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Title page

Title of article

Worry about debt is related to social loneliness in older adults in the Netherlands

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Worry about debt is related to social loneliness in older adults in the Netherlands

Abstract (220 words max)

The amount of financial debt held by older adults has grown substantially over the past two decades in Europe. This study examines the association of objective and subjective debt burden with social and emotional loneliness among 1,606 older adults in the Netherlands. Objective debt burden is based on financial terms, such as debt-to-income ratio; whereas subjective debt burden measures the psychological distress caused by financial debt. Data are from the 2015/16 wave of the Longitudinal Aging Study Amsterdam. First, we use means-comparison tests to examine whether older adults who experience social and emotional loneliness differ from older adults who do not experience loneliness regarding their subjective and objective debt burdens. Subsequently, using linear regression models we address two questions: whether social loneliness and emotional loneliness are associated with objective and subjective debt burden; and whether social participation, social network size, anxiety, and depression mediate these relationships. We find that subjective debt burden (i.e. the worry related to debt) is a significant predictor of social loneliness, above and beyond the role of social and psychological measures. Objective debt burden, in contrast, is unrelated to social and emotional loneliness. Social participation, social network size, anxiety, and depression do not mediate the debt-burden-to-loneliness relationships. The results point to the importance of subjective debt burden in understanding social loneliness and designing interventions. (218 words)

Keywords (three to eight)

Social loneliness, emotional loneliness, subjective debt burden, objective debt burden, social network, depression, anxiety

Worry about debt is related to social loneliness in older adults in the Netherlands

Introduction

As many as one in two older adults in Europe carry debt and almost one in three older adults are burdened by the repayment of loans and instalment purchases (Eurostat 2019b, Lewin-Epstein and Semyonov 2016). Debt burden can be measured in both objective and subjective terms (Keese 2012). Objective debt burden is based on financial indicators, such as a household's debt-to-income ratio (Dalton *et al.* 2016); whereas subjective debt burden reflects the psychological distress caused by financial debt (Keese 2012, Yabroff *et al.* 2016). Evidence suggests that out-of-pocket medical expenses, limited access to jobs, and rising costs of living contribute to the growing debt burden in older age (Büttner *et al.* 2019, JCHS 2016). For example, German data show that older adults' debt amount and debt-to-income ratio are the highest among those households that use debt advisory services (Destatis 2019). Adults aged 65 to 70 who use debt advisory services carry an average of 45,211 Euro in debt (42,193 Euro for age 70 and older). On average, it would take this age group 45 months' worth of income to pay off the debt (39 months for the 70 and older age group), while the average across all age groups is 28 months (Destatis 2019).

In addition to debt, loneliness is also an issue of concern in older age, because it is widespread and has been associated with significant mental and physical health problems as well as with increased risk of premature death (for a review, see Burholt *et al.* 2019, Holwerda *et al.* 2016). Social loneliness reflects the perceived absence of a broader, engaging social network (Cacioppo and Cacioppo 2014, Jivraj *et al.* 2016), while emotional loneliness reflects the

perceived absence of an intimate relationship with a spouse, partner or best friend (De Jong Gierveld and Van Tilburg 2010, De Koning *et al.* 2017). Social activities that could be implemented to prevent social loneliness may be costly. They may require payment for transportation expenses, shared meals, or entrance fees and are often cut first in case of financial problems (Deutsch *et al.* 2015, Vandermeerschen *et al.* 2017). Emotional wellbeing, in contrast, is largely independent of people's material position (Kahneman and Deaton 2010). Emotional loneliness, which tends to be prevented by having a good quality close relationship may be less directly dependent on financial resources than maintaining a broad range of social ties (De Jong Gierveld and Van Tilburg 2010, Hawkey *et al.* 2008). Thus, there is reason to suspect that social and emotional loneliness are differentially associated with objective and subjective debt burden.

Loneliness and objective financial burden

The role of households' financial situations has received limited attention in the loneliness literature. Only a small number of studies have examined household income and assets as predictors of loneliness in older age (see review in Hawkey and Kocherginsky 2018). This literature documents that lower assets and lower income are associated with higher reported levels of loneliness among older adults (Hawkey and Kocherginsky 2018, Jivraj, *et al.* 2016).

Furthermore, households with greater net wealth quintiles report less loneliness according to the revised University of California at Los Angeles loneliness scale, which does not distinguish between social and emotional loneliness (Niedzwiedz *et al.* 2016). The same inverse association is reported across several waves of the English Longitudinal Study of Ageing, with lower wealth, poorer health, and lower education showing similar effect sizes in predicting social loneliness (Jivraj, *et al.* 2016). In European countries, older adults in the lowest income quartile

or quintile are more likely to report persistent loneliness (Vozikaki *et al.* 2018). Vozikaki, *et al.* (2018), using the Center for Epidemiological Studies Depression (CES-D) scale, asks participants to respond to a single item, “I felt lonely.” This study, and several others examining loneliness in individual European countries (e.g. Drennan *et al.* (2008) for Ireland), aligns with findings for older adults in the U.S. based on the Health and Retirement Study (Theeke 2010) and the Chicago Health, Aging and Social Relations Study (Hawkley, *et al.* 2008).

Furthermore, a recent literature review of both quantitative and qualitative studies suggests that lack of financial resources limits the extent to which older adults participate in the social life of their communities (Burholt, *et al.* 2019). Failing resources and social withdrawal have also been used to explain the link between poverty and social loneliness (for review, see Hansen and Slagsvold 2016). However, these studies do not examine emotional loneliness, nor do they examine the role of debt in the experience of social and emotional loneliness.

Loneliness and subjective financial burden

Traditionally, subjective measures of financial burden have been used to assess the link from older adults’ financial situation to loneliness and its components (i.e., Dahlberg and McKee 2014, De Jong Gierveld *et al.* 2015, Fokkema *et al.* 2012). A study across 14 European countries for example, shows that people who reported difficulties with current income demonstrated higher levels of loneliness (Fokkema, *et al.* 2012). However, only the single CES-D scale item was used, which does not allow the distinction between social and emotional loneliness. In a sample of older adults in the United Kingdom, a subjective measure of income inadequacy is associated with both social and emotional loneliness (Dahlberg and McKee 2014). A similar result was found in Canada, where researchers, using a scale that measured social and emotional

loneliness, reported that adults who had experienced a financial shock in the past year demonstrated a higher level of loneliness (De Jong Gierveld, *et al.* 2015). In a study of older adults in rural Britain, a subjective measure of perceived financial problems is associated with higher odds of emotional loneliness but also, unexpectedly, with lower odds of social loneliness (De Koning, *et al.* 2017). The authors posit that this result may reflect the benefit of living in tighter-knit rural communities (De Koning, *et al.* 2017). To our knowledge, studies have yet to identify the role of objective debt burden or specific financial problems.

Potential social and psychological mediators of the debt-to-loneliness relationship

Debt burden and loneliness in older age have received significant attention in the literature, but the potential underlying pathways are not well understood. Both social and psychological pathways could underlie the relationship. Indeed, social and emotional loneliness have been linked to lower social and psychological resources, such as social network size and stress exposure (e.g., De Jong Gierveld, *et al.* 2015, De Koning, *et al.* 2017, Hawkey, *et al.* 2008). Similarly, objective and subjective debt burden have been shown to adversely impact these social and psychological resources (e.g., Keene *et al.* 2015, Lusardi 2012). Debt burden is associated with depression and anxiety in older adults of higher and lower socio-economic status, and in ways distinct from general measures of economic hardship (Drentea and Reynolds 2015).

The literature on household finances and loneliness suggests a potential social pathway linking debt and loneliness. Having debt, such as mortgage debt, personal loans, or credit card balances, leads to monthly recurring debt payments (e.g., Butrica and Karamcheva 2018, Butrica and Karamcheva 2019). These payments lower the discretionary income available to older adults, unless financial assets are dissolved to repay the debt. Yet decades of research document

that older adults' are reluctant to liquidate assets, such as home equity (e.g., Poterba *et al.* 2011). In order to meet debt repayment obligations, older adults on a fixed income may decide to cut non-necessary expenses, such as going out to participate in leisure or educational activities, or socializing with family and friends, (Lusardi *et al.* 2018, NOCA 2018). Even if they want to stay socially active, liquidity constraints resulting from debt can limit individuals' abilities to pay for transportation, activities away from home, and other expenses associated with a social life (Green-LaPierre *et al.* 2012).

European data indicate that a significant number of older adults carry debt. About 5% (Slovenia) to 55% (Denmark) of older adults in Europe carry mortgage debt and 5% (Switzerland) to 30% (Luxembourg) carry non-housing debt, such as credit card balances or consumer loans, based on an analysis of 2013 data of the Survey of Health, Ageing and Retirement in Europe (Hiilamo and Grundy 2018, Lewin-Epstein and Semyonov 2016). Among older Dutch households, close to 50% report mortgage debt and about 7 to 8% report non-housing debt in these data (Lewin-Epstein and Semyonov 2016).

In addition to reduced social activity, the literature on household finances and loneliness suggests a potential psychological pathway that links debt and loneliness. Debt can lead to feelings of financial stress (Dunn and Mirzaie 2016), which have been shown to express themselves as anxiety and depression in a number of studies (Drentea 2000, Hiilamo and Grundy 2018). Both anxiety and depression are associated with loneliness (O'Luanaigh and Lawlor 2008, Smith and Victor 2018). From a theoretical perspective, depressed individuals are more likely to express hostility and are less able to engage in the active management of social ties. Due to feelings of hopelessness and sadness, they tend not to initiate contact and are less likely to respond to invitations or attend social gatherings. Furthermore, as research documents, loneliness

and depression can be mutually reinforcing, creating a negative bidirectional spiral (Hsueh *et al.* 2019). While they tend to be better at managing negative emotion in social interactions than people in younger age groups (Charles and Carstensen 2003), the increased likelihood of being on a fixed income combined with debt can lead to detrimental mental health effects in older adults (Keese 2012). From a clinical perspective, an aging body is less able to reduce the physiological burden of stress (Charles and Carstensen 2003). Difficulty sleeping can further worsen the mental health effects of stress over time, particularly among older adults (MacLeod *et al.* 2018). Moreover, the sensitivity to stigma and feelings of shame that are often associated with debt support a causal relationship between debt and loneliness. In a German sample, greater subjective debt burden is associated with older age because it is less common and “natural” to have debt late in life (Keese 2012). Interviews with older homeowners during the recent housing crisis in the U.S. suggest that fear of mortgage default can diminish the pride and status associated with homeownership and intensify debt stress (Keene, *et al.* 2015). Based on this literature, we expect that anxiety and depression serve as mechanisms that mediate the relationships between objective and subjective debt burden and social and emotional loneliness.

In addition to these potential mediator variables, a number of psychological and socio-economic variables have been shown in previous literature to be related to loneliness and are therefore included in our study as control measures. Psychological controls include self-efficacy and mastery, which are well-established predictors of lower levels of loneliness with effect sizes similar to demographic measures (Suanet and Van Tilburg 2019). Self-efficacy measures the willingness to initiate behavior, the willingness to expend effort in completing the behavior, and the persistence in the face of adversity (Bosscher and Smit 1998). Mastery assesses to what extent individuals feel in control of their lives (Pearlin and Schooler 1978). Established socio-

economic predictors of higher levels of loneliness include older age (Dykstra 2009), female gender (Beal 2006), lower educational attainment (Hawkley, *et al.* 2008), non-married status (Victor *et al.* 2005), living alone (Yeh and Lo 2004), and not holding a job (Lauder *et al.* 2004).

Research questions

The current study investigates objective and subjective debt burden as predictors of social and emotional loneliness. We also examine the potential role that social participation, social network size, anxiety, and depression play in alleviating or lessening that social and emotional loneliness. Additionally, we control for standard measures of psychological and socio-demographic sample characteristics in our analyses. Data for the analysis come from the Longitudinal Aging Study Amsterdam, a longitudinal panel of older adults in the Netherlands (Hoogendijk *et al.* 2016, Huisman *et al.* 2011). Using Dutch data is further justified by the fact that Dutch households have among the highest debt levels in Europe (OECD 2019). The specific research questions are:

1. How do older adults who experience subjective and objective debt burdens differ in terms of social and emotional loneliness from older adults who do not experience debt burdens?
2. Is social loneliness (emotional loneliness) associated with objective and subjective debt burden, controlling for psychological and socio-economic characteristics?
3. Do social participation, social network size, anxiety and depression mediate the relationships between subjective and objective debt burden and social and emotional loneliness?

Method

Data source and sample

We use data obtained from the Longitudinal Aging Study Amsterdam (LASA). This nationally representative survey effort collects stratified random samples of men and women born between 1908 and 1957 (for detailed information, see Hoogendijk, *et al.* 2016, Huisman, *et al.* 2011). We use data from the 2015/2016 survey, which is the eleventh wave of this data collection effort. LASA started in 1992/1993 as a longitudinal multidisciplinary research program on the social, physical, cognitive, and emotional functioning of older adults in the Netherlands (Huisman, *et al.* 2011). Psychological measures, social participation measures and socio-demographic controls are collected in the main, face-to-face interview. We use the 2015/2016 wave of LASA because data about indebtedness have been collected only in this wave through a separate leave-behind survey and 1,608 of the 1,770 total respondents (91%) completed it.

Social and emotional loneliness

Five items of the 11-item De Jong Gierveld Loneliness Scale are used to measure social loneliness (Tilburg *et al.* 2004), on a three-point scale (coded as 1=no, 2=more or less, and 3=yes). Following previous research (De Jong Gierveld and Kamphuis 1985, De Jong Gierveld and Van Tilburg 2010), positive and neutral responses (yes, more or less) are coded as 1; negative responses are coded as 0. As a result, the summed score for social loneliness ranges from 0 to 5. Example items for social loneliness include “There is always someone I can talk to about my day-to-day problems” or “There are plenty of people I can lean on when I have problems.” Internal consistency is acceptable (Cronbach’s alpha=0.77).

Additionally, six items are used to measure emotional loneliness, using the same response scale and dummy-coding. Here the summed score ranges from 0 to 6. Example items for emotional loneliness include “I miss having a really close friend” and “I experience a general sense of emptiness.” Internal consistency is acceptable at (Cronbach’s $\alpha=0.83$). A binary measure of social and emotional loneliness is used in the descriptives table, following the mental health literature (Brown *et al.* 2018). The binary measure is coded as 1 if a respondent has a score of 1 or higher on the social or emotional loneliness scale. Detailed variable information is provided in online Appendix Table 1.

Objective and subjective debt burden

The measure of objective debt burden is the debt-to-income (DTI) ratio of a household, a common measure of objective debt burden (Dalton, *et al.* 2016). It is constructed based on two questions. First, we use a question about repayment amounts, which inquires, “How much money do you spend every month on debt repayment? If you don’t know the exact amount, please give us your best estimate.” Responses are provided in an open-ended box in Euro per month. The question is adapted from the German Socio-Economic Panel, Wave 2013, Q34 (DIW 2019). Respondents who indicated no debt are coded as having repayment amounts of 0 Euro. Responses to this question range from 0 to 2,000 Euro, and are then divided by the responses to the monthly household income question using the midpoints of the income categories plus the lower bound of the top category to create the debt-to-income (DTI) ratio. Monthly household income is collected in 24 narrow categories, each spanning 226 Euro, such as from 1,816 to 2,042 Euro. The top category is 5,446 Euro or more (3.7% of the sample). The DTI variable ranges from 0 to 0.93.

The question measuring subjective debt burden is only asked of participants who indicated they hold any debt. Whether or not an older adult holds debt is elicited with the question “Are you, or is someone in your household, currently paying back loans and interest on loans that you took out for consumer purchases or other expenditures?” Response options include yes (coded as 1 in this study), no (coded as 0), and don’t know (coded as missing). Affirmative responses are followed up with the subjective debt burden question; all others skipped to the next questionnaire section. The question is adapted from the German Socio-Economic Panel, Wave 2013, Q33 (DIW 2019).

The subjective debt burden question asks, “How difficult is it for your household to repay these loans?” Response options are keeping up, no difficulties (coded as 1 in this study), keeping up, struggle from time to time (coded as 2), keeping up, constant struggle (coded as 3), falling behind further and further (coded as 4), and we are so far behind that we have real problems (coded as 5). Don’t know responses and refusals are coded as missing. Respondents who do not have debt are coded as 1. The question is adapted from the German Socio-Economic Panel, Wave 2013, Q4400 (DIW 2019) and the European Union Statistics on Income and Living Conditions (Eurostat 2019a).

The number of non-mortgage types of loans are elicited with the question, “Which of the following types of credit and loans do you currently have?” The response options include credit card, personal loan, short-term credit, loans from family, friends or acquaintances, and other loans. The number of affirmative responses is added up and ranges from 0 to 6. The question is adapted from the Dutch National Bank Household Survey (DNB 2019). Detailed variable information is provided in online Appendix Table 1.

Potential mediators

The analysis accounts for social and psychological variables that may serve as potential mediators of the relationship between debt burden and loneliness. These include social participation and network size, anxiety and depression.

Social participation includes seven types of leisure activities in which respondents may be currently participating (Broese van Groenou and Deeg 2010), including visiting a cultural institution (cinema, museum, exhibition, gallery, stage show, concert, ballet or opera); going out on an excursion (to the forest, heath, dunes, nature or amusement park, recreation, zoo or buildings of interest); participating in social cultural center, society, club or community center or club nights, billiards, card or bingo nights; going out to a café, restaurant or dance hall; carrying out sports activities outdoors (e.g. swimming, hiking, biking, fishing or football); attending sport events and games; and going shopping for pleasure. Response options range from almost never (coded as 1 in this study) to every day (coded as 7). The total number of selected activities ranges from 7 to 35.

Network size reflected the core socially active relationships of the older adult as well as the outer layers of their larger network (Van Tilburg 1998). The variable is a count of the number of individuals age 18 and older with whom the respondent is in touch regularly and who are important to the respondent. The measure ranges from 0 to 70.

To measure anxiety, the study uses the seven items of the Hospital Anxiety Depression Scale HADS-A, which inquire about feelings of restlessness, tension, or panic over the past four weeks (Spinhoven *et al.* 1997, Zigmund and Snaith 1983). Depression is measured with the Center for Epidemiologic Studies Depression Scale (CES-D) (Beekman *et al.* 1997, Radloff 1977). The 20 items cover depressive symptomatology experienced in the past week. Response

options for both scales include rarely or never (coded here as 0), some of the time (coded as 1), occasionally (coded as 2), and mostly or always (coded as 3). The anxiety variable ranges from 0 to 20 and the depression variable from 0 to 39; both show acceptable internal consistency (anxiety: $\alpha=0.787$; depression: $\alpha=0.86$). Further information is provided in online Appendix Table 2.

Control variables

Control variables include psychological and socio-economic variables. The psychological control variables include self-efficacy and mastery, which are well-established predictors of loneliness and tend to show an association with loneliness that is similar to demographic controls, such as marital status (Suanet and Van Tilburg 2019). Levels of self-efficacy are assessed with the 12-item Bosscher and Smit (1998) General Self-Efficacy Scale (GSES-12). An example item includes, “When I decide to do something, I go right to work on it.” Mastery is measured by the seven-item Pearlin Mastery Scale (Pearlin and Schooler 1978). An example item includes, “What happens to me in the future mostly depends on me.” Responses for both measures are provided on a five-point Likert Scale ranging from strongly disagree (coded as 1) to strongly agree (coded as 5). The summed perceived self-efficacy score ranges from 23 to 60 and the summed mastery score from 11 to 35. The scales show acceptable internal consistency (self-efficacy: Cronbach’s $\alpha=0.94$; mastery: Cronbach’s $\alpha=0.74$). Detailed variable information is provided in online Appendix Table 3.

The socio-demographic variables characterize the respondent and the respondent’s household. Binary measures include gender (male=1, female=0), marital status (married, partnered=1, never married, divorced, widowhood=0), holding a paid job at present (yes= 1,

no=0), owner of the primary residence (yes= 1, no=0). Categorical variables include nine education categories (elementary not completed=1, elementary education=2, lower vocational education=3, general intermediate education=4, intermediate vocation education=5, general secondary education=6, higher vocational education=7, college education=8, university education=9) and 24 monthly income categories (454-567 Euro=1 to 4,992-5,445 Euro=23, and 5,446 Euro or more=24). Continuous variables include age (range: 58 to 98) and the number of household members (range: 0 to 6). Detailed variable information is provided in online Appendix Table 4.

Sample characteristics

About half of our sample is male, about two-thirds are married or partnered, and the average age is 70 years. Most participants live alone or in two person households with about two-thirds being homeowners. The typical educational attainment is an intermediate vocational degree. About a quarter of the sample has employment. The average household income is 2,560 Euro. The prevailing debt is mortgage debt; only 7 percent of respondents carry other debt types. The prevalence of mortgage debt in older age in the Netherlands is largely due to the tax deductibility of mortgage interest payments, interest-only mortgages, and contractual savings mortgages which tend to delay principal repayment (ECB 2019). Among participants who report having debt, the average monthly debt repayment amount is 356 Euro and they have a debt-to-income ratio of 13%, which lenders consider manageable (Dalton, *et al.* 2016). The sample is not weighted because this study is primarily concerned about the relationship between loneliness and debt burden, rather than in statements about the prevalence of both measures in the Netherlands (for this information, please turn to Hoogendijk, *et al.* 2016).

Data analysis

Missing values are treated in the following ways. Missing values in the dependent variables, social and emotional loneliness, are not replaced. Of the 1,606 respondents who reported this information on the leave-behind survey, income has the highest number of missing values (8.77%). All other missing values are below 5 percent, see Table 1, Column 3. We use a common approach for small data sets; see, for example Acock (2005), which replaces missing values with a zero (binary measures) or the mean (categorical, continuous measures) and adds a binary (1=missing value; 0=value not missing) indicator variable to account for the replacement in the regression analysis.

To examine Research Question 1, t-tests were used to examine the difference between the means of our focal measures, potential mediator variables, and control variables among older adults who experience social and emotional loneliness and those who do not. Bivariate correlation analysis (Pearson r) is used to assess the correlation of loneliness, debt burden, and potential mediator variables. The analysis for Research Questions 2 and 3 is based on linear Ordinary Least Squares (OLS) regression analysis. Social loneliness and emotional loneliness serve as the dependent variables. For Research Question 2, each loneliness variable is regressed on objective and subjective debt burden, controlling for the sample's psychological and socio-demographic characteristics. For Research Question 3, the four potential social and psychological mediators are added to the regression models. In a robustness test, we limit the sample to survey respondents who indicated that they hold debt, and repeat correlation, regression, and mediation analyses. This sample consists of 258 respondents. Tests for multicollinearity indicate that values for the variance inflation factor are below 10 for the variables in the regression specifications. Only the binary indicators of missing values show

above 10 values for the variance inflation factor for both dependent variables, indicating that they are redundant as a predictor.

To formally test for mediation, we use the PROCESS macro for SPSS, which is a path analysis modeling tool for OLS and logistic regression (Hayes 2017). Figure 1 illustrates PROCESS model #4 (Hayes 2017), where social loneliness served as Y, subjective loan burden as X, social participation as M1, network size as M2, anxiety as M3, and depression as M4, controlling for the sample's psychological and socio-demographic characteristics. The analysis uses a bootstrapping procedure (5,000 bootstrapped samples) to identify the indirect, mediating effects of the four explanatory variables. Due to collinearity among the binary missing values variables, they are removed from the PROCESS procedure.

The following indices are used to evaluate model fit: F value, change in F value and R squared adjusted in the main regression models and indirect effects of X on Y in the mediation model. Our threshold is significant at the 1% significance level for F values, and for bootstrap confidence intervals to not include zero in the mediation model. All analyses are performed using IBM SPSS 25.

[Figure 1 about here]

Results

How do older adults who experience subjective and objective debt burdens differ in terms of social and emotional loneliness from older adults who do not experience debt burdens?

The first analysis examines descriptive differences in the financial characteristics between older adults who experience social and emotional loneliness and those who do not. Table 1 gives the sample means or percentages for older adults who experience social loneliness (Column 1) and

emotional loneliness (Column 2). The first two columns also include flags for significant means differences between those who experience social or emotional loneliness and those who do not. Column 3 shows the means or percentages for the total sample.

As seen in Table 1, older adults who experience social or emotional loneliness differ only slightly in their financial burdens from older adults who do not. Older adults who experience social loneliness report higher subjective debt burden, but the objective debt burden is similar between the two types of loneliness. Older adults who experience emotional loneliness report similar levels of subjective debt burden and objective debt burden to those who experience social loneliness. In addition, social and emotional loneliness are both associated with lower social participation, smaller network size, and higher levels of anxiety and depression at $p < 0.001$.

[Table 1 about here]

Table 2 shows the results of a correlation analysis of social and emotional loneliness, and subjective and objective debt burden. Social loneliness is correlated with subjective debt burden, but not with objective debt burden, measured as debt-to-income ratio. Emotional loneliness is not correlated with either debt measure. The correlation coefficients of social and emotional loneliness and the four potential mediator variables are statistically significant, confirming previous literature. In contrast, the correlation coefficients of subjective and objective debt burden and the four potential mediator variables are close to zero, indicating that the two measures of debt burden represent concepts that are independent of these explanatory variables.

[Table 2 about here]

Are social loneliness and emotional loneliness associated with objective and subjective debt burden, controlling for psychological and socio-economic characteristics?

First, we regress social loneliness on the psychological and socio-demographic control variables. These focal results are presented in Column 1 of Table 3 and the full results in online Appendix Table 5. The association of subjective debt burden and social loneliness is significant and positive. The two psychological control variables, mastery with and self-efficacy are negatively related to social loneliness, as expected. Additionally, socio-demographic characteristics related to greater social loneliness include male gender, higher educational attainment, lower income and not owning a home.

Regressions predicting emotional loneliness are shown in Column 2 of Table 3. There is a positive but insignificant relationship of objective and subjective debt burden with emotional loneliness. The detailed results in online Appendix Table 5 show that mastery, self-efficacy, and female gender are inversely related with emotional loneliness, paralleling the findings for social loneliness. As might be expected, participants who reported not being married or partnered and those in smaller households are more likely to experience higher levels of emotional loneliness, while these two measures are unrelated to social loneliness. We also find a positive association between higher educational attainment and social loneliness in the regression. Following an approach suggested in Hawkley, *et al.* (2008), descriptive analysis showed that the importance of having people within respondents' networks that are important to them is similar across the nine educational levels with a small means difference of 1.31 people from the lowest education level (mean=17.89; SD=3.61) to the highest (mean=19.20; SD=9.09).

[Table 3 about here]

Do social participation, social network size, anxiety and depression mediate the relationships between subjective and objective debt burden and social and emotional loneliness?

To investigate Research Question 3, the four potential mediator variables are added to the regression specification for Research Question 2. The focal results for social and emotional loneliness are shown in Table 3, Columns 3 and 4 respectively; the full results are shown in the online Appendix Table 5. With regard to predicting social loneliness, the coefficient of subjective debt burden has $p < 0.001$ and is only slightly smaller compared the baseline specification in Column 1. The adjusted R^2 increases from 0.12 to 0.22, indicating that the four social and psychological variables increase the explanatory power of the regression specification. The finding indicates a robust relationship between subjective debt burden and social loneliness, independent of the four potential mediator variables. Each of these four variables, social participation, network size, depression, and anxiety all show a significant negative relationship with social loneliness.

In Column 4 of Table 3 and online Appendix Table 5, emotional loneliness serves as the dependent variable. Objective and subjective debt burden are found to both be positively but not significantly related to emotional loneliness¹. Among the four potential mediator variables, a smaller network size and a higher degree of depression are associated with emotional loneliness. As expected, social participation is not associated with emotional loneliness. Similar to the results for social loneliness, the adjusted R^2 increases from 0.19 to 0.30 when adding the four

¹ The denominator of the objective debt measure is coded as the midpoint of the household income variable's categories plus the lower bound of the top category. To test the robustness of the denominator in this key variable, the analyses were repeated using the lower bounds of the household income categories. The lower-bound results are similar to the results using the midpoint of the income categories, for both social loneliness ($\beta_{DTI}=0.21$ ($CI_{DTI}=-0.61, 1.02$), $p_{DTI}=0.62$) and emotional loneliness ($\beta_{DTI}=0.43$ ($CI_{DTI}=-0.49, 1.35$), $p_{DTI}=0.36$). It seems unlikely, therefore, that our operationalization, using the mid-point approach, is the main reason for the absence of association.

mediator variables, indicating that the four variables strengthen the explanatory power of the regression specification.

Results of the mediation analyses show that social participation, social network size, anxiety and depression do not mediate the relationships between subjective and objective debt burden and social and emotional loneliness. These results are shown in the online Appendix Table 6.

Robustness of findings

In an alternative specification, we test the robustness of the findings by limiting the sample to survey respondents who indicated that they hold debt, and repeated correlation, regression, and mediation analyses. This sample consists of 258 respondents. The results of the borrower-only sample are shown in the online Appendix Tables 7 and 8. The direction of correlation and regression results is similar to the full sample. The regression results for the borrower-only sample show that the relationship of subjective and objective debt burden to social and emotional loneliness is similar to that of the full sample. The coefficients of the explanatory and control variables are similar in size and direction as in the full sample regression. The strength of the relationships is weaker due to the small sample size of the borrowers compared to the full sample, see online Appendix Table 4. Mediation tests on both social and emotional loneliness confirmed the findings of the full sample. Specifically, social participation, social network size, anxiety and depression do not mediate the relationships between subjective and objective debt burden and social and emotional loneliness.

Discussion

This research examined the effect of objective and subjective debt burden on social and emotional loneliness among older adults in the Netherlands. We investigated whether social and emotional loneliness are associated with objective and subjective debt burden and tested whether the associations are mediated by social and psychological variables. To the best of our knowledge, this is the first study to examine the role of debt in loneliness in older age, and we have three main findings. First, t-tests indicate that older adults who report social loneliness show higher levels of subjective debt burden than those who do not report social loneliness. In contrast, there is no difference in subjective debt burden among older adults who experience emotional loneliness. Objective debt burden does not differ between older adults who experience social or emotional loneliness and those who do not. Second, regression results show that subjective debt burden serves as a predictor of social loneliness, but not objective debt burden. We found that neither subjective nor objective debt burden are related to emotional loneliness. Third, mediation analysis indicates that social participation, social network size, anxiety and depression do not mediate the relationships of objective and subjective debt burden to social and emotional loneliness, confirming a direct relationship between subjective debt burden and social loneliness.

Limitations

As with any study, limitations should be considered. First, this research relies on cross-sectional analysis and caution should be used when results are interpreted. Future research should consider longitudinal designs instead of cross-sectional designs to better assess the causal relationship of

social loneliness and subjective debt burden. Second, the data are collected in the Netherlands only and during a single year of relative economic stability (2015). Therefore, the results only reflect the experiences of older adults in this country at this point in time. Caution is warranted when transferring the findings to older adults living in other countries and facing other macroeconomic circumstances, although the general mechanisms linking debt to loneliness may be more broadly applicable. Third, we focus on household income rather than wealth because LASA does not collect wealth measures. For this reason, we cannot examine a debt-to-assets measure even though wealth can be a stronger predictor of financial well-being than income in older, retired households. Fourth, we limit the examination of potential mediators to those with strongest theoretical and empirical support. A number of other potential mediators could be considered, including social support mechanisms and social security programs available to older adults.

Implications for research

The results of the current study point to three implications for future research. First, our findings—that different debt burden indicators can be more or less associated with different loneliness outcomes—advance our understanding of financial hardship in older age. As such, our study extends prior research that documents the association of social loneliness with perceptions of income inadequacy or a worsened financial situation (Dahlberg and McKee 2014, De Jong Gierveld, *et al.* 2015). We identify the crucial role that worry about debt plays in this relationship. Building on the stress process theory (Pearlin *et al.* 1981), recent research on debt stress indicates a direct association of debt stress with mental health (Drentea and Reynolds 2015). Drawing on this framework, our findings point to the impact of subjective debt burden on

social loneliness, thereby illustrating the importance of further investigation of the “social meanings of debt” (p. 29), which are currently poorly understood (Drentea and Reynolds 2015). Further studies are needed to investigate the reasons for the impact of debt burdens on loneliness, including potential methodological issues such as residual confounding.

A second implication is the finding that objective debt burden is not related to social loneliness, which aligns with findings in the emotional well-being literature, specifically Kahneman and Deaton (2010). This research finds a lack of association of emotional with financial well-being above a certain income level (for a review, see also Kapteyn *et al.* 2015). Our study extends these insights to the experience of indebtedness and points to the need for further research to identify whether certain levels or types of debt are likely to be related to social loneliness. It may be argued that the type of debt we studied contributed to the lack of association we found with social loneliness. The majority of debt held by study participants is mortgage debt, which is typically held for decades and it is collateralized, and secured by the house (Moulton *et al.* 2015). Housing economics research has shown that these characteristics of mortgage debt explain why mortgage debt creates the lowest amount of financial distress of all types of consumer debt (Dunn and Mirzaie 2016). Future research should investigate if the same association holds for older adults who have repaid their mortgage or do not own a home, and are burdened with non-collateralized debt types, such as credit card debt.

A third implication of the current study points to the direct association of subjective debt burden and social loneliness. The relationship is mediated by neither social network, social participation, anxiety nor depression, and it is robust to the inclusion of psychological and socio-economic control variables. The direct effect of debt parallels the direct effect of income on loneliness (Hawkey and Kocherginsky 2018). A useful avenue for future research would be to

deconstruct subjective debt burden into components suggested in qualitative research, such as shame, guilt, anger, and feelings of discomfort and recognition (Marston *et al.* 2018). This approach may be particularly fruitful in cross-country comparison, following the approach in the poverty literature (Walker *et al.* 2013). Our study also adds nuance to a groundbreaking study by Netemeyer *et al.* (2018) that has identified subjective financial wellbeing to be as much a predictor of overall wellbeing as factors such as physical and mental health, job satisfaction, and relationship satisfaction. We echo Netemeyer, *et al.* (2018) by showing that it is important to separate subjective financial perceptions from objective, as they may give us better windows into the underlying mechanisms.

A fourth implication for future research is the need to examine the causality of the subjective debt burden-to-social loneliness relationship. For one, literature on loneliness suggests that social loneliness is initiated by the debt-burdened individual, due to emotions such as guilt, anger, or shame (Marston, *et al.* 2018). In addition, because having debt in older age is not as “natural” or common as in younger age groups, older adults may feel more burdened by it (Keese 2012). On the other hand, social contact theory suggests that the social environment may also initiate the isolation of the debt-burdened individual through peer rejection (Pettigrew and Tropp 2006). Debt-related worries can lead older adults to behave in ways that do not align with peer expectations. The psychology of scarcity has shown that liquidity constraints can express themselves in nervousness, memory loss, and near-term tunnel vision (Haushofer and Fehr 2014, Mani *et al.* 2013, Shah *et al.* 2012). This behavior may lead to peer rejection as documented in loneliness studies among adults with cognitive disabilities (Gilmore and Cuskelly 2014). The peer-induced perspective may be supported by our finding that if an older adult has debt, but feels unburdened, social integration and embeddedness do not suffer.

Implications for practice

For practice, the findings of this study indicate that subjective debt burden in older age, such as expressions of distress or worry, can serve as a meaningful predictor of the social integration and embeddedness of older adults. As suggested in this study, financial worries can be associated with mortgage debt in older age, although this type of debt is typically associated with low debt stress (Dunn and Mirzaie 2016). These older adults, who are distressed by their debt burden may benefit from additional resources and support that assist them in managing and repaying their debt. This support could be provided by consumer credit counseling or debt advisory services, lenders, or even government agencies that service older adults.

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Declaration of contribution of authors

All authors collaborated on the development of the study design and analyses, with the corresponding author conducting the statistical analyses. All authors contributed to the drafting

of the manuscript, provided critical comments throughout the writing process, and approved the version to be published.

Statement of conflict of interest

The authors declare no conflicts of interest.

Ethical standards

The Longitudinal Aging Study Amsterdam (LASA) has received approval by the medical ethics committee of the VU University Medical Center. Signed informed consent was obtained from all study participants. For the present study, the permission to use data was obtained from the LASA steering group using the official analysis proposal form (https://www.lasa-vu.nl/data/availability_data/availability_data.htm).

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TABLE 1:

Descriptive statistics of variables used in the analysis for those who experience social and emotional loneliness and for the full sample

Variables (sample range)	(1) Experience social loneliness	(2) Experience emotional loneliness	(3) Total sample
	% or Mean (SD)	% or Mean (SD)	% or Mean (SD)
Social loneliness (0-5)	2.04*** (1.22)	1.43*** (1.52)	0.80 (1.25)
Emotional loneliness (0-6)	1.51*** (1.84)	2.41*** (1.55)	0.88 (1.50)
Subjective debt burden (1-5)	1.05* (0.32)	1.04 (0.29)	1.03 (0.25)
Subjective debt burden missing (%)	1.43	1.70	1.37
Objective debt burden (DTI ratio, 0-0.93)	0.02 (0.07)	0.02 (0.07)	0.02 (0.07)
<u>Potential mediator variables:</u>			
Social participation (7-35)	16.25*** (5.05)	16.09*** (4.91)	16.99 (4.80)
Social participation missing (%)	4.60	4.77	3.79
Network size (0-80)	14.43*** (8.71)	15.43*** (9.21)	18.25 (10.73)
Network size missing (%)	4.44	4.60	3.86
Anxiety (0-20)	3.56*** (3.26)	3.92*** (3.30)	2.88 (2.94)
Anxiety missing (%)	0.00	0.17	0.06
Depression (0-39)	9.48*** (7.49)	10.65*** (7.56)	7.43 (6.64)
Depression missing (%)	0.16	0.34	0.25
<u>Psychological control variables:</u>			
Perceived self-efficacy (23-60)	42.86*** (5.60)	42.07*** (5.70)	43.94 (5.54)
Perceived self-efficacy missing (%)	4.44	4.60	3.61
Mastery (11-35)	23.73*** (4.28)	23.28*** (4.26)	24.66 (4.08)
Mastery missing (%)	5.07	5.45*	4.04
<u>Socio-demographic characteristics:</u>			
Gender (% male)	50.87**	46.34	46.70
Age (58-98)	71.51*** (9.02)	72.72*** (9.35)	70.35 (8.51)
Married or partnered (%)	61.33***	50.60***	66.98
Education (1-9)	4.80 (2.14)	4.54*** (2.15)	4.80 (2.12)
Household size (0/1)	0.76** (0.66)	0.61*** (0.64)	0.82 (0.67)
Household size missing (%)	1.90*	1.87*	1.00
Paid job at present (%)	21.59	17.38***	23.57
Paid job at present missing (%)	4.26	4.43	3.48
Income midpoints (€511-€5,446)	€2,401*** (€1,039)	€2,307*** (€1,054)	€2,560 (€1,105)
Income categories (1-24)	11.96*** (4.55)	11.53*** (4.60)	12.65 (4.75)
Income category missing (%)	9.67	8.86	8.77
Monthly debt repayment (€0-€2,000)	€49 (€191)	€46 (€189)	€57 (€200)
Number non-mortgage debts (0-5)	0.07 (0.31)	0.06* (0.29)	0.08 (0.33)
Homeowner (%)	58.69***	57.93***	65.27
Homeowner missing (%)	2.06*	1.87	1.12
N (lonely)	631 (39.37%)	587 (36.51%)	
N (not lonely)	975 (60.63%)	1,019 (63.50%)	

Note: *** p<0.001, ** p<0.01, * p<0.05; total N=1,608

Columns (1) and (2) indicate significant means differences between older adults who experience social or emotional loneliness (means shown in table) and those who do not (means not shown in table)

TABLE 2:

Correlation coefficient of social and emotional loneliness, objective and subjective debt burden with potential mediators, N=1,606

Variable:	Social loneliness Pearson r	Emotional loneliness Pearson r	Objective debt burden Pearson r	Subjective debt burden Pearson r
Social loneliness				
Emotional loneliness	0.46***, p<0.001			
Objective debt burden	-0.01, p=0.66	-0.02, p=0.34		
Subjective debt burden	0.08**, p<0.001	0.01, p=0.84	0.24, p<0.001	
Social participation	-0.18***, p<0.001	-0.16***, p<0.001	0.03, p=0.18	-0.01, p=0.81
Network size	-0.30***, p<0.001	-0.22***, p<0.001	0.03, p=0.19	-0.02, p=0.43
Anxiety	0.27***, p<0.001	0.36***, p<0.001	-0.01, p=0.76	-0.01, p=0.96
Depression	0.35***, p<0.001	0.48***, p<0.001	-0.03, p=0.20	0.04, p=0.13
N	1,606	1,606	1,608	1,608

Note: *** p<0.001, ** p<0.01, * p<0.05

TABLE 3:

Parameter estimates (Standard Error) from OLS regression of social and emotional loneliness on subjective and objective debt burden, potential mediator variables, psychological and socio-demographic control variables, N=1,606

Variable	(1) Social loneliness B (C.I.)	(2) Emotional loneliness B (C.I.)	(3) Social loneliness B (C.I.)	(4) Emotional loneliness B (C.I.)
Subjective debt burden	0.41** (0.15, 0.67) p=0.002	0.12 (-0.18, 0.41) p=0.43	0.36** (0.12, 0.61) p=0.004	0.04 (-0.24, 0.31) p=0.79
Subjective debt burden missing	0.26 (-0.25, 0.77) p=0.32	-0.16 (-0.74, 0.42) p=0.58	-0.05 (-0.54, 0.44) p=0.84	-0.53 (-1.08, 0.02) p=0.06
Objective debt burden (DTI)	0.43 (-0.49, 1.34) p=0.36	0.74 (-0.30, 1.79) p=0.16	0.22 (-0.64, 1.08) p=0.62	0.47 (-0.50, 1.44) p=0.35
<u>Potential mediator variables:</u>				
Social participation			-0.02*** (-0.04, -0.01) p<0.001	-0.01 (-0.02, 0.01) p=0.21
Social participation missing			1.19 (-0.15, 2.54) p=0.08	-0.80 (-2.32, 0.72) p=0.30
Network size			-0.02*** (-0.03, -0.02) p<0.001	-0.01*** (-0.02, -0.01) p<0.001
Network size missing			-0.30 (-1.24, 0.64) p=0.53	0.13 (-0.93, 1.19) p=0.81
Anxiety			0.01 (-0.02, 0.04) p=0.35	0.02 (-0.01, 0.05) p=0.24
Anxiety missing			-0.06 (-2.61, 2.48) p=0.96	1.94 (-0.92, 4.81) p=0.18
Depression			0.04*** (0.03, 0.06) p<0.001	0.08*** (0.06, 0.10) p<0.001
Depression missing			-0.68 (-1.98, 0.62) p=0.31	-0.31 (-1.77, 1.16) p=0.68
Control variables included	Yes	Yes	Yes	Yes
Constant	4.08*** (3.17, 4.98) p<0.001	5.22*** (4.18, 6.25) p<0.001	3.03*** (2.06, 4.00) p<0.001	2.32*** (1.23, 3.42) p<0.001
F (df)	11.47*** (20) p<0.001	19.16*** (20) p<0.001	16.97*** (28) p<0.001	25.46*** (28) p<0.001
R2 adjusted	0.13	0.19	0.22	0.30
F change			26.95*** p<0.001	33.36*** p<0.001

Note: *** p<0.001, ** p<0.01, * p<0.05

The full results are shown in online Appendix Table 5. Control variables: Mastery, Self-efficacy, Gender, Age, Married or partnered, Education, Household size, Paid job at present, Income categories, Number non-mortgage debts, and Homeowner

FIGURE 1:

Paths of the mediation analysis

[See separate TIFF file]