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Is dietary quality associated with depression? An analysis of the Australian Longitudinal Study on Women’s Health data†

Megan Lee1*, Joanne Bradbury2, Jacqui Yoxall3 and Sally Sargeant2

1 Bond University, Gold Coast Campus, Robina, Australia
2 Southern Cross University, Gold Coast Campus, Coolangatta, Australia
3 Southern Cross University, Lismore Campus, Lismore, Australia

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Abstract
Depression is a chronic and complex condition experienced by over 300 million people worldwide. While research on the impact of nutrition on chronic physical illness is well documented, there is growing interest in the role of dietary patterns for those experiencing symptoms of depression. This study aims to examine the association of diet quality (Dietary Questionnaire for Epidemiological Studies version 2) and depressive symptoms (Centre for Epidemiological Studies for Depression short form) of young Australian women over 6 years at two time points, 2003 (n = 9081, Mean age = 27 ± 6) and 2009 (n = 8199, Mean age = 33 ± 7) using secondary data from the Australian Longitudinal Study on Women’s Health. A linear mixed-effects model found a small and significant inverse association of diet quality on depressive symptoms (β = −0.03, 95% CI (−0.04, −0.02)) after adjusting for covarying factors such as BMI, social functioning, alcohol and smoking status. These findings suggest that the continuation of a healthy dietary pattern may be protective of depressive symptoms. Caution should be applied in interpreting these findings due to the small effect sizes. More longitudinal studies are needed to assess temporal relationships between dietary quality and depression.

Keywords: Dietary patterns; Depression; Depressive symptoms; Australian Longitudinal Study of Women’s Health; Diet quality

Over the last decade, there has been an increase in interest in the relationship between nutrition and mental health in epidemiological studies. Poor diet and poor mental health are leading causes of global mortality and morbidity. Mental health disorders currently represent one of the most substantial global burdens of disease, estimated as costing US$8.5 trillion, including costs such as medication, psychotherapy, workplace absenteeism and income losses. In Australia between 2017 and 2018, over 2.5 million people experienced depression, with a prevalence of 10.4%. Females aged 25 to 34 (11.8%) reported higher rates than their male counterparts (10.2%). The role of nutrition in chronic lifestyle diseases such as type 2 diabetes, cardiovascular disease, some cancers, metabolic syndrome and obesity is generally well documented. However, the role of nutrition in mental health is less well known and has provoked growing interest in the association between dietary patterns, diet quality and the association with symptoms of depression.

Research proposes that a wide variety of biological mechanisms are involved in the heterogeneous and complex relationship between nutrition and depression including decreased monoamine function, dysfunctional hypothalamic pituitary adrenal axis, neuro-progression/brain plasticity, mitochondrial disturbances, cytokine-mediated inflammatory processes, increased oxidative stress, immune responses, immunoinflammation, gut dysbiosis and gut/brain axis relationships. However research on the role of these biological mechanisms and nutrition in depression is relatively new and focuses on single food components and nutritional supplementation rather than whole-of-diet sources.

Dietary patterns are defined as ‘the quantity, variety or combination of different foods and beverages in a diet and the frequency with which they are habitually consumed’ (Sanchez-Villegas et al., 2018, p. 4). Diet quality is defined as ‘the nutritional adequacy of an individual’s dietary pattern and how closely this aligns with national dietary guidelines’ and is commonly used as a measure of healthy and unhealthy dietary patterns assessing high and low diet quality (Sanchez-Villegas et al., 2018). Healthy dietary patterns are generally rich in fresh vegetables and fruits, nuts, seeds, whole grains, fermented foods, legumes and water. Most of the research on dietary patterns and depression involves observational epidemiological studies that indicate an association between healthy dietary patterns and decreased depressive

Abbreviations: AIC, Akaike Information Criterion; ALSWH, Australian Longitudinal Study of Women’s Health; ARFS, Australian Recommended Food Score; CEDS-10, Centre for Epidemiological Studies Depression short form; DQES v2, Dietary Questionnaire for Epidemiological Studies version 2.

* Corresponding author: Dr M. Lee, email melee@bond.edu.au
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symptoms (37,38), while unhealthy dietary patterns high in ultra-
processed, refined and sugary foods are associated with higher
symptoms of depression (39,40). Currently, there are four ran-
omised control trials that have assessed the effect of changing
from an unhealthy to a healthy dietary pattern (41–44). All four
Australian randomised control trials found a significant im-
provement in depression scores between the intervention and social
control groups. However, evidence arising from meta-analyses
and systematic reviews shows inconsistent or inconclusive find-
ings when the research is viewed as a whole (39,40,45–49). These
findings could be clarified through further prospective longi-
tudinal studies on dietary intake and depression (50).

One study that examines both diet quality and depressive symp-
toms prospectively is the Australian Longitudinal Study of Women’s
Health (ALSWH) (51). Previous research using ALSWH data has
examined the role of diet quality and depressive symptoms using
longitudinal analysis (25,32–55). Not all have found an association. For
instance, Lai et al. (53) utilised data from the ALWH, which focused
on Australian women born between 1946 and 1951 and found a
significant inverse association between diet quality and depressive
symptoms (β = −0.24, P = .001). However, they also demonstrated
that these associations were no longer significant after adjusting for
covarying factors such as BMI, smoking and alcohol status and
physical activity (β = −0.04, P = .100). This result suggested that
a relationship between diet and depression may be explained by
covarying lifestyle factors (56–59). A follow-up analysis using the
ALSWH data by the same authors (52) resulted in lower odds of
depressive symptoms in high (OR = 0.86; 95% CI (0.77, 0.96))
and moderate (OR = 0.94; 95% CI (0.80, 0.99)) diet quality tertiles
compared with low diet quality. This suggests that maintaining diet
quality over the long term could reduce the odds of depressive
symptoms. The authors recommended more longitudinal research
using a younger cohort from the ALSWH.

One cross-sectional survey measured diet quality and depressive
symptoms in 3963 Japanese middle-aged women (M = 47–9, SD = ± 2 years) (60). After adjusting for covariates, they found
that high diet quality was associated with lower depressive
symptoms compared with participants with low diet quality
(OR = 0.65, 95% CI (0.45, 0.78)). Apart from this study, there is
a paucity of research that focuses on the relationship between
diet quality and depressive symptoms in young women. To fill
this gap in the literature, we conducted a secondary analysis of
the ALSWH data examining whether there is a longitudinal
association between dietary quality and depressive symptoms
in a cohort of young Australian women. The sample for the cur-
cent study was sourced from the 1973–1978 cohort, including
data from two time points in 2003 (Mean age = 27–6, SD = ± 1–5)
and 2009 (Mean age = 35–7, SD = ± 1–5) where diet quality, depressive
symptoms and all covarying factors were measured. These
data have not been analysed in previous research, and it is our
aim to replicate the previous studies analysis with fresh data.

Methods
Participants

The ALSWH (51) is a continuing longitudinal cohort study of more
than 50,000 women in Australia. It is divided into four age cohorts
of women born between 1921 to 1926, 1946 to 1951, 1973 to
392 women were recruited into the first three cohorts, fol-
lowed by 17 069 into the 2012 fourth cohort (62). Participants were
randomly selected from the Australian health insurance data-
base, Medicare, including all Australian permanent residents.
Response rates for each cohort were estimated as 37% to
40% (1921–1926), 53% to 56% (1946–1951), 41% to 42%
containing questions relating to their health outcomes every 3
to 4 years from 1996 to 2018. The study protocol followed the
Declaration of Helsinki guidelines (63), and formal ethical appro-
val was given by the Human Research Ethics Committees of the
University of Queensland and the University of Newcastle in
Australia. Participants supplied informed consent before being
included (51).

The analysis for this particular paper is targeted to the cohort
of women who were born between 1973 and 1978. Participants
completed a baseline questionnaire in 1996 (n = 14 247) and every
3 years thereafter; 2000 (n = 9688), 2003 (n = 9081), 2006 (n = 9145),
2009 (n = 8199), 2012 (n = 8009), 2015 (n = 7186) and 2018 (n = 7121).
The sample for the current study includes data from two time
points in 2003 (n = 9081, Mean age = 27–6) and 2009 (n = 8199,
Mean age = 33–7) where diet quality, depressive symptoms and all
covarying factors were measured.

Materials

Depressive symptoms. The Centre for Epidemiological
Studies Depression short form (CESD-10) was used in the
ALSWH to ‘assess depressive symptoms during the past week at
each survey’ (64). The CESD-10 includes ten of twenty items
from the original CESD (65). Response format is a four-point
Likert scale, ranging from 0 (none of the time) to 3 (all of the
time). Total scores are obtained by summing across items rang-
ing from 0 to 30, with higher scores indicating greater depressive
symptom severity. The CESD-10 was designed to measure
depressive symptoms experienced in the general population
rather than provide a clinical diagnosis. A score greater than
ten is the standard cut-off to classify people experiencing depres-
sive symptoms (65).

The CESD-10 has high internal consistency (Cronbach α = 0.88), 92% specificity identifying those without depressive
symptoms, 91% sensitivity identifying those with depressive
symptoms and 92% positive predictive values reflecting the
presence of depressive symptoms (66).

Food frequency questionnaire. The Dietary Questionnaire
for Epidemiological Studies version 2 (DQES v2) was administered
to the selected cohort in 2003 and again in 2009 in the ALSWH.
The DQES v2 is a self-report FFQ developed by the Cancer
Council Victoria that measures dietary intake in epidemiological
studies (67). In the DQES v2, participants report dietary consump-
tion of seventy-two foods over the previous 12 months.
Additional questions are asked on the frequency of consuming
fruit, vegetables, meat, meat alternatives, milk, bread, butter,
spreads, cheese, sugar and eggs (67). A study of 237 Australian
participants indicated test-retest reliability of the DQESv2 with
The association of diet quality & depression in Australian women

Diet quality (Australian Recommended Food Score). The ARFS uses scoring in line with the Australian Dietary Guidelines (ADG) and the Australian Guide to Eating (71). The ARFS is calculated by summing points within eight subscales: vegetable intake (twenty-one items), fruit (twelve items), protein foods (seven items), plant-based protein (six items), bread and cereals (thirteen items), dairy products (eleven items), water (one item) and fats (two items). Foods are given one point for a frequency of more than once/week. Scores range from 0 to 73, with higher values corresponding to healthier dietary quality. The ARFS has been validated using the Australian Eating Survey (33) and used in previous studies using ALSWH cohorts (52,53).

Covariates. Covarying factors commonly associated with depressive symptoms in the literature included BMI – measured by calculating self-report weight in kilograms divided by height in metres squared; social functioning – measured by averaging two items of the thirty-six-Item Short Form Survey (SF-36) (72); with α reliability levels of 0.85 (73); anxiety – measured using self-report of clinical diagnosis (yes/no); alcohol status – measured using three self-report items (independent of the ARFS diet quality score) on how often and how much alcohol was consumed each week and engagement in binge drinking (no risk; binge less than once a month; binge once a month or more; more than two drinks/d on average) in line with classifications from the National Health and Medical Research Council (73); smoking status – measured using three self-report items on how often and how many cigarettes smoked each week and; education level – no qualification, school certificate, trade certificate, higher school certificate, trade certificate, diploma, undergraduate degree and postgraduate degree.

Data analysis strategy. We calculated descriptive statistics for both time points (2003 and 2009) using mean, median, standard deviation, histograms and boxplots for continuous variables (CESD-10, ARFS, SF36 and age) and frequencies, percentages and bar charts for categorical variables (BMI, clinically diagnosed depression and anxiety, education, marital, smoking and alcohol status). Assumptions for linear mixed-effects model, including linearity and equal variance, were assessed using histograms and scatterplots of residuals (75). Normality of distributed errors was observed using probability-probability (pp) and quantile-quantile (qq) plots. The Akaike Information Criterion (AIC) and log-ratio tests were used to assess the model fit. AIC is used to determine the information lost by adding a variable to the model, with lower AIC indicating a better fit (76). Criteria for retaining or excluding variables in the final models were a substantial reduction of the AIC and a significant log-ratio test.

Only data that were complete for both time points 2003 and 2009 for each participant were included in the model (n 8199).

A linear mixed-effects model was used to predict depression total scores (continuous CESD-10 score) as a function of diet quality (continuous ARFS total score) and year (2003 and 2009), with participant as a random effect. The model was formulated as follows with i indicating individual and j indicating time:

\[
&\text{CESD} = \alpha + \beta_1 \text{ARFS}_{ij} + \beta_2 \text{year}_{ij} + \\
&+ \beta_3 \text{BMI}_{ij3} + \beta_4 \text{social function}_{ij4} + \beta_5 \text{anxiety}_{ij5} + \\
&+ \beta_6 \text{alcohol status}_{ij6} + \beta_7 \text{smoking status}_{ij7} + \\
&+ \beta_8 \text{education level}_{ij8} + b(\text{participant}_i) + \varepsilon_{ij}
\]

Continuous covariates (BMI and social function) and categorical covariates (anxiety, alcohol status, smoking status, physical activity, geographical location, marital status, socio-economic status and education level) were added one at a time in a stepwise fashion. Each step in the model reduced the AIC and was associated with a significant log-ratio test, apart from physical activity, geographical location, socio-economic status and marital status. Therefore, these four variables were removed. The final model was specified with the CESD-10 as the outcome, ARFS total score as the predictor, with covariates as BMI, social function, anxiety, alcohol status, smoking status and education level added stepwise.

Results

Participant characteristics. Participant characteristics of women at 2003 and 2009 are summarised in Table 1. At baseline, in 2003, 9081 participants were included (mean age = 27.6, SD = 1.5). At the final time point in 2009, 8199 (90%) participants remained (mean age = 35.7, SD = 1.5). At this time point, 77% of women were partnered, 56% had completed a university degree, 41% had smoked cigarettes in their lifetime, 88% currently consumed alcohol and 10% were clinically diagnosed with anxiety. According to WHO (77) BMI categorisation, 45% of women were classified as overweight or obese compared with 37% in 2003. In 2003, sample mean diet quality was 29.2 (SD = 9.3) compared with 33.2 (SD = 9.3) in 2009. In relation to depression, 13% (2003) and 18% (2009) of the cohorts were clinically diagnosed with depression, while CESD-10 scores across the cohort fell below the cut-off for experiencing depressive symptoms 7.0 (SD = 5.3) in 2003 and 6.4 (SD = 5.2) in 2009.

Linear mixed-effects model. In the unadjusted model, there was a small, significant inverse association of ARFS on CESD-10 (β = -0.06, P < 0.01), indicating that for every point increase in diet quality, as measured by the ARFS total score, there was a 0.06-point reduction in depressive symptoms, as measured by the CESD-10 total score (online supplementary material). Each step in the model reduced the AIC and was associated with a significant log-ratio test indicating all variables in the table contributed to the model. There was
nonsignificant interaction between ARFS total score and year. Therefore, only the main effects were included in the adjusted model. After adjusting for all covariates in the model, there remained a small but significant inverse association of ARFS on CESD-10 (β = -0.03, 95% CI (-0.04, -0.02)), indicating that for each point increase in diet quality there is a .03 point reduction in depressive symptoms (Table 2).

Discussion

This analysis of the ALSWH longitudinal cohort study measured the size and significance of the association between Australian women’s diet quality and depressive symptoms over 6 years between 2003 and 2009. In a linear mixed-effects model, ARFS scoring was applied to the DQESv2 FFQ to measure diet quality and depressive symptoms between at both time points. After adjusting for covariates, diet quality was inversely associated with depressive symptoms at both time points in this large cohort.

This longitudinal data analysis suggests that a continuation of healthy diet quality predicts lower depressive symptoms for women who already have a healthy diet. The findings are statistically significant after adjusting for various confounders but had small effect sizes. Caution must be applied when interpreting these results. Although statistically significant, the small effect sizes may not suggest clinical significance. Therefore, it is unclear how much change from an unhealthy to a healthy diet would be needed to infer a result in depressive symptoms in clinical application. A reason for the small effect sizes may be that although 13% to 18% of the cohort were clinically diagnosed with depression, overall, when measuring depressive symptoms using the CESD-10 scores, the cohort, on average reported lower than the cut-off scores for depressive symptoms. These findings are comparable with other data analyses using the ALSWH to examine diet quality and depressive symptoms using the same diet quality score (ARFS) and depressive symptoms score (CESD-10) as our study. In their study using the 1946 to 1951 cohort, women who had a greater consumption of foods within a Mediterranean dietary pattern had 8% lower odds of depressive symptoms in women who had moderate to high diet quality compared with those who had lower diet quality using the ARFS (moderate v. low: OR = 0.94, 95% CI (0.80, 0.99)), high v. low: OR = 0.86, 95% CI (0.77, 0.96)). Similarly, Riens et al. (54) found that after adjusting for covariates in the 1946 to 1951 cohort, women who had a greater consumption of foods within a Mediterranean dietary pattern had 8% lower odds of depressive symptoms in 2001 (OR = 0.82, 95% CI (0.77, 0.88)) and lower odds of depressive symptoms in 2004 (OR = 0.83, 95% CI (0.75, 0.91)).

Similarly, another longitudinal study measured the association between dietary patterns and depressive symptoms using reduced rank regression in 903 Japanese participants after a 3-year follow-up (78). They found that high adherence compared with low adherence to a healthy Japanese dietary pattern—high in fish, soya products, green tea, vegetables, mushrooms and seaweed was associated with a reduced odds of depressive symptoms (OR = 0.57, 95% CI (0.35, 0.93)). However, a longitudinal study in the UK assessing dietary patterns and depressive symptoms in young female parents aged 29 to 40 years (n 7608) over 4 years (79) found no significant association after adjusting for covariates. The ARFS measurement of diet quality used in this study implies that the diversity of healthy foods may be an important factor for depressive symptoms. Participants who recorded limited intake from each food group received lower scores on the ARFS, Australian recommended food score.
oxidative stress, chronic inflammation and improve the health of the gut microbiome, which is already identified as contributing to a reduction in depressive symptoms(86,87). A recent cohort study comparing microbiome samples from 10 000 citizens-scientists from Australia, the UK and USA found that consuming more than thirty different plant types each week was beneficial to the gut and psychiatric health(88).

This current analysis also found several other predictors of depressive symptoms within the model in addition to diet quality. When assessing diet quality using the ARFS, higher scores in anxiety and BMI were associated with increased depressive symptoms, and women who had higher social functioning had lower odds of depressive symptoms.

This study’s strengths are that the data were collected from a large sample of women representing the Australian population over 6 years. A further strength of this study is the ability to adjust across various socio-demographic and health-related factors within the model enhance the strength of this particular analysis. Furthermore, the ability to assess the impact of diet and socio-demographic factors specific to a female cohort is appropriate as women have higher reported rates of depressive symptoms than men in Australia(86). However, caution must be applied in suggesting a causal role between diet and depression and from the small effects found as the clinical significance of these findings could be uncertain. Clinical significance is distinctly different from statistical significance and indicates whether the association could make a demonstrated, clinically meaningful difference to an individual receiving treatment in the real world(87). Additionally, some variables included in the model are along the causal pathway between depressive symptoms and diet quality (for example, BMI). It was beyond the scope of this cross-sectional study to explore the potential causal roles of variables. Future research could explore mediation and moderation impacts of the other significant variables in the model. A further limitation is that the ARFS measurement of diet quality gave scores for some food types, which were not representative of the definition the authors use of a healthy dietary pattern (high intake of fruits, vegetables, nuts, seeds, legumes, wholegrains, water and low intake of processed, sugary and refined foods) including ice cream, white bread and rice and processed meat products. The ARFS also disadvantaged participants who followed a plant-based dietary pattern as scores were given for following vegetarian and vegan diets. This disadvantage could result in participants who followed a plant-based dietary pattern having reduced scores and potentially being categorised as consuming an unhealthy diet when the opposite may have occurred. Further, the 1-year recall of food consumed was the basis for the diet quality measurement. The reliability of an individual’s recall of foods eaten over this time is questionable and may influence the accuracy of the results(88).

In this report, a longitudinal analysis using linear mixed-effects models, diet quality measured by a FFQ in 2003 and 2009 had a small and statistically significant association. However, this association may not be clinically meaningful. Other predictors of depression were important, including

Table 2. Adjusted model of ARFS total score on CESD-10 between 2003 (n 9081) and 2009 (n 8199)

<table>
<thead>
<tr>
<th></th>
<th>β</th>
<th>β</th>
<th>SE</th>
<th>Z</th>
<th>P</th>
<th>95 % CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARFS total score</td>
<td>-0.03</td>
<td>-0.06</td>
<td>0.004</td>
<td>-8.29</td>
<td>&lt; 0.001</td>
<td>-0.04, -0.02</td>
</tr>
<tr>
<td>Years</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2003</td>
<td>-0.21</td>
<td>-0.02</td>
<td>0.064</td>
<td>-3.35</td>
<td>0.001</td>
<td>-0.34, -0.09</td>
</tr>
<tr>
<td>Anxiety</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1.81</td>
<td>0.09</td>
<td>0.128</td>
<td>14.15</td>
<td>&lt; 0.001</td>
<td>1.56, 2.06</td>
</tr>
<tr>
<td>No</td>
<td>0.08</td>
<td>0.09</td>
<td>0.066</td>
<td>12.20</td>
<td>&lt; 0.001</td>
<td>0.07, 0.09</td>
</tr>
<tr>
<td>Social function</td>
<td>-0.13</td>
<td>-0.54</td>
<td>0.002</td>
<td>-81.16</td>
<td>&lt; 0.001</td>
<td>-0.13, -0.12</td>
</tr>
<tr>
<td>Alcohol status</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-drinker</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low-risk drinker</td>
<td>-0.04</td>
<td>-0.01</td>
<td>0.122</td>
<td>-0.29</td>
<td>0.772</td>
<td>-0.27, 0.20</td>
</tr>
<tr>
<td>Rarely drinks</td>
<td>0.24</td>
<td>0.02</td>
<td>0.130</td>
<td>1.82</td>
<td>0.069</td>
<td>0.02, 0.49</td>
</tr>
<tr>
<td>Risky drinker</td>
<td>0.67</td>
<td>0.02</td>
<td>0.217</td>
<td>3.07</td>
<td>0.002</td>
<td>0.24, 1.09</td>
</tr>
<tr>
<td>High-risk drinker</td>
<td>1.33</td>
<td>0.02</td>
<td>0.429</td>
<td>3.09</td>
<td>0.002</td>
<td>0.49, 2.17</td>
</tr>
<tr>
<td>Smoker status</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never smoked</td>
<td>0.26</td>
<td>0.02</td>
<td>0.091</td>
<td>2.84</td>
<td>0.005</td>
<td>0.08, 0.43</td>
</tr>
<tr>
<td>Smokes ≤ 10 d</td>
<td>0.31</td>
<td>0.02</td>
<td>0.122</td>
<td>2.55</td>
<td>0.011</td>
<td>0.07, 0.55</td>
</tr>
<tr>
<td>Smokes 11–19 d</td>
<td>0.80</td>
<td>0.04</td>
<td>0.149</td>
<td>5.36</td>
<td>&lt; 0.001</td>
<td>0.51, 1.09</td>
</tr>
<tr>
<td>Smokes ≥ 20 d</td>
<td>0.98</td>
<td>0.03</td>
<td>0.194</td>
<td>5.04</td>
<td>&lt; 0.001</td>
<td>0.60, 1.36</td>
</tr>
<tr>
<td>Education level</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No qualification</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Year 10</td>
<td>-0.49</td>
<td>-0.02</td>
<td>0.376</td>
<td>-1.31</td>
<td>0.189</td>
<td>-1.23, 0.24</td>
</tr>
<tr>
<td>Year 12</td>
<td>-0.57</td>
<td>-0.04</td>
<td>0.366</td>
<td>-1.57</td>
<td>0.118</td>
<td>-1.29, 0.14</td>
</tr>
<tr>
<td>Trade certificate</td>
<td>-0.72</td>
<td>-0.02</td>
<td>0.411</td>
<td>-1.76</td>
<td>0.078</td>
<td>-1.53, 0.08</td>
</tr>
<tr>
<td>Diploma</td>
<td>-0.65</td>
<td>-0.05</td>
<td>0.363</td>
<td>-1.80</td>
<td>0.073</td>
<td>-1.36, 0.06</td>
</tr>
<tr>
<td>Undergraduate</td>
<td>-0.95</td>
<td>-0.09</td>
<td>0.362</td>
<td>-2.61</td>
<td>0.009</td>
<td>-1.66, -0.24</td>
</tr>
<tr>
<td>Postgraduate</td>
<td>-0.89</td>
<td>-0.06</td>
<td>0.370</td>
<td>-2.40</td>
<td>0.016</td>
<td>-1.61, -1.63</td>
</tr>
</tbody>
</table>

CESD-10, centre for epidemiological studies depression score; ARFS, Australian recommended food score; β, unstandardised β coefficient; β, standardised β coefficient.
anxiety, BMI and social functioning. This ALSWH longitudinal cohort study analysis has highlighted small inverse findings in the association between dietary patterns and depressive symptoms in Australian women. Further analysis of longitudinal and intervention studies is needed to assess temporal relationships and causality between dietary patterns and depression.

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**Supplementary material**

For supplementary material/s referred to in this article, please visit https://doi.org/10.1017/S0007114522002410

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