Peer Review File

Reviewer A
Comment 1: Vegetarian diets have been associated with lower incidence of depression (Shen YC, Chang CE, Lin MN, Lin CL. Vegetarian Diet Is Associated with Lower Risk of Depression in Taiwan. Nutrients. 2021 Mar 24;13(4):1059. doi: 10.3390/nu13041059. PMID: 33805124; PMCID: PMC8064096). 5 out of 9 food types: vegetables, fruits, legumes, nuts, tea are plant-based food and considered healthy, do you have any data to show that these plant-based foods are associated with lower incidence of depression? Both meat and nuts are included in your Dietary Diversity Score and are consumed by large proportion of participants without depression more than those with depression. Can you calculate and compare the DDS of 5 plant-based food and the 9 food types you listed?

Reply 1: Thank you very much for the constructive comment. In our study, the median DDS of 5 plant-based food was 3 (2, 4). Correlation analysis found that the DDS of 5 plant-based food was negatively correlated with depression score ($r = -0.255$; $P < 0.001$) and anxiety score ($r = -0.152$; $P = 0.010$). By analyzing the differences between groups with and without depression/anxiety, we found that people with depression ($P < 0.001$) or anxiety ($P = 0.015$) had lower scores. That is, eating more vegetarian diets is associated with lower incidence of depression and anxiety. The table below shows for a comparison of the DDS of the 5 plant-based food and the 9 food.

Table Comparison of DDS of 5 plant-based food and 9 food among people with or without depression / anxiety

	The DDS of 5 plant-based food	P	The DDS of 9 food	P
Depression		**< 0.001**		**< 0.001**
Yes	2 (2, 3)		4 (3, 6)	
No	3 (2, 4)		6 (5, 7)	
Anxiety		**0.015**		**0.010**
Yes	3 (2, 3)		5 (3, 6)	
No	3 (2, 4)		6 (4, 7)	

DDS: Dietary diversity score. The value in bold indicates $P < 0.05$.

Changes in the test: We added some data to show that these 5 plant-based food are associated with lower incidence of depression and anxiety. (see Table) However, we did not append this part to the revised manuscript. Because after reviewing the literatures, we found conflicting results on the relationship between vegetarianism and

depression and anxiety (1-5). We think this is an interesting and well-discussed point, but mentioning vegetarianism and anxiety and depression in this manuscript is a bit off topic. We focus on the relationship between dietary diversity and mental health in this study. Thank you again for your comments. We will focus on that issue in the follow-up research.

Reference:
1. Michalak J, Zhang XC, Jacobi F. Vegetarian diet and mental disorders: results from a representative community survey. Int J Behav Nutr Phys Act 2012;9:67.
2. Hibbeln JR, Northstone K, Evans J, et al. Vegetarian diets and depressive symptoms among men. J Affect Disord 2018;225:13-7.
3. Askari M, Daneshzad E, Darooghegi Mofrad M, et al. Vegetarian diet and the risk of depression, anxiety, and stress symptoms: a systematic review and meta-analysis of observational studies. Crit Rev Food Sci Nutr 2020:1-11.
4. Lavallee K, Zhang X, Michalak J, et al. Vegetarian diet and mental health: Cross-sectional and longitudinal analyses in culturally diverse samples. Journal of affective disorders 2019;248:147-54.
5. Shen YC, Chang CE, Lin MN, et al. Vegetarian Diet Is Associated with Lower Risk of Depression in Taiwan. Nutrients 2021;13.

Reviewer B
Thank you to the authors for their original research manuscript titled 'Higher dietary diversity as a protective factor against depression among older adults in China: a cross-sectional study'. This is an area of high interest and the potential for dietary intervention as an adjuvant therapy alongside conventional treatments for the common mental disorders is well indicated. This study investigates the important relationship between dietary quality, as measured by the dietary diversity score (DDS), with late-life depression and anxiety. The prevalence of mental health issues in older adults cannot be overstated, and it is appreciated that this study is one of the first to investigate this occurrence among Chinese adults. However, several methodological limitations bring to question the validity of the presented findings which are outlined in detail below.

__Major comments__
Comment 1: First and foremost, it was unclear what the justification was for including offspring and spouses of the centenarian participants in the study given that this is not an independent subgroup. Children, and particularly spouses, are likely to have similar or identical dietary intakes which is likely to diminish the explanatory power of the analyses.

Reply 1: Thank you very much for your comment. The question of why the offspring and spouses of the centenarian participants were included in the study was because that we wanted to collect the dietary patterns of families with longer lives to see if they had any particular characteristics that could be generalized to the general

population. Longevity is a complex biological phenotype determined by genetic, epigenetic, and environmental factors such as diet, lifestyle, and even geographic location. Human centenarians have been used as an optimal model for successful aging. However, this model shows several limitations, in particular the selection of appropriate controls. Thus, the interest has been centered on centenarian offspring, since it is well known that they are healthier than the remaining old people are.

As for the question "is not an independent subgroup" mentioned, centenarians have many children and they live separately after getting married, so they have independent diet. In addition, in our actual research, even living in the same family, each person has a personal preference for food intake. For example, the offspring likes to eat fish, while the spouse does not or does eat it occasionally. And there are only so many kinds of food, so the difference in actual analysis is negligible.

Changes in the test: N/A

Comment 2: Furthermore, due to the small sample size for the centenarian group, it was unclear why authors did not recruit participants in the immediate age deciles below (i.e., 90+) to increase the sample size among the oldest adults, given that the age range between 60 to 100+ years is quite broad. Additionally, due to the imbalanced samples (i.e., n = 38 for centenarians and n = 250 for offspring/spouses), caution should be advised around any conclusions drawn for group comparisons in relation to the DDS and anxiety/depression scores (i.e., in Lines 174-176, page 5).

Reply 2: We quite agree with you. In fact, we interviewed more than 100 centenarians, but many of them were unable to complete the scales due to various reasons, such as language barrier and confusion of consciousness, and only 38 of them met our inclusion criteria. The imbalance between the two groups is indeed a limitation of this study. In order to avoid drawing wrong conclusions, we describe the scores of the two groups separately, and delete the comparative analysis. We are currently establishing a longevity cohort study and we will consider including people over the age of 90 in the cohort. Thank you again for your advice.

Changes in the test: Page 8, Line 293 text in red. Delete *P*-value column in Table 1. Delete the original Fig S1.

Comment 3: It was also unclear why the DDS was chosen specifically in relation to mental health as the introduction only briefly touches on the importance of dietary diversity as part of nutritional recommendations but then reviews other but unrelated dietary patterns e.g., the Mediterranean diet and vegetarianism.

Reply 3: I'm sorry we didn't explain it clearly. Many studies confirm the relationship between dietary patterns and mental health. Such as the Mediterranean diet, vegetarian diet and so on. However, most of these dietary patterns were developed based on data from Western populations, and some food groups included in these

patterns are consumed differently among Chinese populations in terms of quantity and the cooking methods used. Thus, the applicability of these patterns in Chinese populations remains unclear. The dietary diversity score (DDS) is an indicator of nutritional adequacy. A diverse diet is a cornerstone of a sufficient and balanced supply of nutrients. Its simple scoring method can be applied to a wide range of different populations and all age groups. People, especially older people, can understand this without having to consult a nutritionist. Adherence to a diverse diet is recommended by the WHO and the dietary guidelines for Chinese populations.

Changes in the test: Page 3, Line 78-93 text in red.

Comment 4: It is also stated in the aims that this study (Page 3, Lines 103-104) will explore the relationships between dietary diversity and disorders of depression and anxiety, even though this would be more accurately described as "probable disorders of depression and anxiety". The Generalized Anxiety Disorder Scale (GAD-7) and Geriatric Depression Scale (GDS-15) are symptom scales but are not diagnostic measures of these disorders so this should be clarified. Anxiety and depressive symptoms may be transient and potentially reversible, whereas clinical diagnoses tend to be more severe and chronic, and this distinction is important in the context of long-term dietary habits.

Reply 4: Thank you very much for your advice. We agree and have changed 'disorders of depression and anxiety' to 'probable disorders of depression and anxiety'. We also considered seeking medical history of depression and anxiety through medical records when formulating the research plan, but in fact, the number of those seeking medical help is very small in China. Very few people go to hospital for mental health checks, especially among the elderly. Therefore, we choose to use the scale to investigate the mental health level of the elderly in China. So our data includes older people with subclinical symptoms.

Changes in the test: Page 3, Line 105 text in red.

Minor Comments
Comment 5: Page 2, Line 46 – 'during the elderly' is not grammatically accurate.

Reply 5: Thank you very much for your careful review. We have changed the text to 'DDS was negatively correlated with depression score in older adults ($r = -0.224$; $P < 0.001$), especially offspring and their spouses ($r = -0.275$; $P < 0.001$)'.

Changes in the test: Page 2, Line 46 text in red.

Comment 6: Page 2, Line 62 – opening line 'With the acceleration of the aging process' is vague and would benefit from clarification. This sentence also requires a reference.

Reply 6: Thank you for reminding, I'm sorry that we didn't make it clear, what we meant to say was 'With the progressive aging of the population …'

Changes in the test: Page 2, Line 62 text in red.

Comment 7: Page 3, Lines 96-98 – there has been considerable work done on the relationship between eating/dietary patterns and mental health in adults; see reviews by Lai et al., 2014; Molendjik et al., 2018; Lassale et al. 2018, etc.)

Reply 7: Thank you for your comment. It's true that there's a lot of research out there on eating patterns and mental health among adults, but we found that a large portion of the research focused on children under 5 years of age or pregnant women. In view of this, we have revised the manuscript to avoid ambiguity. We change the statement to "The association between dietary patterns and mental health has been reported in considerable studies."

Changes in the test: Page 3, Line 98-99 text in red.

Comment 8: Page 3, Line 109 – what is a longevity area? Need to provide a definition.

Reply 8: According to the United Nations, the world's longevity area have at least 75 centenarians per million people. The ratio of centenarians in Rugao reached 36.9 per 100,000 people. Rugao was voted "China's longevity region" and "the world's longevity region" in 2008 and 2011.

Changes in the test: Page 4, Line 110-114 text in red.

Comment 9: Page 4, Lines 113-114 – it would be best to specify that the eligibility criteria listed here are specific to the offspring/spouse group and to have separate criteria for the centenarian group.

Reply 9: Thank you very much for your advice. We separately specify the inclusion criteria for centenarians and the offspring/spouse group.

Changes in the test: Page 4, Line 118-121 text in red.

Comment 10: Page 5, Line 159 – 'DD' should be 'DDS'.

Reply 10: I am very sorry that this is a mistake and it has been corrected. We have updated "DD" into "DDS" as advised.

Changes in the test: Page 5, Line 171 text in red.

Comment 11: Page 5, Line 164 – was there a justification for arriving at the sample size of 288 participants? In the STROBE reporting checklist, it's stated that the justification for this is given in Lines 91-99 but this was not the case.

Reply 11: I'm sorry that our understanding of the study size in the STROBE reporting checklist was wrong. The sample size of 288 participants was actually collected rather than calculated. Therefore, we have modified the text in Checklist.

Changes in the test: In STROBE Statement.

Comment 12: Page 6, Line 189 – which variables were adjusted? Some specification of this would be good.

Reply 12: It was not detailed in Line 189, but we explained in "Notes" below Table 4 which variables were adjusted.

Changes in the test: N/A.

Comment 13: Page 6, Line 199 – the term 'negative correlation' seems inappropriate in this context given the statistical test used.

Reply 13: We have changed the term 'negative correlation' into 'low DDS was a risk factor for depression'

Changes in the test: Page 6, Line 209 text in red.

Comment 14: Page 6, Line 209 – which demographic characteristics were controlled for?

Reply 14: Sorry, it was not detailed in Line 209, but we explained in "Notes" below Table 6 which variables were adjusted.

Changes in the test: N/A.

Comment 15: Page 7, Line 230 – caution on using axiomatic claims such as 'proven'; would rephrase as 'provide evidence'.

Reply 15: Thanks for your reminding. We have updated "proven" into "provided evidence" as advised.

Changes in the test: Page 7, Line 241 text in red.

Comment 16: Page 7, Line 261 – the trial that's cited here only found a reduced risk

for depression when restricted to participants with type 2 diabetes.

Reply 16: Thank you for your reminding. I am sorry that we neglected this point when writing the article. We added 'in patients with type 2 diabetes (DM2)' at the end of the sentence.

Changes in the test: Page 8, Line 272 text in red.

Comment 17: Page 8, Line 271 – why is further research required at the animal level per se?

Reply 17: Because dietary interventions for specific foods, such as meat and nuts, are difficult to implement in people. It's relatively easy to control at the animal level. We thought about changing the statement to 'More prospective studies are needed to determine the effects of regular consumption of beans, nuts, and meat.'

Changes in the test: Page 8, Line 281-282 text in red.

Comment 18: Page 8, Line 278 – this is not necessarily the case: specific subtypes of depression are associated with differential dietary aspects e.g., melancholic depression is related to reduced appetite and weight loss.

Reply 18: I'm sorry for our inconsiderate, we found that anxiety and depression have a two-sided effect on dietary intake. We have changed the statement to 'Depression or anxiety can have positive or negative effects on food intake.'

Changes in the test: Page 8, Line 288-289 text in red.

Comment 19: Table 1 – why is the p-value a '1' for Depression?

Reply 19: *P*-value column in Table 1 has been deleted, see Comment 2. In other places, where *P* value is 1, we changed it to '> 0.999'

Changes in the test: Table 2.

Comment 20: Table 2 – formatting issue with the table in the 'Physical exercise' row

Reply 20: Thank you for your meticulous review work on our article. We were really sorry for our negligence.

Changes in the test: We have modified our table as advised (see Table 2).

[Further comments]
Comment 1: Page 1, Line 30: May need to specify that it's 'poor mental health' that is

a risk factor for older adults' health

Reply 1: Thank you very much for your comment. We have changed the expression of this sentence to 'Evidence suggests that poor mental health is a risk factor for the health of older adults.'

Changes in text: Page 3, Line 27 text in blue.

Comment 2: Page 2, Line 54: Not too sure what you mean by 'confusion' – maybe clarify this

Reply 2: I'm sorry for not being clear. We intended to express that because this study was observational, causality cannot be determined and confounding cannot be ruled out. We have changed the text to 'Further, the possibility of reverse causality cannot be ruled out.'

Changes in text: Page 4, Line 51 text in blue.

Comment 3: Page 3, Lines 98-99: Since you have discussed the background around dietary patterns and mental health in the previous paragraph (the text in red), I'm not sure that this sentence is necessary as it now seems redundant

Reply 3: We have deleted that sentence.

Changes in text: /

Comment 4: Page 3, Line 103: Would be preferable to specify that you are investigating the prevalence of anxiety/depression *symptoms*

Reply 4: We have changed the text to 'our primary objectives were to 1) investigate the prevalence of depression and anxiety symptoms in an older adult population…'

Changes in text: Page 6, Line 98 text in blue.

Comment 5: Page 4, Line 110: This sentence seems disjointed – consider separating

Reply 5: We have modified our text as advised.

Changes in text: Page 7, Line 105 text in blue.

Comment 6: Page 5, Line 178: I would suggest specifying that the (68,79) refers to the 1st and 3rd quartiles as it's not immediately obvious what these numbers are

Reply 6: We have added a description of continuous variables in the '2.5 statistical analysis' section, as follows 'Normally distributed data, assessed by a Kolmogorov - Smirnov test of normality, were presented as mean values with standard deviation (SD); non-normally distributed data were presented as medians with interquartile range (IQR). Categorical variables were expressed as numbers (percentage).'

Changes in text: Page 10, Line 160-164 text in blue.

Comment 7: Page 6, Lines 199-200: It would be preferable to specify that this first result is for the overall participants

Reply 7: We have modified our text as advised. 'Correlation analysis after adjusting variables found that DDS was negatively correlated with depression score among all 288 older adults.'

Changes in text: Page 12, Line 199 text in blue.

Comment 8: Page 7, Line 243: Best to specify 'dietary diversity' rather than DD
Reply 8: We have modified our text as advised.
Changes in text: Page 14, Line 243 text in blue.

Comment 9: Page 7, Lines 245-246: Technically the correlation analysis indicated that the link with anxiety was not significant (Table 4) so I would be cautious about the wording here. Also - when you are describing the finding for overall participants in terms of depression, wouldn't it be necessary to briefly discuss why the association for centenarians was not significant? Since you place so much emphasis on the importance of the centenarians, it feels as though you are overlooking this finding
Reply 9: Thank you very much for your constructive suggestions. We have made corrections as follows 'We found a negative correlation between dietary diversity score and depression among the older adults. This is consistent with some studies that suggest a link between diet and mental health. However, among centenarians, DDS was not significantly associated with anxiety and depression. Overall, the centenarians had lower anxiety and depression scores, and with only 38 participants in our study, we cannot rule out the possibility that this association exists.'
Changes in text: Page 14, Line 244-250 text in blue.

Comment 10: Page 7, Lines 250-254: You state that insufficient living funds or burdensome living conditions could be confounders but since you adjusted for these variables, I'm not sure that your argument is that strong in this case – could there be other reasons why anxiety was not associated with the DDS?
Reply 10: Thank you for reminding us that we made a mistake. Before the variables were adjusted, there was a negative correlation between anxiety and DDS. After incorporating variables that might affect anxiety (Table 2) into the model (Table 4, adjusted for enough money to use and alcohol drinking.), we found that this correlation disappeared. We have changed the text of the manuscript as follows 'A study in Iran found that DDS was inversely associated with anxiety among women. However, we did not find such association in our study. Future studies should examine the nuances of dietary in more detail and their links with anxiety, including dietary composition and cultural differences.'
Changes in text: Page 14, Line 253-255 text in blue.

Comment 11: Page 8, Line 298: It would be best to specify 'prevalence of anxiety and depression symptoms' rather than 'psychiatric disorders'
Reply 11: We have modified our text as advised. We changed the text to 'Our study suggested an association between low dietary diversity and high prevalence of anxiety and depression symptoms ……'
Changes in text: Page 16, Line 299 text in blue.

Comment 12: Table 6a/b: Factor variables should be capitalized; Correct to 'Enough money to <u>live</u>'

Reply 12: We have modified our table as advised.

Changes in text: Table 6a/b.