THE ASSOCIATION BETWEEN DIET QUALITY AND WEIGHT CHANGE IN YOUNG AND MID-AGE WOMEN OVER TIME

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Publications and presentations arising from this thesis

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1. H. Aljadani, A. Patterson, D. Sibbritt and C. E. Collins (2013). "The association between dietary patterns and weight change in adults over time: a systematic review of studies with follow up." JBI Database of Systematic Reviews and Implementation Reports 11(8).
2. H. Aljadani, A. Patterson, D. Sibbritt and C. E. Collins (2013). The association between diet quality and weight change in adults over time: A systematic review in perspective studies. Diet quality- an evidence approach. L. L. a. V. P. Victor R Preedy. New York, Springer. 2: 3 -27.
3. H. Aljadani, A. Patterson, D. Sibbritt, M. J. Hutchesson, M. E. Jensen and C. E. Collins (2013). "Diet Quality, Measured by Fruit and Vegetable Intake, Predicts Weight Change in Young Women." Journal of Obesity 2013: 10.
4. H. Aljadani, D. Sibbritt, A. Patterson and C. E. Collins (2013). "The Australian Recommended Food Score did not predict weight gain in mid-age Australian women during six year of follow-up."
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Manuscripts in peer reviewed journals: Under review

1. H. Aljadani, A. Patterson, D. Sibbritt and C. E. Collins. "Prospective changes in diet quality in mid-age Australian women and its association with weight change during nine years of follow-up." Under review in the journal, Public Health Nutrition.

Manuscripts will be submitted to a peer reviewed journal

1. H. Aljadani, L. Al-Oboudi, A. Patterson, D. Sibbritt, and C. E. Collins. "Frequency and variety of healthy foods, fruit and vegetables predicts lower six year weight gain in young women".

Conferences abstracts: Published in conference

1. Title: The association between diet quality and weight change in adults over time: A systematic review of cohort studies.
   Authors: H. Aljadani, A. Patterson, D. Sibbritt, and C. E. Collins
   Event: The Australian New Zealand Obesity Society annual Meeting (ANZOS) in Adelaide 2011.
2. Title: Does higher diet quality protect weight change in adults over time: A systematic review of cohort studies.
   Authors: H. Aljadani, A. Patterson, D. Sibbritt, and C. E. Collins
   Event: The International Conference of Diet and Activity Methods (ICDAM) at Rome 2012.
3. Title: The role of total energy intake and energy density on changes in body weight: A systematic review of cohort studies.
   Authors: H. Aljadani, C.E. Collins, D. Sibbritt, A. Patterson.
   Event: The International Congress Nutrition, at Sydney 2012
4. Title: Development of overweight and obesity in mid-age women from the Australian Longitudinal on Women Health Study
   Author: H. Aljadani, A. Patterson, D. Sibbritt, and C. E. Collins.
   Event: in ANZOS 2013, Melbourne, Australia.

5. Title: Frequency and variety of fruit and vegetable consumption did not predict 6-year weight change in mid–aged women from the Australian Longitudinal Study on Women's Health
   Authors: H. Aljadani, A. Patterson, D. Sibbritt, and C. E. Collins.
   Event: ANZOS 2013, Melbourne, Australia.
6. Title: Diet Quality is not associated with Obesity risk in mid-age women in the Australian Longitudinal Study on Women's Health
   Authors: Aljadani, Patterson, Sibbritt, and Collins
   Event: The Australasian Epidemiological Association Annual Scientific Meeting 2014, New Zealand.
7. Title: Prospective changes in diet quality in mid-age Australian women and its association with weight change during nine years of follow-up
   Authors: H. Aljadani, A. Patterson, D. Sibbritt, and C. E. Collins.
   Event: ICDAM in Brisbane, Australia.

Presentations arising from this thesis

1. Title: Does eating better predict weight change
   Location: The Priority Research Centre in Physical Activity and Nutrition. That was part of a presentation for the public at an afternoon tea ("Eat our words"), 2012.
2. Title: Diet Quality indexes in the young women from the ALSWH.
   Location: The Priority Research Centre in Physical Activity and Nutrition, 2012.
3. Title: Diet quality does not predict six year weight changes in mid-age women from Australian Longitudinal Study on Women's Health
   Location: The Australian and New Zealand Society of Obesity Annual Scientific Meeting (2012), at Auckland New Zealand.
   Authors: H. Aljadani, A. Patterson, D. Sibbritt, and C. E. Collins.

Abbreviations

The following are the common abbreviations are used in this thesis:

15-point PNNS-GS	15-point French Programme National Nutrition Santé-Guideline score
ABS	Australian Bureau of Statistics
AHEI	Alternative Healthy Eating Index
AIHW	Australian Institute of Health and Welfare
ALDRS	Adult life diet risk score
ALSWH	Australian Longitudinal Study on Women's Health
aMDS	Alternative Mediterranean Diet Score
ANHPA	Australia National Health Priority Areas
ARFS	Australian Recommended Food Score
Au-DGI	Australian version of the DGI
Au-HEI	Australian version of the HEI
BMD	Bone Mineral Density
BMI	Body Mass Index
CBMI	Change in Body Mass Index
Ch-DQI	Chinese Diet quality Index
C-HEI	Canadian version of the HEI
CHFP	Chinese Food Pagoda
CI	Confident Intervals
CVD	Cardiovascular Dieses
CWT	Change in weight
DASH	Dietary Approaches to stop hypertension score
DBS	Dietary Behaviour Score
DDS	Diet Diversity Score
DDS-R	Dietary diversity scores for recommended foods
DDV	Dietary Diversity Score
DGI	Dietary Guideline Index
DGI	Dietary Guideline Index
DHA	Docosa-Hexaenoic Acid (long Chain Omenga-3 fatty acids)
DQESv2	the Dietary Questionnaire for Epidemiological Studies Version 2
DQI	Diet Quality Index
DQI-I	Diet Quality Index-International
DQI-R	Diet Quality Index-Revised

DQS	Diet Quality Score
DRS	Dietary Risk Score
DVRS	Dietary Variety score for recommended food
ED	Energy Density
EDNP	Energy-Dense Nutrient-Poor food score
EPA	Eicosa-Pentaenoic Acid (long Chain omega-3 fatty acids)
EPIC	European Prospective Investigation into Cancer
FDS	Food Diversity Score
FFQ	Food Frequency Questioners
FIS	Fat Intake Score
FNRS	Framingham Nutritional Risk Score
FVS	Food Variety Score
HDI	Healthful Diet Indicator
HDL	High-Density lipoprotein
HDS	Healthy Diet Score
HEI	Healthy Eating Index
HFI	Healthy Food Index
HFNI	Healthy Food and Nutrients Index
HRT	Hormone Replacement Therapy use
KSA	Kingdom of Saudi Arabia
LDL	Low Density Lipoprotein
LSS	Life summary score
MDP	Mediterranean Diet Patterns
MDQI	Mediterranean Diet Quality Index
MDS	Mediterranean Diet score
MUFA	Monounsaturated fatty acids
NCDs	Non-Communicable Diseases
ND	Not the correct time period
NE	Not the exposure
NHMRC	National Health and Medical Research Council
NI	No intervention of the interest
NNR	Nordic Nutrition Recommendation
NNRS	Naturally Nutrient Rich Score
NO	No outcome of interest
NP	Not participants of interest
NRFS	Not Recommended Food Score
NS	Not a study design of interest

OBS	Oxidative balance Score
OCP	Oral Contraceptive Pill
OR	Odds Ratio
OSA	Obstructive Sleep Apnoea
PANDiet	Probability of Adequate Nutrient Intake
PCOS	Polycystic Ovary Syndrome
PNNS-GS	The Programme National Nutrition Santé Guideline Score
PUFA	Polyunsaturated fatty acids
RCT	Randomized Control Study
RDA	Recommendation Dietary allowance
RFBS	Recommended Food and Behaviour Score
RFS	Recommended Food Score
rMed	Relative Mediterranean Diet Score
RR	Relative Risk
RRR	Reduced Rank Regression
SD	Stranded Deviation
SDQ	Short Dietary Questions
SFA	Saturated Fatty Acids
SoFAAS	Solid Fat, Alcoholic beverages, Added Sugar
SWAN	Study of Women's Health Across the Nation
TEI	Total energy Intake
UAE	The United Arab Emirates
UK	The United Kingdom
USA	The United States of America
USDAFG	USA Department of Agriculture Food Guide Recommendations
WHO	World Health Organization

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Abstract

Background:

Weight gain is one of the serious health-related issues facing people in all age groups worldwide. Excessive weight gain is linked to increased risk of type 2 diabetes, cardiovascular disease (CVD), some cancers, premature death, and reduced quality of life. Weight gain is a result of an imbalance between total energy intake and the expenditure of energy. Measuring both energy intake and energy expenditure accurately is problematic, especially in large cohorts. Hence, measures of dietary patterns, developed using *a priori* decisions, is becoming one of the most used methods in epidemiological research. The concept of diet quality is defined as a summary measure of the nutritional quality of the whole diet in comparison to accepted nutrition recommendations. Diet quality tools aim to assess the quality of an individual's overall eating patterns using a score or index to determine how closely dietary intake aligns with national dietary guidelines and/or recommended nutrient intakes. Evidence shows that diet quality assessments are an acceptable tool which can predict the risk of developing chronic diseases and mortality. However, there is still limited evidence on the relationship between diet quality and some risk factors for health outcomes such as weight change.

Aims:

This thesis had six main interconnected aims, as follows:-

1) To synthesise the best available evidence on the relationship between diet quality indexes or scores and body weight change in prospective studies;

2) To compare the predictive association between a number of diet quality indexes with weight change in young women from the Australian Longitudinal Study On Women's Health (ALSWH) over six years;

3) To evaluate the relationship between different diet quality indexes and weight change in a sub-cohort of 'healthy' weight young ALSWH women followed for six years;

4) To test the relationship between diet quality, measured by the Australian Recommended Food Score (ARFS) and six year weight change in mid-age ALSWH women;

5) To examine the association between diet quality (ARFS) in women reporting a healthy weight and valid Total Energy Intake (TEI) and incidence of overweight or obesity in mid-age ALSWH women during six years of follow-up; and

6) To investigate whether improved diet quality scores (ARFS) over nine years of follow-up are associated with weight gain in mid-age ALSWH women with a valid TEI.

Methods and Results:

To achieve these aims systematic reviews (in 2011 and 2014) and secondary data analyses of ALSWH data were conducted. Both systematic reviews considered the relationship between diet quality and weight change in adults over time. In 2011, the search was performed on literature published between 1970 to March 2011 in four databases (MEDLINE, CINAHL, EMBASE and Scopus).

This review indicated that there was limited and inconsistent evidence on the relationship between diet quality and prospective body weight change in adults, especially among women in cohort studies. The evidence suggests that there was an inverse association between diet quality and weight change longitudinally, but the studies were too heterogeneous for any clear conclusions. A significant number of recent studies have been published in this area, and so the search was re-run in 2014. The 2015 systematic review confirms that higher diet quality is associated with lower body weight gain or lower incidence of overweight or obesity. Further, it found that diet quality tools based on food alone may have a stronger association with weight change in adults than those that rely on or incorporate nutrient sub-scales. However, there is a dearth of studies that use diet quality measures based on food components only.

Following the reviews, two analyses were conducted in sub-cohorts of young women from the ALSWH in order to evaluate aims two and three. First, a multivariate linear regression was used to evaluate the predictive relationship between a number of diet quality indexes, with weight change in a sub-cohort of disease-free young women, from the ALSWH who were followed for six years. The three diet quality indexes were the existing ARFS, an adapted version of the Diet Quality Index (DQI) and a newly developed diet quality score named the Fruit and Vegetable Index (FAVI), which have been used to measure diet quality in these women. A second analysis was run on a similar sub-cohort of young women from the ALSWH, but differed in that it included only those women within the healthy weight at baseline. Both studies revealed that young women's baseline dietary patterns, which contained a greater variety of healthy food such as vegetables, fruit and low fat dairy, legumes and lean protein, are associated with relatively low weight gain compared with those who consumed a less healthy dietary pattern.

Three additional analyses were also conducted on data obtained from mid-age women from the ALSWH. The first of these analyses was conducted on a sub-cohort of disease-free women, who were followed for six years. The analyses involved using multivariate linear regression to explore the association between diet quality, defined by the ARFS, and weight change during six years of follow-up. In the second of these analyses data from those women who were identified as having a healthy weight at baseline, had valid TEIs, and were followed for the same six year period, were analysed using multiple linear regression to assess the impact of the ARFS on the risk of becoming overweight or obese over six years of follow-up (i.e. six year incidence of overweight and obesity). From these studies, it was found that higher diet quality, as measured by the ARFS, was not associated with weight gain in mid-age women, nor was it associated with either a decreased or increased risk of becoming overweight or obese. The third of the analyses on mid-aged women from the ALSWH aimed to test whether improvements in diet quality over time can effect weight change in mid-age women during nine years of follow-up. Women were eligible for this analysis if they reported not having any medical conditions at baseline such as type 2 diabetes or heart

disease and they reported a valid TEI at baseline. A strong inverse association between change in diet quality measured by the ARFS and weight gain was found over nine years of follow-up.

Conclusion and Implication:

Taken together, the results show that diet quality is a good predictor of weight change over time in adults in general, although the change is small. In adult women baseline diet quality measured by the ARFS or FAVI is associated with lower weight gain in young women but not in mid-age women. However, the analysis on change in diet quality in the mid-age women revealed that those who improved their ARFS score over time gained the least amount of weight, compared to those who reduced their diet quality over nine years. This research also found that weight gain over time and poor diet quality were common features among both young and mid-age women.

The findings from this thesis will help to inform public health nutrition policies, and women more generally, of the importance of consuming a wide variety of healthy foods regularly and aiming to achieve a high diet quality in order to slow the rate of weight gain in those most at risk of gaining weight. Those at greater risk of gaining weight, defined as women who are physically inactive, smokers, in the menopausal transition and less educated than other women at the same age. This thesis has added to the evidence base examining the ability of diet quality scores to predict weight change prospectively. Food based indexes appear to be a useful tool to explore and detect associations with weight change. However for research in the future, well designed studies in different population groups are required to confirm the findings, and to especially examine the role of changes in diet quality over time.

The results revealed from this thesis add valuable knowledge to the available literature. They provide justification for ongoing research in this area, specifically on the prevention of weight gain and the role of promoting healthy eating. More intervention studies are particularly required, with the aim of promoting healthy eating, to determine the long-term effects on weight gain and how it may vary for women at different life stages.