-42. Of which 630 were in the obese weight range.

Measurements: Body mass index (BMI), eating disorder psychopathology (EDE-Q), psychological distress (K10).

Results: Women with obesity had significantly higher levels of dietary restraint, eating concern, weight concern, shape concern, binge eating, misuse of diuretics, use of diet pills and fasting compared to other women in the community. These eating disorder cognitions and behaviours were associated with increased levels of psychological distress. In women with obesity: eating concern, weight concern, shape concern, dietary restraint and decreased age predicted psychological distress in a multivariate model. Amongst other women in the community, behaviours such as laxative misuse, "hard" exercise and subjective bulimic episodes also contributed to the model predicting psychological distress.

Conclusion: As disordered eating psychopathology is high in young obese women and negatively impacts upon psychological status, obesity prevention and treatment should consider eating disorder psychopathology and mental health outcomes.

INTRODUCTION

Both obesity and eating disorders (ED) are significant health problems in Australian society. Whilst it has been shown levels of obesity are currently increasing with the recent 2001 Australian National Health Survey finding approximately 14% of Australians over the age of 15 to be obese[1], the lifetime community prevalence of eating disorders has remained relatively stable with the lifetime prevalence of anorexia nervosa (AN) estimated to be approximately 0.5% and bulimia nervosa (BN) at 1- 2%. However the prevalence of ED's not meeting the formal criteria for AN or BN such as "eating disorders not otherwise specified" (EDNOS) which includes binge eating disorder is considerably higher up to 5% and these disorders are associated with marked impairment in functioning[2-6]. Whilst often regarded as distinct problems, eating disorders and weight disorders have many common characteristics, including dieting behaviour, binge eating, poor body image and psychosocial difficulties[4, 7-14].

It has been well established that eating disorders are associated with high levels of psychiatric co-morbidities including depression, anxiety, and personality disorders[7]. In contrast research has generally found that levels of general psychopathology such as depression and anxiety are no different for people who are obese compared to those who are not obese, in the community. However this differs for various subgroups within the obese population such as those seeking treatment, those with co-morbid binge eating and poor body image, and those with severe levels of obesity, all whom experience higher levels of psychological distress[15-18].

Many previous studies on the interface between weight and eating disorders have relied on treatment seeking, often small clinical samples of people with obesity[e.g.15, 19-22], or have focused on binge eating disorder (BED)[e.g.20-27], or ED behaviours only[4]. They have found that binge eating contributes to obesity; that obese people with binge eating disorder have higher depression, anxiety, eating and weight concerns and poorer quality of life than in other obese subjects; also that poor body image evaluation and negative self schemas relate to depression in obese people, and that body image beliefs relate to level of obesity (heavier women are less

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satisfied with appearance). Furthermore while there is good evidence that ED symptoms are related to depression and anxiety, we are not aware of any study which identifies specific eating disorder behaviours and cognitions that most affect the mental health status of community women with obesity. Thus this study aims to examine eating disorder psychopathology comprehensively (i.e. assessment of binge eating, compensatory weight control behaviours *and* cognitions) in a large community based sample representative of young adult obese women in the ACT, Australia. It also aimed to examine the way in which the psychological status of women with obesity may be influenced by eating psychopathology by identifying specific ED behaviours and cognitions that contribute to psychological distress. We hypothesised that ED behaviours and cognitions would be more frequent in women with obesity compared to other women in the sample; and that in women with obesity, higher levels of eating disorder psychopathology would be associated with increasing psychological distress. We had no specific hypotheses concerning which particular aspects of eating disorder psychopathology will be contributing to the psychological distress as this part of the study was exploratory.

METHOD

Design and Participants

The research was conducted as part of the Health and Well-Being of Female ACT Residents Study, a large-scale epidemiological study of disability and health-service utilization associated with the more commonly occurring (bulimic-type) eating disorders among young adult women in the community. At the first phase of the study, self-report questionnaires were posted to a sample of 10,000 female residents of the Australian Capital Territory (ACT) region of Australia (population 323,000), a highly urbanized region which includes the capital city of Australia, Canberra. Participants aged 18-42 were selected randomly from the electoral roll[28]. A total of 5255 individuals responded to the phase one questionnaire representing a response rate of 57.1

%[28]. The ACT Human Health Research Ethics Committee provided ethics approval for the project and all participants provided informed written consent.

Measures

Weight Status

Body mass index (BMI, kg/m^2) was calculated from self-reported height and weight. Previously we found a very high correlation (r = 0.97) between BMI calculated in this way and BMI calculated according to measured height and weight[29]. Obesity was classified as BMI ≥ 30.0 using the classification scheme outlined by the World Health Organisation and utilised in the Clinical Practice Guidelines for the Management of Overweight and Obesity in Adults[30].

Eating Disorder Examination Questionnaire (EDE-Q)

The EDE-Q[31] is a 36-item self-report measure derived from the Eating Disorders Examination interview (EDE)[32]. The EDE-Q focuses on the past 28 days and is scored using a 7-point, forced-choice, rating scheme to measure individual items of attitudinal aspects of eating disorders. Subscale scores - relating to dietary restraint, eating concerns, concerns about weight and concerns about shape - and a global score, are derived from the 22 items addressing these attitudinal aspects of ED psychopathology. Frequencies of ED (overeating and compensatory) behaviours are also assessed in terms of the number of episodes occurring during the past four weeks. Reliability and validity of the EDE-Q has been demonstrated in both community and clinical samples (with the exception of overestimation of the binge eating item) [29,33].

Kessler-10 item distress scale (K-10)

General psychological distress (depression and anxiety) were assessed with the K-10. The K-10 has robust psychometric properties, and is designed to detect cases of anxiety and affective disorders in the general population[34], and has been used in our previous eating disorder research[e.g.35]. The frequency of each of 10 depressive or anxiety symptoms is measured on a

scale from one to five. In the present study coding of the response options was such that total scale scores ranged from 10 to 50, with higher scores indicating greater symptomatology.

STATISTICAL ANALYSIS

Data was inspected for normality and parametric and non-parametric tests were used accordingly. Differences between obese and non obese groups on categorical variables were compared using Chi-Square tests (χ^2), where as between group differences on continuous variables were compared using the Mann-Whitney U test (Z). To assess the relationship between variables Spearman's Rho Correlation Coefficient (r_s) was utilised, and following the normalisation of scores using the method of BLOM, backward selection linear regression was performed to examine the predictive value of disordered eating variables in psychological status. To correct for multiple tests the significance level was lowered ($p < 0.01$). Data analysis was conducted using SPSS 12.0.1 for Windows (2003).

RESULTS

Completed questionnaires were received, following reminder letters, from 5,255 individuals which represented a response rate of 57.1% after incorrectly listed addresses (n=684) and individuals away from home at the time of the survey (n=112) were taken into account. This is a conservative estimate as only a proportion of individuals with incorrectly listed addresses will be identified[28]. Only information concerning age was available for non-respondents. The age distribution of respondents did not differ significantly from that of non-respondents[28]. The demographic profile of the phase one sample of 5255 women was compared to the 2001 census data and found to be representative of the total population of young women residing in the ACT with respect to marital and employment status, education, children and first language. The sample consisted of approximately 10% of the female population aged 18-42 in the ACT[28].

Of the 5255 women, 4891 women provided heights and weights from which BMI could be calculated. The 364 women who did not supply heights and weights were excluded from further analysis. The total number of obese women was 639 or 13% of the 4891 women. A comparison of demographic profiles between obese and non- obese women is displayed in Table 1.

Table 1. **Demographic details of non obese and obese sub-samples.**

	Not Obese BMI<30 (n= 4252)	Obese Total BMI$\geq$30 (n=639)	Test Statistic	df	p
Age (years)					
Mean	29.48	31.94	Z = -8.04	n/a	<0.0001
SD	7.26	6.74			
Country of birth %			χ^2 = 6.91	1	0.009
Australia	84.6	88.5			
Other	15.4	11.5			
First language %			χ^2 = 2.14	1	0.144
	91.4	93.1			
English	8.6	6.9			
Other					
Marital status %			χ^2= 33.54	3	<0.0001
Married	38.9	51.0			
Living as married	14.8	11.8			
Single	40.9	33.0			
Separated/ Divorced	5.4	4.2			
Children (one or more %)	42.2	51.4	χ^2= 19.02	1	<0.0001
Education (highest level completed) %			χ^2=52.53	7	<0.0001
School certificate (yr10)	10.3	17.5			
High school certificate (yr12)	33.3	33.1			
Trade/ Tech Cert/ Dip	6.9	9.9			
Nursing/Teaching Qualification	2.5	3.4			
Undergraduate diploma	6.9	7.5			
Bachelor's Degree	26.7	19.0			
Postgraduate diploma	6.8	4.1			
Postgraduate degree	6.4	5.5			
Main Activity %			χ^2=49.85	5	<0.0001
In paid work full-time	47.4	48.7			
In paid work part time/ casually	15.3	15.2			
Home duties/ caring for children	16.6	21.6			
Studying full time	17.0	7.8			
Seeking paid work	1.4	2.7			
Other	2.2	4.0			

Obese and non obese women were compared in regards to psychological distress, EDE-Q global and EDE subscale scores using the Mann Whitney U test (see Table 2). Obese women had a small but significant increase in psychological distress. Obese women experienced higher levels in all the EDE-Q subscale scores.

Table 2 – Comparison of Obese and Non Obese Women in quality of life measures, psychological distress, global EDE-Q and subscale scores

	Obese women (n=639) Mean ± SD	Non obese women (n= 4252) Mean ± SD	Z	p
K10- psychological distress	17.96 ± 7.25	16.89 ± 6.03	-2.57	0.01
Global EDE-Q	2.41 ± 1.29	1.38 ± 1.18	-18.71	<0.0001
Eating Concern	1.42 ± 1.40	0.66 ± 0.96	-15.57	<0.0001
Weight Concern	3.00 ± 1.47	1.60 ± 1.42	-20.84	<0.0001
Shape Concern	3.41 ± 1.67	2.04 ± 1.57	-18.25	<0.0001
Dietary Restraint	1.83 ± 1.50	1.22 ± 1.36	-10.29	<0.0001

There were 78 women in the obese subgroup (12.2% of all obese women) that had global EDE-Q scores two standard deviations above normal (a score $\geq$ 4.02)[28]. This level is extremely high and would indicate a possible clinical eating disorder. Only 159 or 3.7% of the 4252 non obese women had EDE-Q scores two standard deviations above normal.

The difference between obese and non obese sub-samples of women in terms of the presence of any and regular eating disorder behaviours was investigated using chi- square test. As shown in Table 3, obese women were significantly more likely to have regular bulimic episodes, diuretic use, use of diet pills, and fasting behaviours.

Table 3 – **Comparison of Obese and Non Obese Women in the use of any eating disorder and in the regular use of these behaviours.**

Behaviour	Frequency	Obese women %	Non obese women %	χ^2	p
Objective Bulimic Episodes	Any	28.5	15	65.52	<0.0001
	Regular	20.3	9.0	76.59	<0.0001
Subjective Bulimic Episodes	Any	30.2	20.9	27.58	<0.0001
	Regular	17.4	12.1	13.78	<0.0001
Self Induced Vomiting	Any	4.1	2.9	2.37	0.124
	Regular	2.0	1.3	2.06	0.151
Laxative Misuse	Any	2.2	1.7	0.64	0.424
	Regular	0.9	1.0	0.05	0.823
Diuretics	Any	0.9	0.3	6.54	0.01
	Regular	0.9	0.2	10.98	0.001
Diet Pills	Any	7.0	2.2	46.21	<0.0001
	Regular	5.8	1.6	45.52	<0.0001
Hard exercise for weight or shape reasons	Any	25.5	29.1	3.52	0.61
	Regular I average 1 time a week	22.2	23.5	0.481	0.488
	Regular II average 5 times a week	4.1	5.0	1.11	0.293
Fasting	Any	15.6	11.3	10.25	0.001
	Extreme (13 or more days in month)	5.8	2.8	16.83	<0.0001

Any behaviour frequency referred to one or more episodes in the month prior to the questionnaire.

Regular behaviour frequency referred to (unless otherwise stated) an average of one episodes of the behaviour per week in the month prior to the questionnaire.

Objective bulimic episodes: an eating episode with an unusually large amount of food consumed and the experience of loss of control.

Subjective bulimic episodes: an eating episode where there was a loss of control and the participant ate more than they would like, however the amount was considered not large for the situation.

Self induced vomiting, laxative, diuretic and diet pill use and hard exercise were all asked with reference to the behaviour being used as a means of controlling shape and weight.

Fasting referred to going for long periods of time (8 hours or more) without eating anything in order to influence shape or weight.

To assess the association between disordered eating psychopathology and psychological distress in the obese and non obese sub-samples, Spearman's rank order correlations were performed between K-10, EDE-Q subscales and levels of specific eating disorder behaviours. As shown in Table 4, the K10 significantly correlated with EDE-Q subscales and bulimic episodes in both sub-samples of women, however significant correlations between the K10 other ED behaviours differed between the groups. To ensure the results in the non-obese sub-sample where not affected by women of low weight the analysis was repeated for women who did not fall into either the underweight or obese categories (i.e those women with BMI$\geq$ 18 and <30) and there were no changes in the results.

Age and weight status (BMI) were considered as possible confounding variables that may have affected linear regression results, therefore Spearman's rank order correlations between these variables and psychological distress were conducted for the obese and non-obese sub-samples of women. Age correlated significantly with the K10 in both the obese and non obese sub-samples (Obese sample: r_s= - 0.156, p< 0.0001; Non obese sub-sample r_s= - 0.150, p< 0.0001); however BMI did not correlated with the K10 in either group.

Table 4. **Spearman Rank Correlations between eating disorder features and psychological distress according to obesity status.**

	K10	
	Obese	**Non Obese**
EDEQ Global	0.419**	0.350**
Dietary Restraint	0.123*	0.168**
Eating Concern	0.428**	0.372**
Weight Concern	0.442**	0.349**
Shape Concern	0.458**	0.384**
Subjective Bulimic Episodes	0.172**	0.219**
Objective Bulimic Episodes	0.230**	0.229**
Self Induced Vomiting	0.052	0.121**
Laxative Misuse	0.015	0.113**
Diet Pills	0.076	0.088**
Diuretic Misuse	0.093	0.015
Hard Exercise to control weight or shape	0.001	0.085**

* Significance p<0.01
** Significance p<0.001

Following normalisation of all variables using the method of BLOM, backward selection linear regression was used to ascertain which eating disorder factors in the obese sub-sample of women, that correlated with psychological distress (refer to Table 4) were the best predictors of psychological distress in a multivariate model. In addition to correlated eating disorder features, age was also entered into the regression calculation. Dietary restraint, eating concern, weight concern, shape concern, level of subjective bulimic episodes, level of objective episodes, and age were entered into the regression calculation; decreased age, dietary restraint, weight

concern, eating concern and shape concern emerged as predicting variables (see Table 5) which explained 24% of the variance in the model (R square= 0.238, F=33.892, p<0.0001), the other variables where excluded from the model.

For comparison backward selection linear regression was used to ascertain which eating disorder factors that correlated with psychological distress in the non-obese sub-sample (refer to Table 4) were the best predictors of psychological distress in a multivariate model. The normalised variables and backward selection linear regression method where again used; and age was added as a variable. Dietary restraint, eating concern, weight concern, shape concern, level of subjective bulimic episodes, objective bulimic episodes, self induced vomiting, laxative misuse, use of diet pills and hard exercise to control shape or weight, as well as age were entered into the regression calculation; decreased age, shape concern, eating concern, restraint, hard exercise, laxative misuse and subjective bulimic episodes emerged as predicting variables (see Table 5) which explained 21% of the variance in the model. (R square= 0.208, F=140.167, p<0.0001), the other variables where excluded from the model.

Table 5. Predicting Variables in Psychological Distress (K-10)

Predicting Variable	Regression Coefficient β	t	95%Confidence interval		p
			Lower bound	Upper bound	
In the obese sub-sample					
Dietary restraint	-0.137	-3.100	-0.248	-0.056	0.002
Eating concern	0.161	2.578	0.041	0.301	0.010
Weight concern	0.161	1.792	-0.019	0.409	0.074
Shape concern	0.235	2.446	0.051	0.464	0.015
Age	-0.087	-2.283	-0.181	-0.014	0.023
In the non-obese sub-sample					
Subjective bulimic episodes	0.078	4.662	0.063	0.153	<0.0001
Laxative misuse	0.067	4.511	0.114	0.290	<0.0001
Hard exercise	-0.033	-2.072	-0.082	-0.002	0.038
Dietary restraint	-0.180	-8.654	-0.236	-0.149	<0.0001
Eating concern	0.208	8.211	0.176	0.286	<0.0001
Shape concern	0.313	12.754	0.272	0.371	<0.0001
Age	-0.098	-6.605	-0.123	-0.067	<0.0001

DISCUSSION

Although there are many studies on obesity, eating disorders and mental health, previous studies have often been in clinical settings or focused mainly on BED, and have not examined the relationship of obesity, disordered eating psychopathology, and psychological status in a large community based representative sample of young Australian women with obesity. This study indicated high levels of ED behaviours and cognitions in young obese women in the community, and when this occurred it significantly increased psychological distress. Furthermore it has identified the specific ED predictors of psychological distress in this sample of obese women to be dietary restraint, weight concern, eating concern and shape concern.

Research has indicated that obesity is more common amongst those with poor socio economic status[36]. Although the questionnaire used in the study did not ask direct questions regarding level of income, it seems to be in agreement with past research, with the obese group of women having lower levels of university higher education and greater likelihood of reporting seeking full time work as their main activity. The obese sample were also slightly older, more likely to be born in Australia, be married or living as married, and more likely to class home duties or caring for children as their main activity. In this sample of women with obesity there was a very small but significant increase in psychological distress (depression and anxiety) compared to non-obese young women.

Many previous studies investigating disordered eating and obesity have focused on the behaviour of binge eating and BED. When comparing levels of binge eating and compensatory behaviours of the obese sub sample to the non-obese sub sample, the women with obesity were more likely to have experienced objective and subjective bulimic episodes; however it is important to note in this comprehensive assessment of eating disorder psychopathology we also found that regular use of diuretics, fasting and diet pills; and eating, shape and weight concerns and dietary restraint; were also significantly higher in the obese sub-sample. Furthermore self

induced vomiting, laxative misuse, and hard exercise for shape or weight reasons occurred at similar or higher frequencies in the obese group, but not at levels that reached statistical significance. This comparison highlights that obese woman in the community experience a range of eating disorder psychopathology, not limited to those expected in BED.

This study differs from a South Australian community epidemiological study of ED behaviour that found increased weight was associated with binge eating, but not purging (use of laxatives, diuretics and self induced vomiting), or strict dieting or fasting ("going on a very strict diet" or "hardly eating anything at all for a time")[4]. This present study however, consisted of young women only. Young women are known to be at high risk of eating disorders[37] and it appears that young women with obesity may be particularly vulnerable to eating disorder behaviours and cognitions compared to other segments of the Australian population.

All EDE-Q subscale scores were higher in the obese subgroup and all correlated strongly within the obese subgroup to psychological distress. This confirms previous studies that have shown, dieting, weight and shape concerns or body image problems, eating concerns and binge eating to be high in obese people[8,15,18,24,38,39] and those that indicate a relationship with these factors with psychological health[8,15,18,24]. Although the presence of ED psychopathology increased psychological distress in all women irrespective of weight status, this study indicates that the levels of ED psychopathology are much higher in women with obesity, and therefore an important factor contributing to the poor health of this population group. Furthermore this study indicates that amongst women with obesity, disordered cognitions and high concerns with eating, weight and shape and dietary restraint, play a significant role in predicting psychological distress (rather then other ED behaviours which play a greater role in other women) and thus these particular eating disorder features may possibly be important to target in obesity treatment.

Similar to our work, a study on obese binge eaters compared to obese non binge eaters by Nauta et al[24], showed that those who binge eat had increased eating concern, weight concern, shape concern, depression and decreased self esteem. They also found that independent of binge eating status people with obesity who had negative self schemas (cognitive generalisations about self which were based on shape, weight and eating) eg "If I eat too much then I am good for nothing" had increased depression and decreased self esteem[24]. Although binge eating is a common amongst people with obesity, this study highlights that disordered eating cognitions in obese people play a role in mental health, irrespective of if they are also displaying the behaviour of binge eating.

An article by Schwartz and Brownell[9] discusses the argument that in obese people life dissatisfaction, social liabilities and body image distress (as shown in our sample by high weight and shape concern), may be helpful in gaining motivation to lose weight[9]. However they suggest that these are more likely to be barriers to emotional regulation, which may lead to increased eating and not to weight loss[9]. This present study supports this idea as the obese women in this sample display significant concern regarding weight and shape have a strong desire to lose weight, with many attempting various levels of dietary restraint and some attempting dangerous weight control measures associated with severe eating disorders. Despite these concerns and attempts at weight loss these women are still obese and among those with high eating disorder psychopathology there was greater psychological distress. Therefore considerable care and effort is required to change people's attitudes and behaviours in terms of effective and safe obesity prevention and weight loss methods, along with ways of enhancing mental wellbeing. Longitudinal studies on the interaction of life variables, disordered eating, mental health and obesity needs to occur so a thorough assessment of the directional and causal links between these factors can be made; and how they may interact as barriers or promoting factors to weight loss or maintenance, improved eating psychopathology and mental health.

There are a number of limitations to this present study. Firstly it would have been beneficial to have an increased response rate, as it can not be ascertained if the women who did not provide contact details, or did not provide height and weight measures differed in eating disorder psychopathology, weight status, or psychological status. Another problem is the reliance on self report instruments, which are an effective way of gathering data in large population studies, but often have problems in validity. In particular previous studies have also found validity problems in the bulimic episode measures in the self report EDE-Q[29].

A recent Cochrane systematic review has recently found that psychological interventions particularly behavioural and cognitive behavioural strategies enhance weight reduction when combined with dietary and exercise strategies[40]. A Cochrane systematic review on psychotherapy for bulimia nervosa and binging also supports cognitive behavioural therapy for the treatment of bulimia nervosa and similar eating disorders[41]. Both reviews however, acknowledge that cognitive behavioural therapies are unlikely to be effective alone in reducing body weight[40-41]. Given the level of disordered eating in a community sample of young women with obesity and the considerable impairment this has psychological status, it would be prudent to screen for eating disorders in all young women seeking help for a weight problem. Further development and evaluation of combined exercise, dietary and psychological therapies (such as behavioural or cognitive behavioural therapy) for young women with obesity and co-morbid clinical or subclinical disordered eating psychopathology needs to occur with measurable outcomes including not only weight reduction, but changes in disordered eating, and other related social, physiological and psychological variables. Prevention efforts in obesity also need to consider the prevention of disordered eating cognitions and behaviours.

CONCLUSION

Levels of disordered eating behaviours and cognitions in young Australian women with obesity in the community are high. These problems have a negative impact on psychological (depression and anxiety) status. The findings of this study act as an important reminder to

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ensure prevention and treatment efforts for young obese women include psychological work on altering disordered attitudes in relation to eating, shape, weight and also altering behaviours and thoughts about effective methods of weight control and maintenance.

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CHAPTER THREE – THE RISING PREVALENCE OF CO-MORBID OBESITY AND EATING DISORDER BEHAVIOURS FROM 1995 TO 2005

The rising prevalence of co-morbid obesity and eating disorder behaviours from 1995 to 2005.

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ABSTRACT

Objective: To measure the co-occurrence of obesity and eating disorder behaviours in the South Australian population and assess the change in level from 1995 to 2005.

Method: Two independent cross-sectional single stage interview based population surveys were conducted a decade apart. Self reported height, weight, eating disorder behaviours and socio-demographics were assessed. Changes between the two time points were analysed.

Results: From 1995 to 2005 the population prevalence of co-morbid obesity and eating disorder behaviours increased from 1% to 3.5%. Co-morbid obesity and eating disorder behaviours increased more (prevalence odds-ratio (POR) = 4.5; 95%-confidence interval = 95%-CI = [2.8, 7.4]; $p<0.001$) than either obesity (POR = 1.6; 95%- CI = [1.3, 2.0]; $p<0.001$) or eating disorder behaviours (POR = 3.1; 95%-CI = [2.3, 4.1]; $p<0.001$) alone.

Conclusion: Co-morbid obesity and eating disorder behaviours are an increasing problem in our society. Prevention and treatments efforts for obesity and eating disorders must consider and address this increasing co-morbidity.

Keywords: Obesity, eating disorders, prevalence.

INTRODUCTION

It is well known that levels of obesity have risen dramatically over the past few decades. In 2004-05 the Australian National Health Survey found approximately 16.4% of Australians over the age of 18 to be obese[1], this compares to the earlier 1989-90 Australian National Health Survey which found 8.7% of adults over the age of 18 years were obese[2].

Evidence concerning change in the prevalence of eating-disordered behaviour is conflicting, in part due to the small number of large-scale general population surveys. The current point prevalence of eating disorders in recent community surveys in North America[3], New Zealand[4] and Europe[5] may vary by more than four fold. In addition, the North American study[3] found cohort effects supporting a increase in prevalence of eating disorders over time and comparatively high rates (2.1%) of binge eating in both men (1.7%) and women (2.5%). Our recent research has indicated that the prevalence of eating disorder behaviour in Australia is increasing[6].

It is only in the past decade that the significance of co-morbidity between obesity and eating-disordered behavior has been recognized, following the introduction of binge eating disorder as a provisional diagnosis requiring further research in DSM-IV[7]. Research on adolescent girls[8] and adult women[9] has found those suffering obesity have high rates of ED behaviors such as binge eating, fasting, diet pill use, laxative misuse, diuretic misuse and self induced vomiting. Other cross sectional studies have focused on the co-morbidity of binge eating, binge eating disorder and obesity, as it has been found that binge eating may contribute to the development of obesity[10-11]. However, we are not aware of any research to address change in the prevalence of co-morbid obesity and ED behaviours over time. Information of this kind would have implications for the conduct of obesity and eating disorder prevention programs, in terms of exploring the possibility of combined obesity and eating disorder prevention efforts.

The aim of this research was to examine the change in the prevalence and characteristics of individuals with co-occurring obesity and eating-disordered behavior in the community between 1995 and 2005. We hypothesized that the proportion of individuals in the community with co-morbid obesity and ED will have increased to a greater extent than the proportion with obesity alone or ED alone. In addition, we hypothesized that young and middle-aged women would be the group most affected by co-morbid EDs and obesity.

METHOD

Design

Two independent cross-sectional single stage interview based surveys were conducted a decade apart. Both surveys were embedded in the respective year Health Omnibus Survey, under the auspices of the South Australian Health Commission. The interviews were conducted by Harrison Health Research.

Sample selection and interview procedures

The sample selection and interview procedures were the same for each survey. Samples were selected from both metropolitan and rural areas. For the metropolitan sample in 1995, 320, and in 2005, 386 "collectors' districts" were selected from those used by the Australian Bureau of Statistics in the 1991 and 2001 census respectively. For the country samples, all towns of 10,000 or more in population size and a selection of towns of at least 1,000 people were surveyed. The collectors' districts were chosen according to their probability of selection proportional to size. Within each collector's district a starting point was randomly selected. From this starting point, using a pre-determined process based on a "skip" pattern of every fourth household, 10 dwellings were chosen. Only one interview was conducted per household or dwelling, and, where more than one resident was aged over 15 years, the respondent was the

person whose birthday was last. The sample was a non-replacement sample, and up to six separate visits were made to interview the person chosen to take part.

The interview was piloted during February 1995 and August 2005, with 50 interviews. Five percent in 1995 and 10% in 2005 of each interviewer's work was selected at random, and the respondents re-contacted and a number of questions were asked of them, to ensure they had been interviewed as reported. Interviews were conducted from March until the second week of May 1995 and September through to 31st December 2005.

The interview

The structured, respondent-based interview, comprised a range of health-related and demographic questions, including present height and weight. The ED behaviour questions were written by the author (PH), and were modeled on related questions used in the investigator-based interview, the Eating Disorder Examination (EDE)[12]. The complete EDE, is however a much more detailed and comprehensive assessment of symptoms, particularly on binge eating. The questions were embedded towards the end of the interview.

Three ED behaviours were assessed, namely binge eating, purging and strict dieting or fasting. Binge eating was described as, an episode of eating an unusually large amount of food in one go and at the time feeling that the eating was out of control. Purging was described as the use of laxatives, diuretics (water tablets), or self-induced vomiting for weight control. Strict dieting was described as "going on a very strict diet" or "eating hardly anything at all for a time", both for the purpose of weight or shape control. Current regular use of these behaviours was defined as the behaviour occurring at least weekly over the three months prior to the interview.

Body mass index (BMI; kg/m^2) was calculated from self-reported weight and height. Obesity was classified as a BMI of 30.0 kg/m^2 or above using the classification scheme outlined by the World Health Organization and as utilized in the Clinical Practice Guidelines for the Management of Overweight and Obesity in Adults[13].

Age was approximately normally distributed and was described using mean values and standard deviation (SD). Differences in socio-demographic characteristics and in the prevalence of obesity, ED-behaviour, and co-morbidity between 1995 and 2005 were tested using Chi-Square tests and independent t-test.

Multinominal (polytomous) logistic regression analysis was used to assess changes in prevalence of obesity, ED behaviours, and co-morbidity between 1995 and 2005 adjusted for socio-demographic characteristics. Data were weighted by the inverse of the individual's probability of selection and multivariate analysis was weighted accordingly. Results were presented as prevalence odds-ratios (POR) and 95%-confidence intervals (95%-CI).

Data analysis was conducted using SPSS version 14, for Windows and STATA, release 8. To correct for multiple tests, the significance level was lowered to $p < 0.01$.

Ethics

All subjects in the study gave informed consent to their participation. Assurance was given to participants in the confidential nature of the information they provided. Ethics approval was obtained through the South Australian Department of Health Ethics Committee.

RESULTS

Population characteristics

In 1995 a total of 3001 people (71.5%) and in 2005 a total of 3047 (63.1%) responded to the survey. Of the people who did not respond to the survey 544 (45%) in 1995 and 1011 (52%) in 2005 declined to take part; 584 (48%) in 1995 and 800(40.3%) in 2005 were not surveyed due to a failure to establish contact, vacant home, or because they were not at home during the

survey period; the remaining 71 (6%) in 1995 and 142 (8%) in 2005 had a lack of fluency in English or had an illness or incapacity making it too difficult for them to participate in the survey. In both 1995 and 2005, 77% (1995 n= 2309; 2005 n = 2334) of the surveys occurred in metropolitan areas, the remaining in rural areas.

There were some demographic changes in the population over the 10 year period. Of those whom responded to the survey there was a significant increase in age (1995 mean= 46.0 $\pm$ 19.0; 2005 mean= 49.6$\pm$ 8.7; $p < 0.001$).   In 1995 only 18% of the population had a household income of greater than \$50 000 and this had increased to 37% in 2005 ($p < 0.001$). The highest level of education achieved had also increased with those obtained a bachelor degree or higher increasing from 9% in 1995 to 16% in 2005, those receiving trades certificates or diplomas increasing from 31% in 1995 to 36% in 2005 and those receiving secondary schooling only declining from 60% in 1995 to 48% in 2005 ($p < 0.001$). There were no significant changes in the respondents' gender (60% female in 1995, 57.7% female in 2005) or birthplace (91% born in western country i.e. Australia, New Zealand, North America or Western Europe in 1995, and 92% in 2005).

Change in prevalence of obesity and eating disorder behaviours

The percentage of participants who reported co-morbidity in ED behaviours and obesity increased from 1% to 3.5% ($p < 0.001$). The overall prevalence of obesity increased from 11.4% in 1995 to 17.7% in 2005 ($p < 0.001$), whilst the percentage of participants who reported obesity without co-morbid ED behaviours increased from 10.5% to 14.1% ($p<0.0001$). For ED-behaviours the overall prevalence increased from 4.1% to 10.9% ($p < 0.001$), whilst the percentage of participants who reported ED-behaviours without co-morbid obesity increased from 3.7% to 7.4% ($p<0.0001$). If the people with obesity were considered separately, in 2005 there were 20% whom had co-morbid ED behaviours, a significant increase from the 8.5% whom had co-morbid ED behaviours in 1995 ($p < 0.001$).

Multi-nominal logistic regression analysis showed that participants in 2005 were 4.5 time more likely to report both being obese and having ED behaviours (95%-CI = [2.8, 7.4]; p < 0.001), they were 1.6 times more likely to report being obese without co-morbid ED behaviours (95%-CI = [1.3, 2.0]; p < 0.001), and 3.1 times more likely to report having ED behaviours without co-morbid obesity (95%-CI = [2.3, 4.1]; p < 0.001), than participants from the 1995 survey (Table 1). The odds of each of the above groups having particular socio-demographic characteristics (age, gender, marital status, income, and rural or metropolitan residence) were also tested in the model. Whilst living in a rural environment (POR=1.4; 95%-CI= [1.2-1.8]; p<0.001) and being married (for not married POR=0.65; 95%-CI= [0.53-0.80]; p<0.001) demonstrated significant increases in risk of obesity without co-morbid ED behaviours, they had no impact on those with co-morbid obesity and ED behaviours, (POR=1.5; 95%-CI= [0.96-2.3]; p= 0.076) and (POR=0.81; 95%-CI= [0.52-1.3]; p=0.364) consecutively. Been a younger age (age was entered into the model as a continuous variable, POR=0.97; 95%-CI= [0.97-0.98]; p<0.001) and female gender (POR=1.5; 95%-CI= [1.1-1.9]; p=0.011) showed increases in risk for those with ED behaviours without co-morbid obesity, and for also for those with co-morbid obesity and ED behaviours, consecutively (POR=0.98; 95%-CI= [0.97-0.99]; p=0.002) and (POR=1.8; 95%-CI= [1.2-2.8]; p=0.010). Country of birth, level of education and income proved to have no relevant confounding effects on the model.

Table 1: Change in prevalence of co-morbid obesity and ED behaviours compared to obesity alone and ED behaviours alone. Results of weight adjusted multinominal (polytomous) logistic regression based on 5366 participants of two surveys conducted in Australia in 1995 and 2005.

	Number of participants in outcome group				Odds-ratio	95%-CI*	p-value
	None N=4271	Obesity only N=676	ED only N=295	Obesity and ED N=124			
Obesity only i.e. without Co-Morbid ED Behaviours							
Year of survey 1995 2005	2262 2009	282 394			1 1.6	[1.3, 2.0]	P< 0.001
ED Behaviours only i.e. without Co-Morbid Obesity							
Year of survey 1995 2005	2262 2009		97 198		1 3.1	[2.3, 4.1]	P < 0.001
Obesity and ED Behaviours							
Year of survey 1995 2005	2262 2009			27 97	1 4.5	[2.8, 7.4]	P < 0.001

*95%-CI = 95%-confidence interval

Characteristics of people suffering co-morbid obesity and ED behaviours (n=137):

Changes in the socio-demographic characteristics between 1995 and 2005 for those with co-morbid obesity and ED behaviours are reported in Table 2. As per the wider sample there was an increase in income. In addition there was a tendency of more males suffering co-morbid obesity and ED behaviours in 2005 compared to 1995 although this did not reach significance and the majority of people suffering co-morbid obesity and ED were female.

Table 2: Change in characteristics of participants with co-morbid obesity and ED behaviours (n=137) between 1995 and 2005.

Characteristic	1995 survey (n=29)	2005 survey (n=108)	p-value
% Country of birth Australia	82.8%	82.4%	P = 0.965
% Area of residence rural	20.7%	29.6%	P = 0.340
Mean age (SD)	39.2 (12.9)	42.5 (15.2)	P = 0.282
% Female	79.3%	61.1%	P = 0.068
% Married or defacto	51.7%	53.7%	P = 0.850
% Income per year $50,000 or more	22.2%	53.6%	P = 0.004
% With graduate diploma or higher level of education	13.8%	27.8%	P = 0.122

* SD = standard deviation

There were no significant changes from 1995 to 2005 in the types of ED behaviours used amongst people suffering from obesity and co-morbid ED behaviours (regular purging p = 0.767; regular binge eating p = 0.131; regular strict dieting p = 0.084). In 2005 the ED behaviours displayed by the 108 participants with co-morbid obesity and ED behaviours were, binge eating alone (56%), strict dieting alone (21%), binge eating in combination with purging or strict dieting (17%), purging alone (6%), purging in combination with strict dieting (5%).

DISCUSSION

In 2005 the prevalence of co-morbid obesity and ED behaviours had increased 4.5 times compared to 1995, the prevalence of obesity alone increased by 1.6 times and eating disorders alone increased 3.1 times. In 2005 in this population survey of South Australia, one in every five people suffering obesity also suffered from co-morbid eating disorder behaviours. The eating disorder behaviours displayed by people suffering obesity, were mainly in the form of binge eating, however strict dieting and purging behaviours were also displayed.

The reason for such a large increase in the number of obese people with ED behaviours in a relatively short time span of 10 years is unknown. In recent years the obesity "epidemic" has received much attention in the media and from politicians, public health promotion, clinical health professionals and others treating obesity. Perhaps these confronting, and at times alarmist, messages, have been conducive to increased levels of body dissatisfaction among obese individuals, and to a perception that weight loss at any cost is the best outcome. This might also account for the observed increase in the prevalence of binge eating and extreme weight control behaviours, as body image dissatisfaction is a risk factor for disordered eating[14-15].

A possible limitation in this project could be information bias between the two time points. In that participants in 2005 may have been more prepared to disclose their ED behaviours than in 1995. However, there is no evidence to our knowledge supporting increased acceptability or reduced stigma of eating disorders.

The high public health burden of obesity is unquestionable[16-18], and ED behaviours also entail a substantial burden to both sufferers and the community in terms of decreased quality of life and increased use of health services[19-21].Thus, individuals with co-morbid obesity and eating-

disordered behaviour may suffer the "double burden" of medical complications associated with obesity and impairment in psycho-social functioning associated with disordered eating.

The present findings have clear implications for both public health and clinical practice. In particular this research lends credence to calls for an integrated approach to obesity and ED prevention efforts[22-23]. Prevention interventions (particularly targeting the high risk group of young females), which, integrate general healthful eating practices, such as regular eating, a well balanced dietary intake, and regular physical activity for enjoyment and, while de-emphasizing extreme weight control methods, and increasing self-esteem and body satisfaction, are urgently required. In terms of treatment, all professionals involved in treating obesity or ED must gain an understanding each condition and associated poor mental and physical health outcomes; assess patients presenting with an ED for obesity, and those presenting with obesity for ED attitudes and behaviours. Furthermore, research, development and incorporation of treatment strategies which are not likely to exacerbate or lead to either problem, and which address both problems in people with co-morbid symptoms is necessary.

In conclusion, the number of people with co-morbid ED and obesity has grown at a much faster rate than those with ED alone of obesity alone. Professionals involved in obesity and ED prevention, treatment or research, must further consider this co-morbidity and develop strategies to overcome this problem.

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CHAPTER FOUR – COMMUNITY RECOGNITION AND BELIEFS ABOUT ANOREXIA NERVOSA AND ITS TREATMENT

Community Recognition and Beliefs about Anorexia Nervosa and its Treatment.

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ABSTRACT

Objective: Mental Health Literacy (MHL), namely recognition, and beliefs about treatment concerning Anorexia Nervosa (AN) were examined in a community sample of men and women (n=983) aged 15 to 94 years.

Method: A vignette describing a women suffering from the symptoms of AN was presented, followed by a respondent-based structured interview concerning recognition of the problem and treatment beliefs.

Results: The majority of participants could identify the problem as that of an eating disorder, although only 16.1% could specifically identify it as AN. Many also believed the problem was primarily one of low self-esteem (32.5%). General practitioners and psychiatrists or psychologists were considered the most helpful treatment providers, whilst obtaining information about the problem and available services, followed by family therapy, were considered the most helpful treatments. Less than one-third of participants believed complete recovery was possible. Better AN MHL was found in younger, higher educated and metropolitan domiciled females.

Discussion: This study offers encouraging results in regard to AN MHL. In particular, there was moderate regard for the use of mental health specialists in the treatment of the disorder. However, there appears to be a misconception that AN is largely the manifestation of low self-esteem, and confusion concerning the distinction between AN and bulimia nervosa. AN MHL was poorer in males and those with higher social and health disadvantage.

INTRODUCTION

Community studies have reported that a minority of individuals who suffer from eating disorders (EDs), and only 50% of those with AN may ever seek treatment (1; 2.). An important barrier to help-seeking is likely poor identification and knowledge about efficacious treatments, i.e. poor mental health literacy (MHL) defined as "knowledge and beliefs about mental disorders which aid their recognition, management or prevention" (3.).

There have been mixed findings relating to MHL of AN. Some have reported moderate to good agreement between lay beliefs and psychiatrists or clinical descriptions of AN in regard to diagnosis (4-6.). However, more recently studies in school, university, heath care and self-selected community samples (5-10) have indicated that whilst many people recognise the behavioural characteristics of AN such as excessive dieting, they are less likely to recognise AN as being a psychological condition. Psychotherapy and counselling were the most known and supported treatments for AN, whilst hospitalisation, drug therapies and strict behavioural regimes were reported less acceptable (4-9.).

To our knowledge there has been no previous study of AN MHL in a representative general population sample. This study aimed to examine recognition of AN and treatment beliefs in a community sample in Australia.

METHOD

Design and Participants

The present study sample was derived from the 2005 South Australian Health Omnibus Survey which is a representative sample from the general population of 3,047 individuals (63% response rate). A full description is found in Mond et al. (11). A third of participants were asked the AN MHL survey which was embedded towards the end of the respondent-based interview.

Participants were read aloud and provided with a written transcript of a vignette describing 'Jenny' a fictional 28 year old women suffering from AN (Appendix A). They were told they could refer back to the transcript of the vignettes at any time in the interview. Participants were first asked: "What would you say is Jenny's *main* problem?". They were required to choose one answer only from a list of 14 options. A series of additional questions followed in which participants were asked their opinions concerning the perceived most helpful treatments, treatment providers and medicines, as well as the likely prognosis with and without the treatment. Difficulty of the treatment process *per se* was assessed with the question: "How difficult do you think Jenny's problem would be to treat?".

All participants in the study gave informed consent to their participation. Ethics approval was obtained through the South Australian Department of Health Ethics Committee.

Demographic features of the study sample

Participants comprised of 983 individuals (32% of the total sample) who were randomly selected to receive the AN MHL survey. Their mean age was 50.2 years (SD 18.8), BMI 26.2 (SD 5.1), 57.5% were female, 76.3% were Australian born, 55.4% were married or living as married, 15.7% completed a Bachelors degree or higher, 38.4% were pursuing higher education or had other tertiary qualifications and 3.2% were still at school, and 46% had an annual income of $A40,000 or more. There were no significant differences in demographic features of participants in the present study and the total sample of interviewed participants.

STATISTICAL ANALYSIS

Data is presented as the percentage of participants choosing particular options for each question. The effects of socio-demographic variables, namely, age, gender, educational attainment, and recognition of the problem on responses were examined by Chi-Square tests. To correct for multiple comparisons only differences at 0.01 significance level were considered.

RESULTS

In responses to the question concerning Jenny's main problem, the most commonly endorsed option was "Low self-esteem/ lacks self confidence" (32.5%), followed by "anorexia nervosa" (16.1%) and "bulimia nervosa" (16.7%). "Depression" was also endorsed by 11%, "an eating disorder but not anorexia or bulimia" by 7%, "anxiety disorder or problem" by 4.7%, "stress" by 4.5%, and other options by ≤ 2% of the population. Table 2 shows the proportion of participants who endorsed each specific intervention as the most helpful within each of the three categories – people, treatment type and "medicines".

Table 1. Perceived helpfulness of interventions for Jenny's problem

TREATMENT TYPE	%
People likely to be most helpful	
GP or family doctor	36.2
Psychiatrist or Psychologist	17.7
Dietitian or Nutritionist	16.5
Counsellor (including telephone, e.g. Lifeline) or Social Worker	10.6
Close friend	6.9
Family member	3.7
Self-help support group such as Overeaters Anonymous	3.2
Naturopath or other alternative therapist	1.8
Commercial weight-loss program such as Weight Watchers	0.6
Other	1.4
Don't know	1.4
Treatments likely to be most helpful	
Getting information about the problem and available services	22.5
Family counselling or therapy	18.1
Just talking about the problem	14.3
Getting out and about more/finding some new hobbies	8.5
Cognitive Behaviour Therapy	7.3
Psychotherapy	5.3
Behavioural weight loss diet and exercise program	5.9
Alternative or relaxation therapy e.g. naturopathy, homeopathy, etc.	3.9
Behavioural re-feeding programme	3.1
Assertiveness or social skills training	1.6
Trying to deal with the problem on their own	1.5
Getting really fit/increasing time spent on exercise	1.0
Admission to the psychiatric ward	0.9
Self-help treatment manual	0.6
Other	1.3
Don t know	4.1
Medicines likely to be most helpful	
Vitamins and minerals	38.8
Anti-depressants such as Prozac or Zoloft	18.3
Herbal medicines or tonics	11.8
Tranquillisers such as Valium or Serepax	0.7
None of the above	22.6
Don't know	7.8

Most participants believed Jenny's problem would be moderately (38.1%) or very (29%) difficult to treat, and a further (10.1%) thought it would be extremely difficult. Thirteen per cent of participants thought that Jenny's problem would be "a little difficult to treat" and a further 7% indicated it would be "not at all difficult to treat". Most participants thought Jenny's prognosis with treatment would be full recovery with either no further problems (29%), with problems likely to re-occur (37%), but without treatment 77% participants thought she would get worse.

To examine associations between responses with age, participants were divided into three groups, namely those aged 15-34 years (younger) (n=236, 24%), 35-54 years (middle) (n=337, 34%) and 55 years or more (older) (n=410, 42%). The younger (25.8%), and middle group (19.3%), were more likely than the older (9.3%) to think the main problem was bulimia nervosa (χ^2= 32.121, p< 0.001). The older group were more likely to say the problem was stress (9% vs. younger 0.8%, middle 1.5%; χ^2= 34.162, p< 0.001); or anxiety (7% vs. younger 2.5%, middle 3.3%; χ^2= 9.197, p=0.01); or poor diet (3.7% vs. younger 1.3%, middle 0.6%; χ^2= 9.626, p=0.008). In addition, the older participants were more likely to say "getting out and about more/ finding some new hobbies" was the best treatment for Jenny (12.7% vs. younger 5.5%, middle 5.6%; χ^2= 15.411, p< 0.001); and less likely to endorse (i) family counselling or therapy was the best treatment for Jenny (12% vs. younger 24.6%, middle 21.1%; χ^2= 19.131, p< 0.001); and (ii) antidepressants as the most helpful medicine (13.2% vs. younger 24.6%, middle 20.2%; χ^2= 14.221, p=0.001).

Females were more likely than males to believe that Jenny's main problem was BN (20.5% vs. 6.9%; χ^2= 14.149, p< 0.001), whereas males were more likely than females to say the main problem was anxiety (6.9% vs. 3.0%; χ^2= 8.314, p=0.004). In regard to the most helpful intervention males were more likely than females to indicate that they do not know which medicine would be most helpful (10.8% vs. 5.7%; χ^2= 8.662, p=0.003).

Participants living in rural areas were (i) more likely to say Jenny's main problem was stress (8.1% vs. 3.4%; χ^2= 8.847, p=0.003); and (ii) less likely to say a psychiatrist or psychologist would be the most helpful person for Jenny (10.8% vs. 19.7%; χ^2= 9.345, p=0.002) compared to those living in metropolitan areas.

Participants who had completed a bachelor degree were more likely to endorse (i) Cognitive Behavioural Therapy (CBT) as the most helpful treatment (17.5% vs. 5.4%; χ^2= 28.032, p<0.001); (ii) a psychologist or psychiatrist as the most helpful person for Jenny (29.2% vs. 15.6%; χ^2= 16.635, p<0.001); and (iii) antidepressants as the most helpful medication (26.6% vs. 16.8%; χ^2= 8.434, p<0.004). Those with a bachelor degree were less likely to believe the non specific treatments such as "just talking about the problem" (5.8% vs. 15.9%; χ^2= 10.737, p=0.001) and "getting out and about more/ finding some new hobbies" (1.3% vs. 9.9%; χ^2= 12.270, p=0.001) would be helpful, than those with lesser education.

For analyses of differences about treatment beliefs depending upon perception of Jenny's main problem, three main groups were identified. The group who believed Jenny's problem was low self-esteem/ lack of self confidence (n=319, 32.5% of total sample), those who identified that Jenny's main problem was any type of ED, *i.e.* the categories of AN, BN, an ED but not AN or BN, and BED combined (n= 397, 40.4% of total sample), and the final group whom believed depression, anxiety or stress were the main problem (n=199, 20.2% of total sample). Participants who believed the main problem was any ED were (i) less likely to think the best treatment was just talking about the problem (9.3%), compared to the low self-esteem group (15.0%), or the depression/ anxiety/ stress group (23.1%; χ^2= 20.778, p<0.001); (ii) less likely to think that getting out and about more/ finding some new hobbies would be the most helpful treatment (3.8%), compared to the low self-esteem/ self confidence group (12.2%), or the depression/ anxiety/ stress group (10.1%; χ^2= 20.778, p<0.001); (iii) less likely to believe that herbal medicines or tonics would be the most helpful medicines (8.1%), compared to the low self-esteem/ self confidence group (12.5%), and the depression/ anxiety/ stress group (17.6%;

χ^2=11.991, p=0.002); (iv) more likely to think that psychotherapy was the most helpful treatment (8.6%), compared to the low self-esteem/ self confidence group (3.4%), and the depression/ anxiety/ stress group (3.0%; χ^2= 11.959, p=0.003); (v) more likely to think a behavioural re-feeding programme would be the best treatment for Jenny (6%), compared to the low self-esteem/ self confidence group (0.0%), and the depression/ anxiety/ stress group (1.5%; χ^2= 24.422 p<0.001); and (vi) more likely to think that a psychiatrist or psychologist would be the most helpful person (23.7%), compared to the low self-esteem/ self confidence group (13.5%), and the depression/ anxiety/ stress group (17.1%; χ^2= 12.535, p=0.002).

DISCUSSION

The present findings suggest that Australians have reasonable ability to recognise AN as a type of ED, however they have poor distinction between AN and other EDs. When compared to recent research on BN and BED MHL (10-15.), it is apparent that AN is more commonly recognised as an ED. This is consistent with Smith et al. (4.) and Huon et al. (16.) but not Hunt and Rothman's findings in College students (9).Many perceived AN as a problem of low self-esteem/self confidence (32.5%), and those who did not recognise the problem as an ED were more likely to endorse non evidence-based treatment strategies such as 'just talking'. Generally, there was moderate regard for various psychological therapies, and for health professionals which play an important role in AN treatment. However less educated participants, older participants and those living in rural Australia had relatively poorer AN MHL.

GPs were regarded as most helpful treatment providers. Whilst not specialising in mental health, it has been found that most individuals who have received treatment for their ED had been identified and treated by their GP(17.) In Australia GPs are the gatekeepers to specialist care. However, recognition and confidence amongst GPs in the treatment of EDs is often poor (18.), thus improving ED MHL and skills in GPs is very important.

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Psychiatrists and psychologists were the second most endorsed helpful treatment provider. In Australia these professionals have specialist level training in treatments for EDs. Compared to research on BN and BED (10-15.) there seems to be greater community support for mental health specialists in the treatment of AN. Dietitians / nutritionists and counsellors / social workers were also commonly endorsed as the helpful treatment providers. However, their ED MHL, confidence and treatment may be limited (19.).

In this study, acquiring information about the problem and available services was the most frequently endorsed helpful treatment. It was encouraging that many participants endorsed an evidence-based treatment (20.). However, non-specific treatments such as just talking were also frequently endorsed. Broad population-based information campaigns to improve recognition, help seeking and use of appropriate evidence-based treatments of EDs, may therefore improve help seeking and uptake of evidence based treatments in EDs. In addition, members of the community who had not completed university education, older members of the community, males, and those living in rural areas were found to have poorer AN MHL. Accordingly, it would be important to design public health awareness campaigns with these groups in mind.

In conclusion, there was moderate regard for evidence-based therapies and for professionals which play an important role in AN treatments. This supports the notion of improving the skills and confidence of relevant health professionals and wider community dissemination of information about AN and its treatments.

CHAPTER FOUR APPENDIX:

The vignette used in the mental health literacy survey

Jenny is a 28 year old "stay at home Mum". She has 3 young children and has recently stopped breastfeeding. Despite major efforts to lose weight in the last five years with a number of diets, she has not had much success until recently. In the last 6 months Jenny has started jogging every night, when her husband arrives home to look after the kids. If she ever misses a night she feels guilty and upset and jogs twice as far the next day. In the last few months Jenny has cut back on her food intake while her husband is at work, she often skips breakfast and only has a small salad for lunch. Jenny has also started secretly vomiting after her husband cooks high fat dinners for the family. Jenny thinks she is fat and worthless; although she is enjoying compliments she has obtained from her husband regarding weight loss (about 10 kg). Jenny is 168cm tall and has a present weight of 44kg (BMI =15.6). She looks thinner than most 'supermodels'.

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CHAPTER FIVE – THE PARADOX OF POSITIVE REGARD AND PERCEIVED DISCRIMINATION IN EATING DISORDERS: IMPLICATIONS FOR PREVENTION AND TREATMENT

THE PARADOX OF POSITIVE REGARD AND PERCEIVED DISCRIMINATION IN EATING DISORDERS: IMPLICATIONS FOR PREVENTION AND TREATMENT

Abbreviated title: Positive regard and discrimination in Eating Disorders

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Key words: obesity, binge-eating, anorexia, body-image, stigma.

ABSTRACT

The aim of the present study was to explore the apparent paradox of a favourable regard towards weight losing and other eating disorder (ED) behaviours in the context of known high levels of community stigma towards EDs and obesity. Data were derived from interviews with individuals participating in a general population health survey. Vignettes of a female with Anorexia Nervosa (AN), a male with Eating Disorder Not Otherwise Specified (EDNOS) and an overweight female with Binge Eating Disorder (BED) were presented to three randomly selected sub-samples of n=983, 1033 and 1030 respectively. Questions followed that assessed attitudes towards the person with the ED and their relevant ED behaviours. Levels of perceived discrimination were moderate: 683 (65.7%) for the BED (majority because of her weight disorder and significantly more likely in graduates and older participants), 436 (45%) for the AN (significantly more likely in graduates, in older and in obese participants) and 345 (33%) for the EDNOS (significantly more likely in older participants) vignette respectively. A positive regard for the weight loss or body image enhancing ED behaviours was reported 'occasionally' or more often in 7.5% respondents to the AN vignette and 29.3% respondents to the EDNOS vignette. Favourable regard was significantly more likely in obese, females (AN vignette only), younger and ED symptomatic participants. Levels of positive regard for ED behaviours were significantly lower in those who perceived discrimination towards the EDNOS but this was not found towards the AN vignette. The findings support integrated ED and obesity prevention programs that address the social desirability of ED behaviours in vulnerable individuals.

INTRODUCTION

A favourable regard for weight loss in anorexia nervosa (AN) has been found in surveys of university and college students [1, 2] and friends and family of AN sufferers [3]. Furthermore, there is a perception that other people are likely to imitate the disordered eating behaviours of a person suffering from AN or Bulimia Nervosa (BN) [2]. This is a concern as it may lead to an uptake in dieting and lead to other eating disorder (ED) behaviours [4-5] that are associated with poor quality of life [6] weight gain and obesity onset over time [7-8]. In addition, the weight loss strategies in AN and BN are desired by women with EDs, possibly reflecting a focus on the perceived positive symptoms of the disorders e.g. weight loss, whilst ignoring other symptoms such as vomiting, poor self esteem, low mood, binge eating and starvation [1,9,10].

Positive attitudes towards ED behaviours co-occur with known stigma and discrimination, most research being on AN and BN. In community samples in the UK [11] and the USA [12], it has been reported that ED stigma is high, with many people reporting difficulty talking to and empathising with people with EDs, and a general perception that EDs are 'self-inflicted', or that sufferers 'have only themselves to blame' and 'could pull themselves together'. Studies in a number of high school and university samples have also found stigmatising attitudes toward EDs, with students perceiving ED sufferers as self centered, fragile, and likely to use their disorder to gain attention. The majority of students reported that they would be unwilling or have mixed feelings about interviewing an ED sufferer for a job, or in considering them as a dating partner [1,2,13-14]. However, some participants in community and student studies have shown a more compassionate attitude, indicating that AN and BN are severe distressing conditions which warrant sympathy [1,9,15]. Women with ED symptoms have reported higher rates of perceived discrimination against a BN sufferer, compared to asymptomatic women [10]. This is problematic as perceived stigma associated with bulimic behaviours can be a barrier to seeking treatment [16-17].

There is much less research examining community beliefs and stigma associated with Binge Eating Disorder (BED) and other Eating Disorders Not Otherwise Specified (EDNOS). In 2009, Bannon et al. examined differences in undergraduate psychology students' responses to a written scenario describing two obese women, with and without binge eating. The majority of students considered the obese woman with binge eating to be less attractive, less comfortable to be around, more likely to be blamed for her weight, as well as more difficult to treat, compared to the non binge eating obese female [18]. In general populations, weight stigma and discrimination has been found to be common and increasing. For example, Andreyeva et al. found in a US population sample that the prevalence of weight discrimination increased from 7% in 1995–1996 to 12% in 2004–2006 [19]. An increase in weight based discrimination is important to the ED field as victims are at risk of increased body dissatisfaction, poor self esteem and emotional or binge eating [20-22].

The aim of the present study was to explore the apparent paradox of favourable regard despite stigma towards EDs, better understanding of which may have implications for the conduct of health promotion programs. Specific aims were to investigate and compare perceived discrimination and positive attitudes for weight and/or shape control strategies among three types of ED sufferers: a female sufferer of co-morbid obesity and BED; a female underweight sufferer of AN; and a male normal weight sufferer of EDNOS. In addition, within each problem-type we considered associations between perceived discrimination and positive regard, and participants' demographic and other characteristics, namely, their age, gender, level of education, body weight and ED features. To investigate putative effects on treatment seeking we also examined associations between perceptions of discrimination and treatment difficulty. It was hypothesised that there would be a relationship between positive regard and discrimination, such that as positive regard for a disorder increases the perceived discrimination would decrease. It was anticipated that there would be higher levels of positive regard for AN vignette compared to the EDNOS vignettes given the AN character was underweight. Furthermore it was expected that perceived discrimination would be high across all three

disorders; AN, normal weight EDNOS, and obese BED. Finally, it was hypothesised that those at higher risk for eating disorders, namely females and those participants suffering from obesity, as well as those participants regularly engaging in ED behaviours, would have higher regard for the weight loss behaviours of the female AN sufferer, and the shape control behaviours of the male EDNOS sufferer compared to other participants.

METHOD

A large cross-sectional single stage general population survey was conducted in the South Australian population, under the auspices of the South Australian Health Commission in 2005. The interviews comprised a range of health-related and demographic questions. Both metropolitan and rural households were surveyed. Sample selection and interview procedures are discussed in further detail in previous publications [23-24].

Attitudes and beliefs concerning ED behaviours were assessed in the final section of the survey, in which a vignette of a fictional person suffering from an ED was presented, followed by a series of questions concerning the problem described. After the vignettes were read aloud to participants a written copy was provided to them, in order that they could reflect further on the vignette as the interview proceeded. Chosen households were allocated at random to one of three different versions of the survey, containing vignettes of AN, EDNOS and BED, respectively, so that approximately one third of participants responded to each vignette type. The vignettes were modelled on earlier vignettes used in the ED field to assess community beliefs regarding eating disorders [1,-10,23]. The vignettes are provided in Appendix A.

Perceived discrimination towards the person in the vignettes was assessed by the question "Do you think that Jenny (or Alison or Andrew) would be discriminated against by others in the community if they knew about her/his problems, for example, by an employer, a colleague, a

family member, or by a health professional?". In the obese BED vignette an additional question was asked to determine if discrimination was thought due to eating problems or a weight problem.

Positive regard for the symptoms in the AN vignette were examined with the question "Have you ever thought that it might not be too bad to be like Jenny, given that she has been able to lose a lot of weight?", whereas positive regard for the symptoms in the male EDNOS vignette were examined with the question "Have you ever thought that it might not be too bad to be like Andrew, given what he has been able to attain e.g. a good muscle tone and high level of exercise?". A five point rating scale from 'never' thought it through to 'always thought it' was administered. The expression "it might not be too bad" is an Australian colloquial phrase which is actually a positive feeling toward the issue been discussed. Positive regard for the ED behaviours of the obese BED sufferer (i.e. binge eating) was not assessed as there was no theoretical rationale for this to occur.

Four ED features were assessed. These were binge eating, purging, strict dieting or fasting, and extreme weight or shape concerns. Binge eating was described as an episode of "eating an unusually large amount of food in one go and at the time feeling that the eating was out of control, [that is you could not prevent yourself from overeating or that you could not stop eating once you had started]". Purging was described as the use of "laxatives, diuretics (water tablets), or made yourself sick, in order to control your shape or weight". Strict dieting was described as "going on a very strict diet" or "eating hardly anything at all for a time", for the purpose of weight or shape control. Current regular use of these behaviours was defined as the behaviour occurring at least weekly over the three months prior to the interview. The occurrence of extreme weight or shape concerns was assessed with the question "Has your weight and/or your shape influenced how you think about (judge) yourself as a person?". A six point rating scale from 'not at all - no influence', through to 'extremely' important was administered. For the purposes of this paper, participants with a score of 4 (moderate influence) or more, were

considered to have undue influence of shape or weight on their evaluation of self as a person. Body mass index (BMI; kg/m^2) was calculated from self-reported weight and height. Obesity was classified as a BMI of 30.0 kg/m^2 or above using the classification scheme outlined by the World Health Organization.

All subjects in the study gave informed consent, and ethics approval was obtained through the South Australian Department of Health Ethics Committee.

STATISTICAL ANAYLYSIS

Data are presented as the percentage of participants choosing particular options for each question. Data were weighted by the inverse of the individual's probability of selection, then re-weighted to benchmarks derived from the Estimated Resident Populations at 30th June 1994, by age, sex and Local Government Area, from the Australian Bureau of Statistics (Catalogue No 3204.4). The effects of obesity status, gender, age educational status, and regular ED behaviours on participant perceived discrimination, and positive regard toward the ED vignettes were all examined by means of Chi-Square tests. Between group differences in perceived discrimination and positive regard or treatment difficulty were tested using non parametric Mann-Whitney U tests. All tests were conducted using the software SPSS version 18.

RESULTS

Demographic features of the participants
From 4827 households selected for interview, interviews were completed with 3,047 individuals (63.1%). The participation rate (proportion of individuals with whom contact was established who were interviewed) was 70.8%. One participant choose not to complete the section of the interview regarding recognition and beliefs about EDs. The demographic features, weight status and ED features of the participants are shown in Table 1.

Table 1. Demographic, weight status and Eating Disorder features of participants (n=3047)

	Mean	SD
Age	45.1	18.8
BMI (n=2813)	26.0	5.3

	N	%
Gender		
Female	1553	51
Country of birth		
Australia	2363	77.5
UK and Ireland	296	9.7
Other European	84	2.7
Other	304	10.0
Region of residence		
Metropolitan:rural	2137:910	70:30
Marital status		
Never married	736	24.2
Married/ Living as married	1900	62.3
Separated or divorced or widowed	411	13.5
Level of education		
Still at school	199	6.5
Left school at 15 years or less	393	12.9
Left school after age 15	708	23.2
Left school after age 15 but still studying	153	5.0
Trade qualification/ Certificate/Diploma	1107	36.3
Bachelor degree or higher	486	15.9
Annual household income		
$A 12,000 or less	157	5.1
$A 12,001 - $40,000	886	29.1
$A 40,001 - $80,000	903	29.6
$A 80,001 or more	681	22.4
Not stated	420	13.8
Eating Disorder Features in current 3 months		
Regular weekly binge eating	218	7.1
Regular weekly laxative, diuretic use or vomiting	47	1.5
Regular weekly strict dieting or fasting	140	4.6
Shape or weight moderately or more important in self-evaluation	551	18.0

Of the total participants, 1039 (34%) were selected to answer the questions pertaining to the co-morbid obese/BED vignette, 1042 (34%) were selected to answer the questions pertaining to the male EDNOS vignette, and 965 (32%) were selected to answer the questions pertaining the AN vignette. The three different subgroups were compared, and it was found there was a significant difference in the proportion of each gender answering the different vignettes (for obese/BED vignette 571 female (55%), for EDNOS vignette 482 female (46%), for AN vignette 500 female (52%, (χ^2=16.3, df=2, p<0.001)). There were no other demographic, weight status or ED features that differed significantly between the subgroups.

Perceived discrimination

Of 1039 participants selected to answer the questions regarding the co morbid obese/ BED vignette, 683 (65.7%) thought that the sufferer would be discriminated against, 308 (29.6%) indicated that she would not, and the remaining 48 (4.7%) indicated that they did not know. Of those who said she would be discriminated against, the majority (n=572, 83.5%) believed this would be due to weight problems, 96 participants (14.1%) thought it would be due to eating problems and the remaining 16 (2.4%) did not know. There were no significant differences in gender, how obese and non-obese participants, or how participants with and without ED features responded to these questions. Seventy-seven percent of those with a bachelors degree or higher perceived discrimination compared to 66% of those without (χ^2=5.6, df=1, p=0.02). Younger participants (age 15-34 years) were less likely (60%) than those aged 35-54 years (73%) or those aged more than 55 (74%) to believe the sufferer of co-morbid obesity and BED would be discriminated against (χ^2=18.4, df=2, p<0.001). However, of those who thought there would be discrimination, whether this would be for weight or eating problems did not significantly differ by age or obese/non-obese status.

Of the 983 participants selected to answer the questions regarding the AN vignette 436 or 45% thought that the AN sufferer would be discriminated against, 462 (48%) thought that she would not be discriminated against and 67 (7%) did not know. Obese participants (n=92, 57%) were

more likely than non-obese (n=311; 46%) to perceive discrimination (χ^2=5.62, df=1, p=0.02). Those with a bachelor degree (59%) as compared to those who have not obtained this level of education (47%; χ^2=6.3, df=1,p=0.01) were also more likely to perceive discrimination. There were no significant differences among participants with or without ED features, of either gender in response to these questions. There was a statistical trend for younger participants (age 15-34 years) to be less likely (44%) than those aged 35-54 years (49%) or those aged more than 55 (53%) to perceive discrimination (χ^2=4.74, df=2, p=0.09) and the difference between those aged 15-34 years compared to those older than 34 reached significance (χ^2=4.1, df=1, p<0.05).

Of the 1042 participants selected to answer the questions regarding the male normal weight sufferer of EDNOS, 345 (33%) thought that the sufferer would be discriminated against, 640 (61%) thought that he would not be discriminated against, and 58 (6%) did not know. There were no significant differences in how obese and non obese participants, participants with or without ED features, the two genders, or those with a bachelor degree as compared to those who have not obtained this level of education, answered these questions. However, younger participants aged 15-34 years and 35-54 years were less likely (31 and 32% respectively) to perceive discrimination compared to those aged 55 years or more (45%) (χ^2=17.4, df=2, p<0.001).

Positive regard for ED behaviours

Of participants selected to answer the questions regarding the AN and male EDNOS vignette, the majority of participants 'never' had the desire to be like the AN vignette (n=828, 86%) given her weight loss, or to be like the EDNOS vignette (n=622, 60%) given his muscle tone and high exercise. Fewer participants 'rarely' thought this in regard to AN (n=107, 10%), and EDNOS (n=62, 6%). A similar portion 'occasionally' thought this in regard to AN vignette (n= 60, 6%), and a larger proportion in regard to the EDNOS vignette (n=227, 22%). A minority of participants 'often or always' thought like this in regard to the AN vignette (n=15, 1.5%) or the EDNOS vignette (n=82, 7.3%).

Prior to examining the influence of demographic features and obesity status on results, the answers were recoded into two answers: those who had never or rarely had these thoughts, and those who had occasionally through to always had these thoughts. In the AN vignette sub-sample, age group, education status, did not significantly influence the result of the question concerning positive regard for AN symptoms. Those participants suffering from obesity were significantly more likely (n=23, 14%) than those who were not obese (n=49, 6.8%) to report positive regard for the AN symptoms (χ^2=8.0, df=1, p=0.005). Males (n=27, 5.8%) were less likely to have a favorable regard than females (n=48 9.6%; χ^2=4.84, df=1, p=0.03). Those participants who reported regular purging behaviours (n=4, 21%) were significantly more likely than those without (n=72, 7.6%; χ^2= 4.65, df = 1, p=0.03) to favour the AN symptoms, and those reporting regular strict dieting or fasting were significantly more likely (n=9, 20%) to report high positive regard for the AN symptoms, compared to those not engaged in strict dieting or fasting (n=66, 7.2%) (χ^2=9.82, df=1, p<0.01 Fishers exact statistic). Those participants suffering from regular (>once a week) binge eating were significantly more likely (n=19, 28%) than those not engaged in regular binge eating (n=56, 6%) to report a high positive regard for the AN symptoms (χ^2=41.5, df=1, p<0.001). Finally, participants with an undue influence of shape or weight on self-evaluation were significantly more likely (n=24, 32%) than those with low shape or weight influence on self-evaluation (n=134, 15%) to report a high positive regard for the AN symptoms (χ^2=14.5, df=1,p<0.001).

In the male EDNOS vignette sub-sample, gender, education status, or the presence of purging behaviours did not significantly influence the result of the question concerning positive regard for EDNOS symptoms. Younger participants, i.e. those in the 15-34 year old age group (n=126, 34%) and those in the 35-54 year old age group (n=127, 35%), were more likely than older participants aged 55 years or more (n=55, 18%) to have high regard for the EDNOS symptoms (χ^2=27.3, df=2, p<0.001). Also, participants suffering from obesity (n=75, 43%) were more likely than those who were not obese (n=212, 27%) to have high regard for the EDNOS symptoms (χ^2=17.2, df=, p<0.001). Similarly, participants engaging in regular strict dieting or

fasting (n=27, 56%) were more likely to have high regard for the EDNOS symptoms, compared to participants not regularly engaging in these behaviours (n=255, 25.8%) (χ^2=16.4, p=0.003), as were participants who suffered from regular binge eating (n=38, 59%), compared those who did not (271, 28%) (χ^2=27.2, df=1, p<0.001). Finally, participants with an undue influence of shape or weight on how they evaluate themselves as a person were significantly more likely to have high regard for the EDNOS symptoms (n=102, 52%), compared to those who did not (n=207, 32%) (χ^2=55.0, df=1, p<0.001).

Relationship between perceived discrimination and positive regard for ED behaviours

Levels of positive regard for the weight reducing behaviours of the person in the AN vignette were not significantly different in the 436 participants who perceived discrimination for her, compared to the 463 who did not perceive discrimination (median levels in both groups = 'never', IQ range 'never'-'never'; Man-Whitney U test p=0.41). Levels of positive regard for the muscle tone enhancing and exercise behaviours of the person in the EDNOS vignette were significantly lower in the 346 participants who perceived discrimination for him (median regard 'never', IQ range 'never'-'rarely'), compared to the 640 who did not perceive discrimination for him (median regard 'never', IQ range 'never'-'occasionally'; Mann-Whitney U test p<0.02).

Relationship between perceived discrimination and treatment difficulty

Perceived level of treatment difficultly for the person in the AN vignette were significantly higher in those participants who perceived discrimination for her (median level 'moderately', IQ range 'moderately' to 'very difficult') compared to those who did not perceive discrimination (median level 'moderately', IQ range 'a little' to 'very difficult'; Man-Whitney U test p<0.001). Levels of treatment difficulty for person in the EDNOS vignette were significantly higher in the participants who perceived discrimination for him (median 'moderately difficult', IQ range 'a little' to 'moderately'), compared to those who did not perceive discrimination for him (median 'a little', IQ range 'not at all difficult' to 'moderately difficult'; Mann-Whitney U test p<0.001). Levels of treatment difficulty for the person in the

BED vignette were also significantly higher in the participants who perceived discrimination for her (median 'moderately difficult', IQ range 'moderately-'very difficult'), compared to those who did not perceive discrimination for him (median 'moderately', IQ range 'a little' to 'very difficult'; Mann-Whitney U test p<0.001).

DISCUSSION

The majority of participants believed there would be discrimination against the woman suffering from co-morbid obesity and BED and 45% perceived discrimination for the underweight woman with AN. In contrast, fewer thought the normal weight man suffering from EDNOS would be discriminated against. Younger participants were less likely than older participants to believe the ED sufferers would be discriminated against. A sizable minority of the community had a favorable regard for the features of AN and EDNOS. Other hypotheses were however partly supported. Whilst participant gender was found to play no role in the desirability of the EDs, obesity and the presence of ED symptoms including undue influence of shape or weight on self evaluation did increase the likelihood of participants having positive regard for the ED behaviours markedly. Perceived discrimination was related to perceived treatment difficulty, which may help explain in part previous qualitative findings of an association between stigma and poor help seeking [16-17] i.e. both may be acting together as a barrier to accessing therapy.

When forced to choose between the reasons of weight and eating, the majority of participants thought that discrimination for the woman with obesity and BED would be due to weight problems. Stigma and discrimination in obesity is well documented [19-20], and the present study's findings suggest that the community consider discrimination is more due to weight problems rather than an ED problem. Brannon et al. found increased stigma against an obese sufferer of BED compared to a sufferer of obesity alone [18], which also indicates that stigma due to the eating and the weight disorder may be cumulative. It has been reported in the obesity

literature that obese females are more likely to experience discrimination compared to obese males [19, 25-26] and gender differences in ED discrimination, such as found in the present study towards the obese BED character, merit further exploration.

Many participants in the present study also believed discrimination would occur in the underweight female sufferer of AN, therefore it maybe that discrimination based on health problems increases when symptoms are highly visible e.g. severe underweight or obesity. This could also explain why the number of participants who perceived that the normal weight sufferer of EDNOS would be discriminated against was lower. The difference may as well be due to other features, namely the greater acceptability of the EDNOS behaviours (i.e. exercise), the gender difference of the vignettes, and possibly an increased association for AN with mental health problems and stigma due to psychiatric illness in general. In addition, we found younger participants and those without a university level degree in both the obese binge eating scenario and the AN scenario were less likely to believe the individual would be discriminated against. Whether this reflects improved attitudes toward eating and weight problems amongst young people (who may also be less likely to have completed a degree) or simply a level of naivety with less lived experience, can only be speculated upon at this time.

A small but notable proportion of the community had high regard for the weight and shape control behaviours of the AN vignette, and to a greater degree of the EDNOS vignette. This is consistent with previous studies that have found community members find certain aspects of EDs highly desirable [1-3]. Those people with higher levels of shape and weight influencing self-evaluation, dieters, and those with regular binge eating were significantly more likely than others in the community to have a favourable regard for the behaviours depicted in the AN and EDNOS vignettes. Many of these participants with a favourable regard for ED features would have sub-threshold ED symptoms and could be at risk for developing clinical EDs. Interventions for similarly at risk individuals have been successful in reducing the onset of

further EDs symptoms and clinical EDs [5], and the present findings add support to making these interventions more widely available.

The significantly higher levels of ED behaviour desirability amongst obese participants was also of concern. This finding helps to explain the increasing rates of ED behaviours amongst obese persons in Australia [24], as body image concerns in obese people are likely to drive acceptability toward these behaviours. However, they may not be aware that these factors place them at higher risk of poor psychological health [27] and further weight gain over time [7-8]. Consistent with this, is the finding of no relationship between perceived discrimination and positive regard for the behaviours in the AN vignette. Features of AN often give the sufferer a welcomed sense of self-control and this is reinforced by societal attitudes [28], both of which perpetuate the disorder despite associated psychological distress and stigma of mental illness. However, this was not found for levels of positive regard for the behaviours of the person in the EDNOS vignette which, as might be expected, were lower in those who perceived discrimination.

A limitation of this study is the lack of detail about what form the discrimination would take. Although the question stated several examples (such as discrimination by an employer, a colleague, a family member, or by a health professional) participants were not given the opportunity to think about each of these separately. Similarly, stigma was not assessed on a personal level, for example, how comfortable would the participant be socialising or working with a sufferer with this problem, or if a similar problem had caused them to be discriminated against and the nature of that discrimination. Another limitation is the gender differences in the vignettes and the male gender of the EDNOS vignette may have contributed to the different level of responses to the questions on perceived discrimination and positive regard. This requires further investigation. Finally, we chose not to ask the question of favourable regard for the binge eating behaviour of the participants given the BED vignette. The strengths of the

research include the large representative population sample, the good response rate, and the nesting of the questions within a larger health survey, decreasing selection bias.

This study adds further credence to the calls for an integrated approach to ED and obesity prevention [29-30]. Such a prevention effort should aim to increase awareness of the morbidity from EDs and extreme dieting behaviors [10]. Informing sufferers about accessible and effective therapies for these problems, and would also help redress the issue of lack of knowledge about effective treatments being a barrier to help seeking [16]. Any broad based public health campaign should aim to mitigate weight based discrimination, and promote positive self esteem and body image, regardless of size. In our view, promotion of healthy eating and exercise practices should be available to the whole of the community, and efforts be made not to single out, stigmatise or isolate vulnerable individuals i.e. those suffering from obesity and/or co-morbid disordered eating, this is supported by obese persons experiences of health campaigns [31-32]. Furthermore, a returned emphasis on solving environmental and culture problems which are associated with disordered eating and obesity, for example, public planning and media influences, rather than placing onus on obese individuals may be helpful.

In conclusion, we found high levels of perceived discrimination against obese and underweight sufferers of EDs, whilst normal weight sufferers appear to be less affected. Paradoxically, there is a large minority, especially amongst obese persons and persons already suffering ED behaviours or with body image concerns, who find the weight reducing and body image enhancing aspects of people with EDs desirable. Public health interventions targeting obesity need to be mindful of the likely positive regard for ED behaviours amongst many obese persons.

CHAPTER FIVE APPENDIX:

Vignette 1.

Jenny is a 28 year old "stay at home Mum". She has 3 young children and has recently stopped breastfeeding. Despite major efforts to lose weight in the last five years with a number of diets, she has not had much success until recently. In the last 6 months Jenny has started jogging every night, when her husband arrives home to look after the kids. If she ever misses a night she feels guilty and upset and jogs twice as far the next day. In the last few months Jenny has cut back on her food intake while her husband is at work, she often skips breakfast and only has a small salad for lunch. Jenny has also started secretly vomiting after her husband cooks high fat dinners for the family. Jenny thinks she is fat and worthless; although she is enjoying compliments she has obtained from her husband regarding weight loss (about 10 kg). Jenny is 168cm tall and has a present weight of 44kg (BMI =15.6). She looks thinner than most 'supermodels'.

Vignette 2.

Andrew is a 26 year old male who works in the meat works. Andrew is normal weight with good muscle tone, but feels that he has a "pot belly". Andrew is very worried about his looks and wants to bulk up his muscles and lose fat. Andrew's job involves a lot of physical labour but he does not count this as exercise. Every night Andrew spends an hour and a half in the gym lifting weights, and on his day off he goes for a 15km run. Andrew has recently started replacing his dinner meal with a high protein sports drink. He also tries to eat high protein foods through the rest of the day. He sometimes (about twice a week) has uncontrolled eating 'binges' where he eats e.g. half a loaf of bread in the late afternoon. Andrew does not have many friends and feels that if he changes his shape he will be more attractive and a better person.

Vignette 3.

Alison is a 32 year-old secretary working at a solicitor's office. Alison has been overweight since she was an adolescent but in recent years this has increased to where she is now a size 18

and has been told she has 'severe obesity'. Over the years Alison has tried a number of diet and healthy eating plans; however she has never stayed with the recommendations for very long. Alison lives by herself and often feels lonely; to counteract these feelings Alison likes to 'treat' herself with luxurious foods such as chocolate and cheesecake. Alison's diet is regular with 3 meals a day and it contains a wide variety of foods. When Alison gets home from work she often goes to the fridge for a small snack, however Alison finds that after eating the snack she is unable to stop eating and continues to eat a large amount of food. She may eat for example an apple, a slice of cheesecake, 5 biscuits, a jam sandwich and three glasses of milk. Later in the evening she will eat dinner and sometimes she loses control with this also and eats the extra helping that she was planning to save for the next day. Alison feels guilt and sadness after she has eaten like this and despises the shape of her body. Alison has never told anyone about the way she feels or the way she loses control of her eating. She has often thought about different ways to control her weight (e.g. exercise or laxatives) but has never done them.

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CHAPTER SIX – BETTER PSYCHOLOGICAL HEALTH IS ASSOCIATED WITH WEIGHT STABILITY IN WOMEN WITH EATING DISORDERS

Title: Better psychological health is associated with weight stability in women with eating disorders.

Abbreviated title:

Weight change in eating disorders

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ABSTRACT

Aim: To explore the associations between changes in weight, eating disorder psychopathology and psychological distress in a community sample of women with eating disorders over two years.

Method: One hundred and twenty two women identified with disordered eating in a baseline population survey agreed to participate in a follow up study, of whom 87 (71%), mean age 28 $\pm$ 6.2, completed the two year follow up. Body mass index, eating disorder psychopathology, psychological distress, and demographic details were assessed at both time points.

Results: Over the two years there was a mean weight gain of 1.76 kg (SD 7.03), 11 (13 %) women lost $\geq$ 5kg, 25 (29%) gained $\geq$ 5kg, and 49 (58%) remained weight stable (i.e., within 5kg of baseline weight). Comparisons between those who had lost, gained and remained weight stable showed few significant differences, however, women who remained weight stable were the least psychologically distressed at baseline and those who lost weight had the greatest reduction in shape concern. Body mass index at baseline, and change in level of binge eating episodes were not associated with weight change.

Conclusion: Disordered eating behaviours have little influence on weight change over two years in community women with disordered eating. Low levels of psychological distress at baseline may promote weight stability. Concerns about shape are likely to increase with increased weight.

INTRODUCTION

Whilst often regarded as distinct problems, eating disorders and weight disorders have many common characteristics, including dieting behaviour, binge eating, poor body image and psychosocial difficulties (1-8). Our recent work has indicated that community women with obesity have significantly higher levels of dietary restraint, eating concern, weight concern, shape concern, binge eating, misuse of diuretics, use of diet pills and fasting compared to other women, and that in women with obesity: eating concern, weight concern, shape concern, dietary restraint and younger age predicted psychological distress in a multivariate model (9). Weight is an important outcome variable in eating disorders with the problems of obesity in relation to the development of chronic lifestyle disease such as diabetes mellitus and cardio-vascular disease well documented (10-11), and research showing increased mortality for both obese and underweight people (12).

Work examining relationships amongst disordered eating psychopathology, obesity, psychological distress and psychosocial quality of life, has found binge eating (13-14), and more recently weight and shape concerns (15), to be the main factors related to the psychosocial quality of life and general psychological distress independent of weight. This is in agreement with numerous cross sectional studies showing no clear relationship between levels depression and obesity status (16).

In a 20 year prospective study on weight and psychopathology in a general community sample of adults, Hassler et al found binge eating to be associated with being overweight and with increased weight gain (17). Many cross sectional studies have found similar associations (1, 18-20). In contrast in a 4 year prospective study on adolescent girls, Stice et al found binge eating did not predict obesity onset; and that other behaviours congruent with eating disorders, including self reported dietary restraint, extreme weight control behaviours such as vomiting

and laxative misuse, and factors such as depressive symptoms and perceived parental obesity, predicted obesity onset over time (21). Neumark-Szrainer et al also found that dieting and unhealthful weight control behaviours at baseline were related to both weight gain and binge eating 5 years later, however they did not report on the relationship between weight gain and binge eating (22).

Few studies, other than those on treatment effects, have examined weight outcomes in people with eating disorder prospectively. One study on the course of binge eating disorder (BED) and bulimia nervosa (BN) over a 5 year period, found obesity increased from 22% to 39% in participants with BED and from 12% to 20% in participants with BN. BED suffers gained an average of 4.2kg $\pm$ 9.8kg and those with BN gained an 3.3kg $\pm$ 10.1 this time frame (23).

This study aimed to explore the relationship between change in weight and eating disorder psychopathology in community women with disordered eating over two years. We hypothesised that in this sample of women with disordered eating, weight would increase, and there would be a positive association between disordered eating behaviours (binge eating, fasting, and purging) and increase in weight. We also predicted that higher psychological distress at baseline would be associated with weight gain. There were no specific hypotheses on the relationship between weight change and eating disorder cognitions i.e. perceived dietary restraint, eating concerns, weight concerns and shape concerns, or with psychological distress, as this part of the study was exploratory.

METHOD

Design and Participant Recruitment

Community women identified with disordered eating were followed to two years. The first year of the follow-up study was a randomised controlled trial (RCT) of a mental health literacy intervention compared to a no intervention control (24).

Participant recruitment took place in three phases. First, in 2003-2004 we conducted the Women's Health and Well-Being Study, a large-scale epidemiological study of disability and health-service utilization associated with the more commonly occurring (bulimic-type) eating disorders among young adult women in the community (25). At this phase, self-report questionnaires were posted to a sample of 10,000 female residents aged 18-42 selected randomly from the electoral roll of the Australian Capital Territory (ACT) region of Australia (population 323,000), a highly urbanized region which includes the city of Canberra. A total of 5255 individuals responded to the phase one questionnaire which included measures of eating disorder psychopathology, height and weight, psychological distress, quality of life (QoL), socio-demographic information, and self-reported height and weight. Three hundred and twenty-four respondents who met the screening criteria (based on the Eating Disorder Examination Questionnaire (EDE-Q) (26) and who indicated a willingness to be contacted at a future date participated in the second phase of the study, involving administration of a structured interview for the assessment of DSM-IV eating disorders, namely, the Eating Disorder Examination (EDE 12th edition) diagnostic items (27).

At the third phase, 185 women with eating disorder symptoms of clinical severity, namely (i) shape and/or weight concerns of at least moderate importance (score $\geq$4 on the EDE) during the current three months, and/or (ii) one or more regular eating disorder behaviour(s) such as objective and/or subjective bulimic episodes and extreme weight control behaviour(s), and who did not have anorexia nervosa (DSM-IV criteria (28)), were invited (by JM) to participate in a follow-up study. None were excluded because of anorexia nervosa. One hundred and twenty-two (66%) women agreed and were randomised to an intervention or a control group. They did not differ in age (mean 28 years in both groups) or level of eating disorder symptoms from the 63 who did not participate (global EDE-Q mean of 3.7 and 3.8 respectively, p=.72). Ninety (74%) completed six months, and 102 (84%) completed 12 month follow-up, and 87 women (81.7%) completed the two year follow-up.

At baseline half the women (n=61) were given a mental health literacy package about eating disorders, effective treatments, a list of services indicating where to seek help and purchasing information on a self directed treatment manual. The control group (n=61) were given a list of services only. At the end of year one the control group was also posted the intervention. The results of the RCT have been published elsewhere (24). The present study reports the findings at two years of follow-up.

Of the 122 women in the randomised controlled trial, 87 women (71%) completed the two year follow-up at a median of 2.27 years (mean 2.29, SD 0.15). Women who completed the follow-up were more likely to have achieved education beyond the high school certificate than women whom did not complete the follow up (n = 35) (55.3% versus 47.1%; p = .036). Of the women with complete follow-up, 42.5% had been seeking professional help for an eating problem before the baseline assessment compared to 17.1% of women whom did not complete follow-up (p = .011). None of the other socio-demographic characteristics, measures of severity of eating disorders, and measures of psycho-pathology assessed at baseline, differed between women who completed and women who did not complete the follow-up.

The ACT Human Health Research Ethics Committee provided ethics approval for the baseline assessment and approval for the follow up study was provided by the James Cook University Human Ethics Committee. All participants gave written informed consent.

MEASURES

Weight Status

Change in weight over two years was calculated from self-reported weight at both time points (weight at 2 years- weight at baseline). In this study weight stability was classified as those whom at two years remained within 5kg of their baseline weight, weight gain was classified as greater than or equal to 5kg positive weight change, weight loss was classified as greater than or equal to 5kg negative weight change. There is no universally accepted cut off points for what is

considered weight stability, or weight loss or gain, and past research has used a wide range of classification methods. However, the amount of 5kg has been used in the past to describe major weight gain (29), and a weight loss of 5kg used to describe successful dieters (30), this cut off point also helps to differentiate between women who have had small fluctuations in weight, and those who have had a significant weight change.

Body mass index (BMI, kg/m^2) was also calculated from self-reported height and weight. Classification of weight was completed using the classification scheme outlined by the World Health Organisation and utilised in the Australian Clinical Practice Guidelines for the Management of Overweight and Obesity in Adults (31). Underweight BMI < 18.5, normal weight BMI $\geq$18.5 and < 25; overweight BMI $\geq$ 25 and <30, obesity BMI $\geq$ 30.0 (27).

Eating Disorder Examination Questionnaire (EDE-Q)

The EDE-Q (26,32) is a 36-item self-report measure derived from the Eating Disorders Examination interview (EDE) (27). The EDE-Q focuses on the past 28 days and is scored using a 7-point, forced-choice, rating scheme. Subscale scores relating to dietary restraint, eating concerns, concerns about weight and concerns about shape - and a global score, are derived from the 22 items addressing these attitudinal aspects of ED psychopathology. In this study, however, the scoring system for dietary restraint subscale is altered so that it does not take into account the item on fasting. This is because fasting is assessed as an actual behaviour "Have you gone for long periods (8 hours or more) without eating anything in order to influence your shape or weight", whereas, the ratings on other items in the subscale assess attempted dietary restriction regardless of their success e.g. "Have you tried to avoid eating any foods which you like in order to influence shape or weight?" Problems with the internal consistency of the fasting item of the EDE-Q have been reported previously (33). Frequencies of other ED (overeating and compensatory) behaviours are also assessed in terms of the total number of episodes occurring during the past four weeks or in the case of fasting 7 options of various frequencies. Objective bulimic episodes (eating episodes with an unusually large amount of

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food consumed and the experience of loss of control), and subjective bulimic episodes (eating episodes where there was a loss of control and the participant ate more than they would like, however the amount was considered not large for the situation), were combined into an overall score of bulimic episodes. Self induced vomiting, laxative, and diuretic misuse as a means of controlling shape or weight, were combined into an overall score of purging. Hard exercise was also assessed with reference to the behaviour being used as a means of controlling shape and weight. Fasting was assessed as described above. Reliability and validity of the EDE-Q has been demonstrated in both community and clinical samples (with the exception of over estimation of the binge eating items) (33, 34).

Kessler-10 item distress scale (K-10)

General psychological distress (depression and anxiety) were assessed with the K-10. The K-10 has is designed to detect psychological distress and screen for anxiety and depression in the general population (35), and has been used in our previous eating disorder research (e.g. 37). Internal consistency of items is high (e.g. alpha 0.93 (36), as is its sensitivity in detecting non-specific psychological distress in community surveys (36). The frequency of each of 10 depressive or anxiety symptoms is measured on a scale from one to five. In the present study, coding of the response options was such that total scale scores ranged from 10 to 50, with higher scores indicating greater symptomatology. In an Australian community survey the K-10 had a mean score of 14.2, median of 12, range 10-50, and mean of 13.9 in women only, and only 3% of all respondents scored $\geq$ 30 (35).

Help seeking for an eating problem

Participants were asked if they had spoken to or sought advice from a range of professional people including a general practitioners, psychiatrists, psychologists, counsellors, social workers, dietitian or nutritionist, in relation to a problem with their eating, e.g. "such as eating too much in one go, feeling that your eating is out of control, been preoccupied with what you can eat or when you can eat, with burning up calories, or other problems like this?". An overall

variable for any professional help seeking for an eating problem over the two years was then derived.

STATISTICAL ANAYLSIS

Data analysis was conducted using the Statistical Package for the Social Sciences, SPSS, version 14. Data were inspected for normality and non-parametric tests were used accordingly. Wilcoxon signed rank test (Z) was used to examine significant changes between base and two years in the overall sample. To assess the relationship between weight change and other variables Spearman's Rho Correlation Coefficient (r_s) was utilised. Differences in baseline BMI, as well as baseline and change in levels of eating disorder psychopathology, and psychological distress, between those who gained weight, lost weight and remained weight stable (within 5kg of baseline reported weight) were tested using Chi-Square tests (χ^2) for categorical variables and Kruskal-Wallis (k-w χ^2) tests for continuous variables. Where cell sizes were small, data was aggregated. Post hoc analyses were conducted for variables which reached or approached statistical significance, to assess in further detail how the three weight change groups were different to one another. Post hoc tests involved the aggregation of data, and the use of Fishers exact tests for categorical variables, and the Mann Whitney U (Z) tests for continuous variables. Potential confounding variables in the differences between weight change groups, including socio-demographics, pregnancy, help seeking for an eating problem, and RCT condition from the first year of the study were tested as above. To correct for multiple tests the significance level was set at $p<.01$.

RESULTS

Participant features at two year follow-up

A demographic profile of the 87 young women, whom completed the two year follow up, and weight status and eating disorder behaviours at baseline are displayed in Table 1. The mean age of the women at baseline was 28.21 years (SD= 6.18). The majority of these women (91%)

were born in Australia and 48.4% were living single at the time of baseline assessment, and

66% were in full or part-time paid employment. The median body mass index at baseline was

25.2 kg/m^2. Sixty one point five percent of women reported a clinical level of binge eating and

9% a clinical level of purging at baseline. During the follow-up time 10.7% of the women

became pregnant. At two years of follow-up the mean EDEQ global score was 3.1 (SD1.1),

59.8% of women had experienced at least one day out of role during the past four weeks, and

the mean SF12 mental component score was 38.0 (SD13.3).

Table 1.
Description of socio-demographics, weight status and eating disorder behaviours of women at baseline

Measure	%
Country of birth (n= 87)	
Australia	91
Other	9
Marital status (n= 87)	
Married or living as married	51
Single	47
Separated/ Divorced	2
Children (one or more)(n= 87)	33
Education (highest level completed) (n= 85)	
School certificate (yr10)	5
High school certificate (yr12)	40
Trade, Undergraduate Diploma /Certificate, Nursing/ Teaching qualification	15
Bachelor's Degree or higher	40
Main Activity (n=86)	
In paid work full-time	57
In paid work part time/ casually	13
Home duties/ caring for children	12
Studying full time	16
Seeking paid work	1
Other	1
Weight status (n= 85)	
Obese	28
Overweight	26
Normal weight	42
Underweight	4
Any[1] occurrence of eating disorder behaviours over one month (n= 87)	
Binging (subjective or objective bulimic episodes)	90
Purging (vomiting, diuretic or laxative use to control shape or weight)	23
Fasting (8 or more hours without food to influence shape or weight)	38
Exercise (hard exercise to influence shape or weight)	63

[1] *Any occurrence of eating disorder behaviours* referred to one or more episodes in the month prior to the questionnaire.

Fifteen (13%) of participants met diagnostic criteria for bulimia nervosa, 18 (15%) for binge eating disorder, 54 (44%) had Eating Disorder not Otherwise Specified (EDNOS; defined as having extreme weight and/or shape concerns and a regular ED behaviour *throughout* the preceding three months) and the remainder (35, 29%) had sub-threshold disorders with either current extreme concerns and/or regular ED behaviour(s) at a level of clinical severity.

The present study reports on factors related to change in weight at 2 years.

Participants' weight change

Two of the 87 women did not supply details regarding weight at both time points and thus could not be included in any further analysis. Overall the mean change in weight was + 1.76kg (SD 7.03), greatest decrease in weight was 25kg, greatest increase in weight was 20kg. There were 25 (29%) women gained 5kg or more, 49 (57%) remained weight stable within 5 kg of baseline, and 11 (13%) lost 5 kg or more. The majority of this sample indicated that they were trying to lose weight at the two year follow-up assessment (n=79, 93 %).

Participants change in ED psychopathology and psychological distress

The global eating disorder examination questionnaire score at baseline were high (median=3.58, IQR (3.18, 3.86), mean= 3.75, SD=0.82), compared to a community sample of women in the general population of the ACT (n= 5255 mean=1.52, SD =1.25) (32). There was a significant reduction in EDE-Q global score at two years compared to baseline in the overall sample (Z= -4.821, p<.0001), however this score remained high at two years (median=3.32, IQR (2.40, 3.86), mean= 3.15, SD=1.15). A similar reduction was found for all EDEQ subscale scores (all Z< -3.030, all p≤.002). There was also a significant reduction in binge eating (Z= -3.829, p<.0001), however levels of purging, fasting and exercise did not significantly change (all z ≥ -0.975, all p>.330). The baseline psychological distress score was high (median=20.00, IQR

(16.00, 27.00), mean=21.96, SD=8.11) (33), and did not significantly change at two years (Z=-1.187, p=.235).

Association between weight change, and levels of ED psychopathology and psychological distress in the overall sample

Correlations between change in weight, and baseline levels of ED behaviours, EDE-Q subscale scores, psychological distress, and BMI in the overall sample (n=85) were examined. However, no significant relationships were found (all $r_s \leq 0.181$, all $p \geq .10$). Similarly, change in levels of ED behaviours, EDE-Q subscale scores, and psychological distress (i.e. year two score or frequency minus baseline score or frequency) at two years did not significantly correlate with change in weight, although there were trends with change in level of shape concern approaching significance (r_s=0.269, p=.013) and change in level of weight concern approaching significance (r_s=0.235, p=.032), all other $r_s \leq 0.206$, all $p \geq .061$.

Weight gain, weight loss and weight stable participants- between group differences.

Characteristics of baseline weight, eating disorder features and level of psychological distress in the three weight change category groups, and summary statistics of between group analyses are reported in Table 2. The only baseline variable which had significant differences between weight change category groups was psychological distress. Post hoc Mann Whitney U tests indicated, the weight stable group had a lower psychological distress score at baseline than the weight loss or weight gain group (Z= -2.88, p= .004). Baseline BMI and shape concern showed trends in been different amongst the three weight groups. Post hoc Mann Whitney U tests indicated the weight stable group had a trend in been a lower weight at baseline compared to weight loss or weight gain group (Z= -2.156, p= .031), and the weight loss group a trend in been the heaviest compared to the weight stable or weight gain group (Z= - 1.76, p=.078). For

shape concern, the weight loss group showed a trend in having the highest shape concern at

baseline compared to the weight stable or weight gain group (Z= -1.86, p=.063).

Table 2. **Descriptive information on baseline psychopathology according to change in weight category.**

BASELINE MEASURES		Lost ≥5kg n=11	Weight stable n=49	Gained >5kg n=25	k-w χ^2	df	P
BMI (kg/m^2)	Median (IQR)	29.41 (21.83, 36.00)	24.76 (21.05, 28.24)	25.61 (22.97, 32.19)	5.443	2	.066
EDEQ[1] Attempted restriction	Median (IQR)	4.50 (2.50, 5.00)	4.00 (2.63, 5.00)	4.50 (2.38, 5.38)	0.326	2	.850
EDEQ Weight concern	Median (IQR)	3.80 (3.40, 5.40)	4.00 (3.20, 4.80)	4.00 (3.80, 4.70)	0.390	2	.823
EDEQ Shape concern	Median (IQR)	5.50 (4.75, 5.75)	4.75 (3.94, 5.19)	5.00 (4.00, 5.56)	5.147	2	.076
EDEQ Eating concern	Median (IQR)	2.60 (1.40, 4.20)	2.80 (2.20, 3.90)	3.20 (2.10, 4.00)	0.388	2	.824
Psychological distress (K10)	Median (IQR)	21.50 (15.50, 32.50)	18.00 (15.00, 23.00)	26.00 (20.00, 29.00)	9.049	2	.011*
BASELINE BEHAVIOURS		Lost ≥5kg n=11	Weight stable n=49	Gained >5kg n=25	χ^2	df	P
Bulimic Episodes Any[2]	n (%)	10 (91)	43 (88)	23 (92)	0.345	2	.842
Regular[3]	n (%)	7 (64)	34 (69)	20 (80)	1.332	2	.514
Purging Episodes Any	n (%)	2 (18)	8 (16)	9 (36)	3.818	2	.148
Regular	n (%)	2 (18)	5 (10)	6 (24)	2.513	2	.285
Fasting Any	n (%)	4 (36)	16 (33)	12 (48)	1.670	2	.434
Regular	n (%)	2 (18)	5 (10)	4 (16)	0.802	2	.670
Exercise Any	n (%)	7 (64)	34 (69)	12 (48)	3.235	2	.198
Regular	n (%)	7 (64)	31 (63)	12 (48)	1.713	2	.425
Extreme (everyday)	n (%)	0	5 (10)	1 (4)	1.931	2	.381

[1] EDEQ= Eating Disorder Examination Questionnaire

[2] *Any* behaviour frequency referred to one or more episodes in the month prior to the questionnaire.

[3] *Regular* behaviour frequency referred to (unless otherwise stated) an average of one episodes of the behaviour per week in the month prior to the questionnaire.

* Post hoc finding weight stable group < weight loss or weight gain group (p=.004)- see text.

Changes in levels of eating disorder psychopathology and psychological distress at two years were calculated (i.e. year two score or frequency minus baseline score or frequency) and between group differences tested (Table 3). Changes in levels of symptomatology over time did not significantly differ between the three weight change groups, although changes in levels of weight concern and shape concern were approaching statistical significance. Post hoc tests Mann Whitney U tests were performed for these variables approaching significance, and indicated the weight loss group had the greatest reduction in shape concern compared to the weight stable or weight gain group (Z=-2.62, p= .009), and similarly showed a trend in having the greatest reduction in weight concern (Z= -2.240, p= .025).

Table 3.　　　　**Two year change in psychopathology according to change in weight.**

Change in measure at two years		Lost ≥ 5kg n=11	Wight stable n=49	Gained ≥ 5kg n=25	k-w χ^2	df	P
EDEQ[1] attempted restriction	Median (IQR)	0.00 (-1.50, 0.75)	-0.75 (-1.75, 0.25)	-0.75 (-1.63, 0.25)	1.128	2	.569
EDEQ weight concern	Median (IQR)	-1.20 (-1.60, -0.40)	0.60 (-1.0, 0.40)	-0.30 (-0.60, 0.75)	7.459	2	.024
EDEQ shape concern	Median (IQR)	-1.13 (-3.00, -0.38)	-0.50 -1.06, 0.13)	0.00 (-0.81, 0.44)	8.356	2	.015*
EDEQ eating concern	Median (IQR)	-0.40 (-2.20, 0.80)	-0.60 (-1.80, - 0.20)	-0.40 (-1.20, 0.70)	2.609	2	.271
Bulimic Episodes	Median (IQR)	-2.50 (-10.75, 4.75)	-3.00 (-9.50, 2.50)	-7.00 (-16.00, 0.00)	1.912	2	.384
Purging	Median (IQR)	0.00 (0.00, 0.00)	0.00 (0.00, 0.00)	0.00 (-0.50, 0.00)	0.965	2	.617
Fasting	Median (IQR)	0.00 (0.00,1.00)	0.00 (-1.00, 0.00)	0.00 (-1.00, 0.50)	1.341	2	.512
Exercise	Median (IQR)	0.00 (-2.00, 0.00)	0.00 (-7.50, 6.00)	0.00 (-7.00, 0.00)	0.107	2	.948
Psychological distress (K10)	Median (IQR)	0.00 (-5.00, 3.25)	1.00 (-3.00, 6.50)	1.00 (-6.00, 8.00)	0.686	2	.710

[1] EDEQ= eating disorder examination questionnaire
* Post hoc finding weight loss group < weight stable or weight gain group (p=.009)- see text.

Potential confounders in between group differences

Demographic features, pregnancy, help seeking for an eating problem, and RCT condition from the first year of the study and were investigated as possible confounding variables on a participant allocation to weight loss, gain or stability groups. There were no between group differences in marital status (χ^2= 7.245, df=6, p=.299), being a mother (χ^2=1.309, df=2, p=.520), place of birth, (χ^2=1.375, df=2, p=.503) highest education level achieved (χ^2= 5.604, df=4, p=.231), and main work activity (χ^2= 9.090, df=10, p=.524). Pregnancy was reported by thirteen (15%) women over the two years of the study, however there were no between group differences in reported pregnancies (χ^2= 3.487, df= 2, p= .175). Professional help seeking over the two years for an eating problem was reported by 34 (40%) of the women, however there was no between group differences for this variable (χ^2= 2.738, df=2, p=.254). For RCT condition from the first year of the study, between group differences were approaching significance (χ^2= 5.376, df= 2, p= .068), thus a 2×2 post hoc Fishers exact test was performed. Women who had lost weight appeared more likely to have received the intervention (n=9, 82% weight loss group vs. n=35, 47% of weight stable or gained), however, this effect did not reach statistical significance (p= .050).

DISCUSSION

We hypothesised that weight would increase in this sample of women with disordered eating, overall there was a small mean weight gain, and 29% gained 5 kg or more, however, the majority (58%) of these women remained weight stable (within 5kg of baseline weight) over the two year period. Despite weight loss been highly desired and women displaying a range of behaviours and attempted dietary restriction to control weight, weight loss was relatively uncommon. The results have some similarities with the finding of Fairburn and colleagues in their prospective study of women with bulimic eating disorders (23), which showed weight gain and increase in obesity over a five year period. The weight gain in the current sample was not as

great; however, it was observed only during a two year period. In contrast, this study showed many women remained weight stable and a small minority lost a substantial amount of weight over two year period.

The majority of participants in this study were overweight or obese at baseline, and a small number were underweight. These weight risk factors are associated with long term increased morbidity and mortality due to associated illness (10-12). Thus, weight and change in weight is an important outcome for women with eating disorders, with neither movement into or towards underweight or movement into or toward obesity being a positive outcome based on the current evidence.

In contrast to studies conducted in general community samples or populations of adolescents (17, 21-22), and in discord with our hypothesis, neither binge eating nor compensatory weight control behaviours, were associated with change in weight over time in this sample of women with eating disorders. This lack of association may be due to the general decline in binge eating behaviours over the two years in this sample, thus whilst reduction in binge eating may not be associated with weight loss, as few women increased levels of binge eating in this sample we can not determine if this is associated with weight gain. This is congruent to treatment studies on bulimia and binge eating that show that whilst cognitive behavioural therapy is effective in reducing ED behaviours and psychopathology (including reduction of binge eating), they are unlikely to be effective alone in reducing body weight of women suffering co-morbid eating disorders and overweight (38).

Unlike previous research in community women indicating heavier women are more likely to put on more weight (39), in this selected sample of women with disordered eating there was a statistical trend for those who had the highest BMI at baseline to be in the weight loss group, and those with in the lowest BMI at baseline to be in the weight stable group The women in the weight loss group tended to have the highest shape concern at baseline (although not

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statistically significant), and at the two year time point, having lost a substantial amount if weight, showed the greatest reduction in shape concern. In the overall sample there was a trend for weight gain been positively associated with changing levels of shape concern and weight concern, a finding not unexpected, with preferred shape for women in Western society been slender.

Women who were the least psychologically distressed (a measure of depression and anxiety) at baseline were more likely to be weight stable at two years. Weight change both positive and negative is recognised as common symptom of depression (40) and is possibly related to changes in food intake and energy expenditure. Although the weight stable group was the least psychologically distressed at baseline, at two years they appeared to have greater increase in level of psychological distress compared to those whom had lost weight, although the group differences were not statistically significant. Therefore, over a longer period we would expect psychological distress and shape concern may fluctuate with weight change and stability, and high levels of psychological distress and shape concern will be found to precede periods of weight change in women with chronic disordered eating. In a clinical setting it may be that addressing psychological distress and shape concern is the most effective way of preventing weight gain and weight fluctuations in women with disordered eating.

There are several limitations to this study; firstly the small sample size and sample heterogeneity may lead to type II statistical error. There was also low frequency of purging and fasting behaviours in this small sample, making it difficult to draw any conclusion in regards to their relationship to change in weight. Thus we recommend further prospective studies on outcome in eating disorders (including weight) be conducted in larger samples. Secondly, the analysis is based on two time points, which were two years apart, thus we can not be sure of the extent or influence of symptoms fluctuating up and down within the two years. Thirdly, the EDE-Q, although widely accepted as a tool for measuring eating disorder psychopathology in research, it does not assess actual dietary restriction and intake well (41). This is a common

behaviour in women with eating disorders and separate to attempting to diet (regardless of success) and also separate to fasting, as it is possible to eat regularly and have very low energy intake. Actual dietary intake is possibly more strongly related to change in weight, and physical and mental chronic disease outcome in eating disorder samples. Thus, future studies in this area should obtain greater details on actual dietary intake. Finally, there was a reliance on self-report data for height and weight and only one instrument was used to measure psychological distress.

CONCLUSION

Overweight and obesity are significant problems in women with disordered eating in the community. However, in this sample change in weight over time did not relate to eating disorder behaviours, but related to concern about shape and to psychological distress. Further studies conducted in larger samples which include improved assessment of dietary intake are required over a longer period to assess the relationship between eating disorders, change in weight and chronic disease status. Future research on the merits of weight stability verses weight loss in terms of physical and mental health outcomes in community women with eating disorders, particularly those with co-morbid overweight and obesity needs to be conducted.

CHAPTER SIX – REFERENCES

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PART THREE

CHAPTER SEVEN- DISCUSSION

The thesis findings build upon the understanding offered in previous research and offer a number of important new insights into the interrelationships between eating, weight disorders and psychological health, and the public perceptions of these issues. At an Australian population level the co-morbidity of disordered eating behaviours and obesity was found to be high, affecting about 1 in 5 obese adults. The proportion of obese persons suffering from ED behaviours had increased from 1995 to 2005. This has implications for both physical and mental health, with ED behaviours leading to fluctuating weight and an overall increase of weight over time; and ED psychopathology contributing to poor psychological health.

Whilst underweight ED-MHL in the community was at best satisfactory, it compared favourably to previous work on normal weight and overweight bulimic ED-MHL. Stigma toward sufferers of co-morbid ED and obesity was higher than other forms of EDs. Those suffering from this co-morbidity will likely suffer from the burden of the physical and mental health consequences of both these disorders, and also very high community stigma, which may serve to worsen symptoms. Whilst the community perception that an underweight person or normal weight person with an ED will be discriminated against was still high, there was also a positive regard for persons who are able to achieve weight loss and alter body shape, despite the strategies used having clear associations with poor psychological health. Obese persons and persons with existing ED psychopathology, were the most likely to have this positive regard for ED behaviour, and combined with the stigma of overweight, this may help explain the increase of ED behaviours in obese persons.

This discussion will examine the key findings of the thesis on their own merit, and in concert with the existing literature, discuss the overall picture now established regarding the relationship between EDs, weight disorders and psychological distress. The thesis discussion

will consider the implications for health at both a population level and an individual clinical treatment level. It will them proceed to discuss the strengths and limitations of the work and recommendations for future research.

THE EPIDEMIOLOGY OF CO-MORBID DISORDERED EATING BEHAVIOURS AND OBESITY

The first aim of this research was to examine the occurrence of disordered eating behaviours and cognitions in obese and non-obese Australian community dwelling adults. In 2005 we found in a representative population sample of adults aged over 15 years in South Australia, that 20% of obese persons reported regular ED behaviours, and 7.4% of non-obese persons reported regular ED behaviours[1]. Of the participants who reported co-morbid obesity and regular ED behaviours, 56% were binge eating alone, 21% reported strict dieting alone, 17% reported binge eating in combination with purging or strict dieting, 6% reported purging alone, and 5% reported purging in combination with strict dieting. Demographically, those of younger age and female gender were the most at risk of suffering from the co-morbidity of ED behaviours and obesity[1].

A separate representative population study in the Australian Capital Territory, examined obesity in relation to ED psychopathology in the most at risk group, namely young (aged 18 to 42 years) women[2]. It was found 20% of obese women regularly used one or more ED behaviour, the most commonly reported being objective bulimic episodes, and 12% of non-obese women regularly used one or more ED behaviour, the most commonly reported being subjective bulimic episodes. Women suffering from obesity were significantly more likely than non-obese women to report regular objective bulimic episodes (20.3% vs. 9.0%), regular subjective bulimic episodes (17.4% vs. 12.1%), frequent fasting (5.8% vs. 2.8%), regular use of diet pills (5.8% vs. 1.6%), and regular diuretic misuse (0.9% vs. 0.2%). They were no less likely to report self-induced vomiting (2% vs. 1.3%), laxative misuse (0.9% vs. 1.0%), or regular hard exercise

(4.1% vs. 5.0%). Obese women also scored more highly then non-obese women in ED cognitions pertaining to eating concern, dietary restraint, weight concern and shape concern.

The rates of ED behaviours found in obese and non-obese persons in Australia are higher than in epidemiological surveys which reported on formal DSM diagnosis only[3-5], and higher than in Hudson et al.'s report of only 2.1% of persons reporting any binge eating in the 12 months prior to a survey of US adults[4]. They are closer to Gauvin et al.'s findings in Canadian women, which found 20% of the population suffered from EDs and which included subthreshold EDs[6], and Waaddegaard et al.'s study which found 19% of young women suffered from at risk ED behaviours and that obese women were at increased odds of suffering from at risk ED behaviours[7]. The rates of ED behaviours we report for obese people living in the community are not as high as prevalence rates of BED amongst persons seeking obesity treatment where the prevalence rate is around 30%[8-10].

Our findings that obese persons are more likely to suffer from ED behaviours and cognitions are at odds with the work of Masheb and White who found that rates of BN did not differ between overweight and normal weight women[11], however are consistent with numerous studies in children and adolescents[12-18], a study on women in a weight gain prevention program [19], and a community study focused on BED[20], which have indicated higher levels of ED behaviours amongst participants suffering from obesity compared to non-obese participants.

The second aim of the thesis was to examine how the prevalence of co-morbid disordered eating and obesity has changed in the Australian population over time. The findings from South Australian population surveys indicated that the prevalence of ED behaviours in persons suffering from obesity significantly increased from 8.5% in 1995 to 20% in 2005. Whilst the overall population prevalence of obesity and ED behaviours separately also increased, the co-morbidity of ED behaviours combined with obesity increased at a faster rate, such that in 2005 the prevalence of co-morbid obesity and ED behaviours had increased 4.5 times compared to

1995, the prevalence of obesity alone increased by 1.6 times and eating disorders alone increased 3.1 times[1]. This work is at odds with two other studies examining time trends in the prevalence of co-morbid EDs and obesity, who did not find any statically significant increase in co-morbid obesity and EDs[21] or ED behaviours[7]. It may be that the cultural and environmental pressures on obese persons within Australia are different to those of participants in these two previous studies which were both conducted in Scandinavian countries, where the overall prevalence of obesity is markedly lower.

The reason for such a large increase in the number of obese people with ED behaviours in a relatively short time span of 10 years is unknown. In recent years the obesity "epidemic" has received much attention in the media and from politicians, public health promotion, clinical health professionals and others treating obesity. Perhaps these confronting, and at times alarmist, messages, have been conducive to increased levels of body dissatisfaction among obese individuals, and to a perception that weight loss at any cost is the best outcome. This is supported by the thesis finding that obese persons are more likely to feel that it would 'not be too bad' to be like a sufferer of AN presented to them in a vignette, given the sufferers weight loss, despite the vignette discussing clear implications on her psychological health[22]. As numerous studies have found body image dissatisfaction and dieting are risk factors for binge eating and more extreme weight control behaviours[17][23-31] , it is possible that an increase in dieting and body dissatisfaction in relation to the obesity epidemic, has lead to a greater proportion of obese persons suffering from ED behaviours.

Another possibility leading to the increased rate of adults with obesity suffering from ED behaviours in 2005 compared to 1995, could be in relation to an increased proportion of adults in 2005 who were also obese during their childhood, as childhood obesity has been linked to EDs in adults[32][33]. This would fit with increasing prevalence rates of childhood obesity in Australia in the 1980s [34], as a child who was for example 5 years old in 1984, would have been too young to participate in the 1995 survey, but could have been included in the 2005 survey. It

also fits with the increased odds for co-morbid obesity and ED amongst younger participants in the South Australian survey[1]. A further possibility could be information bias between the two time points. Participants in 2005 may have been more prepared to disclose their ED behaviours than in 1995. However, there is no evidence supporting increased acceptability or reduced stigma of EDs in the Australian community.

The high rates of ED behaviours and cognitions among obese Australians and the increasing prevalence of this co-morbidity over the years, has important implications for public health prevention efforts and the clinical treatment of both EDs and obesity. It also generates a range of further questions to be answered in future research. These will be discussed following a summary of the findings pertaining to psychological distress, weight and community beliefs.

THE IMPACT OF DISORDERED EATING ON PSYCHOLOGICAL DISTRESS

The third aim of the study was to gain an understanding of how disordered eating cognitions and behaviours impact upon psychological distress in obese and normal weight women with disordered eating. As expected and consistent with a wide range of other research[23-26], ED psychopathology was related to psychological distress regardless of weight status in the cross-sectional representative population survey of young women[2]. We found that women suffering obesity had higher scores of psychological distress[2], again similar to other research[2,35,36]. However, BMI as a continuous variable was not statistically related to psychological distress in this population of young women. Instead a range of other factors including those pertaining to ED psychopathology (which the study also found were more prevalent among obese women), emerged as the predicting variables of psychological distress[2]. Our findings support a number of other research studies on a wide range of other population groups, which indicate body image distress and ED behaviours partially mediate the link between obesity and psychological distress or depression in women[37-41].

The unique outcome of this research was the identification of variability in the way that ED psychopathology related to psychological status, depending on a women's obesity status. In women with obesity: eating concern, weight concern, shape concern, dietary restraint and decreased age predicted psychological distress in a multivariate model. Amongst other women in the community, behaviours such as laxative misuse, "hard" exercise and subjective bulimic episodes also contributed to the model predicting psychological distress[2]. This indicates that changing cognitions around body image, eating and dieting is important for improving the psychological health of ob ese women.

COMMUNITY BELIEFS AND ATTITUDES TOWARD EATING DISORDERS OF DIFFERING BODY WEIGHT

A further aim of the research was to increase our understanding regarding community attitudes and beliefs of ED sufferers of various weight status i.e. underweight, normal weight and obese. Recent work had been completed on examining community beliefs and attitudes regarding BED[42] and BN[43-47] in the Australian community, and this thesis by way of comparison focused first on recognition and beliefs about AN and its treatment. It then went on to examine stigma toward and positive regard for three different types of EDs, a vignette of an underweight female AN sufferer, an obese female sufferer of BED, and a normal weight male sufferer of EDNOS.

AN MHL compared to other ED MHL

Our findings indicate that Australians had moderate ability to recognise AN as a type of ED, however they had poor ability to discriminate between AN and other EDs. When compared to recent research on BN and BED MHL [42 44-46 48 49], it is apparent that AN is more commonly recognised as an ED. Smith et al. [50] and Huon et al. [51] have also reported better knowledge about AN compared to BN, but this finding is not supported by Hunt and Rothman's findings in College students[52]. Many Australians also perceived AN as a problem of low self-esteem or self

confidence (32.5%). This is consistent with studies of BN[43] and BED[42] MHL in the Australian community.

In this research community participants regarded a GP as the best person to help the sufferer of AN[22]. Very high regard for GPs in ED treatment has also been found in work on examining community MHL in BN[43 44], and BED[42]. Whilst not specialising in mental health, GPs in Australia are the gatekeepers to medical and mental health specialists such as psychiatrists, psychologists or specialist multidisciplinary ED services, which require a GP referral to enter the service and in some cases to receive Medicare rebates from the government. However, it is also somewhat problematic as a survey of Australian GPs indicate recognition, knowledge and confidence in the recognition of EDs and evidence based treatments is often poor [53]. Comparable to research on BED and BN[42-44], dietitians or nutritionists, and counsellors or social workers were also frequently endorsed as the most helpful treatment provider for the AN sufferer. Unless these professionals have specialised in EDs or are working as part of ED specialist service, similar to GPs their ability and confidence to provide evidence based treatment for ED sufferers may be limited[54], and in some cases their own MHL may be lacking in terms of knowing what type of treatment or treatment provider they may be able to refer their client onto for the most efficacious treatments[54]. Given the high regard that the community has for GPs and Dietitians, Counsellors and Social Workers, a key implication of this work is to ensure these professions have adequate skills to assess, recognise, and either be involved in treatment of ED clients, or have good MHL to refer onto other appropriate evidenced based services.

Psychiatrists and Psychologists were the second most endorsed helpful person to the AN sufferer in our survey[22]. These professions are the best equipped to assess the problem and offer treatments for EDs. Compared to research in bulimic EDs[42-44] there seems to be greater support for mental health specialists in the treatment of AN[22].

Getting information about the problem and available services was the option most frequently endorsed as the most helpful treatment for the AN sufferer. This is perhaps a very sensible approach if you have poorer MHL and are not sure of the best treatment and is consistent with work on BN[44] and BED[42]. Although, the evidence base for specific types of intervention in adult suffers of AN is limited, it was a promising finding that many in the community (36%) listed a treatment that may be used by ED specialist services as the most helpful i.e. Family based counselling or therapy, CBT, other psychotherapy, or a behavioural re-feeding programme. Various combinations of these treatments are utilised in ED specialist services treating adults and children with AN in Australia and have some evidence (albeit low grade) or theoretical rationale for their use[55]. However, admission to a psychiatric ward of a hospital, which also commonly occurs for acutely unwell patients with AN in Australia, was among the least likely to be perceived as the most helpful. Non-specific treatments such as "just talking, getting out and about more / finding new hobbies and alternate or relaxation therapies", which have no impact on ED symptomatology, were frequently endorsed as the most helpful treatment. Participants who did not recognise the problem as an ED were more likely to endorse non evidence-based treatment strategies. Compared to research examining community MHL in regard to bulimic EDs[42-44] in which these non-specific treatments have been among the most popularly endorsed, it appears community AN MHL although still problematic, is somewhat better then community BN MHL and BED MHL. It was concerning that treatments that may be harmful to someone with AN such as weight loss diet and exercise programme and "getting really fit/ increasing time spent on exercise" were endorsed as the most helpful by a sizable minority of participants.

Vitamins and minerals were endorsed by many participants as the most helpful medication. Vitamins and minerals are commonly used in AN treatments to assist recovery of any nutritional deficiencies that may be present, and also to prevent re-feeding syndrome in the acute setting[55]. Despite their role in treating malnutrition, vitamins and minerals do not treat the underlying AN symptomatology. Antidepressants were endorsed by a minority of participants.

Whilst antidepressants are commonly used as an adjunct to treatment in AN, and are useful when co-morbidity such as major depression is present, a systematic review of the evidence has found no benefits for their general use in AN patients when compared to placebo[56]. A high number of participants endorsed the 'none of the above' option in regard to most helpful medication, however, they could not be regarded as having poor AN MHL in regard to medication given the evidence is not strongly supportive of medication in the treatment of AN.

The majority of participants surveyed thought that AN would be moderately difficult or very difficult to treat, however with treatment, 29% thought a full recovery was possible and 38% thought recovery could occur but re-occurrence was likely. An overwhelming majority thought the AN sufferer would get worse without treatment, which is perhaps indicative of how serious the community believe the problem of AN to be. Surprisingly, given the high morbidly and mortality rates in AN and the relative success in treating bulimic EDs[55], research on BED[57] has found in a comparable population group, that the community are more pessimistic about BED outcome with treatment compared to this survey on AN.

In relation to previous studies on AN MHL which were in either small convenience community samples, in health care attendees or school or university students our finding that the majority of persons recognised the AN vignette as a type of ED is consistent with work reporting moderate to good agreement between lay beliefs and psychiatrists or clinical descriptions of AN in regard to diagnosis [50,58,59]. Other studies[50,52,59,60] indicated that whilst many people recognise the behavioural characteristics of AN, such as excessive dieting, they are less likely to recognise AN as being a psychological condition. In these earlier studies psychotherapy and counselling were the most known and supported treatments for AN, whilst hospitalisation, drug therapies and strict behavioural regimes were reported as less acceptable [50,52,58-61]. Whilst our population research favoured getting information about the problem and available services and family therapy, participants had a similarly low regard for hospitalisation as reported in other samples.

Stigma of EDs of various weight categories

Whilst perceived stigma was high across ED categories, the proportion of participants who perceived discrimination against an obese female BED sufferer (66%), a normal weight male EDNOS sufferer (33%), and underweight female AN sufferer (45%) differed markedly. Younger participants were less likely than older participants to believe the ED sufferers would be discriminated against. The thesis findings on high ED stigma in a representative Australian population survey is consistent with research in general population samples in the UK [62] and the USA [63], as well as work in a number of high school and university samples[50] [64-66], which have also found stigmatizing attitudes toward EDs. However, some research in community and student studies have shown a more compassionate attitude, indicating that AN and BN are severe and distressing conditions which warrant sympathy [45] [64] [65], and result from a lack of social support as well as biological factors [65].

Perceived community discrimination against ED sufferers in this work was found to be highest for the obese sufferer of BED. Of the persons who believed the sufferer of obesity and co-morbid BED would be discriminated against, the majority (when forced to choose an option) thought this would be due to her weight problem. This is consistent with work on obesity discrimination which has found weight discrimination is high and increasing[66]. Weight bias and obesity stereotypes, for example that overweight and obese persons are lazy, unmotivated, lacking in self-discipline, less competent and noncompliant, are common in western countries. Weight based discrimination has been found to occur in employment settings, health-care facilities, and educational institutions. [67]. Weight based discrimination is important to the disordered eating field as it is significantly associated with body dissatisfaction, poor self esteem and emotional or binge eating in discrimination victims [68] [69]. Contributing to obesity stigma are messages regarding the obesity epidemic in the media and from health agencies, which place the onus on individual responsibility for weight loss. Research has found that many obese persons feel there is an emerging culture of blame against obese people and obesity stigma is heightened by the simplicity of public health messages. These messages often imply

for example, that it is easy to exercise more, eat healthier and be thin, which does not match with obese persons own experience of the complexity and difficulty in trying to lose weight [70] [71]. The work of Bannon et al[72] found more perceived stigma against an obese woman with binge eating, whom participants of the study found less attractive, less comfortable to be around, and more likely to blame for her weight compared to a non binge eating obese female. Therefore the obese sufferer of BED is likely to feel the double burden of obesity and ED in regard to both impact on mental and physical health, and the additional burden of stigma.

Participants suffering from various ED behaviours and cognitions themselves in this research were no more likely to perceive discrimination against the vignette described sufferer of underweight AN, the sufferer of obesity and BED, or the normal weight EDNOS sufferer compared to others in the community. This is at odds with previous work on BN which showed women with ED symptoms have reported higher rates of perceived discrimination against a fellow BN sufferer, compared to asymptomatic women [43]. Our research did indicate better educated persons were more likely to perceive discrimination towards the AN and BED sufferer but not the EDNOS sufferer, and younger participants were less likely to perceive discrimination across all three ED vignettes. The obesity status of the participant did not influence the likelihood of perceived discrimination. In our research perceived discrimination was related to perceived treatment difficulty, which may explain other research indicating stigma is related to poor help seeking[73].

Positive regard for ED symptoms

A positive regard for the weight loss or body image enhancing ED behaviours was reported by a minority of participants regarding the AN vignette (7.5%), and by a sizable minority (29%) of respondents to the EDNOS vignette. Favourable regard for the weight loss behaviours ofAN was significantly more likely in obese participants (14%), and those suffering from ED behaviours and cognitions (around 20- 30 % depending on the behaviour) compared to others in the community. Favourable regard for the body shape enhancing EDNOS behaviours was found

to be higher in younger and middle aged participants (approximately 35% of those aged 15-54) compared to older participants, in participants suffering from obesity (43%), and those suffering from ED behaviours and cognitions (around 50- 60 % depending on the behaviour).

Findings of a favourable regard for ED behaviour is consistent with other research indicating that the weight loss and control in AN is desirable or admirable in university and college students[64 74], and friends and family of AN sufferers[75]. There is a perception in college students that other people are likely to imitate the disordered eating behaviours of a person suffering from AN or Bulimia Nervosa (BN) [74]. Positive regard for ED behaviour is a concern not because of development of AN, as we know that incidence has remained uncommon and relatively stable over time [76], but because it may lead to an uptake in dieting and lead to other eating disorder (ED) behaviours [77 78], that are associated with poor quality of life [79]. Of major concern were the significantly higher levels of ED desirability amongst obese participants. This helps to explain the increasing rates of ED behaviours amongst obese persons in Australia [1]. Obese person's body image concern is likely to drive this feeling of acceptability toward ED behaviours, however, they may not be aware that these factors place them at higher risk of poor psychological health [80], and further weight gain over time [81 82].

THE IMPACT OF DISORDERED EATING AND PSYCHOLOGICAL DISTRESS ON THE BODY WEIGHT OF AUSTRALIAN COMMUNITY WOMEN WITH PRE-EXISTING DISORDERED EATING BEHAVIOURS

The fourth aim of the research was to gain an understanding of how disordered eating behaviours/ cognitions and psychological distress impact on weight over time, in community dwelling women, with existing EDs. We studied 87 adult women with ED symptoms followed at 2 time points, a baseline and two year assessment. Overall there was a mean increase in weight of 1.76 kg over two years. The results have some similarities with the finding of

Fairburn and colleagues in their prospective study of women with bulimic eating disorders, which showed weight gain and increase in obesity over a five year period[83]. The weight gain in the current sample was not as great; however, it was observed only during a two year period. In contrast to the work of Fairburn, we found many women did not gain weight. Whilst some women had large fluctuations in weight (as much as a decrease of 25kg, to an increase of 20kg), the majority of women (57%) remained within 5kg of baseline weight, 29% gained and 13% lost 5kg or more. Over the same time period ED psychopathology reduced for the sample overall, with a significant decrease in EDE-Q global sore (albeit still much higher than community norms), and a significant decrease in binge eating over the two years of the study. Levels of purging, fasting and exercise did not significantly change, although the numbers of women engaging in regular purging and fasting behaviour was low in the baseline survey. The overall levels of psychological distress were high and remained unchanged throughout the study. Most women were trying to lose weight at the 2 year time point (93 %).

Our findings yielded very few results in regard to the relationship between ED psychopathology and weight change. In contrast to studies conducted in general community samples or populations of adolescents[25 82 84 85], and in discord with our hypothesis, neither binge eating nor compensatory weight control behaviours, were associated with change in weight over time in this sample of women with EDs. Change in weight did not correlate with changing levels of ED behaviours, cognitions, or psychological distress in the group as a whole; and when comparing the subgroups of women who gained 5kg or more of weight, lost 5kg or more of weight, or remained weight stable, there were no significant between group differences for baseline or changing levels of ED behaviours (binge eating, purging, fasting or exercise) as measured by the EDE-Q. The finding of key importance was that the weight stable group had significantly lower levels of psychological distress at baseline. In addition, the weight stable group also had a trend towards having a lower weight at baseline. Comparably the weight loss group a trend towards being heavier and having the highest shape concern at baseline, at two

years and having lost weight, they also had the greatest reduction in shape concern and weight concern.

This research indicates lower levels of psychological distress may be protective against weight loss or gain in women with disordered eating. This is in agreement with research indicating depression maybe related to either weight gain or weight loss[36]. Whilst neither binge eating nor compensatory weight control behaviours were associated with large weight change in this study, this may have been due to the general decline in binge eating. This would be supported by CBT treatment studies on BN and BED, that indicate the resolution of binge eating, leads to weight stabilization but not weight loss[86]. The numbers of women with frequent extreme weight compensating behaviours i.e. fasting, purging and extreme exercise were also quite low due to the relatively small sample size.

Previous research has indicated binge eating or disinhibited eating leads to weight gain or re-gain or obesity onset in most, but not all population groups[87-90]. In contrast the relationship between dieting or dietary restraint and weight change has been variable, depending on the population and measure of dietary restraint used. One of the difficulties is that the tools used to measure dietary restraint in the ED literature, do not always assess actual dietary restriction and intake well[91 92]. However a summary of the possible links between diet restraint and weight would need to include the following possibilities[25 77 82 87 89 90 93-96]:

   f)   No relationship

   g)   That current sustained dieting and diet restraint leads to current low body weight.

   h)   High restraint leads to increased weight

   i)   High restraint and dieting is associated with increased binge eating or disinhibited eating which is in turn associated with weight gain

   j)   Dieting and high restraint moderates the impact of binge eating and disinhibited eating on weight gain

k) Sustained dieting but not complete restriction of favourite foods leads to maintained weight loss following obesity treatment.

All we can say with certainty from our research is that dietary restraint as measured by the EDE-Q, does not relate to major weight gain or loss in a community sample of women with ED symptoms when measured two years apart, despite the vast majority of participants expressing their desire to lose weight. Whilst previous work has indicated body dissatisfaction, (which in our work has been measured by the EDE-Q subscales shape and weight concern) is related to binge eating and therefore likely increased weight[82 17 23 28 87-90], we have found that high body dissatisfaction at baseline, can also be related to subsequent weight loss and reducing body dissatisfaction, in community women with ED.

Taking into consideration of the information from this thesis and other literature on weight change, psychological distress and ED psychopathology, a model of weight change in relation to community women with bulimic ED behaviour could be proposed. This model is depicted in Figure 1. 'Hypothetical model of weight changes in women with Bulimic ED'. This figure represents different fluctuating patterns of weight and degree of psychological distress in women with bulimic ED. In the model weight is represented on the x axis and time on the y axis. The graph indicates weight in relation to time for different longitudinal weight change patterns of bulimic ED and in relation to the thin ideal. The gradient of the slope is related to degree of psychological distress, but there is no positive or negative value, thus both upward and downward slopes indicate increased psychological distress, with a steeper slope indicating higher psychological distress. In the weight gaining ED pattern, the decrease in weight is usually not as much or as rapid as that previously gained, therefore the gradient of the slope is less, and there is often a temporary decreasing level of psychological distress (albeit still high) which lasts as long as weight loss is continued. However this can suddenly change and increase back to equally high levels when the person realises they are still a long way away from the thin ideal, and recommences high levels of ED behaviours in a state of overall positive energy balance, which combined with the metabolic effects of restrictive dieting leads them to put on

more weight compared to when they   started. Hypothetically the highest levels of body dissatisfaction can be found at both the high and low points in the weight curves, they can trigger a change in behaviour; either weight gaining behaviours e.g. emotional eating, binge eating, and inconsistent dieting (although often but not always still high cognitive restraint) leading to an overall positive energy balance; or weight losing behaviours e.g. consistent dieting (cognitive restraint maybe high or low depending on the dieting approach used), excessive exercise or other compensatory behaviours, whilst emotional eating and binge eating may still occur these are likely less frequent and/or with less energy intake during a binge, thus overall they are in negative energy balance. The weight stable ED person in the model is characterised by consistently high levels of psychological distress, and high levels of both binge eating and compensatory behaviours. In this group weight fluctuates rapidly but with a 5kg range depending on the frequency and severity of the behaviours employed and the resulting alternating positive or negative balance.

In this study, the majority of our participants could fit in the hypothetical model into the resolving pattern of ED, with decreasing ED symptomatology and stabilising levels of psychological health and hence weight stability. A large portion of women could also fit in the weight gaining pattern (of which some may have still lost weight over the 2 year time frame, due to the fluctuations in this curve, and a smaller number would have appeared weight stable, but had actually decreased weight and then increased back to the same point in the two year time frame). Whereas only a minority of participants would fit the long term high ED and weight stable pattern, characterized by consistently high levels of psychological distress and ED psychopathology.

Figure 1. Hypothetical model of weight changes in women with Bulimic ED
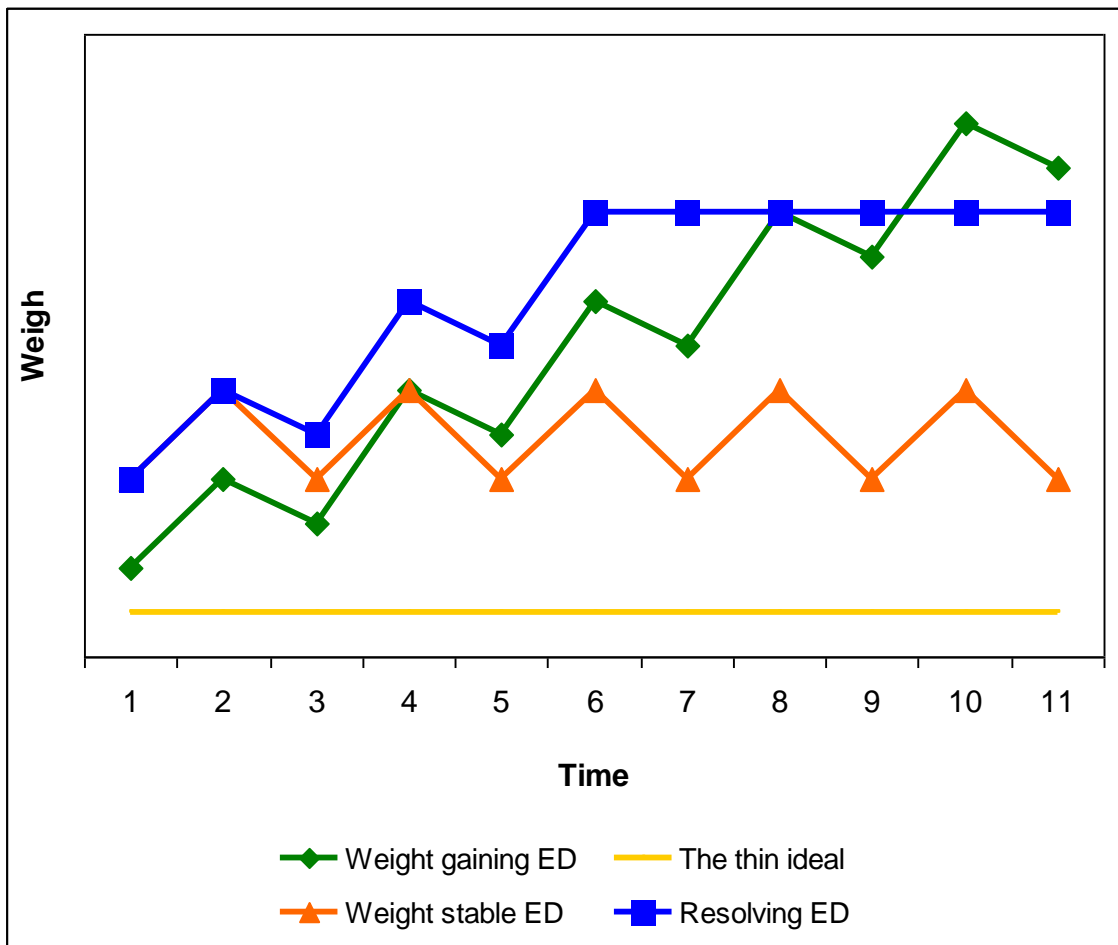
IMPLICATIONS FOR EATING DISORDER AND OBESITY TREATMENT

There are a number of findings in the work that have substantial implications for the obesity and ED clinical treatment settings, these include:

a) The importance of accessible accurate information on EDs and ED behaviours, when community members are considering treatments.

b) The high regard that the community have for GPs, Dietitians, Counsellors and Social workers in treating persons with co-morbid weight problems (underweight or overweight) and ED.

c) The high prevalence of ED psychopathology among obese persons in Australia, which has been found to be increasing over time.

d) The detrimental effect of negative cognitions around eating, restraint, body shape and weight to psychological health of obese women.

e) The importance of psychological health in achieving weight stability in community women with ED behaviours of various weight categories.

In thesis work examining community beliefs about AN[22], which is consistent with work on BN[43 47] and BED[42], when asked to choose among a range of potential treatment and activities that maybe helpful, the vast majority of participants selected the best treatment or activity to help with the problem was 'finding information about the problem and available services'. However web based information on ED in a study conducted in 2003 was found to be of poor quality [97], and a latter review published in 2010, of web based information on various MH issues, also found information was generally of poor quality[98]. In regard to co-morbid ED and obesity, an examination of information fact sheets on the website of 'The Butterfly Foundation'[99] a well respected and known ED organization in Australia, showed no obvious information about weight and ED except for one brief statement that ED can affect people of all shapes and sizes, but no information about weight in their BN, BED or treatment fact sheets. Similarly an examination of fact sheets on the Australian Governments 'Measure up' obesity prevention website[100], has no obvious information on body image or where to get help for related problems like ED or Depression. In contrast 'Beyond Blue'[101] an independent

organisation supported by the Australian Government which aims to respond quickly and help prevent depression, has a website that in addition to information on depression and anxiety, has fact sheets regarding exercise, sensible healthy eating, and EDs which includes a section on dispelling myths about EDs such as they only affect slim people, when they can also affect overweight and obese persons.

The community has a high regard for non specialist MH professions including GPs, Dietitians, Counsellors and Social Workers in the treatment of ED[22 42 43] . Many in these professions, however, do not consider that they have the skills, knowledge and confidence in dealing with EDs[53 54], even when they are involved in the treatment of obesity (i.e. as often would be the case for GPs and Dietitians). Given that many people with an ED will seek help for a real or perceived problem with overweight or with other mental health problems rather then their ED[102], the high prevalence of ED psychopathology among obese persons[1 2], and the high regard the community have for these professions in treatment ED[22 42 43], it is imperative that we ensure these professions have adequate skills to recognise, assess and either be involved in treatment of ED clients (regardless of the presenting complaint, and especially when this is weight related), or have good MHL and be able to refer onto other appropriate evidenced based services.

Similarly it is important for mental health professionals in the ED field to recognise the importance of weight, not only in respect to the individuals cognition, where over emphasis on the importance of weight in how they see themselves as a person is likely, but to the individuals physical health, as weight gain and obesity have a strong relationship with type 2 diabetes mellitus, cardiovascular diseases and a number of cancers[103]. ED professionals need to have confidence in assessing weight in relation to physical health, and all the potential variables that can impact on weight, or alternatively work together with professionals who are skilled in this field. If an ED professional and/or multidisciplinary group of professionals could confidently offer an evidenced based bulimic ED treatment where weight outcome (either maintenance for those in the healthy weight range, or modest loss for those overweight or obese), was equally

focussed on together with improving ED psychopathology and psychological health, there may be greater treatment acceptability and reduced attrition. Effective treatments for both weight and ED symptomatology in obese persons with EDs have remained somewhat elusive, and new approaches for those with co-morbid ED and obesity, with adequate follow up to assess for relapse, are needed to be developed and evaluated.

Whilst CBT treatments are known to be effective in the treatment of bulimic EDs they have little impact on their own in regard to weight of obese patients with bulimic ED[86]. Obesity treatment trials have had mixed results in their impact on weight[104] (weight regain is common), and mixed results are also apparent in those trials which have measured ED psychopathology and psychological health. A number of treatments for obesity, including intensive lifestyle and behavioural treatments[105] [106], and bariatric surgery[107] which have examined weight, psychological outcomes and ED behaviours, have shown some improvements in all three parameters in the short to medium term, although studies with longer term follow up offer less optimistic views e.g. Krussman et al study on long term outcome following bariatric surgery indicate around 50% of women engaged in ED behaviours at 8 years[108]. Other studies have shown that patients with co-morbid depression or BED are less likely to achieve weight loss compared to other patients in an obesity treatment program[109]. Some research suggests CBT approaches (which can be effectively employed in reducing BE) can enhance diet, lifestyle and behavioural approaches to weight loss[110], however a recent RCT with longer term follow up yielded more disappointing results with patients from all conditions regaining weight lost[111]. A recent RCT was published by Grilo et al examined the effectiveness of CBT vs. Behavioural Weight Loss (BWL) treatment vs. Sequential treatment which included both modalities, on treating obese patients with BED. The study found that whilst CBT was superior in reducing binge eating (12 month remission of 51% VS 36% for BLW); the BWL treatment was superior in obtaining weight loss, however the weight loss achieved was small and arguably not clinically significant in all groups (2.1% of BMI in BWL, 0.9% in CBT and 1.5% in sequential treatment. The authors conclude that BWL is an alternate treatment to BED, but there was no

benefit of combining the two modalities in the sequential treatment. Therefore new treatments, or refined treatments, which effectively deal with co-morbid ED, obesity and psychological health are required. A more individualised treatment could be envisaged whereby treatment modules are added or subtracted based on the clinical and social demographic features of the presenting individual.

The thesis work has indicated that the cognitive aspects to dietary restraint, eating and body image are important in relation to the psychological health of obese women in the community. It has also established that psychological health is important for achieving weight stability in community women with ED. Other research has shown that ED behaviours (including binge eating, and complete restriction of favourite foods), body dissatisfaction, and poor psychological health are associated with less success in weight loss treatments and greater likelihood of weight regainn[89 90 93 94]. Therefore it could hypothesised that obesity treatments for women, especially those with current or a history of ED psychopathology, may have improved long term outcomes, if in addition to diet, physical activity and lifestyle modification to achieve negative energy balance; they specifically worked on psychological health, body image, binge eating and changing attitudinal aspects in the individual's relationship to food and eating e.g. changing dichotomous thinking in regard to dieting.

IMPLICATIONS FOR PUBLIC HEALTH

The findings of this thesis provide further evidence of a strong link between disordered eating, obesity and psychological distress. Specifically a high level of disordered eating cognitions and behaviours was found amongst obese adults within Australia which was strongly related to decreased psychological health, and the proportion of obese adults suffering from eating disordered behaviour has been increasing from 1995 to 2005. These findings have implications for public health campaigns, especially efforts pertaining to obesity,ED behaviour and EDs. In addition poor ED MHL, high obesity and ED stigma and a positive regard for the weight loss

aspects of ED may impact on health promotion efforts in the ED or obesity fields. Finally as we found ED behaviour and cognitions impact upon psychological distress, and better psychological health promotes weight stability these findings have implications for those working in the prevention of both psychological distress and obesity. Indeed the findings of this research support the the call for an integrated approach to obesity and eating disorder prevention[112 113 114 115], and also depression prevention campaigns..

There has been limited work conducted aimed at understanding the best methods of achieving an integrated approach to ED and obesity prevention. Haines and Neumark-Sztainer[114], examined the shared risk factors between obesity and eating disorders and identified the following key areas to focus on:

- Dieting: which in community studies has been linked to weight, obesity onset and eating disorder onset via a number of mechanisms

- The media: which encourages increased dietary intake, reduced physical activity (via displacement of active leisure time with television viewing) and simultaneously promoting the thin ideal

- Body dissatisfaction, which may lead to depression, dieting, decreased physical activity, eating disorder behaviours and obesity, via a number of different mechanisms

- Weight teasing, which is related to binge eating (and therefore in time obesity) and other eating disorders.

The findings of this thesis concur with this list of factors, however additionally, depression could be added to the key areas given the multidirectional relationship between depression, weight change/ obesity and disordered eating psychopathology[15 37 38 40 41 82 116]. Dieting could also include a discussion around the positive regard for both dieting and other more extreme weight losing behaviours, which are likely to lead not to weight loss as the individual expects, but conversely weight gain in community dwelling individuals. Similarly weight teasing could be broadened out to all obesity and eating disorder stigma, which occurs not only in direct teasing of children and adolescents, but a range of both direct and indirect forms of

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discrimination in adults[67], that have also been linked to increased disordered eating behaviour[68] [69]; the media who promote the thin ideal, also contribute weight based stigma.

The practicalities of how these shared risk factors might then be considered ineffective disordered eating, obesity and depression preventative public health campaigns presents a unique challenge and any conceived campaign would always need careful evaluation. Furthermore existing or future campaigns for either obesity, or disordered eating or depression, may have a positive or negative impact on these other interrelated problems. Indeed it is plausible that the focus on the obesity epidemic in the last 10 years has lead to increased body dissatisfaction and the growth in prevalence of eating disorder behaviours amongst obese persons. Work on community attitudes and beliefs about EDs, has repeatedly shown that getting information about the problem and available services is the most commonly endorsed 'best' treatment option[22 42 43]. Additionally we know that individuals with EDs are more likely to seek help for a real or perceived problem with weight, rather than their ED[102]. With this in mind, the following paragraphs will evaluate the key current Australian population level (government funded) obesity prevention information social marketing campaign 'Measure Up/ Swap It', to assess the potential positive and negative impact on ED, and suggest ways of improving the campaigns with a more holistic framework, with the shared risk factors in mind.

The Measure Up & Swap It, obesity prevention campaign[100] was funded by the federal government and designed by the Department of Health and Ageing. The campaign commenced in 2008 and is to be continued until 2013. The campaigned commenced with a series of TV advertisements, which encouraged people to measure their waist circumference, discussed the danger level, highlighted the dangers of obesity and encouraged people to utilise a website with further information. The initial TV advertisement depicted a semi clothed (shorts only) man walking along a measuring tape and visibly gaining weight and becoming increasingly unhappy looking, as he aged into middle age. The ad' emphasised the implications of increased waist span on a number of serious life threatening conditions e.g. cancer and heart attack, and then

pictured the man having difficulty playing tag with his child, with a very worried look on his face, and the slogan 'the more you gain the more you have to lose'. The ad' encouraged viewers to see how they measure up; with at risk values highlighted in red on the measuring tape at more than 80 centimetres for females and 94 centimetres for males and recommended people view the website for further information. In a follow up advertisement the man decides to turn his life around with diet and exercise.

The measure-up website has a large amount of didactic information and fact sheets on measuring up, the health consequences of the 'at risk' waist measurement category, healthy eating and exercise. It encourages moderately restrictive dieting for example discussing foods that are important to limit whilst also discussing the 'golden rules' of healthy eating[100]. Despite acknowledging, under the Frequently Asked Questions banner, that some people are concerned that the campaign will have a negative impact on people's attitudes regarding their body weight and shape[100] there are no information or fact sheets on developing a positive body image. The campaign justifies the concern about potential impact on body image, stating that the campaign is concerned with achieving health and healthy weight, the waist measurement cut offs are from credible sources including the World Health Organisation and National Health and Medical Research Council, and the campaign is for all Australians to improve activity and healthy eating, and is not just for overweight or obese persons[100]. This is difficult to agree with, when one would assume for the campaign to work, that after TV viewers 'measured up', those suffering from overweight and obesity would have heightened concern about their shape and the implications for health, and thus feel inclined to look up the website and in turn change their eating and physical activity behaviours. The project evaluation contains no information or items to measure body image, which is clearly identified as a potential negative consequence[100 117], and could potentially be of benefit given the shared risk factors of obesity and EDs[114]. The website also contains no information, or links to other information sources, for people who are worried about their weight and may also have co-morbid depression or eating disorder

psychopathology. This could be an important addition to any population based obesity public health campaign, given the high levels of co-morbidity of these factors[1,2].

Carter et al[118] have discussed the lack of an evidence base, for the 'measure up' campaign and question the ethics of the campaign. These authors considered the unethical aspects of the campaign included the use of parental guilt, the low cut off points chosen for the measuring tape and the focus on only one measure of adiposity, (it is possible that weight stable persons at the high end of the healthy BMI range, or just over a BMI of 25, also have a waist measure above 80 centimetres for women or 94 centimetres for men, and would perceive themselves as overweight and are worried about the serious health consequences), the potential implications for self esteem, body image, self harm and the stigmatization of obesity. The follow up advertisement may be particularly stigmatizing, as it may encourage blame on obese individuals who do not simply ' turn their life around' and achieve reduced girth with diet and exercise[118]. Other research has shown that many obese Australian adults feel there is an emerging culture of blame against obese people, and that obesity stigma is heightened by the simplicity of public health messages. These messages, (as in the measure up campaign), often imply for example, that it is easy to exercise more, eat healthier and be thin, which does not match with obese persons experience of the complexity and difficulty in trying to lose weight [70,71].

The measure up evaluation[117] was conducted via telephone interview, a benchmark survey interviewed 2806 adults aged 18-65 years, surveys were weighted to be demographically representative of adults aged 18-65 years in Australia as compared to Australian Bureau of Statistics data. Further cross sectional interviews were conducted at various points in the campaign e.g. at wave 3 of the campaign 2161 persons were interviewed. The evaluation found increased awareness of waist measurement and the link to chronic disease, but no change in intention or actual behaviour in relation to healthy eating or physical activity; the only significant behaviour change was that more people intended to measure or actually measured their waist circumference. Despite the campaigns identity as a healthy weight promotion social

marketing campaign, it did not ask for self reported waist measure, or height and weight. However, as there was no behaviour change, we would expect that the campaign itself had no positive influence on measures of adiposity, and it may have negatively impacted on weight, via increased knowledge about overweight status, which has been linked to body dissatisfaction and the uptake of disordered eating behaviours such as binge eating[119] and obesity stigma which has similarly been linked to binge eating behaviours and higher weight[68 120 121].

A follow up campaign to 'measure up' is entitled 'Swap it' this was launched by the Commonwealth Department of Health and Ageing in March 2011. The advertisements for this campaign via TV, radio and print media, feature a happy cartoon balloon family, the male 'Eric' is depicted measuring his waist, and the health risks are still identified but in a non-threatening friendly manner. The key message in the advertisements involves health behaviour 'you don't have to stop it, just swap it'. The messages around healthy eating are less in the dieting framework compared to the 'measure up' campaign, with emphasis on not needing to totally restrict e.g. 'swap big portions for small', 'swap often (depicting takeaway food), for sometimes'. Similar suggestions are made for physical activity e.g. 'swap watching (depicting TV sports) for playing'. The advertisement directs viewers to a new website (which includes a link to the measure up website), where more ideas of how to swap various lifestyle habits with more healthy eating and exercise habits are outlined. The 'swap it' website similarly has no information or links to information on body image, disordered eating or depression. The campaign is yet to be formally evaluated, however based on the programs contents, and with consideration of the shared risk factors for obesity and ED, the campaign does not promote dieting, it emphasises changeable behaviour rather than body shape, and is therefore less likely to negatively impact on body satisfaction or obesity stigma. In comparison to the 'measure up' portion of the campaign, 'swap it' has decreased potential for harm.

It is conceivable that in addition to efforts to increase physical activity and improve healthy eating, a new integrated marketing campaign, which incorporates efforts to increase body

satisfaction and decrease obesity and ED stigma, could be dovetailed into the 'swap it' campaign and positively impact on community prevalence of EDs, obesity and depression. For example, this new marketing concept could introduce Eric's wife, Betty, Betty states that Eric's swapping efforts have changed the whole family for the better. She has only reduced a few centimetres but already has reduced her risk of serious conditions like type 2 diabetes, cancer and heart disease. She states that she had always worried about her weight, but she realised she needed to swap her attitude from a quick fix to a sustainable solution; she swapped yo-yo dieting for sensible eating; self criticism (looking angrily at self in mirror) with self loving; hiding away, with getting more involved in the community; coffee with her neighbour for a walk with her neighbour; telling her kids to play outside, with playing with her kids outside; frequent sweet snacks for occasional sweet snacks; eating when worried or upset with relaxation methods, and exercise when worried or upset. Betty states it has not always been easy, and not every day is perfect, but she is already feeling so much better about her self. The advertisement would re-name the website where in addition to the 'swap it' messages regarding eating and physical activity, a range of new information could be found. This information would include information on improving body image and reducing emotional eating, information on the known health benefits of losing even a small amount of weight (because it is not practical, and potentially harmful, for everyone to get to the healthy weight range quickly), and information acknowledging that some people may be dealing with serious depression and ED behaviours and provide links so they can learn more and get help.

However, some argue that universal obesity prevention social marketing campaigns will not succeed. Baum[122] provides commentary on the accumulation of evidence that indicates mass social marketing to change lifestyles are not effective, and the politically less inspiring, but likely more effective public health strategies, are those that target the social determinants of health. Baum suggests the government focus on 'swapping' these social determinants of health e.g. poverty with wealth, low educational achievement with high educational achievement, as the most positive way forward. In my opinion given the success of corporations in enlisting

behaviour change (e.g. as in purchasing behaviour and travel destination etc) via marketing that this is a somewhat negative view, and whilst the social determinants of health and access to healthy environments is of key importance, campaigns to change behaviour run in unison with efforts to change the social determinants of health and improve health services have the potential to become very effective. It is important that development and evaluation of mass marketing campaigns for obesity prevention, consider overall physical and mental health, and given their high levels of co-morbidity, eating psychopathology and depression[1][2].

The practical difficulties of creating suitable prevention strategies across the obesity, eating disorder and depression fields cannot be underestimated. In 2005 Neumark- Sztainer discussed a range of challenges[112]. It could be argued the biggest barrier to even trying to develop an integrated approach is the lack of shared knowledge and communication between professionals working in the eating disorder, obesity and depression arenas. However it goes beyond knowledge deficits; there is too often a lack of willingness of professionals from these specialties to work together due to differing ideologies, and what could sometimes be described as level of disrespect between the professional groups, in acknowledging the importance of each field and the potential impact each field may have on the other[112]. Despite these challenges much has been achieved since 2005, for example in 2012 there are at least 2 major international conferences which may bring people working in these fields closer together, the 20th International Conference Alpach in Austria covers the topics of AN, BN, BED and obesity, and the 2012 Annual Columbia River Eating Disorder Network Conference is themed Re-thinking Obesity: A Compassionate and Collaborative Approach to Weight Concern.

The second difficulty is coming to consensus on potential strategies to trial[112], even amongst professionals who have an understanding of the interrelationship between eating disorders, weight and psychological health, consensus is difficult to achieve. For example Corsica and Hood[115] discuss a range of broad environmental prevention strategies in an article titled "Eating Disorders in an Obesogenic Environment" that it could be argued are potentially harmful. These

include the suggestions of regulation of media advertisement of junk foods, which would enforce disclosing calorie and fat content in the advertisement; and imposing a tax on snack food is controversial. Regarding the first suggestion, it is possible that this may lead to increased dieting, one of the established shared risk factors for obesity and EDs[114], via calorie counting. Whilst it could be counter-argued that is necessary for an obese person to achieve negative energy balance for weight loss, and for others to have improved knowledge of their energy intake to prevent weight gain, and calorie counting is one way of achieving this, it is certainly not the only way. A balanced low energy diet (if the persons objective is weight loss) can be achieved with education and behaviour change therapy on balanced eating in terms of food groups and macro-nutrients, education on appropriate portion sizes for the individual, education on the energy dense components of foods and the reduction of the frequency in eating these energy dense components that offer little other nutritional value e.g. sugar based drinks and deep fried takeaway foods. Whilst obviously taking time and expertise and a therapeutic relationship with a health professional, this approach is less dangerous than encouraging the community at large to calorie count, which without knowledge or skills of achieving a balanced diet is likely to lead to various deficiencies. I would argue it is not necessary for obese persons to calorie count, and it maybe harmful to them and others in the community especially those prone to disordered eating psychopathology or with poor overall nutrition knowledge. Similarly a tax on snack foods, has to be very carefully considered and may have unintended affects. A number of countries in Europe have implemented various forms of a 'fat tax' in recent years. The evidence for these taxes is of poor quality and often based on modelling studies[123], a review of this research has indicated that large taxes do have an impact on foods consumed and is likely to result (based on the modelling studies) in reduced weight and risk of chronic lifestyle disease. However the review raises concerns for those taxes on a single food or nutrient (and the associated models) which likely fail to account for shifts in consumption of other foods/ nutrients. Research has shown that consumer's awareness that a food item is taxed because it is unhealthy may also be a disincentive to purchase[123]. In regards to EDs and depression it could be hypothesised that a tax on any kind of 'unhealthy' or 'bad' foods, will contribute to a moral

value being placed on food items, which in reality can be healthfully consumed in small amounts as part of a healthy eating plan even for obese persons who are successfully maintaining lost weight[89].

Other more subtle inter-sectorial environmental measures which have been discussed in relation to the obesity epidemic such as legislative changes to ensure city planning include adequate and accessible (both in close proximity to the people, and either free or very affordable) green space, walkways/ cycle ways, sporting facilities and community centres[124] [125]; could have a positive influence on depression and ED psychopathology. This would occur via increased community participation which is linked to better psychological health[126], and increased physical activity which has been linked to decreased psychological distress[127] and reduced weight gain[87], and therefore likely to decrease the occurrence of ED behaviours which can occur over time in distressed overweight people. However, these types of measures have been sporadic in their implementation, e.g. only in new developments and not required in urban planning or existing communities, if done at all. Again it would seem the challenge is to get various professions, and in this case government departments and levels of government to work together, and to make this an important health and government priority at all levels of government.

Whilst a range of whole of population universal health promotion has occurred in the obesity field, this has not yet been attempted in the ED field. There have been a number of successful ED prevention programs, conducted at schools and university campuses and those targeted towards at the highest risk categories e.g. females only, seem to have the best results[128-130]. Therefore perhaps the most appropriate starting point for an integrated approach to obesity, ED and depression prevention, are smaller at risk targeted population groups. Indeed there are now a small number of examples of obesity and ED prevention, in adolescent groups of women indicating very promising, albeit mixed results (i.e. not always achieving all of the desired outcome, but improvements in one or more of the outcomes), ranging from improved body

satisfaction, decreased ED behaviours, improved healthy eating and physical activity behaviours and maintained weight/ prevented obesity onset [112 131 132-134].

Another group that an integrated ED, obesity, and depression prevention program could target would be young adult women who we found were at the greatest odds of suffering from co-morbid ED behaviours and obesity in our population research[1], and therefore represent an important group to work with. The benefits of working with women of child bearing age, is the likely ongoing effects for their children, as research has indicated that the eating practices of mothers and any critical comments from family about weight, impact upon the eating practices and the development of ED in their children[12 32 33 135 136]. Given the high desirability of ED behaviours amongst certain population groups namely those young adults suffering obesity or disordered eating, these high risk groups should also be targeted in ED prevention programs.

A study by Hepworth and Paxton[73] found sufferers of EDs, frequently first confide about their eating problem to a friend or family member. Thus broad secondary prevention population based ED MHL campaigns to improve recognition, help seeking and use of appropriate evidence based treatments of EDs could in theory improve help seeking and uptake of evidence based treatments . An example of a population based initiative to improve MHL and access to treatment is that which has occurred in Australia over the last ten years in relation to depressive illness, with the establishment of Beyondblue: the national depression initiative, and the Better Outcomes in mental health care programme. These initiatives have been found to be successful in rasing MHL[137] which also corresponded with increased treatment seeking and medication use[138]. However despite the above efforts more recent research by Goldney et al[139] has, found an increasing prevalence of major depression between 1998-2008. This is consistent with targeted ED prevention efforts, which have found those with a psycho-educational focus were least effective at prevention of ED[130]. However, whilst improving community ED MHL may not be helpful at decreasing ED behaviours, it may be helpful at increasing appropriate help seeking

and reducing stigma of existing sufferers. It is important to note that raising awareness and knowledge would be of little value and could be damaging, if there were not also action to improve access to treatments for EDs, and to improve the MHL and confidence of health practitioners in treating EDs.

Another approach to improving ED-MHL include efforts that target certain groups. Jorm, Kitchener et al[140-142] have developed and evaluated mental health first aid (MHFA) training courses for community members that aimed to give participants the knowledge and skills in order to provide initial help to people suffering from or developing mental health problems including depression, anxiety, psychosis and substance misuse disorders. MHFA training has been found effective in improving MHL, increasing the confidence of participants in providing help to others and increasing the amount of help provided. More recently a youth course which in addition to the above mental health issues, has covered the topic of EDs, has been designed[143]; however, we are not aware of any published evaluation of the ED component at this time. A minimal intervention regarding MHL would be to improve the range of ED, obesity and psychological information on websites, so that when sufferers or family members or friends seek information they have available good quality information about EDs and their treatments to encourage help seeking.

STRENGTHS, LIMITATIONS AND DIRECTIONS FOR FUTURE RESEARCH

There are a number and strengths and limitations to the research. Work carried out on ED and obesity prevalence, the relationship to psychological distress and community attitudes and beliefs were based on large Australian representative population samples with reasonable to good response rates. The findings pertaining to the prevalence of ED behaviours in obese persons occurred in two different representative population groups which adds strength to this portion of the research. Using representative samples means our findings are more likely to be generalisable to other population groups in Australia. The longitudinal study on weight change

in adult community living women, recruited from the general a population and had a full range of subthreshold and threshold ED including EDNOS, and BED, which is a relatively understudied group in the ED field. With much of the work on weight change previously occurring in adolescents, women have been recruited from health services or have focused on one ED and not others. The use of validated and widely used tools such as the EDE-Q and K10, or surveys such as used in the ED- MHL that have been modelled on previous ED MHL and general MHL surveys, ensures our work can be compared to other research in the field.

A limitation of the research includes the reliance on self report instruments, which are an effective way of gathering data in large population studies, but often have problems with reliability. In particular previous studies have also found reliability problems in self report height and weight[144]. Furthermore the self report EDE-Q although widely accepted as a tool for measuring eating disorder psychopathology, has problems with the validity of items relating to bulimic episodes, with the EDE-Q likely to underestimate episodes compared to EDE[145], and dietary restraint, which does not correlate well with actual dietary restriction or nutritional intake[91 92].

In regard to the changing prevalence of obesity and co-morbid ED behaviours over time, it is possible that there was information bias between the two time points. In that participants in 2005 may have been more prepared to disclose their ED behaviours than in 1995. However, there is no evidence to our knowledge supporting increased acceptability or reduced stigma of eating disorders over this time period.

In regard to the work on MHL and stigma and positive regard for ED, these surveys were not specifically designed to examine these factors, but were rather a small part of a much larger study on epidemiology and health behaviours. Whilst this reduces selection bias, it also limited the amount of data that could be collected on these issues. For example we only asked for what the participant regarded as the 'best' type of treatment activity and not for their opinion on a

range of possible activities, and our questions on perceived discrimination lack detail about what form they expect the discrimination would take, and did not assess this on a personal level, such as how comfortable the participant would be with the character in the vignette in a range of situations, or if the participant themselves had experienced discrimination based on their eating, or body shape.

There are a number of further limitations to the study examining weight change in community women with ED. Firstly the small sample size may have lead to type II statistical error. There was also low frequency of purging and fasting behaviours in this small sample, and binge eating was decreasing, making it more difficult to draw any conclusion in regards to there relationship to change in weight. Furthermore the analysis is based on two time points, which were two years apart, thus there may have been some influence of symptoms fluctuating up and down within the two years.

To gain a better understanding of how weight change is related to ED psychopathology and psychological distress I have several suggestions for future research. Firstly I recommend a new tool is developed and validated in different samples to assess the full range of influences on energy balance. This is because the difficulties in measuring dietary restraint are not limited to the EDE-Q, with a range of differences between various restraint tools, dieting and dietary intake have been noted in the literature, with cognitive restraint not correlating well with actual dietary restriction in a number of studies[91][92][146]. Furthermore each study in the area including our own lacks detail in one or more area, for examples they may measure binge eating, but not emotional eating or other types of disinhibited eating; or they gather more or less information on physical activity. A tool would need to adequately measure different dieting domains including; cognitive restraint, energy restriction, perceived current dieting, levels of sustainability and discontinuity in the diet approach, dichotomous thinking and behaviour toward eating, nutritional intake and balance and pattern, emotional eating and binge eating. Such a tool should also include attitudinal aspects to eating and body image (such as the eating

concern, weight concern and shape concern subscales of the EDE-Q). It would need to cover attitudinal aspects towards physical activity, types of physical activity or inactivity and time spent on each, and physical impacts on weight such as pregnancy, breastfeeding, chronic disease and medication use. Following the development of such a tool, the relationship between weight change, ED psychopathology and psychological distress, should be explored and compared in large samples of different groups of participants e.g. general community; community sufferers of obesity, community suffers of ED, clinical groups. This should occur over a longer period with shorter follow up intervals e.g. 5-10 year study with follow up every 6 months. The hypothetical weight change patterns proposed in figure 1, could be thoroughly tested.

In contrast smaller qualitative studies could gain more detail regarding the stigma and positive regard that the community feel towards, and is felt by ED sufferers of varying weights, and how various influences e.g. health promotion campaigns, media, health practitioners, family experiences, knowledge about the detrimental effects of ED, may influence these attitudes. Also among ED/ obesity sufferers it would be possible to explore how stigma and positive regard were perceived to impact upon their ED symptoms and psychological distress at various points in the history of the illness, and how they currently impact upon symptoms.

Further monitoring of the co-morbidity of ED psychopathology and obesity is recommended. Future opportunities for this to occur would be in the SA health omnibus study, which occurs annually, and in a repeated study of young adult women in the ACT. Hypotheses relating to this changing prevalence, namely the impact of media and health messages on the obesity epidemic and experiences of childhood obesity and related dieting history could be explored in these surveys.

Given the relationship between ED psychopathology, obesity and psychological distress we recommend the evaluation of any public health programs in these three areas should consider

the impact of the program on the other variables. Specifically current social marketing campaigns for obesity preventions need to consider the impact on body satisfaction, ED behaviours and psychological distress. Furthermore there is a need for an integrated approach to ED, obesity and psychological public health and health promotion efforts both at an environmental level (e.g. impact of community planning on these issues), broad public health level (e.g. integration of positive body image messages, efforts to reduce extreme dieting and obesity stigma into obesity prevention campaigns), and targeted health promotion level (e.g. health promotion approaches for young women which integrate obesity prevention, ED prevention and depression prevention; or that focus on increasing overall ED MHL and help seeking for those either in high risk groups or who work closely with high risk groups). All of these efforts would require full evaluation.

It is strongly recommend that all health professionals working in/ exposed to the obesity field, or that the community hold in high regard for the treatment of ED especially GPs, Dietitians, Counsellors and Social Workers in the treatment of ED[22 42 43]are both knowledgeable, have the required skills and are confident in the recognition, basic assessment of ED and psychological distress, regardless of the presenting complaint, and especially when this is weight related. They need to either confidently offer and be involved in a multidisciplinary holistic treatment for the client, with appropriate input from mental health practitioners/ services or refer onto other more appropriate services. Programs to aid this knowledge and skill development need to occur at multiple levels from influencing curriculum development at a university level in the training of health, nursing and allied health professionals, to programs influencing the skills and knowledge and interest of practitioners in well established obesity services. An integration of community services pertaining to obesity, ED and depression at both an administrative and physical level, would assist in the delivery of integrated treatments.

Similarly it is important for mental health professionals in the ED field to recognise the importance of weight, not only in respect to the individuals cognition, where an over emphasis

on the importance of weight in how they see themselves as a person is likely, but to the individuals physical health, as weight gain and obesity have a strong relationship with type 2 diabetes mellitus, cardiovascular diseases and a number of cancers[103]. ED professionals need to have confidence in assessing weight in relation to physical health, and all the potential variables that can impact on weight, or alternatively work together with professionals who are skilled in this field. If an ED professional/ multidisciplinary group of professionals could confidently offer an evidenced based bulimic ED treatment where weight outcome (either maintenance for those in the healthy weight range, or modest loss for those overweight or obese), was equally focused on to the focus on reducing ED psychopathology and improving psychological health, it may improve treatment acceptability and help reduce treatment attrition.

The development and testing in RCTs of new integrated treatments for those with obesity and ED and possibly depression are urgently required. Outcome needs to consider long term impact.. Our work suggests that the cognitive aspects of dietary restraint, eating and body image are important in relation to the psychological health of obese women in the community. We also established that psychological health is important for achieving weight stability in community women with ED of various weight status. Furthermore other research has shown that ED behaviours (including binge eating, and complete restriction of favourite foods), body dissatisfaction, and poor psychological health are associated with less success in weight loss treatments and greater likelihood of weight regain[89 90 93 94]. Therefore we could recommend the development and trial of an obesity treatment for women with current or a history of ED psychopathology with the following elements;

 1) Behavioural change therapy and education to modify diet, physical activity and lifestyle to achieve negative energy balance;

2) Intervention focused on improving psychological health; and

3) Intervention targeted towards improving body image, reducing binge eating, and changing attitudinal aspects in the individual's relationship to food and eating e.g. changing dichotomous thinking in regard to dieting.

CONCLUSION

This research has contributed to the literature and the collective understanding of co-morbid eating and weight problems. Specifically we found a high prevalence of ED psychopathology in a representative sample of obese women within Australia. This is important as we found ED psychopathology, specifically the cognitive aspects of weight, shape and concerns as well as dietary restraint are associated with psychological distress in obese women. Furthermore we found better psychological health is associated with weight stability in community women with EDs of various weight categories, and thus psychological distress maybe related to further weight gain in obese persons with co-morbid ED. The impact of eating and weight co-morbidity is not limited to a burden on physical health and mental health, but is likely to affect other aspects of a person's life, specifically we found obese and underweight sufferers of EDs maybe more vulnerable to discrimination, compared to normal weight ED sufferers.. The rising prevalence of ED behaviours particular in younger female obese persons may be related to the finding that obese participants, younger participants and those with some existing ED psychopathology were more likely to have a positive regard for the weight and shape control aspects of an ED despite the impact on mental health. Finally while ED MHL is poor, we found slightly better recognition and knowledge regarding AN and its treatment, compared to other EDs, particularly compared to work on co-morbid obesity and BED.

I discussed the findings of the research and proposed recommendations for clinical services and treatments, public health and health promotion efforts, and for further research in this area. Whilst promoting effective change in the prevention and treatment of EDs, weight disorders and depression has proven difficult at times, there are promising strategies on the horizon. There is good reason to expect prevention and treatment efforts for EDs, weight disorders and general psychological distress could be effectively carried out in unison.

CHAPTER 7 REFERENCES

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APPENDICIES

APPENDIX 3

Survey items used to measure ED behaviours and ED MHL in the South Australia Health

Omnibus Survey

Contents of 'Alison' Prompt Card

Alison is a 32 year-old secretary working at a solicitor's office. Alison has been overweight since she was an adolescent but in recent years this has increased to where she is now a size 18 and has been told she has 'severe obesity'. Over the years Alison has tried a number of diet and healthy eating plans; however she has never stayed with the recommendations for very long. Alison lives by herself and often feels lonely; to counteract these feelings Alison likes to 'treat' herself with luxurious foods such as chocolate and cheesecake. Alison's diet is regular with 3 meals a day and it contains a wide variety of foods. When Alison gets home from work she often goes to the fridge for a small snack, however Alison finds that after eating the snack she is unable to stop eating and continues to eat a large amount of food. She may eat for example an apple, a slice of cheesecake, 5 biscuits, a jam sandwich and three glasses of milk. Later in the evening she will eat dinner and sometimes she loses control with this also and eats the extra helping that she was planning to save for the next day. Alison feels guilt and sadness after she has eaten like this and despises the shape of her body. Alison has never told anyone about the way she feels or the way she loses control of her eating. She has often thought about different ways to control her weight (e.g. exercise or laxatives) but has never done them.

Contents of Andrew Prompt Card

Andrew is a 26 year old male who works in the meat works. Andrew is normal weight with good muscle tone, but feels that he has a "pot belly". Andrew is very worried about his looks and wants to bulk up his muscles and lose fat. Andrew's job involves a lot of physical labour but he does not count this as exercise. Every night Andrew spends an hour and a half in the gym lifting weights, and on his day off he goes for a 15km run. Andrew has recently started replacing his dinner meal with a high protein sports drink. He also tries to eat high protein foods through the rest of the day. He sometimes (about twice a week) has uncontrolled eating 'binges' where he eats e.g. half a loaf of bread in the late afternoon. Andrew does not have many friends and feels that if he changes his shape he will be more attractive and a better person.

Contents of 'Jenny' Prompt Card

Jenny is a 28 year old "stay at home Mum". She has 3 young children and has recently stopped breastfeeding. Despite major efforts to lose weight in the last five years with a number of diets, she has not had much success until recently. In the last 6 months Jenny has started jogging every night, when her husband arrives home to look after the kids. If she ever misses a night she feels guilty and upset and jogs twice as far the next day. In the last few months Jenny has cut back on her food intake while her husband is at work, she often skips breakfast and only has a small salad for lunch. Jenny has also started secretly vomiting after her husband cooks high fat dinners for the family. Jenny thinks she is fat and worthless; although she is enjoying compliments she has obtained from her husband regarding weight loss (about 10 kg). Jenny is 168cm tall and has a present weight of 44kg (BMI =15.6). She looks thinner than most 'supermodels'.

G. ATTITUDES AND BELIEFS ABOUT A HEALTH PROBLEM – JAMES COOK UNIVERSITY (SCENARIO 1)	
G.1 **Please show respondent "Alison" prompt card and ask them to read it. Show prompt card xxx From the list what would you say is Alison's <u>main</u> problem?** 1 Depression 2 Anorexia (anorexia nervosa) 3 Bulimia (bulimia nervosa) 4 Stress 5 Anxiety disorder/problem 6 Low self-esteem/lacks self-confidence 7 Poor diet 8 "Yo-Yo" dieting 9 An eating disorder, but not anorexia or bulimia 10 No real problem, just a phase 11 Obesity/overweight 12 Binge eating disorder 13 Other 14 Don't know	☐

G.2 **Show prompt card XXX From the list of possible psychological or behavioural treatments for Alison, choose the one you think would be most helpful for her.** 1 Just talking about the problem 2 Cognitive Behaviour Therapy 3 Psychotherapy 4 Alternative or relaxation therapy e.g naturopathy, homeopathy, massage, meditation or yoga 5 Assertiveness or social skills training 6 Admission to the psychiatric ward 7 Trying to deal with the problem on their own 8 Behavioural 're-feeding' programme 9 Self-help treatment manual 10 Getting really fit/increasing time spent on exercise 11 Getting out and about more/finding some new hobbies 12 Getting information about the problem and available services 13 Behavioural weight loss "diet and exercise" program 14 Family counselling or therapy 15 Other 16 Don't know	☐

G.3 Show prompt card xxx There are a number of different people or groups who might be able to help Alison. From the list choose the one you think would be most helpful for her.

    1   GP or family doctor

    2   Counsellor (including telephone, e.g. "Lifeline") or Social Worker

    3   Psychiatrist or Psychologist

    4   Family member

    5   Close friend

    6   Dietitian or Nutritionist

    7   Naturopath or other alternative therapist

    8   Self-help support group such as "Overeaters Anonymous"

    9   Commercial weight-loss program such as "Weight Watchers"

    10   Other

    11   Don't know

G.4 Which one of the medicines below do you think would be most helpful for Alison?

    1   **Vitamins and minerals**

    2   **Herbal medicines or tonics**

    3   **Anti-depressants such as Prozac or Zoloft**

    4   **Tranquillisers such as Valium or Serepax**

    5   None of the above

    6   Don't know

G.5 What do you think would be the likely result if Alison received the sort of help you think is best (most appropriate) for her?

1 **Full recovery with no further problems**

2 **Full recovery, but problems will probably re-occur**

3 **Partial recovery**

4 **Partial recovery, but problems will probably re-occur**

5 **No improvement**

6 **Get worse**

7 Don't know

G.6 **What do you think would be the likely result if Alison did NOT receive any help?**

1 **Full recovery with no further problems**

2 **Full recovery, but problems will probably re-occur**

3 **Partial recovery**

4 **Partial recovery, but problems will probably re-occur**

5 **No improvement**

6 **Get worse**

7 Don't know

G.7 **What do you think would happen to Alison's weight with treatment?**

1 **Decrease a lot**

2 **Decrease**

3 **Stay the same**

4 **Increase**

5 **Increase a lot**

6 Don't know

G.8 Do you think that Alison would be discriminated against by others in the community if they knew about her problems with eating or with weight, for example, by an employer, a colleague, a family member, or by a health professional? 1 Yes 2 No *(Go to G.10)* 3 Don't know *(Go to G.10)*	☐
G.9 Do you think discrimination would be most because of her eating or her weight problems? 1 Eating problems 2 Weight problems 3 Don't know	☐
G.10 How difficult do you think Alison's problem would be to treat? **1 Not difficult at all** **2 A little difficult** **3 Moderately difficult** **4 Very difficult** **5 Extremely difficult** 6 Don't know	☐
G.11 How many <u>women aged 18 to 45</u> in the general community do you think might have Alison's problem at any given point in time? **1 Very few – less than 10%** **2 More than 10% but less than 30%** **3 More than 30% but less than 50%** **4 About 50%** **5 More than 50% but less than 70%** **6 More than 70% but less than 90%** 7 Most women, 90% or more 8 Don't know	☐

G.12 **Do you think that you might currently have a problem at all like Alison's**? 1 Yes 2 No *(Go to G.14)* 3 Don't know *(Go to G.14)*	☐
G.13 **How would you describe this problem?** **1 Anorexia** **2 Bulimia** **3 Binge eating disorder/problem** 4 Other	☐
G.14 **Have you ever spoken to or sought advice or treatment from any professional person, e.g. a counsellor, a psychologist, a doctor, a dietitian, specifically in relation to a problem with your EATING (*not your weight*), such as eating too much in one go, feeling that your eating is out of control, being preoccupied with what you can eat or when you can eat, or with burning up calories, or other problems like this?** 1 Yes 2 No	☐
G.15 **Over the past 6 months have you been trying to lose weight?** 1 Yes 2 No	☐
H. ATTITUDES AND BELIEFS ABOUT A HEALTH PROBLEM – James Cook University (Scenario 2)	

H.1 **Please show respondent "Andrew" prompt card and ask them to read it. Show prompt card xxx From the list what would you say is Andrew's <u>main</u> problem?** 1 Depression 2 Anorexia (anorexia nervosa) 3 Bulimia (bulimia nervosa) 4 Stress 5 Anxiety disorder/problem 6 Low self-esteem/lacks self-confidence 7 Poor diet 8 "Yo-Yo" dieting 9 An eating disorder, but not anorexia or bulimia 10 No real problem, just a phase 11 Obesity/overweight 12 Binge eating disorder 13 Other 14 Don't know	☐

H.2 **Show prompt card XXX From the list of possible psychological or behavioural treatments for Andrew, choose the one you think would be most helpful for him.**

1 Just talking about the problem

2 Cognitive Behaviour Therapy

3 Psychotherapy

4 Alternative or relaxation therapy e.g naturopathy, homeopathy, massage, meditation or yoga

5 Assertiveness or social skills training

6 Admission to the psychiatric ward

7 Trying to deal with the problem on their own

8 Behavioural 're-feeding' programme

9 Self-help treatment manual

10 Getting really fit/increasing time spent on exercise

11 Getting out and about more/finding some new hobbies

12 Getting information about the problem and available services

13 Behavioural weight loss "diet and exercise" program

14 Family counselling or therapy

15 Other

16 Don't know

☐

H.3 Show prompt card xxx There are a number of different people or groups who might be able to help Andrew. From the list choose the one you think would be most helpful for him.

1 GP or family doctor

2 Counsellor (including telephone, e.g. "Lifeline") or Social Worker

3 Psychiatrist or Psychologist

4 Family member

5 Close friend

6 Dietitian or Nutritionist

7 Naturopath or other alternative therapist

8 Self-help support group such as "Overeaters Anonymous"

9 Commercial weight-loss program such as "Weight Watchers"

10 Other

11 Don't know

☐

H.4 Which one of the medicines below do you think would be most helpful for Andrew? **1 Vitamins and minerals** **2 Herbal medicines or tonics** **3 Anti-depressants such as Prozac or Zoloft** **4 Tranquillisers such as Valium or Serepax** 5 None of the above 6 Don't know	☐
H.5 What do you think would be the likely result if Andrew received the sort of help you think is best (most appropriate) for him? **1 Full recovery with no further problems** **2 Full recovery, but problems will probably re-occur** **3 Partial recovery** **4 Partial recovery, but problems will probably re-occur** **5 No improvement** 6 Get worse 7 Don't know	☐
H.6 **What do you think would be the likely result if Andrew did NOT receive any help?** **1 Full recovery with no further problems** **2 Full recovery, but problems will probably re-occur** **3 Partial recovery** **4 Partial recovery, but problems will probably re-occur** **5 No improvement** **6 Get worse** 7 Don't know	☐
H.7 **What do you think would happen to Andrew's weight with treatment?** **1 Decrease a lot** **2 Decrease** **3 Stay the same** **4 Increase** **5 Increase a lot** 6 Don't know	☐

H.8 Do you think that Andrew would be discriminated against by others in the community if they knew about him problems with eating or with weight, for example, by an employer, a colleague, a family member, or by a health professional? 1 Yes 2 No 3 Don't know	☐
H.9 How difficult do you think Andrew's problem would be to treat? **1 Not difficult at all** **2 A little difficult** **3 Moderately difficult** **4 Very difficult** **5 Extremely difficult** 6 Don't know	☐
H.10 How many <u>men aged 18 to 45</u> in the general community do you think might have Andrew's problem at any given point in time? **1 Very few – less than 10%** **2 More than 10% but less than 30%** **3 More than 30% but less than 50%** **4 About 50%** **5 More than 50% but less than 70%** **6 More than 70% but less than 90%** 7 Most men, 90% or more 8 Don't know	☐
H.11 Do you think that you might currently have a problem at all like Andrew's? 1 Yes 2 No *(Go to H.13)* 3 Don't know *(Go toH.13)*	☐
H.12 How would you describe this problem? **1 Anorexia** **2 Bulimia** 3 Binge eating disorder/problem 4 Other	☐

H.13 **Have you ever spoken to or sought advice or treatment from any professional person, e.g. a counsellor, a psychologist, a doctor, a dietitian, specifically in relation to a problem with your EATING (*not your weight*), such as eating too much in one go, feeling that your eating is out of control, being preoccupied with what you can eat or when you can eat, or with burning up calories, or other problems like this?** 1 Yes 2 No	☐
H.14 **Over the past 6 months have you been trying to lose weight?** 1 Yes 2 No	☐
H.15 **Have you ever thought that it might not be too bad to be like Andrew, given that he has been able to maintain. good muscle tone and high level of exercise?** **1 Never thought it** **2 Rarely though it** **3 Occasionally thought it** **4 Often thought it** 5 **Always though it**	☐
I. **ATTITUDES AND BELIEFS ABOUT A HEALTH PROBLEM –** James Cook University (Scenario 3)	

14

I.1 **Please show respondent "Jenny" promt card. and ask them to read it. Show prompt card xxx From the list what would you say is Jenny's <u>main</u> problem?** 1 Depression 2 Anorexia (anorexia nervosa) 3 Bulimia (bulimia nervosa) 4 Stress 5 Anxiety disorder/problem 6 Low self-esteem/lacks self-confidence 7 Poor diet 8 "Yo-Yo" dieting 9 An eating disorder, but not anorexia or bulimia 10 No real problem, just a phase 11 Obesity/overweight 12 Binge eating disorder 13 Other 14 Don't know	☐

I.2	**Show prompt card XXX From the list of possible psychological or behavioural treatments for Jenny, choose the one you think would be most helpful for her.** 1 Just talking about the problem 2 Cognitive Behaviour Therapy 3 Psychotherapy 4 Alternative or relaxation therapy e.g naturopathy, homeopathy, massage, meditation or yoga 5 Assertiveness or social skills training 6 Admission to the psychiatric ward 7 Trying to deal with the problem on their own 8 Behavioural 're-feeding' programme 9 Self-help treatment manual 10 Getting really fit/increasing time spent on exercise 11 Getting out and about more/finding some new hobbies 12 Getting information about the problem and available services 13 Behavioural weight loss "diet and exercise" program 14 Family counselling or therapy 15 Other 16 Don't know	☐
I.3	Show prompt card xxx There are a number of different people or groups who might be able to help Jenny. From the list choose the one you think would be most helpful for her. 1 GP or family doctor 2 Counsellor (including telephone, e.g. "Lifeline") or Social Worker 3 Psychiatrist or Psychologist 4 Family member 5 Close friend 6 Dietitian or Nutritionist 7 Naturopath or other alternative therapist 8 Self-help support group such as "Overeaters Anonymous" 9 Commercial weight-loss program such as "Weight Watchers" 10 Other 11 Don't know	☐

I.4   Which one of the medicines below do you think would be most helpful for Jenny?
 	
   1   **Vitamins and minerals**
   2   **Herbal medicines or tonics**
   3   **Anti-depressants such as Prozac or Zoloft**
   4   **Tranquillisers such as Valium or Serepax**
   5   None of the above
   6   Don't know
	☐

I.5   What do you think would be the likely result if Jenny received the sort of help you think is best (most appropriate) for her?
 	
   1   **Full recovery with no further problems**
   2   **Full recovery, but problems will probably re-occur**
   3   **Partial recovery**
   4   **Partial recovery, but problems will probably re-occur**
   5   **No improvement**
   6   **Get worse**
   7   Don't know
	☐

I.6   **What do you think would be the likely result if Jenny did NOT receive any help?**
 	
   1   **Full recovery with no further problems**
   2   **Full recovery, but problems will probably re-occur**
   3   **Partial recovery**
   4   **Partial recovery, but problems will probably re-occur**
   5   **No improvement**
   6   **Get worse**
   7   Don't know
	☐

I.7   **What do you think would happen to Jenny's weight with treatment?**
 	
   1   **Decrease a lot**
   2   **Decrease**
   3   **Stay the same**
   4   **Increase**
   5   **Increase a lot**
   6   Don't know
	☐

I.8 Do you think that Jenny would be discriminated against by others in the community if they knew about her problems with eating or with weight, for example, by an employer, a colleague, a family member, or by a health professional? 1 Yes 2 No 3 Don't know	☐
I.9 How difficult do you think Jenny's problem would be to treat? **1 Not difficult at all** **2 A little difficult** **3 Moderately difficult** **4 Very difficult** **5 Extremely difficult** 6 Don't know	☐
I.10 How many women aged 18 to 45 in the general community do you think might have Jenny's problem at any given point in time? **1 Very few – less than 10%** **2 More than 10% but less than 30%** **3 More than 30% but less than 50%** **4 About 50%** **5 More than 50% but less than 70%** **6 More than 70% but less than 90%** 7 Most women, 90% or more 8 Don't know	☐
I.11 Do you think that you might currently have a problem at all like Jenny's? 1 Yes 2 No *(Go to I.13)* 3 Don't know *(Go to I.13)*	☐
I.12 How would you describe this problem? **1 Anorexia** **2 Bulimia** 3 Binge eating disorder/problem 4 Other	☐

I.13 **Have you ever spoken to or sought advice or treatment from any professional person, e.g. a counsellor, a psychologist, a doctor, a dietitian, specifically in relation to a problem with your EATING (*not your weight*), such as eating too much in one go, feeling that your eating is out of control, being preoccupied with what you can eat or when you can eat, or with burning up calories, or other problems like this?** 1 Yes 2 No	☐
I.14 **Over the past 6 months have you been trying to lose weight?** 1 Yes 2 No	☐
I.15 **Have you ever thought that it might not be too bad to be like Jenny, given that she has been able to lose a lot of weight?** **1 Never thought it** **2 Rarely though it** **3 Occasionally thought it** **4 Often thought it** 5 **Always though it**	☐
J. ATTITUDES AND BELIEFS ABOUT A HEALTH PROBLEM (GENERAL) - James Cook University	
I would now like to ask you about episodes of overeating that you may have had recently. By overeating, or binge eating, I mean eating an unusually large amount of food in one go and at the time feeling that your eating was out of control, [that is you could not prevent yourself from overeating, or that you could not stop eating once you had started]. J.1 **Over the past three months how often have you overeaten in the way I have described?** **1 Not at all** **2 Less often than once a week** **3 Once a week** **4 Two or more times a week**	☐

The next questions are about various weight-control methods some people use.	☐
J.2 Over the past three months have you regularly, that is at least ONCE A WEEK, used any of the following: laxatives, diuretics (water tablets), or made yourself sick, in order to control your shape or weight? 1 Yes 2 No	

J.3 Over the past three months have you regularly, e.g. at least once weekly, or recurrently during the three months, done any of the following: gone on a very strict diet or eaten hardly anything at all for a time, in order to control your shape or weight? 1 Yes 2 No	☐

J.4 In the past three months has your weight and/or your shape influenced how you think about (judge) yourself as a person? e.g. Has it been a really important issue to you/to your self-confidence? **1 Not at all – no influence** **2 Very slightly** **3 Slightly** **4 Moderately** **5 Markedly** 6 **Extremely (the most important thing for you)**	☐

J.5 During the past four weeks, on how many days (approximately), if any, were you unable to complete your work, study or household responsibilities because of any problem with your physical or emotional health? **1** Record the number of days between 0 and 28	☐☐