The Effect of Elderly’s Social Engagement on their Emotion

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Abstract. The mental health problem of middle and old people cannot be ignored, while depression is a common but serious mental illness that affects the health of the elderly. In order to find the optimal social activity which seniors would like to do to decrease their depression, this research employed 5 different models onto elderly longitudinal study from 4 different countries. Based on database analysis and detailed interpretation, the research found suitable approaches to prevent senior depression in different countries and communities.

Keywords: Depression; social engagement; mental health.

1. Introduction

Nowadays, the world is rapidly entering an aging society. One of the two major problems of an aging population is health in old age. According to the data of WHO in 2017, more than 300 million people worldwide suffer from depression, accounting for 4.4% of the world's total population.[1] Mental health not only directly affects the elderly's attitude to life and satisfaction with life, but also affects the elderly's physical health through some indirect effects, which is of great significance to the quality of the latter half of life of the elderly.[2] Despite the availability of effective treatments for depression, less than 50% of the world's population receives treatment for depression, and in many countries, it is even less than 10%.[1]

Considering the background of the population aging and the large size of middle-aged and elderly people with depression but the lack of recognition and treatment, it is particularly important to study the factors related to depression in middle-aged and elderly people from the perspective of epidemiology, so as to provide intervention basis for preventing the occurrence of depression. Thus, the aim of this research is to find the optimal social activity seniors do to decrease their depression. To achieve this aim, this research will employ 5 different models onto elderly longitudinal study from 4 different countries.

2. Literature Review

The current analysis of older adults’ social activity and emotional patterns mainly focuses on a single culture. Liu et al (2019) examines the social activity engagement and elderly health in China, by using the China Health and Retirement Longitudinal Study (CHARLS). The result demonstrates social engagement significantly improves elderly mental health in urban areas, though less effects are shown in chronic diseases.[3] Ma et al (2020) analyzes CHARLS data over a period of time, on the relationship between social participation and health for elderlies.[4] Wang et al (2022) investigates the type of social activity to elderly’s depression by using k-means method.[5] The topic is also investigated with reference to the Health and Retirement Study (HRS) in the United States. Bone et al (2022) investigates the relationship between engaging in social activities and depression for older adults in the U.S.,[6] Nelson et al (2013) analyzes the social engagement to the physical and cognitive health on American Indian elders.[7] However, existing literature only analyzes the relationship of older adult social participation by using dataset from one country. Few research works analyze such relationship in multiple country scale, and very few make a comparison between countries, with reference to country’s social structure, economical status, etc. Furthermore, only a few existing works employs multiple models and approaches for the analysis. Therefore, using various approaches are essential to produce more accurate result, and reduce bias. Based on the existing literature, this research perform an analysis on various social activities and older adults’ emotion. 5 models from longitudinal study from 4 different countries are employed for in-depth result comparison.

3. Methods

The models used include Multivariate Logistic Regression (MLR), Least Absolute Shrinkage and Selection Operator (LASSO), Random Forest Model (RF), Variance Inflation Factor (VIF) and mean trend analysis.
The dataset of this research involves the Health and Retirement Study (HRS) from the United States[8], China Health and Retirement Longitudinal Study (CHARLS)[9], Korean Longitudinal Study of Aging (KLoSA)[10], and Costa Rica Longevity and Healthy Aging Study (CRELES)[11]. The access of data is officially approved by the data center.

4. Result Analysis

4.1 Health and Retirement Study (HRS)
Five random forest models used to find the most important activities elderly do which can affect the mental health of elderly, for 5 different metrics to evaluate mental health. Then, a VIF test will be performed to make sure the results are correct.

The data we used in the Health and Retirement Study is the HRS 2022 version, Everyday life and Well-Being questionnaire.

The independent variables in the dataset are:
Question 1: How often do you do each activity?

<table>
<thead>
<tr>
<th>Table 1: Answers to question 1</th>
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<tbody>
<tr>
<td>RLB001A: Care for a sick and disabled adult</td>
</tr>
<tr>
<td>RLB001B: Do activities with grandchildren/nieces</td>
</tr>
<tr>
<td>RLB001C: Do volunteering work with children</td>
</tr>
<tr>
<td>RLB001D: Do other volunteering work</td>
</tr>
<tr>
<td>RLB001E: Attend educational course</td>
</tr>
<tr>
<td>RLB001F: Go to social club</td>
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<tr>
<td>RLB001G: Attend non-religious groups</td>
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<tr>
<td>RLB001H: Pray privately</td>
</tr>
<tr>
<td>RLB001I: Read books</td>
</tr>
<tr>
<td>RLB001J: Watch television</td>
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</tbody>
</table>

The result of the independent variable and its corresponding dependent variable is shown here:

<table>
<thead>
<tr>
<th>Table 2: Independent Variable and Its Corresponding Dependent Variable</th>
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<tbody>
<tr>
<td>Dependent variable question</td>
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</table>

Since RLB001P and RLB001O appeared to be the most frequent in the top 2 most significant variable. We also tested the VIF index to demonstrates that there’s no multicollinearity within variables, ensure the result of one variable do not affects the another. We judge if the VIF index <10, it means that there’s unlikely to have multicollinearity.
Table 3: VIF Index of RLB001P and RLB001O

<table>
<thead>
<tr>
<th></th>
<th>RLB001O</th>
<th>RLB001P</th>
</tr>
</thead>
<tbody>
<tr>
<td>VIF</td>
<td>5.194430</td>
<td>6.227781</td>
</tr>
</tbody>
</table>

This concludes that do home or car maintenance (RLB001O) and cook something special (RLB001P) is able to decrease the depression the most.

4.2 China Health and Retirement Longitudinal Study (CHARLS)

In this section, a mean trend analysis and a multivariate logistic regression (MLR) are used to look into the most significant practices to decrease depression in China. The independent variable “da056: Have you done any social activities in the last month”. Answers include:

i. Interacted with friends
ii. Played Ma-jong, played chess, played cards, or went to community club
iii. Provided help to family, friends, or neighbors who do not live with you
iv. Went to a sport, social, or other kind of club
v. Took part in a community-related organization
vi. Done voluntary or charity work
vii. Cared for a sick or disabled adult who does not live with you
viii. Attended an educational or training course
ix. Used the Internet
x. Other
xi. None of these

Dependent variable: dc011 “I felt depressed”

i. Rarely or none of the time (< 1 day)
ii. Some or a little of the time (1-2 days)
iii. Occasionally or a moderate amount of the time (3-4 days)
iv. Most or all of the time (5-7 days)

By looking into the percentage of “users do that practice” from dc011=1, which the participant is rarely depressed, to dc011=4, which the participant is mostly depressed, we select three most significant percentage drops:

Table 4: Percentage of Users Do that Practice

As represented in this chart, question number 6, 8 and 10 still are the three most significant variables. We can conclude that doing charity work (question 6) and using internet (question 8 and 10) are the most useful for elderlies in China to decrease depression.

4.3 Korean Longitudinal Study of Aging (KLoSA)

Korea, as the world greatest elderly suicide country, is concerned with their elderly issue in many aspects. Many of the elderlies have not received enough pensions by the Korea government, therefore looking into activities that is able to make them less depressed is especially important in this stage. This data is the KLoSA wave 8 data, conducted and published at 2020. In this analysis, a random forest analysis on the feature importance, and a LASSO method to verify the accuracy will be done. The only dependent variable will be “Satisfaction with respondent’s overall quality of life”, and the independent variable includes:

#033: In last year, the number of tour or picnic (unit: the number)
#035: In last year, the number of cinemas, theatres, concerts, art galleries, or sports events (unit: the number)
#037: In last year, the monthly time spent for hobby or recreation related activities (unit: hours)
#039: In last year, the monthly time spent for education programs for individual development (unit: hours)
#041: In last year, the monthly time spent for volunteer activities (unit: hours)
#030: Satisfaction with a R’s overall quality with life

We look into the feature importance score and the VIF score for each independent variable, which are:

Table 6 Feature Importance in the Random Forest Model

As represented in this chart, question number 6, 8 and 10 have the most significant drops, which are 63.45%, 74.37% and 68.08%, respectively. We continue to test this result by using a multivariate logistic regression, and find the coefficients for each independent variable. A larger coefficient represents that the activity is more significant in alleviating depression.
We can see that question 033 and question 037 has the greatest feature importance score, and as well, their VIF score is lower than 5. This represents a strong correlation between the activity done in question 033 and question 037 with the overall satisfaction of life. As 033 represents the number of tour and picnic, and 037 represents the number of recreational activities, we can clearly see that overall having any recreational and fun activities is able to effectively decrease depression within the Korean Elderlies, than watch TV, or do volunteering.

4.4 Costa Rica Longevity and Healthy Aging Study (CRELES)

In this part, a random forest model for feature importance and the LASSO model will be employed to verify the result. The list of independent variables is showing below:

- G19: Hours Activity Helping Others
- G20: Hours Activity Church
- G21: Hours Activity Child Care
- G22: Hours Activity Civics
- G23: Hours Activity TV
- G24: Hours Activity Sports
- G25: Hours Activity Daily chores
- G26: Hours Activity Recreational

Below represents the feature importance scores:

The VIF score also passed successfully <10. This shows that G23 and G25 is able to help improve elderly’s happiness. We still verify this with the LASSO method. The LASSO method shrinks some of the coefficient into 0, and the variables did not shrink would be considered significant. After putting the optimal Lambda value, we concluded that: G19, G23, G25 are not shrunk. This verified the RF model where watching TV (G23) and doing daily chores (G25) would help Costa Rican elderlies decrease their depression!

5. Interpretation

5.1 Doing something fun (US, Korea, Costa Rica)

Doing something fun, mostly by the elderly themselves, or with some close people, as seen in the data, would be something that is TOP to depression alleviation! This is also somewhat shown in the CHARLS data about China, where “playing Ma-Jong, chess” ranked the fourth most important according to the multivariate logistic regression.

5.2 Doing chores (US, Costa Rica)

Doing chores may also be helpful in some countries as it would be a way for people to exercise and feel satisfaction!

5.3 Using Internet (China, Costa Rica)

Since China and Costa Rica are still upper-middle income country, instead of upper income country (such as US or Korea), the access to internet may be a new thing for some of the residents. Therefore, people will feel satisfied with life when they get in touch with the powerful Internet. This trend may still be existing in other upper-middle income country where internet is just recently popularized in the country.

Surprisingly, volunteering only comes important in China. I tried to interpret this by the culture of China. As China focuses on a collectivistic culture instead of a individualistic one, helping others and helping my community would lead to more satisfaction than other places.
6. Conclusion

In conclusion, depression has become an important public health problem, which will not only have an important impact on emotional management, quality of life, daily living ability and suicide tendency of the middle-aged and elderly[12], but also bring about an increase in medical costs for the elderly[13]. Thus, it is urgent to find various ways to release the senior from great pressure and enjoy their lives.

According to the research, there are kinds of approaches to address the citizen mental health problems. For instance, advocating for “doing something fun individually” and “doing chores” would be a good choice to decrease depression for the senior. Advocating for using internet or TV in upper-middle income country, or even lower-income country would also be helpful to age gracefully. Moreover, advocating for volunteering work, organizing community events and community volunteering would also be a good choice in collectivistic culture.

References

1. Information on: https://www.who.int/mental_health/management/depression/prevalence_global_health_estimates/en/
8. Health and Retirement Study, ([2020 HRS Core]) public use dataset. Produced and distributed by the University of Michigan with funding from the National Institute on Aging (grant number NIA U01AG009740). Ann Arbor, MI, (2023)