PEER REVIEW HISTORY

ARTICLE DETAILS

TITLE (PROVISIONAL)	Community social support and onset of dementia in older Japanese individuals: A multilevel analysis using the JAGES cohort data
AUTHORS	Miyaguni, Yasuhiro; Tabuchi, Takahiro; Aida, Jun; Saito, Masashige; Tsuji, Taishi; Sasaki, Yuri; Kondo, Katsunori

VERSION 1 – REVIEW

REVIEWER	DOXA PAPAKONSTANTINOU Department of Educational and Social PolicyUniversity of Macedonia156 Egnatia st., 54636, Thessaloniki, Greece
REVIEW RETURNED	03-Oct-2020

GENERAL COMMENTS	The manuscript addresses a topic with significant research implications. It is a very well written text, with an innovative research objective that has not been addressed before. However, I submit some minor revisions for consideration. • The researchers explore the association of social support with dementia. The main categories of social support are described but there is no definition of the term, which could be considered essential for the readers to comprehend the objective of the research. More effects of social support on health could also be added on page 4. • The researchers mention on page 5 that a random selection of 33,152 people aged 65 years or older was performed. More details on how the sample was randomly collected would be enlightening. • At the end of page 7 and at the beginning of page 8 the researchers report that the individual-level social support was assessed based on four dimensions of the Two-Way Social Support Scale. Additionally, they report that a single item measured each support, providing examples of the questions included. A reference for the Two-Way Social Support Scale is provided. However, more details on the Scale are essential, as many questions arise from the present description. Where do the authors base the question-examples included? Are these question-examples part of the scale? The answer to these questions should be clear to every reader. • The limitations of the study are well presented. However, I do not agree with the limitation mentioned about the low response rate to the survey. This is very promising research with a high response rate to the survey, which would not affect the generalizability of the results. • More discussion on the practical implications of the research would be helpful to explain how these findings could be used and by whom, the policymakers, the family members, the medical staff, etc.

REVIEWER	Kay Shannon Auckland University of Technology, New Zealand
REVIEW RETURNED	17-Nov-2020

GENERAL COMMENTS	Thank you for the opportunity to review this worthwhile manuscript on an important topic. I offer the following suggestions to improve readability. -on the second page of the introduction, in line 26, the statement about pre/posterior relationships is confusing -on the second page of the discussion, the argument about the effect of receiving emotional support from an older person's children on the onset of dementia is confusing. Rewording would make the effect (either positive or negative) more obvious to the reader. Once again, thank you for the opportunity to review your work

REVIEWER	Agnieszka Micek Uniwersytet Jagiellonski w Krakowie Collegium Medicum, Department of Nursing Management and Epidemiology Nursing
REVIEW RETURNED	26-Dec-2020

GENERAL COMMENTS	The article “Community social support and onset of dementia in older Japanese individuals: A multilevel analysis using the JAGES cohort data” written by Yasuhiro Miyaguni et. al is interesting and well conducted. I have only small remarks and questions: 1. Line 44, page 10 : “The proportion of people receiving community level emotional support was moderately correlated with the proportion of people receiving instrumental support (p = .44) ”. There should be r=0.44, Spearman rank coefficient, not p = 0.44. 2. In Table 1 column titles maybe would be better to name not as “%” and SD but “Mean” and ”SD”. All are expressed as ”%”, but these are mean and sd. 3. Could you discuss the result of Spearman rank correlations: negative correlation between 1&2, but positive between 3&4. 4. Is this Incidence Rate (IR) of dementia per 1000 person-years? It looks like if it would be per person-day not per person-year. 5. What about missing data in individual level variables? In GDS-15 was 13% of missing data. Please explain the practical sense of adjustment to variable with included additional category of ”missing data”. How to interpret the results of such kind of the adjustment? 6. Line 6, Page 12, “Regarding individual-level social support, in Model 1, the incidence of dementia was significantly associated with community-level emotional support (HR=0.83; 95% CI=0.73-0.94) as well as instrumental support (HR=0.83; 95% CI=0.73-0.94).” This is unclear for me. Community-level variables effects were described earlier. Here individual-level social support is discussed, so why the result is once again about community-level emotional support, but not about individual level? Secondly the result for emotional support (HR=0.83; 95% CI=0.73-0.94) as well as instrumental support (HR=0.83; 95 CI=0.73-0.94) is the same. In Supplementary Table 2 providing instrumental support in individual-level gave hazard ratio 0.76 (0.66-0.89) for onset of incidence of dementia. 7. “Among older people, a 1% rise in receiving community-level emotional support correlated with an approximately 4% decrease in the incidence of dementia, irrespective of socio-demographic factors and health circumstances”. Please explain whether all

	models were constructed separately for each type of support or whether all “dimensions” of support were put in the same models simultaneously? In other words whether adjustment to “socio-demographic factors” includes adjustment to the remaining types of social support in the same model? In Table 1 Spearman's Rank Correlations were calculated between pairs of community level social support indicators, however, most of them were significant, they were not very high. So what was an implication? Building one model including all types of social support together? 8. Line 24, page 13 The justification preceding the sentence in the discussion: “Therefore, a community-level indicator of receiving emotional support may only be associated with the onset of dementia.” is unclear for me. Please explain what is the meaning of the above sentence.

REVIEWER	Dorina Cadar University College London United Kingdom
REVIEW RETURNED	26-Dec-2020

GENERAL COMMENTS	Re: Community social support and onset of dementia in older Japanese individuals: A multilevel analysis using the JAGES cohort data This is a longitudinal analysis of 15,313 community-dwelling adults from the Japan Gerontological, showing that receiving community-level social support in the form of emotional support is associated with a lower risk of developing incident dementia Evaluation Study. This is a well-executed study. I only have a couple of minor comments: 1. Should the STRENGTHS AND LIMITATIONS OF THIS STUDY b presented on page 3 or replaced with highlights? 2. Outcome variable; dementia (method, page 6). Please explain what M means or stands for. Furthermore, the authors should explain how many impairments were considered on the Activities of Daily Living in their classification for dementia grade M. Similarly, the authors should provide a clear explanation of the thresholds used on the MMSE scores for determining dementia classification I to IV. I find it concerning that dementia was evaluated only with MMSE and ADL. This should be further explained and acknowledged as a limitation. 3. The multilevel survival analysis sounds robust. The authors should make available their code/ syntax in the supplementary material. 4. Table 1 should be placed as supplementary material, and all the supplementary tables S1 & S2 should be presented as the main tables in the paper. 5. The discussion of the results should be linked back to the concept of social capital presented in the introduction. Further references should be made comparatively with American and British studies on this area.

VERSION 1 – AUTHOR RESPONSE

Reviewer #1
General Comments:
The manuscript addresses a topic with significant research implications. It is a very well written text, with an innovative research objective that has not been addressed before. However, I submit some minor revisions for consideration.

Comment 1:
The researchers explore the association of social support with dementia. The main categories of social support are described but there is no definition of the term, which could be considered essential for the readers to comprehend the objective of the research. More effects of social support on health could also be added on page 4.

Our response:
Following the suggestion, we added and corrected specific descriptions as follows.

Change (Introduction, P4, L18-L21):
Social support can be defined as aid and assistance exchanged through social relationships and interpersonal transactions [10], and it might be a significant protective factor for cognitive aging.[11] A previous systematic review paper indicated that people with social support had 50% lower mortality than those without.[12]

Corrected (Introduction, P5, L1-L4):
Providing emotional support to the spouse, and instrumental support to relatives, friends, and neighbors, further lowers the risk of mortality.[14] Receiving emotional support is associated with improved cognitive function.[11] In addition, diverse social relationships, including social support from family members, are associated with a lower incidence of dementia.[15]

Change (reference):
10. Heany CA, Israel BA. Social networks and social support. In: Glanz K, Rimer BK, Viswanath K, eds. Health Behavior and Health Education Theory, Research, and Practice. 4th ed. San Francisco, CA: Jossey-Bass; 2008:189–210.

12. Holt-Lunstad J, Smith TB, Layton JB. Social relationships and mortality risk: a meta-analytic review. PLoS Med 2010;7(7):e1000316. doi:10.1371/journal.pmed.1000316

Comment 2:
The researchers mention on page 5 that a random selection of 33,152 people aged 65 years or older was performed. More details on how the sample was randomly collected would be enlightening.

Our response:
Following the reviewer's suggestion, we have added the following explanations about sampling.

Change (Sample of Methods, P5, L21-L23; P6, L1-L6):
The research was carried out in seven—three larger (Handa, Tokoname, and Chita Hokubu) and four smaller (Agui, Mihama, Minamichita, and Taketoyo)— municipalities that encompass the entire southern region of the Chita peninsula and the Aichi Prefecture. In October 2003, an estimated 276,208 people resided in these locations where 18.0% were aged 65 years or above.[17] On average, the data of 6,300 residents in the 44 school districts were analyzed in this study. In the three

larger municipalities, 5,000 survey candidates were randomly selected from the list of persons insured by long-term care insurance who were not certified as requiring long-term care. In the four smaller municipalities, candidates were randomly selected from those not receiving public long-term care insurance benefits due to a physical or cognitive disability. Of the 33,152 people selected, 15,313 individuals answered the baseline survey (response rate = 52.1%).[15]

Comment 3:
At the end of page 7 and at the beginning of page 8 the researchers report that the individual-level social support was assessed based on four dimensions of the Two-Way Social Support Scale. Additionally, they report that a single item measured each support, providing examples of the questions included. A reference for the Two-Way Social Support Scale is provided. However, more details on the Scale are essential, as many questions arise from the present description. Where do the authors base the question-examples included? Are these question-examples part of the scale? The answer to these questions should be clear to every reader.

Our response:
Thank you for your helpful comment. Following the reviewer's suggestion, we added Supplementary Table S2 as follows. Since there are four types of explanatory variables and it is difficult to understand them only with text, we created supplementary materials.

Table S2 Four categories of social support (including questionnaire items)
Receive Provide
Emotional social support (a) receiving support at the emotional level

（Question: "Do you have someone who listens to your concerns and complaints? Circle all that apply. Options included family living together, separated children and relatives, acquaintance/friends/neighbors"） (b) providing support at the emotional level

（Question: "Do you listen to someone’s concerns or complaints? Circle all that apply. Options include family living together, separated children and relatives, acquaintances/friends/neighbors"）
Instrumental social support (c) receiving support at the instrumental level

（Question: "Do you have someone who looks after you when you are sick and confined to bed for a few days? Circle all that apply. Options include family living together, separated children and relatives, acquaintance/friends/neighbors"） (d) providing support at the instrumental level

（Question: "Do you look after someone when he/she is sick and confined to bed for a few days? Circle all that apply. Options include family living together, separated children and relatives, acquaintance/friends/neighbors")

Comment 4:
The limitations of the study are well presented. However, I do not agree with the limitation mentioned about the low response rate to the survey. This is very promising research with a high response rate to the survey, which would not affect the generalizability of the results.

Our response:
Thank you very much for this important and helpful comment. Accordingly, we have added the following sentence in the limitation section of the discussion.

Change (Discussion, P15, L6-L8):
First, the response rate to the survey (52.1%) could affect the generalizability of the results. However, this response rate was higher than the census conducted by the government (41.8% response rate in the postal survey 2020).[28]

Change (Reference)
28. Ministry of Health, Labor and Welfare. Announcement of the end of the survey period for the 2020 National Census [original in Japanese].
https://www.stat.go.jp/data/kokusei/2020/houdou/pdf/20201021.pdf. Published October 21, 2020. Accessed February 9, 2021.

Comment 5:
More discussion on the practical implications of the research would be helpful to explain how these findings could be used and by whom, the policymakers, the family members, the medical staff, etc.

Our response:
Thank you very much for this important comment. Accordingly, we have changed some descriptions and added the following sentence.

Change (Discussion, P13, L4-L9):
The outcome of this research may have significant implications for public health, i.e., by suggesting potential practical implications useful for policymakers, family members, and medical staff. Because previous intervention research indicated that promoting community through salon activity increased social support in the community [22], providing such activities may be a practical solution to prevent the onset of dementia.

Change (Reference)
22. Murayama H, Kondo K, Fujiwara Y. Global perspectives on social capital health (original in Japanese). In: Kawachi I, Takao S, Subramanian SV, eds. Social Capital to Kenkou Seisaku. 1st ed. Tokyo: Nihon Hyoronsha; 2008:189–210. Japanese.

Reviewer: 2
General Comments:
Thank you for the opportunity to review this worthwhile manuscript on an important topic. I offer the following suggestions to improve readability.

Comment 1:
On the second page of the introduction, in line 26, the statement about pre/posterior relationships is confusing

Our response:
Thank you for this important comment. Accordingly, we have changed the sentence as follows.

Change (Introduction, P5, L12):
And there are reports of research on community social capital and cognitive decline.[18] However, because these studies are cross-sectional studies, longitudinal studies are needed.

Comment 2:
On the second page of the discussion, the argument about the effect of receiving emotional support from an older person's children on the onset of dementia is confusing. Rewording would make the effect (either positive or negative) more obvious to the reader.

Once again, thank you for the opportunity to review your work

Our response:
Thank you very much for your helpful comments. We have revised the sentence as follows.

Change (Discussion, P13, L25 - P14, L2):
Second, because depression was a risk factor for developing dementia [25], abundant community-level emotional support may mitigate the risk of depression, thereby decreasing the incidence of dementia. [26]

Change (Reference)
25. Ownby RL, Crocco E, Acevedo A, John V, Loewenstein D. Depression and risk for Alzheimer disease: systematic review, meta-analysis, and metaregression analysis. Arch Gen Psychiatry 2006;63(5):530–8. doi:10.1001/archpsyc.63.5.530

Reviewer: 3
General Comments:
The article “Community social support and onset of dementia in older Japanese individuals: A multilevel analysis using the JAGES cohort data” written by Yasuhiro Miyaguni et al. is interesting and well conducted. I have only small remarks and questions:

Comment 1:
Line 44, page 10: “The proportion of people receiving community level emotional support was moderately correlated with the proportion of people receiving instrumental support (p = .44).” There should be r=0.44, Spearman rank coefficient, not p = 0.44.

Our response:
Thank you for finding the mistakes. We have corrected the p to Spearman’s ρ.

Change (Results, P11, L9):
The proportion of people receiving community level emotional support was moderately correlated with the proportion of people receiving instrumental support (ρ = .44).

Comment 2:
In Table 1 column titles maybe would be better to name not as “%” and SD but “Mean” and ”SD.” All are expressed as ”%”, but these are mean and SD.

Our response:
Following the comment, we have corrected “%” and SD to “Mean” and ”SD” according to your suggestion (Table1).

Change (Results, Table1):

	Mean	SD	Min	Max	Spearman's Rank Correlation Coefficient		
					1	2	3
1. Community level receiving emotional support	89.9	2.0	82.7	93.5	--		
2. Community level providing emotional support	83.1	2.2	76.1	88.6	-.11*	--	
3. Community level receiving instrumental support	94.0	1.6	91.3	97.6	.44*	.08*	--
4. Community level providing instrumental support	91.9	2.1	85.6	97.9	-.01	.41*	.26*

Comment 3:
Could you discuss the result of Spearman rank correlations: negative correlation between 1&2, but positive between 3&4.

Our response:
Thank you very much for your comments. In Table 1, there is a negative significant correlation of -.11 for 1 & 2 and a positive significant correlation for 3 & 4, but these correlation coefficients were smaller than 0.4.
The interpretation of the correlation coefficient has been conveyed in the previous literature (as well as many other textbooks) as follows.
Correlation coefficient=
0.2: slight almost negligible relationships
0.2 - 0.4: low correlation
0.4 - 0.7: moderate correlation
0.7 - 0.9: high correlation, marked relationship
0.9 -1: very high correlation, very dependable relationship
Kvalseth 1985a. Cautionary note about R2. The American Statitian 39, 279–85. Fundamental Statistics In Psychology And Education J. P. Gullford
According to these interpretations of the correlation coefficients, we did not focus on the results of 1 & 2 and 3 & 4 in the text.

Comment 4:
Is this Incidence Rate (IR) of dementia per 1000 person-years? It looks like if it would be per person-day not per person-year.

Our response:
Thank you for finding the mistakes. We modified the Incidence Rate (IR) and 95% confidence interval per 1000 person-years and added the person-years. Therefore, we modified the layout of the table in Supplementary (Supplementary Table S3). Also, the following text in Results has been corrected.

Change (Results, P10, L21-L23):
During the 9.4-year follow-up period (87,232 person-years), dementia onset was observed in 1,776 individuals (16.1%). Supplementary Table S3 (view as supplementary data online) shows the baseline characteristics and incidence rate of dementia per 1,000 person-years.

Change (Table S3):
Table S3 Descriptive characteristics of the respondents (n = 11,032)

	Patients with Dementia			
[n = 1,776 (16.1%)]		Incidence rate (IR) per 1000 person-years		
Individual level variables	n %	n %	Person-year	IR 95% CI
Sex				
Male	5,405 49.0	746 13.8	41,871	17.8 [16.6, 19.1]
Female	5,627 51.0	1,030 18.3	45,362	22.7 [21.4, 24.1]
Age (years)				
65-69	4,065 36.9	207 5.1	35,143	5.9 [5.1, 6.7]
70-74	3,280 29.7	428 13.1	26,842	15.9 [14.5,17.5]

75-79 2,228 20.2 548 24.6 16,689 32.8 [30.2,35.7]
80-84 1,012 9.2 376 37.2 6,502 57.8 [52.3,64.0]
85+ 447 4.1 217 48.6 2,057 105.5 [92.4,120.5]
Living alone

No 9,959 90.3 1,558 15.6 79,038 19.7 [18.8,20.7]
Yes 1,073 9.7 218 20.3 8,194 26.6 [23.3,30.4]
Marital status

Married 7,905 71.7 1,038 13.1 63,992 16.2 [15.3,17.2]
Widowed or divorced 2,745 24.9 658 24.0 20,274 32.5 [30.1,35.0]
Never married 190 1.7 41 21.6 1,453 28.2 [20.8,38.3]
Other/Missing 192 1.7 39 20.3 1,514 25.8 [18.8,35.3]
Education (years)

≧13 455 4.1 171 37.6 3,004 56.9 [49.0,66.1]
10-12 6,002 54.4 963 16.0 47,576 20.2 [19.0,21.6]
6-9 3,341 30.3 470 14.1 26,908 17.5 [16.0,19.1]
＜6 1,132 10.3 149 13.2 8,965 16.6 [14.2,19.5]
Other/Missing 102 0.9 23 22.6 780 29.5 [19.6,44.4]
Present illness

No 2,906 26.3 354 12.2 24,074 14.7 [13.3,16.3]
Yes 7,679 69.6 1,348 17.6 59,636 22.6 [21.4,23.8]
Missing 447 4.1 74 16.6 3,523 21.0 [16.7,26.4]
GDS-15

0-4 6,737 61.1 857 12.7 55,179 15.5 [14.5,16.6]
5-9 2,234 20.3 450 20.1 16,840 26.7 [24.4,29.3]
10-15 644 5.8 170 26.4 4,393 38.7 [33.3,45.0]
Missing 1,417 12.8 299 21.1 10,820 27.6 [24.7,31.0]
Smoking status

Never 6,501 58.9 1,129 17.4 52,412 21.5 [20.3,22.8]
Former 2,757 25.0 367 13.3 21,375 17.2 [15.5,19.0]
Current 1,396 12.7 213 15.3 10,543 20.2 [17.7,23.1]
Missing 378 3.4 67 17.7 2,902 23.1 [18.2,29.3]
Alcohol consumption

Non 7,094 64.3 1,268 17.9 55,456 22.9 [21.6,24.2]
Does not drink every_day 1,513 13.7 188 12.4 12,275 15.3 [13.3,17.7]
Drinks every_day ≦ 35 g/day 1,769 16.0 233 13.2 14,247 16.4 [14.4,18.6]
Drinks every_day ＞ 35 g/day 495 4.5 49 9.9 4,032 12.2 [9.2,16.1]
Missing 161 1.5 38 23.6 1,222 31.1 [22.6,42.7]
Social supports

Receiving emotional support

No 1,089 9.9 208 19.1 8,161 25.5 [22.2,29.2]
Yes 9,943 90.1 1,568 15.8 79,071 19.8 [18.9,20.8]
Providing emotional support

No 1,836 16.6 409 22.3 13,135 31.1 [28.3,34.3]
Yes 9,196 83.4 1,367 14.9 74,097 18.4 [17.5,19.5]
Receiving instrumental support

No 868 7.9 112 18.1 4,849 23.1 [19.2,27.8]
Yes 10,164 92.1 1,664 16.0 82,384 20.2 [19.3,21.2]
Providing instrumental support

No 619 5.6 250 28.8 6,044 41.4 [36.5,46.8]
Yes 10,413 94.4 1,526 15.0 81,189 18.8 [17.9,19.8]

Comment 5:
What about missing data in individual level variables? In GDS-15 was 13% of missing data. Please explain the practical sense of adjustment to variable with included additional category of ”missing data”. How to interpret the results of such kind of the adjustment?

Our response:
The GDS is a 15-item scale. Therefore, the score ranges from 0 to 15, but there are 1,417 samples (12.8%) that do not fall into any category. We adopted this missing category as an adjustment category instead of excluding these samples (resulting in sample loss). In our previous study below (Tsuji et al., 2019), the missing value category of GDS was handled in the same way.

Tsuji T, Kanamori S, Miyaguni Y, Hanazato M, Kondo K. Community-level sports group participation and the risk of cognitive impairment. Med Sci Sports Exerc 2019;51(11):2217–23. doi:10.1249/MSS.0000000000002050

Comment 6:
Line 6, Page 12, “Regarding individual-level social support, in Model 1, the incidence of dementia was significantly associated with community-level emotional support (HR=0.83; 95% CI=0.73-0.94) as well as instrumental support (HR=0.83; 95% CI=0.73-0.94).” This is unclear for me.
Community-level variables effects were described earlier. Here individual-level social support is discussed, so why the result is once again about community-level emotional support, but not about individual level? Secondly the result for emotional support (HR=0.83; 95% CI=0.73-0.94) as well as instrumental support (HR=0.83; 95 CI=0.73-0.94) is the same.
In Supplementary Table 2 providing instrumental support in individual level gave hazard ratio 0.76 (0.66-0.89) for onset of incidence of dementia.

Our response:
Thank you for your pointing out our mistake and for the important comment. We have corrected and changed the following sentences in the Results section.

Change (Results, P12, L10-L13):
Regarding individual-level social support, in Model 1, the incidence of dementia was significantly associated with receiving individual-level emotional support (HR=0.83; 95% CI=0.73-0.94) as well as providing individual-level instrumental support (HR=0.76; 95% CI=0.66-0.89).

Comment 7:
“Among older people, a 1% rise in receiving community-level emotional support correlated with an approximately 4% decrease in the incidence of dementia, irrespective of socio-demographic factors and health circumstances”.

Please explain whether all models were constructed separately for each type of support or whether all “dimensions” of support were put in the same models simultaneously?
In other words whether adjustment to “socio-demographic factors” includes adjustment to the remaining types of social support in the same model?
In Table 1 Spearman's Rank Correlations were calculated between pairs of community level social support indicators, however, most of them were significant, they were not very high.
So what was an implication? Building one model including all types of social support together?

Our response:
Thank you very much for your comments. Social-demographic factors and all types of social support were included in the same model. We added these descriptions in the footnote section of Table 2. In addition, we corrected and added this explanation in the main text as follows.

Change (Results, Table 2):
Table 2 Results of multilevel survival analyses for onset of incident dementia

	Model 1	Model 2 (1 year)
n = 11,032	n=10,780	
Fixed effect	HR (95% CI)	HR (95% CI)
Community level variables		
Rate of receiving emotional support*	0.96 (0.94-0.99)	0.97 (0.94-0.99)
Rate of providing emotional support*	0.99 (0.96-1.01)	0.99 (0.96-1.01)
Rate of receiving instrumental support*	1.01 (0.97-1.04)	1.01 (0.97-1.04)
Rate of providing instrumental support*	1.00 (0.97-1.03)	1.00 (0.97-1.02)
Random effects		
Community level variance (SE)	0.06 (0.05)	0.04 (0.06)

*HR for one-point increment of community social support (range: 0-100)
HR adjusted for sex, age, living alone, marital status, education, present illness, GDS, smoking status, alcohol consumption, receiving emotional support, providing emotional support, receiving instrumental support, and providing instrumental support. (The full version, including individual-level results, is shown in Table S4).

Change (P10, L9-L10):
For the analyses, all four social support indicators at the community level and social-demographic factors were concurrently adjusted.

Comment 8:
Line 24, page 13 The justification preceding the sentence in the discussion: “Therefore, a community-level indicator of receiving emotional support may only be associated with the onset of dementia.” is unclear for me. Please explain what is the meaning of the above sentence.

Our response:
Thank you very much for this helpful comment. Following the suggestion from the reviewers, we have modified it as follows.（Removed "only"）

Change (Discussion, P14, L7-L8):
Therefore, a community-level indicator of receiving emotional support may only be associated with the onset of dementia.

Reviewer #4

General Comments:
This is a longitudinal analysis of 15,313 community-dwelling adults from the Japan Gerontological Evaluation Study, showing that receiving community-level social support in the form of emotional support is associated with a lower risk of developing incident dementia. This is a well-executed study. I only have a couple of minor comments:

Comment 1:
Should the STRENGTHS AND LIMITATIONS OF THIS STUDY b presented on page 3 or replaced with highlights?

Our response:
Thank you very much for your comments. STRENGTHS AND LIMITATIONS OF THIS STUDY have been written following the writing guidelines of BMJ Open.

https://bmjopen.bmj.com/pages/authors/

Comment 2:
Outcome variable; dementia (method, page 6). Please explain what M means or stands for. Furthermore, the authors should explain how many impairments were considered on the Activities of Daily Living in their classification for dementia grade M.

Our response:
Thank you for your helpful comment. We have added the following about Criteria of levels of dementia symptomatology in the Japanese LTCI system (in Supplementary Table S1).

Table S1 Criteria of levels of dementia symptomatology in the Japanese LTCI system
Rank Criteria Examples of observable symptoms or behaviors
0 Independent
Ⅰ Suffers from certain dementia symptoms, but daily living is almost fully independent in the domestic and social spheres.
Ⅱ Manifests some symptoms/behaviors and communication difficulties that may hinder daily activities, but can be independent if someone takes care of them.
Ⅱa The above-mentioned conditions in II are observed while outside the domestic sphere. Frequently gets lost on the street, or makes noticeable mistakes in matters that the person was previously able to handle, such as shopping, personal administrative tasks, or financial management.
Ⅱb The abovementioned conditions in II are also observed in the domestic sphere. Is unable to manage taking medication or stay alone at home due to an inability to answer the phone or the door.
Ⅲ Occasionally manifests communication difficulties or symptoms/behaviors that hinder daily activities, thus requiring care.
Ⅲa Manifests above-mentioned conditions described in III predominantly during the day. Has difficulty or takes time to change clothes, take meals, defecate, or urinate; puts objects into the mouth, picks up and collects objects, is incontinent, makes loud and incoherent screams, carelessly handles fire, or engages in unhygienic acts or inappropriate sexual acts, etc.
Ⅲb Manifests above-mentioned conditions described in III predominantly at night. Same as rank IIIa.
Ⅳ Frequently manifests difficulties communicating or symptoms/behaviors that hinder daily activities and constantly requires care. Same as rank III.
M* Manifests significant mental symptoms, problematic behaviors, or severe physical illnesses and requires specialized medical care. Shows continued mental symptoms, such as delirium, delusions, and agitation, and manifests associated problematic behaviors, such as self-mutilation or harm to others.

*M=Medical

In addition, we added an explanation of what the M rank means as follows.

Change (Outcome variables of methods, P7, L23; P7, L25 – P8, L2):
Finally, a score of M (M=Medical, requires specialized medical care) is used when the patient shows significant cognitive impairment, displays difficult behavior, or has a serious physical illness requiring expert medical intervention. Symptoms and behaviors seen in the M rank include delirium, paranoia, agitation, self-injury and harm, and other psychiatric symptoms, as well as ongoing problem behaviors caused by psychiatric symptoms.

Comment 3:
Similarly, the authors should provide a clear explanation of the thresholds used on the MMSE scores for determining dementia classification I to IV.

Our response:
Thank you for your helpful comment. We have added the following on the MMSE scores for determining dementia classification I to IV as follows.

Change (Outcome variables of methods, P7, L9-L12):
It has been reported that dementia symptom indices are strongly correlated with Mini Mental State Examination. (Spearman's rank correlation $\rho = -0.73$, $P < 0.001$). Scores Ⅰ, Ⅱ, Ⅲ, and Ⅳ on the dementia scale are equivalent to 22, 16, 13, and 6 points on the Mini-Mental State Examination, respectively.[20]

Comment 4:
I find it concerning that dementia was evaluated only with MMSE and ADL. This should be further explained and acknowledged as a limitation.

Our response:
Thank you for your helpful comment. We revised the study limitations as follows.

Change (Discussion, P15, L7-L8):
Second, the dementia outcome is a nationally standardized scale used by public long-term care insurance, but it is not a clinical diagnosis.

Comment 5:
The multilevel survival analysis sounds robust. The authors should make available their code/ syntax in the supplementary material.

Our response:
Thank you for your helpful comment. We have shown the actual commands used in stata in the statistical analysis part of the text, however, not in the supplementary material. We have also included that information because it has been revised by updates to the statistical software. The revisions are as follows.

Change (Statistical analysis of methods, P10, L13-L14):
The STATA SE version 13 (Stata Corp., College Station, TX, USA) was used for the analysis, and the

“stmixed” command was used (the “mestreg” command has become a standard feature in STATA 14).

Comment 6:
Table 1 should be placed as supplementary material, and all the supplementary tables S1 & S2 should be presented as the main tables in the paper.

Our response:
Thank you very much for this important comment. We modified Table S2 to be the main Table 2. Table 2 shows the results for model 1 and model 2. Model 3, model 4, and individual level results are shown in Table S4.

Change (Results, Table 2):
Table 2 Results of multilevel survival analyses for onset of incident dementia

	Model 1	Model 2 (1 year)
n = 11,032	n=10,780	
Fixed effect	HR (95% CI)	HR (95% CI)
Community level variables		
Rate of receiving emotional support*	0.96 (0.94-0.99)	0.97 (0.94-0.99)
Rate of providing emotional support*	0.99 (0.96-1.01)	0.99 (0.96-1.01)
Rate of receiving instrumental support*	1.01 (0.97-1.04)	1.01 (0.97-1.04)
Rate of providing instrumental support*	1.00 (0.97-1.03)	1.00 (0.97-1.02)
Random effects		
Community level variance (SE)	0.06 (0.05)	0.04 (0.06)

*HR for one-point increment of community social support (range: 0-100)
HR adjusted for sex, age, living alone, marital status, education, present illness, GDS, smoking status, alcohol consumption, receiving emotional support, providing emotional support, receiving instrumental support, and providing instrumental support. (The full version, including individual-level results, is shown in Table S4).

Comment 7:
The discussion of the results should be linked back to the concept of social capital presented in the introduction. Further references should be made comparatively with American and British studies on this area.

Our response:
Thank you very much for this important and helpful comment. We reviewed the systematic review and, referring to social capital research in the USA and Europe, described the significance of this study as follows.

Change (Discussion, P14, L22 - P15, L3):
In addition, according to a systematic review of social capital, including studies mainly conducted in western countries, most of the intervention studies in the last two decades have focused on individual-level changes, with a dearth of studies examining community-level changes.[27] Furthermore, there are few longitudinal studies, even observational studies, that have produced dementia outcomes. Therefore, the results of this study can contribute to the social capital research agenda for developing intervention research at the community level.

VERSION 2 – REVIEW

REVIEWER	Papakonstantinou, Doxa Univ Macedonia, Educational and Social Policy
REVIEW RETURNED	06-Mar-2021

GENERAL COMMENTS	I have reviewed a previous version of this manuscript and had suggested minor revisions. The authors in the revised manuscript have adequately addressed all the comments and made all the necessary changes.

REVIEWER	Shannon, Kay Auckland University of Technology
REVIEW RETURNED	22-Mar-2021

GENERAL COMMENTS	Thank you for revising the manuscript.

REVIEWER	Micek, Agnieszka Uniwersytet Jagiellonski w Krakowie Collegium Medicum, Department of Nursing Management and Epidemiology Nursing
REVIEW RETURNED	02-Mar-2021

GENERAL COMMENTS	The authors have addressed all my concerns and therefore I support publication without further changes