How Much Is It Worth Not Being Alone? An empirical evaluation of social support using the life satisfaction approach in Japan

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Abstract

This study attempts to clarify the monetary value of social support, the importance of which is becoming widely recognized in the context of the global spread of COVID-19. Using the Life Satisfaction Approach and data obtained from a nationwide survey in Japan, we estimated that the monetary value of social support can be as high as the average household consumption expenditure for one year, and that the value of life satisfaction gained by providing social support to elderly people who live alone and who do not receive social support can be more than 1 trillion yen. These results suggest that the value of social support is high, and that significant social benefits might accrue from policy-based promotion of social support provision.

Keywords: Social support, Life satisfaction, Well-being,

JEL classification: I31

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1. Introduction

Social support refers to "information leading the subject to believe that he is cared for and loved, esteemed, and a member of a network of mutual obligations" (Cobb, 1976) and is one of the key aspects of the concept known as social capital (see Scrivens and Smith, 2013). And the advantages and expected benefits derived from it can be an incentive for people to build social relationships such as family, neighborhood and friendship, and would be considered to be one of the factors that induce people to form society. Therefore, quantitatively understanding its value would contribute to clarifying the fundamental question, "Why do people form societies? "

However, it remains a challenging issue to clarify the actual worth of social support. In January 2018, the appointment of the world's first minister for loneliness in the United Kingdom made headlines, and there is a growing awareness of the need to address loneliness and isolation around the world (see WHO, 2021; Baarck et al., 2021). In Japan, the minister for loneliness and isolation was appointed in February 2021, and the office for loneliness and isolation policy was established in the cabinet secretariat. In December 2021, a nationwide survey focusing on loneliness and isolation was conducted, which is expected to be utilized for consideration in future policy making. Thus, in the context of the global spread of Covid-19, policy responses are being promoted to tackle with the problems of loneliness and isolation. In view of various policy issues and fiscal constraints, however, the government needs to prioritize for each policy. In addition, to determine which policies to promote and how much budget to invest, it is desirable to know about expected outcomes of these policies. For this reason, evaluating the value of social support, which is not necessarily traded in the market, through comparisons with other goods and services would not only reaffirm its importance, as isolation and loneliness has become social problems, but would also be important for policy planning and cost-effectiveness judgements.

Based on this motivation, this study attempted to quantify the value of social support as a monetary value, by using the Life Satisfaction Approach (LSA). LSA is a method for estimating well-being with life satisfaction as the explained variable and using estimated results to assess the value of goods. It is used to measure the value of various goods that are not traded in the market. Social support is known to be one of several predictors of differences in subjective well-being in many countries (Diener and Tay, 2015; Helliwell et al., 2021), and analyses using individual-level data have indicated that social support might increase life satisfaction (House et al., 1988; Viswesvaran et al., 1999; Taylor et al., 2001; Shields et al., 2009)[1]. If social support is one of the factors that influence subjective well-being, it is reasonable to consider a well-being function that takes social support into account and to apply LSA to assess its value.

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[1] Some studies examined the possibility that social support could affect life satisfaction via positive or negative affect (Kong et al., 2019; Liu et al., 2016; Song and Kong, 2013).

Several studies have attempted to measure how much personal relationships are worth. For example, Clark and Oswald (2002), using data from the British Household Panel Survey (BHPS), estimated the monetary value of various life events, such as unemployment and marriage, based on estimations of well-being functions. According to their estimation, the value of an unmarried person getting married and having a spouse is £72,000 per year, and the loss due to spousal bereavement is £168,000. Powdthavee (2008) also estimated the monetary value of social networks based on data from the BHPS. He used frequency of meeting with friends and relatives outside the home and frequency of talking to neighbors as indicators of social networks, and calculated monetary values based on the estimated coefficients of these variables and the coefficient of household income. He estimated that the value of increased frequency of interaction with friends and acquaintances could reach £85,000 per year, equivalent to about nine times the average household income per capita in the data he used.

Although these studies estimated the monetary value of changes to a social relationship, such as gaining or losing a spouse, frequency of seeing friends and relatives, or frequency of talking to neighbors, they did not directly assess the monetary value of social support. This study attempts a new evaluation of the monetary value of social support based on existing studies in psychology and LSA used in economics. The results suggest that the monetary value of social support can be as high as the average Japanese household consumption expenditure for one year, and that the value of life satisfaction gained by providing social support to elderly people living alone with insufficient social support can be more than 1 trillion yen.

In the following, Section 2 describes the LSA and data used in the study. Section 3 describes the estimation results and robustness of the results. Section 4 discusses the monetary value derived from the estimation results and the social effects of providing social support. Section 5 summarizes the study.

2. Method and data analysis

2.1. Life satisfaction approach

LSA is a method for valuing goods that are not traded in the market. It is a new approach that differs from more established methods such as the Contingent Valuation Method (CVM) and conjoint analysis, and revealed preference methods such as hedonic and travel cost methods. The advantages of LSA are that it is less likely to include strategic bias, known to occur in CVM, and that unlike the hedonic method, it does not require the assumption of perfect equilibrium in the real estate market (Frey et al., 2010; Fujiwara and Campbell, 2011).

Numerous empirical studies have used LSA. It has been applied to various environmental

issues including climate change (Frijters and van Praag, 1998; Rehdanz and Maddison, 2005; Brereton et al. 2008; MacKerron and Mourato, 2013), air pollution (Welsch, 2002, 2006; Luechinger, 2009; Luechinger, 2010), airport noise (Van Praag and Baarsma, 2005), flooding (Luechinger and Raschky, 2009; Hudson et al., 2019), as well as terrorism (Frey et al., 2009), public security (Kuroki, 2012; Brenig and Proeger, 2018), summer time (Kuehnle and Wunder, 2015), and urban regeneration (Dolan and Metcalfe, 2008). Recently, it has been used to assess the value of individual behaviors such as cultural and sporting activities (Fujiwara et al., 2014) and health behaviors (Shi et al., 2019).

Although several variations on the formulation of the well-being function exist, this study estimates the following function, based on Fujiwara and Campbell (2011).

$$LS = \alpha + \beta_1 SS + \beta_2 lnM + \gamma_1 z_1 + \gamma_2 z_2 + \cdots + \gamma_n z_n + \varepsilon \qquad \cdot \cdot \cdot (1)$$

LS stands for life satisfaction, M is the equivalent income of the household (annual household income divided by the square root of the number of household members), z_1 to z_n are variables representing various attributes and socioeconomic conditions that affect individual life satisfaction, and ε is the error term. SS is social support, a variable that is assigned 1 with social support and 0 without it.

The monetary value of social support ($MVSS$) is the additional income that would be required to achieve the same level of life satisfaction with social support as would be obtained without social support, in the case that the values of other variables are held constant.

Since,
$$\alpha + \beta_1 SS + \beta_2 lnM + \gamma_1 z_1 + \gamma_2 z_2 + \cdots + \gamma_n z_n + \varepsilon$$
$$= \alpha + \beta_2 ln(M + \Delta M) + \gamma_1 z_1 + \gamma_2 z_2 + \cdots + \gamma_n z_n + \varepsilon$$

then, $MVSS$ can be calculated by the following equation.

$$MVSS = \Delta M = M - e^{\left[lnM - \frac{\beta_1}{\beta_2}\right]} \qquad \cdot \cdot \cdot (2)$$

It is justifiable to treat the value obtained here as an annual value, as it is calculated in relation to the household's annual income and, as can be seen from the equation, its magnitude depends on income.

As both signs of the estimated β_1 and β_2 are expected to be positive, the sign of the derivative of $MVSS$ with M is positive, and the larger the income, the larger the amount of $MVSS$.

2.2.   Data used in the analysis and explanation of variables

The data used in this study are from the Survey on Quality of Life in 2013 (SQL2013) conducted by the Economic and Social Research Institute, Cabinet Office in Japan[2]. The survey covered household members aged 15 or older in 4,950 households randomly selected from the Basic Resident Registration system (Jumin-kihon-daicho), and 7,717 respondents were obtained. The survey was designed to identify quality of life, such as subjective well-being, and factors that support it, and included a wide range of questions on life satisfaction, household income, social support, as well as gender, age, educational background, employment status, and family relationships (marital status and presence of children). Although these data are cross-sectional, an advantage is that they take into account various factors that have been implicated in subjective well-being in previous studies.

For life satisfaction, which is used as independent variable, the answer to the question "As a whole, how satisfied are you with your life these days?" was used. This question is identical to the main measure of subjective well-being in the OECD (2013), and was answered on an 11-point scale, with 0 being "not at all satisfied" and 10 being "very satisfied."

Regarding social support, we utilized two scales in SQL2013 to examine different types. House et al. (1985) proposed three domains of social support and corresponding scales, namely social integration, social network, and functional content of relationships. In particular, functional content of relationships can be classified into perceived or received social support (Dunkel-Schetter and Bennett, 1990). Moreover, two subdivisions of perceived social support are often referred to: instrumental and emotional social support (Carver et al., 1989).

Based on the questions in the SQL2013, two indicators: instrumental social support and emotional social support were used here. For instrumental social support, the answer to the question "How many family members, relatives, friends, or neighbors do you have who help you when you are sick or encounter difficulties?" was used. A dummy variable was created for each of (1) parents, (2) family members and relatives other than parents, (3) friends, (4) neighbors, and (5) others, with 1 for having at least one, and 0 for the others[3].

Regarding emotional social support, SQL2013 contains six items of 16 items in 'The Scale of Expectancy for Social Support' (Hisada, Chida, and Minoguchi, 1989), which was based on the definition of social support by Cobb (1976) and which has been used for adults of various ages in Japan. In this scale, participants were asked how much they agreed with each item while thinking of a familiar person (e.g., "When I am down, he/she cheers me up".)[4] The response options were on 5-

point Likert scales, ranging from 1 (strongly disagree) to 5 (strongly agree). To interpret the results in terms of emotional social support, as with instrumental social support we created a dummy variable: emotional social support was coded as 1 if a participant's responses to the six items totaled no less than 24 points (agree = 4 or higher was the average score), and the other total scores were coded as 0 (undecided = 3 or lower was the average score)[5].

Equivalent household income was also based on data from the SQL2013. Respondents were asked to select from the following categories: 1 million yen increments up to 10 million yen, 10-15 million yen, and 15 million yen or more. In this study, household equivalent income was calculated by dividing the median of each category by the square root of the number of household members[6].

Other individual attributes included in this study were gender (female dummy), age, age squared, self-rated health status, marital status, presence of children, education, employment status, working hours, and home ownership[7]. For self-rated health status, the response to the question "How do you feel about your current state of health?" was indicated on a 5-point Likert scale ("healthy," "somewhat healthy," "neither healthy nor unhealthy," "rather unhealthy," "not healthy"), and dummy variables were created for each option. Concerning marital status, dummy variables were created for unmarried, having a spouse, being separated, and being widowed, respectively. For the presence of children, dummy variables were used for no children, children under 12 years old, and all children over 12 years old, respectively. Regarding educational background, dummy variables were created for each education level in the following four categories: lower than high school graduate, high school graduate but lower than college graduate, college graduate and above, and other/unanswered.

Regarding employment status, dummy variables were based on a question about employment status in the past week, with respondents indicating that they worked, even a little, being classified as "working," those reportedly looking for or hoping to find work as "looking for work" and the rest as "not working."[8]   For working hours, dummy variables were created for less than 15, 15-30 , 30-45, 45-60, 60-75, and 75 hours or more, respectively. A dummy variable was also used for house owners. For all of the above variables, unanswered dummies were considered if respondents did not answer questions.

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you feel."; "He/she accepts you for who you are, with all the good and the bad."
[5] The distribution of the total score of the six items had spikes at 18, 24, and 30 points. 8.0% of the responses were distributed among 30 points, 35.6% between 24 and 29 points, and 44.3% between 18 and 24 points.
[6] The responses of '15 million yen or more' were treated as 21 million yen, because the average of household income was 21,030,000 yen among the sampled household that had 15 million yen or more as household income in 'National survey of family income and expenditure 2014' (Statistics Bureau of Japan, 2016).
[7] As the data on age were categorical in 5-year increments, the median value for each category was used. For age 100 and above, the median age was treated as 100.
[8] Because some respondents who were not working indicated that they already had a job lined up, these samples were categorized as "working."

Other individual attributes included were personal traits, relationships with others, and environment in neighborhood, based on the discussion in Dolan et al. (2008). With regard to personal characteristics, optimism (Scheier and Carver, 1992; Carver et al., 2010) along with self-control, extraversion, and self-esteem (Frey and Stutzer, 2002) are considered to be related to well-being. The SQL2013 included six items suggested as a scale of eudaimonic well-being in OECD (2013). One of those items ("I am always optimistic about my future") is originally from the 'Life Orientation Test' and its revised version (Scheier and Carver, 1985; Scheier, Carver, and Briges, 1994)[9]. Response options were on 11-point Likert scales, with options ranging from 0 (strongly disagree) to 10 (strongly agree). It was employed as a scale of optimism in the present study.

Regarding relationships with surrounding people, we included frequency of meeting friends and relatives, generalized trust, and stress related to caring for family members. The SQL2013 includes questions about the frequency of meeting "spouse," "your children," "your parents," "your spouse's parents," "your brothers and sisters," "your spouse's brothers and sisters," "other relatives," "friends," and "lovers," respectively. Of these items, "other relatives" and "friends" are used as variables, with "living together" and "daily" as 6, "once every 2 or 3 days" as 5, "at least once a week" as 4, "once or twice a month" as 3, "several times a year" as 2, "less than several times a year" as 1, and "being out of contact" or "no applicable person" as 0[10].

Generalized trust is a 6-item scale used in Yamagishi and Yamagishi (1994). This scale comprises the answers to six questions, which are answered on a 5-point Likert scale from "Strongly disagree (1)," "somewhat disagree (2)," "neither agree nor disagree (3)," "somewhat agree (4)," and "Strongly agree (5);" the average of these responses was used as the variable[11][12].

Stress related to caring for family members, was addressed in a question asking respondents with bedridden family members or relatives how much they feel stress. A dummy variable was considered as 1 for those who answered "very much" or "a little," and 0 for those who answered otherwise or who were not included in this question.

Responses to questions about the level of dissatisfaction with the local environment concerned six items: (1) noise, (2) air pollution, (3) lack of nearby parks and green spaces, (4) water quality, (5) crime, violence, and vandalism, and (6) trash and waste on the streets. Each question was

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[9] In the SQL2013, there is an item "I feel very positive about myself," which is also used in the OECD (2013) for self-esteem. However, the original text of this item is "In general, I feel very positive about myself," and the Japanese translation does not reflect the original meaning of "I feel very positive about myself." This means that the evaluation of oneself in the definition of self-esteem by Rosenberg (1965) and Zeigler-Hill (2013), is missing, and was not employed as an explanatory variable for personal trait in this analysis.

[10] Unanswered cases were treated as 0.

[11] "Most people are basically honest."; "I am trustful."; "Most people are basically good and kind."; "Most people are trustful of others."; "Most people are trustworthy."; "Most people will respond in kind when they are trusted by others."

[12] The Cronbach's alpha for the six items was 0.8866.

answered on a 5-point Likert scale from 1 (strongly dissatisfied) to 5 (not at all dissatisfied). The average score on the six items was used as an indicator.

Equation (1) was estimated considering these variables as explanatory variables, and the monetary value of social support was calculated from the equation (2) based on the obtained estimation results. The estimation of equation (1) was performed using the instrumental variable method (two-stage least squares; 2SLS) in addition to the ordinary least squares method (OLS). Fujiwara and Campbell (2011) point out that one of the problems in using LSA is the endogeneity of income, which is an important explanatory variable[13]. If endogeneity of income is not taken into account, then OLS estimator is likely to be biased and the monetary value of non-market goods calculated from the estimation might be overvalued. In this study, since household income was expected to be higher when the number of household members is the same, and household income was expected to be higher in households with more college graduates in the household, dummy variables of 1 for two or more college graduates in the household and the percentage of employed persons in the household were used as instrumental variables. Although these variables are correlated with household income, multiple employed persons and college graduates in the household are not likely to affect the level of life satisfaction directly, and thus it seemed appropriate to utilize these variables as instrumental variables, as a limitation of variables deriving from the SQL2013.

Descriptive statistics for the variables used in the above estimation are presented in Table 1.

3. Estimation results and robustness

3.1. Estimation results

Estimations were made for two models: Model 1, which takes into account basic individual attributes such as gender, age, and marital status, and Model 2, which also considers factors such as optimism and generalized trust.

As shown in Table 2, significant results were obtained for variables including gender, age, marital status, working status, self-rated health status, and home ownership. These results are consistent with previous studies, and there was no significant difference in the estimation results, in both models when the OLS and the 2SLS were used.

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[13] Variables other than income might raise endogeneity issues. For example, people with higher levels of life satisfaction may consider those around them to be more dependable, and that might bring about reverse causality between life satisfaction and social support. In order to address these issues, it is necessary to find further instrumental variables. However, no appropriate variables were found in the data used in this study. Therefore, the regression analysis in the present study was conducted assuming that variables other than income are exogenous. Addressing the endogeneity of variables other than income is an issue for future research.

In Model 2, the sign of optimism, an aspect of individual personality, was significantly positive, indicating that people with more optimistic temperaments tend to have higher life satisfaction. However, no significant results were obtained for frequency of meeting with friends and relatives, which was included to consider the level of personal relationships. By contrast, a significantly positive result was obtained for generalized trust, and a significantly negative result for stress of family caregiving. The result was also significantly positive for living environment, indicating that respondents who were less dissatisfied with their living environment reported higher levels of life satisfaction.

Household income, an important variable in LSA, was significantly positive in both models. The estimated coefficients were 0.469 for the OLS and 0.443 for the 2SLS in Model 1, closely matched. In Model 2, the values were 0.375 for the OLS and 0.365 for the 2SLS, both smaller than in Model 1[14].

Concerning social support, Model 1 revealed significant results for instrumental social support of friends, neighbors and others, with Model 2 showing a significantly positive result only for neighbors. As Model 2 takes into account the individual's temperament and relationship with others, it is possible that these factors also affect feelings of dependability of friends and others. However, neighbors' perceived dependability may be less affected by factors such as optimism than expectations of family and friends, and may not be affected by the addition of individual's temperament and relationships with others. Emotional social support was significantly positive in both models. The coefficient was smaller in Model 2, however, possibly also reflecting the influence of temperament and relationship with the surroundings.

Overall, these results are consistent with existing studies (e.g., Diener and Tay, 2015) showing that social support is a factor influencing well-being. Social support strongly appears to affect life satisfaction, and it can be assessed by LSA.

3.2. Robustness of social support

The instrumental social support measure is about people who help you in case of illness or difficulties, and our analysis examined the impact of this measure by assuming that instrumental social support is obtained when there is more than one such person. Conceivably, increasing life satisfaction may depend on the number of such persons. In addition, the indicator for emotional social support was a dummy variable that assigned 1 when the sum of the six items was 24 or more, but results may

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[14] Regarding the validity of the instrumental variables, the F value in the estimation at the first stage was sufficiently large and not rejected even at the 10% significance level for the over identification test.

change depending on how the dummy variable is made[15].

In view of these considerations, for instrumental social support we examined the impact depending on the number of reliable persons. For emotional social support, to check whether the results changed depending on how the variable was made, estimation was performed for a dummy variable with value 1 if the respondent answered "agree (4)" for any one of the six items of the scale. Furthermore, as the question is answered on a 5-point Likert scale, we divided the sample into the following five levels: respondent answered "strongly agree (5)" for all items, average response between 4 and 5 (total is 24-29), between 3 and 4 (total is 18-23), between 2 and 3 (total is 12-17), and lower (total is 11 or less).

Table 3 shows the estimation results. Column (1) shows the estimation results when instrumental social support of neighbors was considered as dummy variables by number of neighbors who can be relied on. In Model 1, all results were significant for two or more people, but the coefficient was notably smaller for four to six or more neighbors, with no increasing effect on life satisfaction as the number of reliable neighbors increased. By contrast, Model 2 showed no significant results for the cases of 1, 4, or 6 or more people. This result indicates that life satisfaction level may not change even if there is one neighbor who can be relied on in the case of illness or difficulties, and that life satisfaction may not simply increase with the number of such neighbors.

Column (2) shows the estimation results for the dummy variable for emotional social support when one or more items scored 4 or more. The coefficient of emotional social support was significant even when the way of making the indicator was changed. The coefficient was similar to those in both models in Table 2, with no significant differences. Column (3) shows the results for when the sample was divided into five groups depending on the levels of indicators; all were significant. The coefficients differed in magnitude according to level, indicating that respondents' increasing confidence about obtaining emotional social support positively impacts on life satisfaction.

Thus, even with different ways of constructing social support variables, the results were consistent with those presented in Table 2, suggesting a robust impact of instrumental social support from neighbors and emotional social support on life satisfaction.

4. Calculation of monetary value of social support and discussion

We calculated the monetary value of social support based on the estimates obtained in Table 2. As mentioned earlier, because the monetary value of social support depends on an individual's income, for the calculation we used the average equivalent income. According to the "Comprehensive Survey of Living Conditions" published by the Ministry of Health, Labour and Welfare, the average

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[15] The OLS was used here for estimation because the results were not notably different between the OLS and the 2SLS in Table 2.

annual household income in Japan in 2012 was 5,372,000 yen, and the median was 4,320,000 yen. If the average household size is 2.64 persons, the equivalent income (mean) is 3,306,000 yen and the equivalent income (median) is 2,659,000 yen.

Table 4 shows the results of the monetary value of social support using equation (2) based on the equivalent income mentioned above and the estimates in Table 2. The figures vary depending on the model and estimation method. For instrumental social support of neighbors, the figures range from 1,015,000 to 1,138,000 yen when average income is used, and from 816,000 to 915,000 yen when median income is used. For emotional social support, the figures range from 2,815,000 to 3,008,000 yen when mean income is used, and from 2,264,000 to 2,419,000 yen when median income is used.

Thus, the monetary value of emotional social support obtained is at a level equivalent to the equivalent income used in the calculation, and when combined with the monetary value of instrumental social support of neighbors, it exceeds the equivalent income of average household. In addition, the monetary value of emotional social support is equivalent to the average consumption expenditure of a household over a year. According to the "National Survey of Family Income and Expenditure (2014)" conducted by the statistics bureau of Japan, the average monthly consumption expenditure of households was 254,402 yen, or approximately 3,053,000 yen per year.

The estimation results in Table 2 can also be used for calculating and comparing the monetary value of other life events. For example, using the results of Model 2 with the least squares method, the value of a change in health status from "neither" to "rather healthy" is 2,201,000 yen (1,770,000 yen if the median value is used) and the monetary value of obtaining a spouse (changing "unmarried" to "married") is 2,921,000 yen (2,349,000 yen if the median value is used). Thus, the value of social support is substantial compared to life events such as improving health or obtaining a spouse[16].

Furthermore, the obtained estimates can be used to consider the social benefits of providing social support. In Japan, the population is aging at a higher rate than in other developed countries, and deaths among elderly people living alone have become a major social problem (Cabinet office, 2010). Research addressing the reality of social isolation among the elderly and its effects is underway. Mizuho Research and Technologies (2021) provided a report adopted by the Ministry of Health, Labor and Welfare as a social welfare promotion project in FY2020, which estimated the incidence of socially isolated persons based on a nation-wide questionnaire survey conducted in 2017. Several definitions of isolated persons were given in the report, and the incidence rates were estimated for each. Below, the incidence rate for the type of lack of receptive social support (narrow definition) is used to approximate the total number of elderly people living alone without access to social support.

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[16] The monetary value of getting a spouse was smaller than that reported by Clark and Oswald (2002) and Powdthavee (2008). One reason for this might be that emotional social support was considered separately in the present study. As previous studies did not consider emotional social support as an independent variable, it is possible that the higher life satisfaction from having a spouse reflects the latter's ability to provide emotional social support.

The definition of the lack of receptive social support (narrowly defined) is when a person responds "I have no one I can rely on" for all of the following nine items. It is assumed that a person meeting this definition cannot obtain either instrumental or emotional social support.

(1) Care and nursing of children

(2) Caring for and looking after a relative (other than children)

(3) Counseling on important matters

(4) Listening to complaints

(5) Sharing joys and sorrows

(6) Providing financial support in times of need

(7) Helping with small things on a daily basis

(8) Asking for a guarantor when renting a house

(9) Asking for a guardian or curator.

According to this report, the incidence rate is 11.1% for single elderly male-headed households and 4.2% for single elderly female-headed households. Multiplying these figures by the population over 60 years of age living alone in the 2015 census to estimate the number of people without social support, gives 289,869 for men and 190.296 for women.

According to the aforementioned "National Survey of Family Income and Expenditure (2014)", the average annual income of single-person households aged 60 or older is 2,612,000 yen for men and 2,211,000 yen for women. Based on these figures and the results of Model 2 estimation obtained by the OLS in Table 2, the monetary value of instrumental social support for male- and female-headed households is 802,000 yen, and 679,000 yen, respectively. The value of emotional social support is 2,224,000 yen for male-headed households and 1,907,000 yen for female-headed households.

Simply multiplying the above figures by the number of elderly people assumed to have no access to social support results in the following figures: instrumental social support: 336.7 billion yen (232.5 billion yen for male- and 129.2 billion yen for female-headed households, respectively); emotional social support: 1,007.5 billion yen (644.6 billion yen for male- and 362.9 billion yen for female-headed households, respectively). These sums are large on a macro level, given that the Japanese government's budget for aging society in 2020 was 22.481 trillion yen, and the obtained estimate is about 6% of that amount. In addition, the monetary value of providing social support to the entire population without social support across all age groups is expected to be even larger[17].

It is not easy to determine the cost-effectiveness of a policy to provide social support, because

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[17] According to the aforementioned nationwide survey conducted by the Office for Policy on Loneliness and Isolation, Cabinet Secretariat, 6.3% of the respondents scored between 10 and 12 (always lonely) on the UCLA Loneliness Scale, which means that one out of every 16 people in Japan is 'always lonely'. By age group, the highest rate (10.0%) was among those in their 30s, followed by those in their 20s at 9.4% and those in their 40s at 8.2%.

it is necessary to ascertain the cost for each individual. However, the above estimates indicate that providing social support to elderly people living alone and unable to afford social support has the potential to improve life satisfaction to the level that would be achieved by providing them with 2.5-3 million yen in monetary benefits each year. In other words, if increasing life satisfaction were a policy goal, providing social support would achieve the same results as providing more than 1 trillion yen in additional benefits to all elderly people who have no social support each year[18]. Once the system and social environment for providing social support are in place, sustained effects can be expected. Therefore, when considered over a longer time span, for example 10 or 20 years, the benefits of creating a social environment that can provide social support are unlikely to be lower than its costs.

5. Conclusion

The monetary value of social support obtained in this study is not small compared to the average annual household income, average consumption expenditure, or the monetary value of improved health and having a spouse, all indicating the importance of social support. In particular, the presence of someone who cares for you when you are down and out has a significant impact on life satisfaction, and its monetary value is high. These results presented here also suggest that establishing mutual aid networks in local communities and fostering a sense of security that people can help each other in times of need are effective not only from the perspective of disaster damage reduction and resilience, but also in terms of improving life satisfaction.

The results of this study can be of value for discussion of policy measures to deal with loneliness and isolation. By using the same approach as used here, the effects of supporting networking within the local community can be estimated in terms of monetary value, which in turn can be used to quantify the outcomes of community policies and for appraisal of the cost-effectiveness of such policies.

Naturally, there remain several challenges. Although based on a nationwide survey, the sample size used in the present study is limited. It would be of value to compare monetary values derived from other data sources. If large size panel data were available, it would be feasible to analyze causal relationships by panel analysis, with the obtained estimates being more accurate. As the perception of loneliness and isolation and the monetary value of providing social support may vary across cultures and societies, as well as on economic conditions, it is important to accumulate evidence by from various countries and regions. These are issues to be addressed in the future.

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[18] For example, Adler and Seligman (2016) point out the importance of well-being as an indicator for evaluation and policy design. In addition, New Zealand introduced the 'Well-being budget' in 2019, which uses a portion of the national budget to improve the well-being of its citizens.

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Table 1 Descriptive statistics of variables

	Number of obs.	Mean	Std. Dev.	Min	Max
Life satisfaction	7,636	6.196	2.276	0	10
Gender					
Male – reference –	–	–	–	–	–
Female	7,717	0.533	0.499	0	1
Age	7,717	48.546	18.899	17	100
Age_squared	7,717	2713.854	1875.455	289	10000
Self-rated health status					
Unhealthy	7,717	0.218	0.413	0	1
Somewhat unhealthy	7,717	0.427	0.495	0	1
Neither – reference –	–	–	–	–	–
Somewhat healthy	7,717	0.134	0.340	0	1
Healthy	7,717	0.050	0.219	0	1
Unanswered	7,717	0.006	0.079	0	1
Spouse					
Married	7,717	0.653	0.476	0	1
Unmarried – reference –	–	–	–	–	–
Separated	7,717	0.031	0.172	0	1
Widowed	7,717	0.044	0.206	0	1
Unanswered	7,717	0.033	0.178	0	1
Children					
Have one or more children (under 12years old)	7,717	0.155	0.362	0	1
Have one or more children (all children above 12years old)	7,717	0.523	0.500	0	1
Have no child – reference –	–	–	–	–	–
Unanswered	7,717	0.035	0.185	0	1
Education					
Not graduated from high school	7,717	0.176	0.381	0	1
High school graduate and other – reference –	–	–	–	–	–
College graduate and above	7,717	0.194	0.395	0	1
Other/Unanswered	7,717	0.019	0.135	0	1
Employment status					
Employed – reference –	–	–	–	–	–
Job searching	7,717	0.050	0.217	0	1
Not working	7,717	0.250	0.433	0	1
Unanswered	7,717	0.080	0.271	0	1

Working hour					
0 hour - reference -	–	–	–	–	–
< 15 hours	7,717	0.107	0.309	0	1
15 – 30	7,717	0.107	0.309	0	1
30 – 45	7,717	0.200	0.400	0	1
45 – 60	7,717	0.148	0.355	0	1
60 – 75	7,717	0.049	0.217	0	1
≥ 75	7,717	0.016	0.127	0	1
Unanswered	7,717	0.105	0.307	0	1
Home ownership					
Own home	7,717	0.827	0.379	0	1
Not own home – reference –	–	–	–	–	–
Unanswered	7,717	0.001	0.038	0	1
Household income(equivalent income, logarithm)	7,391	5.605	0.664	3.016	7.254
Optimism	7,598	5.336	2.476	0	10
Nursing stress dummy	7,717	0.181	0.385	0	1
Frequency of meeting					
Frequency of meeting relatives	7,717	1.641	1.129	0	6
Frequency of meeting friends	7,717	2.822	1.647	0	6
Generalized Trust	7,550	3.014	0.821	1	5
Living Environmet	7,513	3.584	0.726	1	5
Instrumental Social support					
Parent	7,717	0.688	0.463	0	1
Other family and relatives	7,717	0.892	0.310	0	1
Friend	7,717	0.786	0.410	0	1
Neighbor	7,717	0.588	0.492	0	1
Other	7,717	0.339	0.473	0	1
Emotional Social support	7,717	0.451	0.498	0	1
Multiple college graduates	7,717	0.129	0.336	0	1
Employed ratio in the household	7,707	0.510	0.298	0	1

Table 2 Estimation results

Estimation Method	Model 1 OLS		Model 1 2SLS		Model 2 OLS		Model 2 2SLS	
Gender(Female = 1, Male = 0)	0.113	(0.053) *	0.114	(0.054) *	0.154	(0.050) **	0.154	(0.051) **
Age	-0.065	(0.009) **	-0.065	(0.010) **	-0.055	(0.009) **	-0.055	(0.009) **
Age sq.	0.001	(0.000) **	0.001	(0.000) **	0.001	(0.000) **	0.001	(0.000) **
Spouse (reference : not married)								
Married	0.837	(0.116) **	0.842	(0.121) **	0.807	(0.112) **	0.809	(0.116) **
Separated	0.101	(0.169)	0.100	(0.169)	0.172	(0.156)	0.172	(0.155)
Widowed	0.522	(0.169) **	0.525	(0.170) **	0.425	(0.160) **	0.426	(0.161) **
Unanswered	0.363	(0.170) *	0.366	(0.171) *	0.262	(0.157) †	0.263	(0.158) †
Child (reference : No child)								
Under 12years old	0.110	(0.110)	0.104	(0.116)	0.104	(0.106)	0.101	(0.111)
All children over 12years old	-0.048	(0.106)	-0.049	(0.106)	-0.076	(0.102)	-0.077	(0.102)
Unanswered	-0.020	(0.172)	-0.021	(0.172)	0.073	(0.163)	0.072	(0.162)
Employment situation (reference : Not working)								
Working	0.328	(0.285)	0.324	(0.285)	0.326	(0.271)	0.324	(0.270)
Job searching	-1.139	(0.193) **	-1.141	(0.192) **	-0.910	(0.181) **	-0.911	(0.181) **
Unanswered	0.328	(0.285)	0.324	(0.285)	0.326	(0.271)	0.324	(0.270)
Working hour (reference : 0 hour)								
> 15	-0.317	(0.245)	-0.317	(0.244)	-0.317	(0.230)	-0.317	(0.229)
15 – 30	-0.456	(0.236) †	-0.456	(0.235) †	-0.476	(0.222) *	-0.476	(0.222) *
30 – 45	-0.490	(0.231) *	-0.488	(0.231) *	-0.487	(0.217) *	-0.486	(0.217) *
45 – 60	-0.431	(0.234) †	-0.426	(0.235) †	-0.426	(0.219) †	-0.424	(0.220) †
60 – 75	-0.432	(0.249) †	-0.429	(0.249) †	-0.412	(0.235) †	-0.411	(0.234) †
≤75 hours	-0.767	(0.301) *	-0.767	(0.299) *	-0.910	(0.285) **	-0.910	(0.284) **
Unanswered	-0.343	(0.265)	-0.340	(0.265)	-0.404	(0.253)	-0.402	(0.253)
Education (reference : high school graduates and over)								
Less than high school graduate	-0.162	(0.075) *	-0.165	(0.077) *	-0.140	(0.071) *	-0.142	(0.073) †
More than college graduate	0.107	(0.062) †	0.113	(0.074)	0.078	(0.058)	0.081	(0.069)
Other/Unanswered	-0.307	(0.215)	-0.307	(0.214)	-0.238	(0.217)	-0.238	(0.216)
Self rated health (reference: Neither)								
Unhealthy	-1.003	(0.144) **	-1.005	(0.144) **	-0.738	(0.134) **	-0.738	(0.133) **
Rather unhealthy	-0.398	(0.088) **	-0.398	(0.088) **	-0.255	(0.083) **	-0.255	(0.083) **
Rather healthy	0.593	(0.068) **	0.594	(0.068) **	0.411	(0.065) **	0.412	(0.065) **
Healthy	1.167	(0.081) **	1.168	(0.081) **	0.755	(0.078) **	0.755	(0.078) **
Unanswered	0.679	(0.318) *	0.680	(0.317) *	0.688	(0.300) *	0.687	(0.299) *
Household income (Equivalent income、Logarit	0.469	(0.044) **	0.443	(0.169) **	0.375	(0.042) **	0.365	(0.159) *
Housing (reference : Not owing own house)								
Owing own house	0.213	(0.069) **	0.219	(0.079) **	0.174	(0.066) **	0.177	(0.074) *
Unanswered	-0.060	(0.422)	-0.079	(0.435)	-0.506	(0.431)	-0.514	(0.444)
Optimsm	—		—		0.262	(0.011) **	0.262	(0.011) **
Frequency of meeting pople								
Relative	—		—		0.013	(0.021)	0.013	(0.021)
Friend	—		—		0.024	(0.016)	0.024	(0.016)
Nursing care stress	—		—		-0.272	(0.057) **	-0.272	(0.057) **
Generalized trust	—		—		0.416	(0.037) **	0.416	(0.037) **
Living environment	—		—		0.126	(0.030) **	0.126	(0.030) **

	(1)	(2)	(3)	(4)
Instrumental social support				
Parent	0.074 (0.063)	0.076 (0.064)	0.029 (0.059)	0.030 (0.060)
Family members /relatives other than parents	0.133 (0.090)	0.135 (0.090)	0.061 (0.086)	0.062 (0.087)
Friend	0.245 (0.069) **	0.246 (0.070) **	0.065 (0.068)	0.066 (0.068)
Neighbor	0.187 (0.056) **	0.187 (0.056) **	0.138 (0.054) *	0.138 (0.053) **
Other	0.162 (0.052) **	0.162 (0.052) **	0.031 (0.049)	0.031 (0.049)
Emotional social support	1.064 (0.050) **	1.066 (0.050) **	0.716 (0.049) **	0.716 (0.049) **
Constant	2.728 (0.328) **	2.867 (0.938) **	0.708 (0.337) *	0.762 (0.855)
Adj-Rsq.	0.236	–	0.346	–
First–statge partial Rsq	–	0.062	–	0.062
First–statge F statistic	–	223.856	–	216.569
Wu-Hausman test	–	0.025 (0.875)	–	0.005 (0.946)
Test of overidentified restrictions	–	0.764 (0.382)	–	0.524 (0.469)
Number of obs.	7,141	7,141	6,878	6,878

Notes: Robust standard errors are shown in parentheses.

    **, *, and † indicate significance at 1%, 5% and 10% levels, respectively.

Table 3 The results of estimation to confirm robustness

	Model1						Model2					
	(1)		(2)		(3)		(1)		(2)		(3)	
Household income（Equivalent income, logarithm）	0.484	(0.044) **	0.480	(0.044) **	0.466	(0.043) **	0.381	(0.042) **	0.379	(0.042) **	0.380	(0.042) **
Instrumental social support												
Parent	—		0.068	(0.064)	0.072	(0.062)	—		0.023	(0.060)	0.027	(0.059)
Family members/relatives other than parents	—		0.102	(0.089)	0.064	(0.088)	—		0.048	(0.086)	0.035	(0.085)
Friend	—		0.178	(0.070) *	0.149	(0.069) *	—		0.025	(0.069)	0.025	(0.068)
Neighbor	—		0.193	(0.057) **	0.159	(0.056) **	—		0.145	(0.054) **	0.130	(0.053) *
Other	—		0.204	(0.053) **	0.149	(0.052) **	—		0.056	(0.049)	0.030	(0.049)
dummy (neighbor; 1 person)	0.146	(0.086) †	—		—		0.057	(0.079)	—		—	
dummy (neighbor; 2 persons)	0.352	(0.070) **	—		—		0.241	(0.066) **	—		—	
dummy (neighbor; 3 persons)	0.452	(0.077) **	—		—		0.239	(0.072) **	—		—	
dummy (neighbor; 4 persons)	0.256	(0.102) *	—		—		0.115	(0.097)	—		—	
dummy (neighbor; 5 persons)	0.519	(0.108) **	—		—		0.287	(0.103) **	—		—	
dummy (neighbor; more than 6 persons)	0.410	(0.077) **	—		—		0.119	(0.074)	—		—	
Emotional social support												
dummy (sum is 24 or higher)	1.078	(0.050) **	—		—		0.718	(0.049) **	—		—	
dummy (4 or higher in at least one item)	—		1.116	(0.065) **	—		—		0.716	(0.063) **	—	
dummy (5-11)	—		—		-1.302	(0.199) **	—		—		-0.784	(0.189) **
dummy (12-17)	—		—		-0.721	(0.091) **	—		—		-0.488	(0.088) **
dummy (24-29)	—		—		0.814	(0.052) **	—		—		0.566	(0.050) **
dummy (30)	—		—		1.446	(0.097) **	—		—		0.984	(0.094) **
constant	3.030	(0.320) **	2.481	(0.333) **	3.094	(0.325) **	0.772	(0.333) *	0.487	(0.337)	1.053	(0.338) **
Adj-Rsq.	0.233		0.220		0.254		0.346		0.338		0.354	
Number of obs.	7,141		7,141		7,141		6,878		6,878		6,878	

Notes: Robust standard errors are shown in parentheses.

    **, *, and † indicate significance at 1%, 5% and 10% levels, respectively.

   Same explanatory variabels used in the table2 such as gender, age, spouse, children and education are included in estimation.

   The results of other explanatory variables are omitted. These are available upon request.

Table 4 The results of calculation of monetary value

		Model1		Model2	
		OLS	2SLS	OLS	2SLS
Instrumental social support	mean	108.6	113.8	101.5	103.9
	median	87.3	91.5	81.6	83.6
Emotional social support	mean	296.5	300.8	281.5	284.1
	median	238.5	241.9	226.4	228.5

Note) Figures are in 10,000 yen.