PEER REVIEW HISTORY

ARTICLE DETAILS

TITLE (PROVISIONAL)	Gender differences in longevity in free-living older adults who eat-with-others: a prospective study in Taiwan
AUTHORS	Huang, Yi-Chen; Cheng, Hsing-Ling; Wahlqvist, Mark; Lo, Yuan-Ting;Lee, Meei-Shyuan.

VERSION 1 - REVIEW

REVIEWER	Domenica Rasulo Birkbeck College United Kingdom
REVIEW RETURNED	19-Apr-2017

GENERAL COMMENTS	The authors aim to verify whether eating with others impacts mortality differently in men and in women in a population aged 65+. The abstract should quote the results from the full model in Table 4 (Model 3), rather than those from the crude model. This similarly applies to the text - the model without adjustment has confounding, as indicated by the estimates being no longer significant following the inclusion of control variables. If the objective is the comparison between the sexes, a statistical test between the sexes is required. Alternatively, both sexes can be included in the modelling and then an interaction effect between eating arrangements and sex is tested. The results section largely describes Tables 1-3. These tables appear to provide information beyond the scope of the study. They should be simplified and the statistical test used should be clarified. Since the study subjects are 65+, we can expect a change in their eating arrangements through time as family/health circumstances change. Because there is a single point survey (1999-2000), rather than a longitudinal survey, a shorter mortality follow-up would help to control for this. The full model (model 3) is only significant for men eating with someone else twice a day. While the effect is expected to increase with the frequency of eating with others, this is not corroborated by the findings – there appears to be lack of statistical significance for men eating with others three times a day. Hence, the conclusion about the independent effect and the benefit of eating with others for men is not fully supported; I would suggest the authors to investigate in more details the two categories of men (2,3) to pinpoint their differences.

	It is important to present the matrix of correlation between all the variables. If the eating-with-others variable is highly correlated with the marital status, then the positive effect of eating with others could reflect a specific component of the larger beneficial effect of being married. Table 4 should also include the statistical significance level.

REVIEWER	Liang-Kung Chen Aging and Health Research Center, National Yang Ming University, Taiwan
REVIEW RETURNED	29-Apr-2017

GENERAL COMMENTS	This study used a nationally representative sample of older people to evaluate the impact of eating behavior upon mortality through a longitudinal obervational design. The manuscript is well prepared, but a few concerns deserve clarification. 1. The lack of information about multimorbidity, functional status, socio-economic status and other potential confounding factors is the major problem of this study. Eating arrangement may be a result of the abovementioned factors only, instead of exerting real influences on long-term mortality risk. 2. In longitudinal follow-up, the eating arrangement may also vary greatly. Authors should consider eating arrangement as a time-varying variable for statistical analysis. 3. Although authors used ADL to adjust the functional status of study participants, ADL may not be the most appropriate indicators for functional performance among otherwise healthy older adults. The ceiling effect eventually differentiates little of the study subjects. 4. Mental and psychological parameters were not measured in this study despite that authors used QoL for adjustment. However, 5. A previous study from Taiwan indicated that self-perceived health, physical activities, cognition, life satisfaction and stress are major risk factors for mortality among middle-aged and older adults. The afore-mentioned factors should be adjusted for conclusion upon the impact of eating arrangement on mortality.

VERSION 1 – AUTHOR RESPONSE

Reviewer: 1
Reviewer Name: Domenica Rasulo
Institution and Country: Birkbeck College, United Kingdom
Please state any competing interests: 'None declared'

1. The authors aim to verify whether eating with others impacts mortality differently in men and in women in a population aged 65+.
The abstract should quote the results from the full model in Table 4 (Model 3), rather than those from the crude model. This similarly applies to the text - the model without adjustment has confounding, as indicated by the estimates being no longer significant following the inclusion of control variables.

Response: Thank you for this comment. We see value in showing the model as is, since it is adjusted

for basic socio-demographic covariates and, then, allows us to demonstrate its robustness for men with further adjustment for financial status. For women, models with or without further adjustment are non-significant. The other point to make is that the significant associations for men are seen with eating with others twice a day rather than 3 times, which is reflected in the models as shown. We consider this to have likely biological relevance to do with the relative values of company on the one hand and solitude on the other, now discussed in the paper as follows (Lines: 233–235).
“However, there may be value in solitude itself which would be an alternative interpretation of the difference we have found in mortality risk reduction between eating twice and three times a day with others by men.”

2. If the objective is the comparison between the sexes, a statistical test between the sexes is required. Alternatively, both sexes can be included in the modelling and then an interaction effect between eating arrangements and sex is tested.

Response: Thank you for the suggestion. We have analysed the model with both sexes and tested for interaction as well (please refer to the table below). The p value for interaction effect between eating arrangements and sex is 0.0093. Therefore, we used gender-specific analyses. This point has now been made in the text (Lines: 159–161).

Table. Hazard ratios (95% CI) of association between eating-with-others and risk of mortality in older adults
Daily frequency of eating-with-others
0 1 2 3
Crude model 1.00 0.69 (0.48–0.99) 0.53 (0.37–0.76) 0.77 (0.63–0.94)
Model 1 1.00 0.70 (0.48–1.01) 0.53 (0.37–0.75) 0.76 (0.62–0.92)
Model 2 1.00 0.79 (0.48–1.31) 0.65 (0.41–1.04) 0.84 (0.57–1.24)
Model 3 1.00 0.78 (0.46–1.31) 0.69 (0.43–1.10) 0.87 (0.58–1.29)
p for interaction for gender in the final model = 0.0093
Data were weighted for unequal probability of sampling design by SUDAAN and estimated HR (95% CI) by using the Cox proportional-hazard model.
Model 1: adjusted for gender
Model 2: adjusted for gender, age, education, strata, live alone, cook frequency, marital status, appetite status, dietary diversity score, activities of daily living and body mass index
Model 3: model 2 plus adjusted self-rate financial status

3. The results section largely describes Tables 1–3. These tables appear to provide information beyond the scope of the study. They should be simplified and the statistical test used should be clarified.

Response: Thank you for this suggestion. We have simplified the description of the results in Tables 1-3. We have provided the statistical information relevant to each table by way of footnotes.

4. Since the study subjects are 65+, we can expect a change in their eating arrangements through time as family/health circumstances change. Because there is a single point survey (1999-2000), rather than a longitudinal survey, a shorter mortality follow-up would help to control for this.

Response: This is a most interesting point. We have performed two analyses to explore this further, by limiting follow-up times to <2, <4, <6 and ≥6 years (Table A below); and exclusion events in the first and second years (Table B below). As can be seen in the table below, for men, the point estimates for HRs eating-with-others twice a day are consistently <1.00. However, for women, low HRs of 0.15 are seen for eating-with-others once a day in the first two years of observation, but not

beyond. This does not change our conclusions with a 10-years survival analysis. We have made reference to this in the Discussion under “limitations” as data not shown. (Lines: 306–314)

Table A. Different follow-up time

Gender-specific hazard ratios (95% CI) of association between eating-with-others and risk of mortality in older adults
Daily frequency of eating-with-others
Deceased,
n 0 1 2 3
Men
<2 76 1.00 0.29 (0.02–4.88) 0.32 (0.09–1.15) 0.85 (0.31–2.35)
<4 176 1.00 0.42 (0.11–1.54) 0.34 (0.17–0.68) 0.60 (0.33–1.09)
<6 264 1.00 0.64 (0.22–1.81) 0.38 (0.22–0.65) 0.64 (0.39–1.05)
≥6 122 1.00 2.52 (0.52–12.2) 0.75 (0.18–3.18) 0.85 (0.19–3.84)
Women†
<2 75 1.00 0.15 (0.02–0.94) 0.29 (0.06–1.54) 0.50 (0.22–1.13)
<4 135 1.00 0.25 (0.06–1.01) 0.51 (0.16–1.65) 0.60 (0.30–1.22)
<6 191 1.00 0.28 (0.12–0.67) 0.53 (0.25–1.10) 0.55 (0.31–0.97)
≥6 121 1.00 1.66 (0.62–4.46) 1.49 (0.56–3.98) 1.72 (0.66–4.49)
Data were weighted for unequal probability of sampling design by SUDAAN and estimated HR (95% CI) by using the Cox proportional-hazard model.
Model were adjusted for age, education, strata, live alone, cook frequency, marital status, appetite status, dietary diversity score, activities of daily living and body mass index and self-rate financial status
†Women were not adjusted for activities of daily living in the models since it is highly correlated with cooking frequency

B. Exclusion of those who died in the first or second years

Gender-specific hazard ratios (95% CI) of association between eating-with-others and risk of mortality in older adults
Daily frequency of eating-with-others
Deceased,
n 0 1 2 3
Men
<=1 342 1.00 0.75 (0.38–1.48) 0.44 (0.26–0.75) 0.59 (0.36–0.96)
<=2 310 1.00 0.98 (0.50–1.92) 0.51 (0.27–0.96) 0.67 (0.36–1.24)
Women†
<=1 281 1.00 0.42 (0.20–0.90) 0.67 (0.32–1.42) 0.75 (0.37–1.53)
<=2 237 1.00 0.89 (0.47–1.70) 1.03 (0.38–2.81) 1.28 (0.56–2.91)
Data were weighted for unequal probability of sampling design by SUDAAN and estimated HR (95% CI) by using the Cox proportional-hazard model.
Model were adjusted for age, education, strata, live alone, cook frequency, marital status, appetite status, dietary diversity score, activities of daily living and body mass index and self-rate financial status
†Women were not adjusted for activities of daily living in the models since it is highly correlated with cooking frequency

5. The full model (model 3) is only significant for men eating with someone else twice a day. While the

effect is expected to increase with the frequency of eating with others, this is not corroborated by the findings – there appears to be lack of statistical significance for men eating with others three times a day. Hence, the conclusion about the independent effect and the benefit of eating with others for men is not fully supported; I would suggest the authors to investigate in more details the two categories of men (2,3) to pinpoint their differences.

Response: While the hypothesis that eating-with-others increases survival might be expected to be linear and “dose-related”, this may not be the case. It may be a question of the optimal frequency of eating-with-others. This may be at sub-maximal opportunity for this practice if other factors which decease mortality risk are operative in conjunction with eating circumstances. For example, as in our study, the men who eat-with-others three times a day are almost always married and have others cook for them. We know that, in this cohort, cooking frequency is associated with survival (Chen RC, Lee MS, Chang YH, et al. Public Health Nutr 2012;15:1142–9.). Also, as discussed in relation to Question # 1, there may be health advantage in solitude or solitary eating on some occasions.

6. It is important to present the matrix of correlation between all the variables. If the eating-with-others variable is highly correlated with the marital status, then the positive effect of eating with others could reflect a specific component of the larger beneficial effect of being married.

Response: Thank you for this suggestion. The matrix shows that the greatest correlations with eating-with-others are for marital status (positive), living alone (negative), and cooking frequency (negative). In all three, the magnitude of the relationships is stronger for men. These covariates are included in our models. We have identified marital status and cooking as potential explanators for the difference in HRs between eating-with-others twice or three times a day by men (see response Question # 5). These points have now been made under Discussion (Lines: 271–278) and the table provided as Supplementary table 1.

Table. Spearman rank correlation coefficients between daily frequency of eating with others and co-variables

Spearman rank correlation coefficients	Men	Women
Education – higher	0.067*	0.037
Marital status – married	0.522***	0.460***
Dietary diversity score – higher	0.092**	0.033
Body mass index – higher	0.037	0.025
Age – older	-0.092**	-0.127**
Live alone	-0.648***	-0.592***
Cooking frequency – more	-0.407***	-0.157***
Appetite status – poor	-0.035	-0.01
Activities of daily living – more difficulties	-0.037	-0.087**
Self-rate financial status – not enough	-0.066*	-0.124**

*p<0.05; **p<0.001; ***p<0.0001

7. Table 4 should also include the statistical significance level.
Response: Thank you for this suggestion. We have added the statistical significance level in Table 4.

Reviewer: 2
Reviewer Name: Liang-Kung Chen
Institution and Country: Aging and Health Research Center, National Yang Ming University, Taiwan
Please state any competing interests: None declared

This study used a nationally representative sample of older people to evaluate the impact of eating behavior upon mortality through a longitudinal observational design. The manuscript is well prepared, but a few concerns deserve clarification.

1. The lack of information about multimorbidity, functional status, socio-economic status and other potential confounding factors is the major problem of this study. Eating arrangement may be a result of the above mentioned factors only, instead of exerting real influences on long-term mortality risk.

Response: We have now added multimorbidity status which is presented as Charlson comorbidity index (CCI) by eating arrangement in Table 1. For functional status, we used ADL; for socio-economic status, education level and self-rated financial status. As indicated in the Abstract and text, self-rated financial status attenuated the effect of eating-with-others in the final model for men.

2. In longitudinal follow-up, the eating arrangement may also vary greatly. Authors should consider eating arrangement as a time-varying variable for statistical analysis.

Response: Since the eating arrangement was assessed at baseline only, we are unable to treat it as a time-varying variable in the analysis. However, we have considered several time points by restriction and exclusion in regard to survival over the ten years follow-up and confirmed the findings. Please refer to our response to Reviewer 1 Question # 4.

3. Although authors used ADL to adjust the functional status of study participants, ADL may not be the most appropriate indicators for functional performance among otherwise healthy older adults. The ceiling effect eventually differentiates little of the study subjects.

Response: Although ADL does not have the sensitivity required to differentiate people by functional status in relatively healthy community-based people, sarcopenia (low skeletal muscle mass index, SMMI) provides another possible surrogate for this in older adults. We have now added SMMI in Table 1. It did not vary by eating arrangement.

4. Mental and psychological parameters were not measured in this study despite that authors used QoL for adjustment. However, a previous study from Taiwan indicated that self-perceived health, physical activities, cognition, life satisfaction and stress are major risk factors for mortality among middle-aged and older adults. The afore-mentioned factors should be adjusted for conclusion upon the impact of eating arrangement on mortality.

Response: We appreciate the significance of this comment in regard to physical, mental and psychological factors. Some, but not all, are available to the investigators.

These include physical activity (in MET per day), self-perceived health status, and cognition (The Short Portable Mental Status Questionnaire, SPMSQ), for which further adjustments in the models have been made without altering the conclusions (see table below).

Table. Gender-specific hazard ratios (95% CI) of association between eating-with- others and risk of mortality on older adults

Daily frequency of eating-with-others	0	1	2	3
Men				
Final model	1.00	0.78(0.39–1.55)	0.46 (0.28–0.77)	0.66 (0.43–1.02)
+perceived health status	1.00	0.76 (0.36–1.61)	0.48 (0.28–0.82)	0.67 (0.43–1.04)
+Physical activity	1.00	0.78 (0.40–1.52)	0.47 (0.29–0.78)	0.68 (0.45–1.05)
+Cognitive impairment	1.00	0.84 (0.42–1.68)	0.47 (0.29–0.77)	0.66 (0.43–1.01)
Women†				

Final model 1.00 0.54 (0.27–1.06) 0.70 (0.36–1.36) 0.72 (0.40–1.27)
+perceived health status 1.00 0.56 (0.27–1.16) 0.71 (0.37–1.36) 0.75 (0.42–1.35)
+Physical activity 1.00 0.55 (0.28–1.11) 0.71 (0.36–1.39) 0.72 (0.40–1.28)
+Cognitive impairment 1.00 0.53 (0.26–1.08) 0.65 (0.32–1.32) 0.71 (0.39–1.32)
Data were weighted for unequal probability of sampling design by SUDAAN and estimated HR (95% CI) by using the Cox proportional-hazard model.
Model were adjusted for age, education, strata, live alone, cook frequency, marital status, appetite status, dietary diversity score, activities of daily living and body mass index and self-rate financial status.
†Women were not adjusted for activities of daily living in the models since it is highly correlated with cooking frequency

VERSION 2 – REVIEW

REVIEWER	Liang-Kung Chen Aging and Health Research Center, National Yang Ming University, Taiwan
REVIEW RETURNED	13-Jun-2017

GENERAL COMMENTS	All comments have been addressed. Despite the limitation of the original data collection, authors have tried their best to respond all comments.

REVIEWER	Dr Louise Marston, Senior Research Statistician UCL London UK
REVIEW RETURNED	17-Jul-2017

GENERAL COMMENTS	The abstract needs slight rewording as it is not clear what the multivariable HR on lines 46 and 47 relate to. Minor comment: No need to give coding of variables in the text. Line 205: change 44% to 34% Table 1: please revisit the data for lives alone, especially males who have one meal eating with others, as I am not sure this can be 0%. Figure 1: Is one panel supposed to be male and one female? Both are titled female.

VERSION 2 – AUTHOR RESPONSE

Reviewer: 2
Reviewer Name: Liang-Kung Chen
Institution and Country: Aging and Health Research Center, National Yang Ming University, Taiwan
Please state any competing interests: None declared
Please leave your comments for the authors below:

All comments have been addressed. Despite the limitation of the original data collection, authors have tried their best to respond all comments.
Response: Thank you.

Reviewer: 3
Reviewer Name: Dr Louise Marston, Senior Research Statistician
Institution and Country: UCL, London, UK
Please state any competing interests: None
Please leave your comments for the authors below:

1. The abstract needs slight rewording as it is not clear what the multivariable HR on lines 46 and 47 relate to.
Response: Thank you for this suggestion. We have reworded the abstract accordingly. (Lines: 46-47)

2. Minor comment: No need to give coding of variables in the text.
Response: Thank you for this suggestion. We have moved the details from “Statistical analysis” for each categorical covariate to the footnotes of Table 4.

3. Line 205: change 44% to 34%
Response: Thank you. We have changed 44% to 34% (Line: 202).

4. Table 1: please revisit the data for lives alone, especially males who have one meal eating with others, as I am not sure this can be 0%.
Response: We have rechecked the original data and there was no man who lived alone and ate only one meal with others.

5. Figure 1: Is one panel supposed to be male and one female? Both are titled female.
Response: To make the figure unequivocal, the legend now reads “Gender-specific pathway analysis for the associations of eating-with-others and all-cause mortality. All values are presented as β coefficients with their p values. (A) men; (B) women.”

VERSION 3 - REVIEW

REVIEWER	Dr Louise Marston, Senior Research Statistician UCL, London, UK
REVIEW RETURNED	28-Jul-2017

GENERAL COMMENTS	Queries have been addressed.