Longitudinal associations between social connections and subjective wellbeing in the English Longitudinal Study of Ageing

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<th>European Health Psychology Society</th>
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<td>Manuscript ID:</td>
<td>GPSH-2014-0131.R1</td>
</tr>
<tr>
<td>Manuscript Type:</td>
<td>Psychology and Health</td>
</tr>
<tr>
<td>Keywords:</td>
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Longitudinal associations between social connections and subjective wellbeing in the
English Longitudinal Study of Ageing

Word count: 5323

Number of figures: 03

Number of tables: 03
Abstract

Objective: The role of social relationships in determining wellbeing may be particularly salient in ageing populations. There is only limited longitudinal research examining the relationship between different dimensions of social relationships and change in wellbeing over time. The present analysis explores the association between isolation, loneliness and two measures of subjective well-being over 6 years using data from the English Longitudinal Study of Ageing.

Design: Measures of social relationships were obtained at baseline and associations with wellbeing over the following 6 years were analysed using mixed models.

Main outcome measures: Hedonic and evaluative wellbeing assessed every 2 years over the 6-year period.

Results: Levels of wellbeing showed a U-shaped relationship with time. At baseline higher isolation and loneliness were associated with lower levels of hedonic and evaluative wellbeing. Individuals with high levels of isolation and loneliness initially showed a smaller decrease in evaluative wellbeing. The subsequent rise in wellbeing was however, also diminished in this group. In contrast, loneliness was not associated with rate of change in hedonic wellbeing, while high levels of isolation were associated with a sustained decrease in hedonic wellbeing.

Conclusion: Social isolation and loneliness show different associations with changes in evaluative and hedonic wellbeing over time.

Keywords: social isolation, loneliness, subjective wellbeing, older adults, ELSA
Introduction

Psychologists have long since been interested in understanding subjective wellbeing. Following the publication of the Stiglitz Commission report, which recommended complementing traditional drivers of policy-making such as GDP with indicators of national wellbeing, this has also gained attention from other disciplines and from policy makers (Stiglitz, Sen, & Fitoussi, 2009). This has led to increased efforts in the UK and worldwide in developing appropriate measures of wellbeing and in gaining an increased understanding of determinants of wellbeing. The world is also experiencing a major demographic shift, with an increase in the number of older adults. Over the next 20 years, England is expected to have a 39% increase in the population aged 65-84 years and a 106% increase in those aged 85 years and over (The King’s Fund, 2013). Hence, understanding factors that affect the health and wellbeing of older adults is particularly important.

Wellbeing is a complex and multidimensional construct. Research in the area indicates 3 broad dimensions, including *evaluative or cognitive wellbeing* which refers to global evaluations of satisfaction with life in general or specific areas of one’s life, *hedonic or affective wellbeing* which captures mood or feeling within a specific time period and *eudemonic well-being* which relates to satisfaction of basic psychological needs and self-determination (Dolan, Layard, & Metcalfe, 2011). While most studies focus on only a single aspect of wellbeing, it is clear that a consideration of these multiple dimensions is essential to gain a complete picture of an individual’s state of wellbeing. Further, studies show that these dimensions may be associated with different predictors. A meta-analysis by Luhmann and colleagues showed that life events such as marriage and divorce have a greater effect on evaluative than on hedonic wellbeing, while the pattern of effects for events such as childbirth and employment differ for both forms of wellbeing (Luhmann, Hofmann, Eid, & Lucas, 2012). Analyses of Gallup data from 132 countries show that positive and negative feelings...
were more strongly predicted by a consideration of whether participants’ basic psychological needs were met or not, while life evaluations showed stronger associations with material wealth (Diener, Ng, Harter, & Arora, 2010).

Social relationships are found to be an important predictor of wellbeing across the lifecourse (Diener & Seligman, 2002; Diener & Oishi, 2006), but may be particularly salient for older adults (Bowling et al., 2003; Matheson, 2011). Social relationships include multiple dimensions such as the size of individuals’ social networks, frequency of contact with people within the network, feelings of loneliness, or engagement in social activities. Older adults are often at a greater risk of isolation and loneliness due to the many life changes that take place in later life, including retirement, bereavement and children and friends moving away. Hence our analysis focusses on the association of these variables with wellbeing in older adults.

Social isolation is an objective measure, incorporating aspects such as network size, diversity, frequency of contact with network members and participation in social activities. Loneliness, on the other hand, is a subjective assessment and relates to individuals’ perceived levels of isolation and satisfaction with existing relationships (Cornwell & Waite, 2009; de Jong Gierveld & Havens, 2004).

Although interrelated, the association between these constructs is usually small to moderate (Cornwell & Waite, 2009) and this association may be further attenuated in old age. One reason is that older adults may be more prepared to cope with changes to their social networks as they age, as many of these events are viewed as normal parts of ageing. Hence, despite the changes to social network size or frequency of contact with certain members, they may not feel lonely. While most research suggests that loneliness and social isolation are detrimental to wellbeing (Dolan, Peasgood, & White, 2008), the association between social relationships and wellbeing may also be more complex in older ages. Most Western countries, including the UK and USA show a U-shaped association between age and different measures
of wellbeing with high levels of wellbeing in early adult life falling in the 40s and 50s before rising into old age (Blanchflower & Oswald, 2008). However, studies of loneliness also indicate a similar relationship with age, with teenagers and older adults reporting particularly high levels of loneliness, and low levels seen in middle age (Victor & Yang, 2011). On the other hand, analyses by the New Economics Foundation suggest that while satisfaction with life is generally low, satisfaction with personal relationships is high in older adults (Michaelson, Abdallah, Steur, Thompson, & Marks, 2008), while other work shows that older adults may have more positive ties when compared with younger groups (Fingerman & Charles, 2010). In an analysis using the National Social Life, Health, and Aging Project (NSHAP) data, Cornwell and colleagues found that reported closeness to network members and the number of non-primary ties decreased, while certain aspects of social participation increased in older adults. The authors suggest that lower levels of closeness may be associated with decreased frequency of contact with network members (Cornwell, Laumann, & Schumm, 2008).

Socioemotional selectivity theory (SST) (Carstensen, Isaacowitz, & Charles, 1999) provides a framework for us to consider why isolation and loneliness may affect wellbeing in older age. According to SST, individuals’ perception of time affects the emphasis they place on different goals. This differing emphasis, in turn, has implications for the nature of social interactions chosen to achieve these goals. In particular, older age is associated with a view of time as being limited and thus goals associated with emotion regulation are prioritised. This leads to a greater focus on close established relationships at the expense of network diversity. However, close relationships fail to meet expectations and are unsatisfying, may cause distress and be associated with lower levels of wellbeing. Thus we might expect that dissatisfaction with relationships or loneliness, rather than social isolation, would be particularly detrimental to wellbeing. It is unclear, however, whether the effects are likely to
be similar for hedonic wellbeing and evaluative wellbeing. Given the increasing emphasis on
close ties, we may expect that dissatisfaction with these ties may cause individual to evaluate
their lives less favourably over time. But, in line with Diener et al.’s (2010) findings, it is
possible that older adults consider other factors when evaluating their life, or that feelings of
loneliness are actually more situational with limited effect on global life satisfaction.
Similarly, hedonic wellbeing like loneliness also has an affective dimension and hence,
loneliness may be more important for hedonic wellbeing. Unsatisfying close ties and potential
difficulties with forming new ties in older age may have a sustained effect on enjoyment of
life. We aimed to examine this in a sample of older adults, using data from the English
Longitudinal Study of Ageing (ELSA).

It must be noted that much of the research into social networks and subjective
wellbeing is limited by its cross-sectional nature which offers us little understanding of how
the wellbeing changes and how social relationships may affect wellbeing over time. To
address this, we analysed data over a 6-year period and used mixed models for analysis. The
choice of mixed models also enabled us to deal with selective loss of data and different
patterns of missingness, which is a common problem in many longitudinal studies. Such
models offer a further advantage over traditional linear regression techniques in that they
enable us to determine the trajectory of change in outcome over time (Singer & Willett,
2003). While we expected that both isolation and loneliness would be related to baseline
levels of wellbeing, we hypothesized that loneliness rather than isolation would be associated
with changes in wellbeing over time. We did not make any specific predictions regarding
different effects for the evaluative and hedonic wellbeing.

Methods
Participants

Data were obtained from waves 2 to 5 of the English Longitudinal Study of Ageing (ELSA). ELSA is a nationally representative panel study of individuals aged 50 years and over. Fieldwork for the first wave of ELSA was carried out in 2002/3 with follow-ups every 2 years. Further details regarding sampling and data collection are available elsewhere (Banks, Breeze, Lessof, & Nazroo, 2006; Marmot, Banks, Blundell, Lessof, & Nazroo, 2003). Wave 2 of ELSA was the first wave to include a measure of loneliness and hence is used as the baseline for these analyses. When compared with the wave 1 sample, those from wave 2 who were included in this analysis were younger (mean age 64.0 years versus 67.9 years, \( p < 0.001, d = 0.4 \)) and reported higher levels of hedonic wellbeing (mean score 13.5 versus 13.1, \( p < 0.001, d = 0.2 \)). They were also more likely to be in the top quintile of wealth (22.9% versus 15.%, \( p < 0.001, \text{Cramer's } V = 0.2 \)) and less likely to suffer from a limiting long-standing illness (31.7% versus 43.5%, \( p < 0.001, \text{Cramer's } V = 0.1 \)).

Follow-up data on measures of wellbeing were obtained at waves 3 (2006/7), 4 (2008/9) and 5 (2010/11). The present analysis included 7724 participants at baseline. Four thousand and fifty eight participants had provided data at every wave and 6484 participants had data at at least one other wave. In general, participants who drop out between ELSA waves have been shown to be less healthy, wealthy, socially connected, and more lonely than those who remain in the study (Scholes, Taylor, Cheshire, Cox, & Lessof, 2008; Shankar, McMunn, Banks, & Steptoe, 2011; Shankar, Hamer, McMunn, & Steptoe, 2013) and report poorer wellbeing.

Measures
An index of social isolation was computed, based on not living with a partner (scored as 1), not belonging to any organisations, clubs or religious groups (scored as 1), and having less than monthly contact with friends, family or children (each scored as 1). Scores on the index ranged from 0 to 5, with higher scores indicative of a greater degree of isolation (Shankar et al., 2011).

Loneliness was measured using the short form the revised UCLA Loneliness scale (Hughes, Waite, Hawkley, & Cacioppo, 2004). The scale consists of 3 items. Responses to the items were summed and scores on this scale ranged from 3 to 9, with higher scores indicating greater loneliness. The scale showed strong positive correlations with the full UCLA loneliness scale and moderate correlations with negative emotions and perceived stress (Hughes et al., 2004). The scale showed acceptable internal reliability (Cronbach’s $\alpha = 0.82$).

Identical measures of wellbeing were obtained at baseline and at each of the follow-ups.

Hedonic wellbeing was measured using the 4-item pleasure subscale of the CASP quality of life questionnaire (Hyde, Wiggins, Higgs, & Blane, 2003). An example of a typical item would be ‘I enjoy the things I do’ with response options Never, Not often, Sometimes and Often. Responses were summed to form the enjoyment of life scale, which has been shown to predict all-cause mortality in older adults (Steptoe & Wardle, 2012). Scores ranged from 0 to 12, with higher scores indicating greater enjoyment of life (Cronbach’s $\alpha$ ranged from 0.65 to 0.70 across the 4 waves).

Evaluative wellbeing was measured using the Diener Life Satisfaction scale (Diener, Emmons, Larsen, & Griffin, 1985; Pavot & Diener, 1993). The scale consists of 5 items examining how satisfied the individual is with his/her life, with response options on a 7-point scale ranging from Strongly disagree to Strongly agree. An example of a typical item would
be ‘In most ways my life is close to my ideal’. Responses were reversed and summed so scores ranged from 0 to 30, with higher scores indicating greater satisfaction with life (Cronbach’s $\alpha$ = 0.89 at each wave).

Covariates

Details on gender and age were obtained in the interview. Total (non-pension) wealth was used as a measure of socioeconomic status, and was divided into quintiles for the purposes of analysis. Participants were also asked if they had any long-standing health condition and if it limited their activities. Based on their responses, participants were classified as having a limiting long-standing illness or not (McMunn, Hyde, Janevic, & Kumari, 2003). Previous research shows that these variables are closely associated with isolation and loneliness (Shankar et al., 2011) and are also key determinants of wellbeing in older adults (Dolan et al., 2008).

Statistical analysis

Participants were included in the analytical sample for each wave as long as they had responded to at least one item on the life satisfaction or the enjoyment of life questionnaire at that wave. Item-wise missing values on covariates, predictors and measures of wellbeing, were imputed (for variables imputed: median percentage missing = 1.33; mean = 1.54; maximum = 3.12). Following this, mixed models (Singer & Willett, 2003) were used to analyse the effect of social isolation and loneliness at baseline on changes in enjoyment of life and life satisfaction over the 6-year period. As scores on both isolation and loneliness were positively skewed, scores were categorised. Individuals were classified as reporting high
(score of 0), intermediate (score of 1) and low levels of isolation (score of 2 and over), roughly corresponding to tertiles of isolation. Two groups were formed for loneliness, corresponding to those who reported never being lonely (score of 3) and those who reported being lonely some or all of the time (scores greater than 3). Wave, centred at the first wave, was used as a metric of time. Alternative functional forms were explored for the time metric and the best fitting model was chosen using Akaike’s Information Criterion. Based on this, both a linear and a quadratic term were retained for time. The linear term for time corresponds to instantaneous rate of change, while the quadratic term corresponds to the acceleration or deceleration in growth over time (Holt, 2008). The final analysis reports a total of 4 models, with two each for evaluative wellbeing and hedonic wellbeing. The main predictor (isolation or loneliness) and its interactions with time were considered along with adjustment for all covariates. Models of isolation were adjusted for loneliness categories and vice versa. All analyses were adjusted for age, gender, limiting long-standing illness and wealth. Analyses were carried out using SAS v.9.3 and PASW 21.

**Results**

Table 1 indicates characteristics of participants at baseline. Mean age of the participants was just over 66 years at baseline, and more than half the participants were women. Over a third reported having a limiting long-standing illness. Scores on the enjoyment of life and the life satisfaction scale were negatively skewed. Mean scores at follow-up (not presented here) indicated a small drop in scores on wellbeing at the first follow-up but then showed increases at subsequent follow-ups.

*Changes in wellbeing over time*
In models for hedonic and evaluative wellbeing including only an intercept and linear and quadratic time terms, the linear term for time was significant and negative (B = -0.25, 95% CI: -0.29 to -0.21 for hedonic wellbeing; B = -1.24, 95% CI: -1.39 to -1.11 for evaluative wellbeing) suggesting an instantaneous fall in scores for both measures of wellbeing. The quadratic term, however, was positive (B = 0.05, 95% CI: 0.04 to 0.07 for hedonic wellbeing; B = 0.38, 95% CI: 0.33 to 0.42 for evaluative wellbeing) suggesting that this drop is not maintained and an acceleration in wellbeing scores takes place over time. Figure 1 (a & b) show the unadjusted changes in scores on wellbeing over time.

**Social isolation and wellbeing**

In analyses adjusted only for age, gender and the time parameters, greater isolation was associated with lower levels of hedonic wellbeing (when compared with the low isolation group, B = -0.36, 95% CI: -0.44 to -0.27 for the intermediate isolation group and B = -0.97, 95% CI: -1.06 to -0.88 for the high isolation group) and lower evaluative wellbeing (when compared with the low isolation group, B = -1.44, 95% CI: -1.74 to -1.15 for the intermediate isolation group and B = -3.36, 95% CI: -3.67 to -3.06 for the high isolation group). In fully adjusted models including the interaction with the time parameters, the interaction of social isolation with the linear time parameter was significant for both models (Table 2) such that individuals in the highest isolation category showed a smaller instantaneous drop in scores on wellbeing when compared to those in the low isolation group. No significant difference was seen between the low and intermediate isolation groups. The interaction with the quadratic time parameter was also significant, although in the opposite direction, suggesting that the rate of change over time for the high isolation group was diminished compared with other groups.
Figure 2 (a & b) illustrate the association of baseline social isolation with changes in scores on wellbeing. Individuals in the low isolation group showed the highest levels of wellbeing, while those in the high isolation group showed the lowest levels of wellbeing. All groups showed an initial drop in levels of wellbeing, although this drop was less pronounced among individuals with the highest levels of isolation. For individuals with low or medium isolation, scores on life satisfaction and enjoyment of life then increased. In contrast, the high isolation group showed a sustained decline on scores of enjoyment of life and only a small rise on scores of life satisfaction.

Loneliness and wellbeing

Individuals who reported being lonely some or all of the time reported poorer initial wellbeing (for those who reported being lonely some or all of the time B = -1.18, 95%CI: -1.25 to -1.12 for enjoyment of life and B = -4.43, 95%CI: -4.66 to -4.20 for evaluative wellbeing, when compared with those who were never lonely; analyses adjusted for age, gender and time parameters only). In models including the interaction with time and other covariates (see Table 3), the loneliness x time interaction was non-significant in the model for hedonic wellbeing, as was the loneliness x time

interaction, indicating that loneliness was not associated with a change in scores on hedonic wellbeing over time. However, in the model for evaluative wellbeing, the loneliness x time interaction was significant, such that individuals who reported being lonely some or all of the time showed a smaller initial decrease in scores on life satisfaction. As with the model for social isolation, however, the loneliness x time

interaction was significant and indicated that the rate of growth for the lonely group at later assessments was smaller.
As seen in Figure 3(b), individuals who reported never feeling lonely had higher levels of evaluative wellbeing at baseline. They initially showed a more rapid rate of decline but then showed a sharper increase when compared to those who reported feeling lonely some or all of the time. In contrast, the scores for hedonic wellbeing show a similar U-shaped curve for both groups. Individuals with high levels of loneliness show consistently lower levels of hedonic wellbeing.

Repeating the analysis with continuous values on isolation (log-transformed) and loneliness (reflected and inversed) let to substantively similar findings.

Discussion

Levels of wellbeing in this sample of individuals aged 52 years and above were high. Over a 6-year period, wellbeing showed an initial drop but then increased. This supports previous research showing increases in wellbeing after the age of 50 in most developed nations (Deaton, 2010).

Our analyses show that social isolation and loneliness were associated with poorer wellbeing at baseline in older adults. Both isolation and loneliness were associated with changes in the trajectory of evaluative wellbeing over time. Contrary to expectations, the initial decrease in evaluative wellbeing was actually lower among those with high levels of isolation or loneliness. The subsequent increase in wellbeing was, however, diminished in these groups. Individuals in the high isolation and high loneliness group already reported lower levels of evaluative wellbeing when compared with those who were less isolated or lonely. It must be noted, however, that the scores on wellbeing for this group were still towards the upper end of the scale and this is unlikely to be indicative of a floor effect. This may be explained by a number of factors. Firstly, it may indicate that older adults adapt to
having poorer social relationships. While this does affect overall levels of wellbeing relative to those with more social relationships, when evaluating their life these individuals may focus on other factors. Older adults have also been shown to focus on more positive information in attention and memory, and disregard negative information to promote greater wellbeing, i.e. the positivity effect (Reed & Carstensen, 2012). A further explanation is this may reflect the importance of other factors such as material resources in determining evaluative wellbeing (Diener et al., 2010). In contrast, those in the low isolation and low loneliness categories experienced the expected increases in wellbeing that are usually found with ageing. In line with SST, the general pattern of increase in wellbeing in older age may be attributed the nature of emotional self-regulation on older age (Cartensen et al., 1999). For low isolation and low loneliness groups, close and satisfying ties as well as a larger network are likely to provide positive associations and memories. The importance attached to these may increase over time leading to sustained increases in wellbeing.

In accordance with our hypothesis, loneliness at baseline was associated with lower hedonic wellbeing. However, it showed no significant effect on the trajectory of hedonic wellbeing. Both high and low loneliness groups followed a similar trajectory of initial decrease in enjoyment of life followed by an increase, with the high loneliness group reporting consistently lower levels of wellbeing when compared with the low loneliness group. In contrast, increased isolation was associated with poorer hedonic wellbeing at baseline and with sustained decreases in hedonic wellbeing over the 6-year period. Contact with a wider group of people, even those who may not be particularly close, may help individuals to gain knowledge, information and other practical skills which may promote increased wellbeing. A recent study showed that a greater number of daily interactions with others, even those who were not close network members was associated with higher levels wellbeing (Sandstrom & Dunn, 2014). Thus even casual, daily interactions with others have
the power to influence wellbeing. Further, it has been suggested that hedonic wellbeing acts as a marker of underlying health-related or dispositional processes (Steptoe & Wardle, 2012). Hedonic wellbeing has been found to be associated with poorer health, such that individuals who reported greater enjoyment of life (a measure of hedonic wellbeing) were less likely to develop limitations in activities of daily living and incident coronary heart disease (Steptoe, Demakakos, & de Oliveira, 2012). Sustained effects of social isolation on hedonic wellbeing may be associated with these health-related factors. Efforts to improve social integration among older adults may have substantial benefits for health and wellbeing.

Our results also offer some support to recent work examining the effects of structural and functional measures of social relationships on health and wellbeing. Isolation is a structural measure, while loneliness could be regarded as a functional measure. Huxhold and colleagues found that only structural measures of social relationships were associated with increases in positive affect over time, while both structural and functional measures (emotional support) were associated with changes in life satisfaction (Huxhold, Fiori, & Windsor, 2013). The authors also found that changes in emotional support over time were associated with decreases in negative affect but not positive affect. This suggests that functional measures may play a stronger role in alleviating unpleasant mood states rather than promoting positive ones. Our analyses did not examine a measure of negative affect and this represents an interesting avenue for future work.

Strengths and limitations

A major strength of this analysis was the ability to examine changes in wellbeing over a period of 6-years using a large sample of older adults. A further strength of ELSA is the availability of multiple measures of wellbeing as well as of social connections and hence we were able to compare changes in two measures of wellbeing and examine their relationships
with two measures of social relationships. The use of mixed models also allowed us to deal
with dropout and different patterns missingness in longitudinal data by using all the data
provided by participants. However, we were unable to account for dropout between waves 1
and 2 of ELSA and we did not include participants who failed to complete the self-completion
questionnaires at follow-up. Participants who dropped out following wave 1 were in poorer
health and of a lower socioeconomic status and our analysis revealed small to moderate levels
of selectivity. The measure of hedonic wellbeing used in this analysis also showed low levels
of internal reliability which may be cause for concern.

Naturally feelings of loneliness and levels of isolation are likely to change over time
and in response to life events and as noted earlier, this may be particularly true for older
adults. The present study examined measures of isolation and loneliness at a single point in
relation to changes in wellbeing over time and further research could examine dynamic
changes in wellbeing in response to changes in isolation and loneliness. Further, specific
aspects of social networks may change in old age with increases in activities such as religious
participation or volunteering but decreases in network size (Cornwell et al., 2008). As with
isolation and loneliness, these specific dimensions of social isolation may affect wellbeing
differentially and future research could consider these aspects separately.

Conclusion

Social isolation and loneliness show different associations with changes in evaluative
and hedonic wellbeing over time. Interventions to improve the social networks of older adults
are likely to be beneficial in improving hedonic wellbeing, while efforts to change evaluation
of life are likely to require a greater consideration of other factors such as material resources.
Reference List


*Psychological Assessment, 5,* 164-172.


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<td>Limiting long-standing illness (%)</td>
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<td>Social isolation categories (%)</td>
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<tr>
<td>Intermediate</td>
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<tr>
<td>High</td>
<td>33.1</td>
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<tr>
<td>Loneliness categories (%)</td>
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<td>Low</td>
<td>53.3</td>
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<td>High</td>
<td>46.7</td>
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<tr>
<td>Enjoyment of life – Mean (SD)</td>
<td>10.0 (1.8)</td>
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<td>Life satisfaction – Mean (SD)</td>
<td>21.2 (6.1)</td>
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Table 2. Social isolation as a predictor of changes in wellbeing

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<th>Enjoyment of life</th>
<th>Life satisfaction</th>
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<tr>
<td></td>
<td>B (95% CI)</td>
<td>B (95% CI)</td>
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<tr>
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<td>Reference</td>
<td>Reference</td>
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<tr>
<td>Medium</td>
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<td>-0.73 (-1.04 to -0.43)</td>
</tr>
<tr>
<td>High</td>
<td>-0.56 (-0.67 to -0.48)</td>
<td>-2.08 (-2.39 to -1.77)</td>
</tr>
<tr>
<td>Social isolation x Time</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td>Medium</td>
<td>-0.03 (-0.14 to 0.07)</td>
<td>0.03 (-0.31 to 0.37)</td>
</tr>
<tr>
<td>High</td>
<td>0.14 (0.03 to 0.25)</td>
<td>0.46 (0.11 to 0.91)</td>
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<tr>
<td>Social isolation x Time²</td>
<td></td>
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<tr>
<td>Low</td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td>Medium</td>
<td>0.01 (-0.03 to 0.04)</td>
<td>-0.002 (-0.11 to 0.11)</td>
</tr>
<tr>
<td>High</td>
<td>-0.05 (-0.08 to -0.01)</td>
<td>-0.12 (-0.24 to -0.01)</td>
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*aAnalyses were adjusted for time, time², age, wave*age, gender, limiting long-standing illness, quintile of wealth and loneliness category.*
Table 3. Loneliness as a predictor of changes in wellbeing$^b$

<table>
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<tr>
<th></th>
<th>Enjoyment of life</th>
<th>Life satisfaction</th>
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<tr>
<td></td>
<td>B (95% CI)</td>
<td>B (95% CI)</td>
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<tr>
<td>Never lonely</td>
<td>Reference</td>
<td>Reference</td>
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<tr>
<td>Sometimes/Always lonely</td>
<td>-0.97 (-1.04 to -0.89)</td>
<td>-4.12 (-4.37 to -3.86)</td>
</tr>
<tr>
<td><strong>Loneliness x Time</strong></td>
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<td></td>
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<tr>
<td>Never lonely</td>
<td>Reference</td>
<td>Reference</td>
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<tr>
<td>Sometimes/Always lonely</td>
<td>0.08 (-0.02 to 0.17)</td>
<td>0.89 (0.60 to 1.17)</td>
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<tr>
<td><strong>Loneliness x Time$^2$</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never lonely</td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td>Sometimes/Always lonely</td>
<td>-0.01 (-0.04 to 0.02)</td>
<td>-0.17 (-0.26 to -0.07)</td>
</tr>
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</table>

$^b$Analyses were adjusted for time, time$^2$, age, gender, limiting long-standing illness, quintile of wealth and isolation category.
Figure 1. Changes in scores for hedonic wellbeing (a) and evaluative wellbeing (b) over time.

Figure 2. Scores on hedonic wellbeing (a) and evaluative wellbeing (b) over time by levels of social isolation.

Figure 3. Scores on hedonic wellbeing (a) and evaluative wellbeing (b) over time by levels of loneliness.
Figure 1. Changes in scores for hedonic wellbeing (a) and evaluative wellbeing (b) over time.\textsuperscript{a}

\textsuperscript{a}Unadjusted values.
Figure 2. Scores on hedonic wellbeing (a) and evaluative wellbeing (b) over time by levels of social isolation.\(^b\)

\(^b\)Models were adjusted for time, time\(^2\), age, gender, limiting long-standing illness, quintile of wealth and loneliness category.

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Figure 3. Scores on hedonic wellbeing (a) and evaluative wellbeing(b) over time by levels of loneliness.

Models were adjusted for time, time², age, gender, limiting long-standing illness, quintile of wealth and isolation category.

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