Author's response to reviews

Title: Successful aging defined by health-related quality of life and its determinants in community-dwelling elders

Authors:

Chia-Ing Li (a6446@mail.cmuh.org.tw)
Chih-Hsueh Lin (d5496@mail.cmuh.org.tw)
Wen-Yuan Lin (wylin@mail.cmu.edu.tw)
Chiu-Shong Liu (d3350@mail.cmuh.org.tw)
Chin-Kai Chang (d13652@mail.cmuh.org.tw)
Nai-Hsin Meng (d6351@mail.cmuh.org.tw)
Yi-Dar Lee (tcli@mail.cmuh.org.tw)
Tsai-Chung Li (tcli@mail.cmuh.org.tw)
Cheng-Chieh Lin (ccclin@mail.cmuh.org.tw)

Version: 3 Date: 7 August 2014

Author's response to reviews: see over
Dear Editor:

Thank you for your communication dated July 03, 2014 regarding my manuscript, "Successful aging defined by health-related quality of life and its determinants in community-dwelling elders". Your comments and reviewers’ critique are very helpful.

We would like to response to reviewers’ comments point by point, and indicate the changes in red color characters.

Please feel free to contact me if you have any further question or critique.

With best wishes,

Cheng-Chieh Lin, MD, PhD.
Dept. of Family Medicine
China Medical University Hospital
NO 2, Yuh-Der Road, Taichung, Taiwan 404
Reviewer 1

Response to reviewer 1 (Nancye May Peel):

1. In the Abstract Results, the authors state that: “...relative to those aged less than 70 years old, elders aged between 70–75 were associated with higher prevalence of successful aging (OR: 0.27, 95% CI: 0.13–0.58).” These results would indicate the reverse: In comparison to those aged 70 or less, elders aged 70-75 had a lower prevalence of successful aging. This misinterpretation of results is repeated in the Discussion, first paragraph: "Moreover, elders aged 70–75 years old, who can see their relatives or friends whenever they want to, and had no fall history, pain problem, and sleep disorder were more likely to be successfully aging." Younger age (that is less than 70) would appear to be associated with successful aging from the results in univariate and multivariate analysis.

Ans:
Thank you for pointing out our mistake. We have modified the description of elders aged 70-75 in result of abstract and in discussion. The modified sentences are listed and marked as below.

Abstract

Results: The prevalence of successful aging was 10.4% in elders. A higher proportion of successful aging was found in non-frail and pre-frail than in frail elders (16.9%, 7.2% and 0.9%, respectively). In multivariate logistic regression, relative to non-frail elders, pre-frail elders were associated with lower prevalence of successful aging (OR: 0.45; 95% CI: 0.24–0.84). Moreover, relative to those aged ≤70 years, elders aged 70–75 years were associated with lower prevalence of successful aging (OR: 0.27; 95% CI: 0.13–0.58). In addition, those able to visit relatives/friends (OR: 3.86, 95% CI: 1.09–13.61), without a history of falling (OR: 4.95; 95% CI: 1.79–13.74), pain (OR: 4.04; 95% CI: 2.18–7.50) or sleep disorders (OR: 2.36; 95% CI: 1.30–4.27) were more likely to be successfully aging.

Discussion

The prevalence of (skip)…Moreover, elders aged ≤70 years, who are able to visit with relatives or friends whenever they wish, had no history of falling, pain or sleep disorders and who were not frail were more likely to be successfully aging.
2. In the Background, first sentence, the authors refer to "the elderly population" without defining what they mean by "elderly" and "older people". For example: "The proportion of older people is projected to increase by almost triple its current number". What age group are the authors referring to? Those 65 and over? Those 85 and over?

**Ans:**
We have modified our introduction section according to your suggestion. The modified first sentence of background section are listed and marked as below.

<table>
<thead>
<tr>
<th>Background</th>
</tr>
</thead>
<tbody>
<tr>
<td>The proportion of the elderly population aged $\geq 65$ years has continued to dramatically increase worldwide from 8% in 1950 to 11% in 2009 [1].</td>
</tr>
</tbody>
</table>

3. In the Background, second paragraph, first sentence "An extensive review of 28 quantitative studies..." should be referenced. Presumably this is reference 5 (Depp and Jeste, 2006) but this is not obvious in the text.

**Ans:**
Thank you for pointing out our mistake. We have cited the reference for this sentence as you mentioned. The order of reference was changed as reference 4.

4. The modified sentences are listed and marked as below.

   An extensive review of 28 quantitative studies reported that there are several methods to operationally define and measure successful aging; however, the authors found that the prevalence and definition of successful aging varied among studies [4].

4. In the Background, last paragraph, the authors indicate that: "......physical component summary (PCS) and mental component summary (MCS) scores, both corresponding to major researcher-defined criteria." The authors should explain what they mean by "corresponding to major researcher-defined criteria".

**Ans:**
Thank you for your valuable comments. The sentence is modified and marked as below.

   Short-form 36 (SF-36) is a multidimensional scale and a well-established instrument, which measures health concepts and self-reported health-related quality of life [8]. Using SF-36 to define successful aging is feasible because it represents overall health status in two summary measures, namely, physical component
summary (PCS) and mental component summary (MCS) scores. These two scores reflect the status of physical, mental, and social well-being that are generally used to define health status [9]. The aim of the current study is to explore the prevalence of successful aging, as defined by SF-36, as well as to identify determinants of successful aging among community-dwelling elders.

5. In the Methods, first paragraph the authors state: "About 4.58% of the Taichung residents have the same age." What age are the authors referring to?

**Ans:**
It described the proportion of residents aged 65 and above in Taichung city is 4.58%. The modified sentences are listed and marked as below.

**Methods**

*Population and participants*

We conducted a population-based cross-sectional study in June 2009 with a target population of all residents aged ≥65 years residing in eight administrative neighbourhoods of Taichung City, which is located in west-central Taiwan, with a population of just over one million people, making it the third largest city on the island with an area of 163.4 km² and a population density of 6,249/km² in 2009. There were 3,997 elderly residents in these eight administrative neighbourhoods of Taichung City accounting for 4.5% of the population. Data for this study was obtained from records of all individuals complied by the Bureau of Households. The details of the sampling method are described elsewhere [10].

6. In Measures the authors state that: "....the SF-36 PCS and MCS scales were derived following the standard SF-36 scoring algorithms." What population group was used for standardizing the algorithms?

**Ans:**
In Taiwan, population norm of SF-36 has been assessed, but the scoring algorithms are not yet completed. Among eight scales of SF-36, the distributions of physical functioning (PF), bodily pain (BP) and vitality (VT) scales are slightly higher in Taiwan than those in US. Other five scales are similar. For standard scoring algorithms and comparing for worldwide, we used the value from US population for standardizing the algorithms. The distributions of eight scales in population norm in USA and Taiwan are shown as below.
7. In Results, second paragraph the authors state that: "Elders with \(\leq\) (less than or equal to) 6 years of educational attainment..............had higher prevalence of successful aging in the unadjusted analysis (Table 2)." Again the reverse is shown in the Table that elders with \(>\) (greater than) 6 years of educational attainment had a higher prevalence of successful aging.

Ans:
Thank you for pointing out the error in our manuscript. We have modified the description about elders with \(\leq\) 6 years of educational attainment in the second paragraph of results. The modified sentences are listed and marked as below.

Older elders, females, and elders without enough or with just enough money use had lower prevalence of successful aging. Elders with \(\geq\) 7 years of education, general or good visual capacity, good hearing capacity, who regularly exercised and were able to see relatives/friends whenever they wished had higher prevalence of successful aging in the unadjusted analysis (Table 2).

8. In the Discussion, second paragraph, the authors state that: "Studies using the absence of major diseases as one of the domains to define successful aging in elders reported a lower prevalence of successful aging [13, 16, 18] compared with those using this domain. [4, 7, 11, 13]." This sentence needs clarification-do the authors mean "...compared with those NOT using this domain".

Ans:
Thank you for pointing out our mistake. The modified sentences are listed and marked as below.

Studies using the absence of major disease as one of domains to define successful aging in elders reported a lower prevalence of successful aging [15, 18, 20] compared with those not using this domain [5, 7, 12, 15]. …
9. In the Discussion, last paragraph, the exclusion of those with cognitive impairment should be discussed as a limitation to the generalization of results.

Ans:
Thank you for your valuable comments. We added the exclusion of dementia and cognitive impairment in the last limitation of this study. The modified sentences are listed and marked as below.

The present study has certain limitations that should be taken into account when interpreting the results. First, owing to the nature of the cross-sectional study, we cannot explore the possible causal relationships between successful aging and the health conditions considered in this study. Second, the findings of our work are not generalized to rural elders, because study sample is a group of metropolitan elders. Finally, the prevalence of successful aging in urban elders may have been overestimated due to the exclusion of elders who were diagnosed as dementia, cognitive impairment, and unable complete the SF-36 questionnaire. Thus, these elders reflected the global measures of physical and mental dysfunction, rather than the specific disabilities or impairments [32].

Quality of written English: Not suitable for publication unless extensively edited

Ans:
Thank you for your suggestion. Our manuscript has been English-edited by Normal Editing service, Enago (www.enago.tw).
Reviewer 2

Response to Reviewer 2 (Francisco Felix Caballero).

Major Compulsory Revisions:

1) Maybe the most important issue is the definition of 'successful aging'. As you define it now. Some evidence for choosing this cut-off point should be provided or some sensitivity analysis, assessing different cutoff points, should be conducted.

Ans:
Thank you for guiding us. We repeated the analysis procedure for sensitivity analyses by using two cut-off points of the definition of successful aging. The prevalence of successful ageing is 7.86% for cut-off point in the highest seventy percentile and 5.6% for cut-off point in the highest seventy quartile. The method and result of sensitivity analysis were added in our manuscript.

In Method:

<table>
<thead>
<tr>
<th>Statistical Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous variables were reported as mean ± standard deviation (SD), and categorical variables were reported as number and percentage. Student’s t test was used to compare the eight dimensions and the two component summaries of SF-36 among elders who were and were not aging successfully, respectively. Univariate logistic regressions were used to explore the effect of socio-demographic factors, psychosocial support, visual and hearing capacity, health-related practices, and chronic illness/problems on successful aging. Variables found to be statistically significant by univariate logistic regression analysis were selected to further evaluate the relative contributions of each using four multivariate logistic regression models. First, the socio-demographic and psychosocial support factors were evaluated by multivariate logistic regression. Visual and hearing capacity and health-related practices were then added to the second model, and chronic illness and fall history were further added simultaneously to the third model. Finally, chronic problems and frailty were added to the fourth model. All calculations were repeated for sensitivity analysis. The cut-off point of both PCS and MCS to define successfully aging was changed from the highest tertile to the 70th percentile and quartile. All reported P-values were those of the two-sided tests; the level of significance was set at p &lt;0.05. All analyses were performed using SAS version 9.2 statistical software (SAS Institute Inc., Cary, NC, USA).</td>
</tr>
</tbody>
</table>
The sensitivity analysis results showed that age, fall history and pain were still significantly associated with successful aging when using the highest seventy percentiles of both the PCS and MCS as cut-off values. The effects of visiting relatives/friends and sleep disorder on successful aging were not significant (but near significance). While using the highest quartile as a cut-off value, only fall history and pain had significant effects on successful aging. All elders who were frail were found to be unsuccessfully aging; however, this factor could not be added to the final multivariate model due to a problem with statistical convergence.

2) Apart from age, other socio-demographic or socio-economic information should be reported.

Ans:
Five socioeconomic variables were analyzed in this study, including age, gender, education, marital status, and money use. The distributions of these five socioeconomic variables according to successful ageing were reported in Table 2. The effects of these five socioeconomic variables on successful ageing were reported in Table 4. Among these variables, only age is a statistically significant factor of successful aging in the last multivariate logistic regression.

3) The significant differences found in the comparison among elders who were and were not aging successfully, could be due to the large sample size. Effect size measures should be provided to assess the magnitude of these differences (for example, according to the Cohen’s guidelines). The fact that the size (and the standard deviations) of the two groups are very different, should be also taken into account.

Ans:
Thank you for guiding us. The effect size of significant factors were calculated according to the Cohen's guidelines. We added a new paragraph in discussion section (the last two paragraph).

In present study, we used Cohen’s d in the chi-square value formula (\(d = \sqrt{(4x^2)/(N - x^2)}\), where N is total sample size) [31] to calculate the effect size of significant factors. Our results indicated a mid-size effect of pain and frailty (d=0.47 and 0.38, respectively). The effect sizes of other factors (including age, can see
relatives/friends whenever they want to, fall history, and sleep disorder) were small (between 0.2 and 0.3). It revealed that the two determinants (pain problem and frailty) have greater relative contribution to successful aging.

4) It is supposed that the strategy conducted in the main analysis is a nested logistic regression, but it should be specified in Methods. It would be necessary to compare the fit of the different models to show if subsequent blocks (or variables added) are really useful to predict successful aging. This can be done by means of the Likelihood Ratio (LR) test or the Adjusted McFadden's R-squared change.

*Ans:*
Thank you for your valuable comments. The Likelihood ratio test or the adjusted McFadden's R-squared change were added in Table 4. Those values were showed as below.

<table>
<thead>
<tr>
<th></th>
<th>Model I</th>
<th>Model II</th>
<th>Model III</th>
<th>Model IV</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Independent variables</strong></td>
<td>Socio-demographic factors &amp; Psychosocial support</td>
<td>Model I + Visual and hearing capacity</td>
<td>Model II + Health-related practices</td>
<td>Model III + chronic illness</td>
</tr>
<tr>
<td>Adjusted McFadden's R²</td>
<td>9.1%</td>
<td>16.0%</td>
<td>23.4%</td>
<td>32.3%</td>
</tr>
<tr>
<td>Likelihood ratio test</td>
<td>p&lt;0.001</td>
<td>p&lt;0.001</td>
<td>p&lt;0.001</td>
<td>p&lt;0.001</td>
</tr>
</tbody>
</table>

5) The strengths of this study should be emphasized in the Discussion, adding some sentence about the new contributions of this study to the research on the relationships between successful aging and its determinants in elders.

*Ans:*
Thank you for guiding us. We found frailty is an independent determinant of successful aging and added a paragraph in Discussion section to emphasize this finding.

Minor comments:
1) In the description of SF-36, the sum of the items (10 + 2 + 4 + 3 + 5 + 4 + 2 + 5) of each one of the eight domains is not 36.

Ans:  
The measurement tool of SF-36 comprises of 36 items, and it measures 8 domains of health status. Among these items, a single item that provides an indication of perceived change in health is not belonging to any domains. Therefore the sum of items of 8 domains is 35, not 36.

2) It is said in Page 10 of PDF "four logistic regressions”. It should be said "four logistic regression models”. Other mistakes (for example, footnote in Table 1)

Ans:  
Thank you for pointing out our mistake. The modified sentences are listed and marked as below.

Statistical Analysis

Continuous variables were reported as mean ± standard deviation (SD), and categorical variables were reported as number and percentage. Student’s t test was used to compare the eight dimensions and the two component summaries of SF-36 among elders who were and were not aging successfully, respectively. Univariate logistic regressions were used to explore the effect of socio-demographic factors, psychosocial support, visual and hearing capacity, health-related practices, and chronic illness/problems on successful aging. Variables found to be statistically significant by univariate logistic regression analysis were selected to further evaluate the relative contributions of each using four multivariate logistic regression models. First, the socio-demographic and psychosocial support factors were evaluated by multivariate logistic regression…

Table 1’s footnote
Physical functioning (PF), Role physical (RP), Bodily pain (BP), General health (GH), Vitality (VT), Social functioning (SF), Role emotional (RE), Mental health (MH), Physical component summary (PCS), and Mental component summary (MCS)