The Effect of Loneliness on Subjective Well-Being: Evidence from the UK Household Longitudinal Study 2017–2021

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Abstract

Although loneliness is associated with lower levels of subjective well-being, little is known about the precise nature of this association. Theoretical arguments have indicated a negative effect of loneliness on well-being, but there are alternative explanations, such as the possibility that chronically unhappy people select themselves into loneliness. This study investigates whether loneliness is detrimental to subjective well-being by considering selection as a competing explanation. The analyses were based on three waves of panel data from Understanding Society, the UK Household Longitudinal Study (2017–2021, containing 85,083 observations from 31,223 individuals aged 16 to 103 years). Subjective well-being was measured using a single item capturing life satisfaction. Loneliness was measured both directly using a single item and indirectly using the three-item UCLA Loneliness Scale. First, pooled ordinary least squares (POLS) models were estimated to confirm previous cross-sectional findings. Subsequently, fixed-effects (FE) models were used to account for the possibility that chronically unhappy people select themselves into loneliness. The results of the POLS models showed that lonely people reported significantly lower levels of life satisfaction. This association persisted in the FE model, and the remaining association can be interpreted as evidence of the negative effect of loneliness on well-being. Further analyses showed that the results were similar for men and women and for younger and older people. Moreover, the results were remarkably robust across the two measures of loneliness and model specifications. Overall, the results support the claim that loneliness is detrimental to well-being. Thus, intervention strategies aimed at reducing loneliness may also be effective in improving well-being in the general population.

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Introduction

Social connections are widely regarded as key elements of a good life (Diener & Seligman, 2002; Caunt et al., 2013), and as such, they are thought to have significant effects on subjective well-being (e.g., Pinquart & Sörensen, 2000; Proulx et al., 2007). Nevertheless, not all individuals succeed in establishing satisfying social relationships (Qualter et al., 2015). Loneliness is defined as the unpleasant feeling that is experienced when one's social relationships are perceived as deficient relative to one's social needs and desires (Perlman & Peplau, 1981; Peplau & Perlman, 1979). As a subjective feeling, loneliness is empirically different from social isolation, which is an objective state of social disconnection (De Jong Gierveld et al., 2012; Eckhard, 2018). Recently, a large meta-analysis of 114 studies on the health effects of loneliness concluded that feeling lonely is related to significantly lower levels of well-being. This association exhibited a moderate to large effect size and emerged as one of the strongest of all the health outcomes analysed in the study (Park et al., 2020).

Accordingly, loneliness could be detrimental to well-being, but other explanations are also conceivable. Most notably, selection effects may occur because loneliness is not randomly distributed, and certain people are more likely to feel lonely because of characteristics that also influence their well-being (e.g., genetic factors or personality traits). Consequently, it is equally plausible that the observed association reflects the selection of unhappy people into loneliness. As loneliness is highly prevalent worldwide (Surkalim et al., 2022), it is essential to explain the association between loneliness and well-being that has been observed in previous research. The aim of the present study was to address this research gap through the investigation of whether loneliness is still associated with well-being when selection is considered an alternative explanation. If the association persists, such a finding would support the claim that loneliness is detrimental to well-being.

Explanations of the Association Between Loneliness and Subjective Well-Being

Scholars have proposed various mechanisms to explain the lower subjective well-being reported by people who feel lonely, which are directly related to the broader debate in well-being research regarding the importance of bottom-up and top-down influences (Lucas, 2004; Diener, 1984).

One explanation for the lower well-being of lonely people is that loneliness has a negative effect on subjective well-being. This hypothesis, referred to here as the causation hypothesis, follows the theoretical reasoning underlying bottom-up theories of well-being, which describe people's subjective well-being as a subjective average of how satisfied they are with various aspects of their lives (Diener, 1984). Following this reasoning, loneliness might affect subjective well-being in several ways. First, needs theorists have emphasised that well-being depends on the extent to which people's living conditions satisfy their basic physiological and psychological needs (Ryan & Deci, 2000; Tay & Diener, 2011). In particular, needs theorists have

highlighted the importance of satisfying the basic human need to belong to achieve high levels of well-being (Ryan & Deci, 2000; Baumeister & Leary, 1995). From this perspective, loneliness is detrimental to well-being because it is an emotionally distressing experience that results from inadequate satisfaction of a basic human need (Baumeister & Leary, 1995). Second, social support and stress buffering theory argues that positive and meaningful social relationships provide several psychosocial benefits, such as a sense of purpose, self-esteem, and the perceived availability of social support (Thoits, 2011; Cohen & Wills, 1985). Accordingly, loneliness may affect well-being by depriving people of these psychosocial resources, leading to feelings of worthlessness and emptiness. Third, sociocognitive models of loneliness argue that lonely people become hypervigilant toward social threats, which in turn produces negative biases at all stages of social information processing. For example, lonely people tend to exhibit negative beliefs about themselves and others, blame themselves for negative social events, and anticipate social rejection (for a review, see Spithoven et al., 2017). These models further argue that such cognitive biases may lead to problematic social behaviours in lonely people, which can elicit negative reactions from others, thus confirming and reinforcing these negative thoughts (Spithoven et al., 2017). In this way, initial feelings of loneliness are the starting point for a self-reinforcing vicious circle of continually increasing loneliness, negative thoughts, and interpersonal problems (Cacioppo & Hawkley, 2009). The high level of emotional distress caused by this downward spiral increases the risk of a variety of health problems (Leigh-Hunt et al., 2017; Park et al., 2020), which can negatively affect life evaluations.

An alternative explanation, the selection hypothesis, argues that people who are chronically unhappy are more likely to experience loneliness and that such people are less likely to escape loneliness by establishing new satisfying social relationships. This hypothesis is based on top-down theories of well-being, which posit that stable dispositions determine people's overall outlooks on their lives, which in turn trickle down to affect how people evaluate aspects of their lives. Top-down influences may occur for two reasons (Lucas, 2004). First, a large body of research has revealed that happy people are objectively more successful in establishing stable, supportive, and positive relationships (Lyubomirsky et al., 2005; Moore et al., 2018; Kansky & Diener, 2017). In contrast, chronically unhappy people may miss out on the objective social benefits of happiness and be more likely to have deficient social relationships that exacerbate their feelings of loneliness. Second, chronically happy people tend to exhibit positivity bias when evaluating various aspects of their lives (Diener et al., 2000, 2018; Lauriola & Iani, 2015). For example, they are more attentive to positive social stimuli, interpret ambiguous and positive social interactions more positively, and recall more positive life events (Tamir & Robinson, 2007; Raila et al., 2015; Heintzelman & Diener, 2019; Seidlitz & Diener, 1993). In contrast, unhappy people may lack this positivity bias, due to which they may be more likely to perceive their social connections to be inadequate.

The selection of chronically unhappy people into loneliness can be understood in statistical terms as a confounding effect of unobserved stable characteristics. From this perspective, some people are more likely to feel lonely because of stable dispositions that also contribute to chronically lower levels of subjective

well-being. Perhaps the most likely candidates for such stable characteristics are genetic predispositions (Bartels, 2015; Spithoven et al., 2019), traumatic experiences of neglect and abuse in childhood (de Heer et al., 2022; Cao et al., 2022; Reinhard et al., 2022), and personality traits (DeNeve & Cooper, 1998; Buecker et al., 2020). According to this hypothesis, previous research has likely overestimated the effect of loneliness on well-being because it has considered few, if any, of these potential confounders. Thus, taking these stable characteristics into account should reduce the association between loneliness and well-being.

Previous Attempts to Disentangle Causation and Selection

To my knowledge, no study has attempted to disentangle these two hypotheses by using panel data and appropriate panel regression models to examine the association between loneliness and well-being within individuals over time. The previous studies most closely related to this research question have used within estimator versions of the cross-lagged panel model to investigate whether loneliness contributes to mental health problems (Lim et al., 2016; McDowell et al., 2021; Griffin et al., 2022; Joshanloo, 2022; Luo, 2022; Mayerl et al., 2022; Kristensen et al., 2022). Adjusting for previous mental health and unobserved stable confounders, these studies have found limited empirical support for the causation hypothesis. More specifically, two studies based on nonprobability samples of adults from the USA reported weak to moderate effects of loneliness on depression, (social) anxiety, and paranoia (McDowell et al., 2021; Lim et al., 2016). In contrast, many other studies have reported either very weak or nonsignificant effects on symptoms of depression and anxiety in adolescents (Kristensen et al., 2022) and on depressive symptoms in older people (Griffin et al., 2022; Joshanloo, 2022; Mayerl et al., 2022; Luo, 2022). Collectively, these findings challenge the widespread belief that loneliness entails significant risks to mental health. Similarly, the idea that loneliness negatively affects subjective well-being is highly plausible, but it has never been tested empirically using appropriate analytical approaches.

The Present Study

This study was the first in which the causation hypothesis was tested empirically. Specifically, the aim of the study was to investigate whether loneliness is detrimental to subjective well-being while accounting for the selection of people who are chronically unhappy into loneliness as a competing explanation. For this purpose, I applied fixed-effects (FE) models to three-wave panel data from Understanding Society, the UK Household Longitudinal Study (UKHLS), 2017–2021. Several additional analyses were conducted to investigate whether the substantive conclusions are robust across various sociodemographic groups, measures of loneliness, and model specifications.

Data and Methods

The statistical analyses were based on data from waves 9 to 11 of the UKHLS (Institute for Social and Economic Research, 2022b).[1] Since the study began in 2009, participants aged 16 or older have been surveyed on a wide range of topics, including their socioeconomic status, health, and social relationships. The study employed a mixed-mode design involving face-to-face, telephone, and web interviews (Institute for Social and Economic Research, 2022c). When face-to-face interviews were suspended due to the COVID-19 pandemic, participants were asked to participate either online or by telephone (Institute for Social and Economic Research, 2022a). Although the fieldwork performed in each wave covered a period of 24 months or more, participants were interviewed at approximately 12-month intervals. Therefore, the observation period for each participant was three years in length. Further information on the data collection is available elsewhere (Institute for Social and Economic Research, 2022c).

Sample Selection

The initial sample consisted of 100,068 observations from 40,521 individuals. The analytical approach used in this study required at least two observations per individual. After excluding observations that featured missing values for any of the variables analysed and individuals for whom fewer than two observations were available in total, the final sample comprised 85,083 observations from 31,223 individuals (55.57% from women, aged 16 to 103 years; $mean_{age} = 50.79$ and $SD_{age} = 18.18$). In general, the amount of missing data in the pooled data was very low and was highest for the UCLA Loneliness Scale (6.3%). Additional analyses revealed that in the excluded observations, individuals were slightly less satisfied with their lives, slightly more often lonely, younger, less often married, and more often affected by financial deprivation and unemployment (see Table 1).

Measures

Subjective well-being was measured in terms of life satisfaction, which is the cognitive evaluation that one's life is going well. Life satisfaction was assessed using a single item that asked how satisfied the respondents were with their lives overall. The response options ranged from 1 (*completely dissatisfied*) to 7 (*completely satisfied*). Single-item measures are widely used in well-being research and perform as well as multi-item scales, such as the Satisfaction with Life Scale (Cheung & Lucas, 2014).

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Table 1 Summary statistics of the analysed sample and excluded observations

	Analysed observations		Excluded observations	
	Mean	SD	Mean	SD
Life satisfaction	5.16	1.43	4.99	1.54
UCLA Loneliness Scale				
Hardly ever/never lonely	0.62		0.58	
Sometimes lonely	0.33		0.35	
Often lonely	0.05		0.07	
Single-item measure of loneliness				
Hardly ever/never lonely	0.63		0.57	
Sometimes lonely	0.30		0.32	
Often lonely	0.08		0.10	
Age in years	50.79	18.18	45.56	21.40
Female	0.56		0.51	
Employment status				
Employed	0.57		0.49	
Unemployed	0.04		0.07	
Retired	0.27		0.21	
Sick/disabled	0.03		0.05	
Inactive/homemaker	0.05		0.07	
Student	0.05		0.11	
Financial deprivation				
Mild	0.73		0.63	
Moderate	0.20		0.25	
Severe	0.07		0.12	
Relationship status				
Single	0.28		0.29	
Living apart	0.08		0.09	
Living together	0.65		0.63	
Marital status				
Never married	0.27		0.41	
Married	0.56		0.43	
Separated/divorced	0.11		0.08	
Widowed	0.06		0.07	
Living alone	0.16		0.12	
Single parent	0.03		0.04	
Interview mode				
Face-to-face	0.35		0.62	
Telephone	0.03		0.04	
Web	0.63		0.34	
Observations	85,083		14,984	
Individuals	31,223		11,426	

Notes: A small proportion of the respondents contributed observations to both subsamples, which occurred when only one observation was excluded from the analysed sample due to missing values.

Source: UK Household Longitudinal Study 2017–2021, own calculations.

Loneliness was captured using both direct and indirect measures to ensure the robustness of the analyses, as recommended by the Office for National Statistics (2018). The direct measure involved a single item ('How often do you feel lonely?'). The indirect measure was based on the three-item version of the UCLA Loneliness Scale ('How often do you feel a) you lack companionship, b) left out, and c) isolated from others?', Hughes et al., 2004). The response options for all items were 1 (*hardly ever or never*), 2 (*some of the time*), and 3 (*often*). To ensure the comparability of the two measures, the scores of the three items on the UCLA Loneliness Scale were summed and then categorised as 'hardly ever or never' (scores of 3 and 4), 'sometimes' (5, 6, and 7), or 'often' lonely (8 and 9).

The models were adjusted for several *time-varying covariates* that affect both loneliness and life satisfaction. These time-varying covariates included age (in years), employment status (employed, unemployed, retired, sick/disabled, inactive/homemaker, or student), financial deprivation (mild, moderate, or severe), relationship status (single, living apart or with a partner), marital status (never married, married, separated/divorced, or widowed), living alone, and single parenthood. In addition, to account for the potential impact of the COVID-19 pandemic, interview mode (face-to-face, telephone, or web) and period (2017, 2018–2019, January–February 2020, or March 2020–May 2021) were included as control variables in all models. Controlling for time-invariant covariates was not necessary in the FE model, as it already accounts for all time-invariant confounders, even if they are unrecognised or not observed in the data. The pooled ordinary least squares (POLS) model was additionally adjusted for gender.

Statistical Analyses

To investigate the association between loneliness and life satisfaction, I started by using POLS models to replicate the findings of previous cross-sectional studies that did not attempt to disentangle causation from selection. The POLS estimator is obtained by pooling the data collected from all individuals over as many as three waves and applying OLS estimation to the pooled data. To illustrate the POLS model and its assumptions, it can be expressed in terms of the error components model

$$y_{it} = \boldsymbol{x_{it}\beta} + \alpha_i + \varepsilon_{it} \tag{1}$$

where y is the life satisfaction of individual i at time point t, $\boldsymbol{x}$ is a vector of independent variables, including loneliness and the time-varying covariates, and ε_{it} is an idiosyncratic error. In addition, α_i is an individual-specific intercept that captures the joint influence of all unobserved stable characteristics (e.g., genetic factors) on life satisfaction. In other words, α_i captures stable differences in people's tendencies to be (un)happy. For the POLS model to be unbiased, both error terms (α_i and ε_{it}) must be uncorrelated with the independent variables. Crucially, the POLS model is based on the random-effects assumption, which is violated if α_i is correlated with the risk of loneliness (i.e., if chronically unhappy people select themselves into loneliness). Importantly, although it is theoretically possible to decompose the error term

to illustrate model assumptions, the POLS model only estimates the composite error $v_{it} = \alpha_i + \varepsilon_{it}$ and does not separate the two error components.

Subsequently, I applied standard FE models to the pooled data to account for the selection of chronically unhappy people into loneliness. In general, the FE model accounts for all stable characteristics by using only the variation within individuals over time (Brüderl & Ludwig, 2015). As shown in Tables 2 and 3 in the Appendix, sufficient within-individual variation is observed in both measures of loneliness to estimate FE models. To account for the selection of chronically unhappy people into loneliness, this approach eliminates α_i from the equation by subtracting the individual-specific mean of all variables from their observed values:

$$(y_{it} - \bar{y}_i) = (\boldsymbol{x_{it}} - \bar{\boldsymbol{x}}_i)\boldsymbol{\beta} + (\varepsilon_{it} - \bar{\varepsilon}_i) \tag{2}$$

The FE model identifies the causal effect of loneliness on subjective well-being under the strict exogeneity assumption, according to which the idiosyncratic error ε must not be correlated with past, contemporaneous, or future values of the independent variables. Additional information can be found elsewhere (Brüderl & Ludwig, 2015). Unstandardised regression coefficients with 95% confidence intervals based on panel-robust standard errors are reported for both the POLS and FE models in all figures. The statistical analyses were conducted using Stata 15.1 (StataCorps, Texas).

Results

Descriptive Statistics

Table 1 provides an overview of the summary statistics of all relevant variables for both the analysed sample and the sample of excluded observations. In the analysed sample, the indirect and direct measures of loneliness yielded similar results regarding the frequency of loneliness. In 30% and 33% of the observations, the respondents reported feeling lonely 'sometimes', and in 5% and 8% of the observations, they reported feeling lonely 'often'. In addition, the respondents were generally satisfied with their lives (mean = 5.16 on a scale ranging from 1, 'completely dissatisfied', to 7, 'completely satisfied').

Multivariate Analyses

Figure 1 shows the results regarding the association between loneliness and life satisfaction. The full models, including the regression coefficients for all covariates, are presented in Table 4 in the Appendix. First, I estimated POLS models to replicate the findings of previous research that reported a substantial association between loneliness and well-being (Park et al., 2020). Comparing individuals who felt lonely 'often' with those who were 'hardly ever/never' lonely, I found differences in life satisfaction of -1.777 and -1.644 scale points for indirect and direct measures of loneliness, respectively. For people who felt lonely 'sometimes', the differences were -0.777 and -0.702 scale points, respectively. Thus, the magnitude of the association
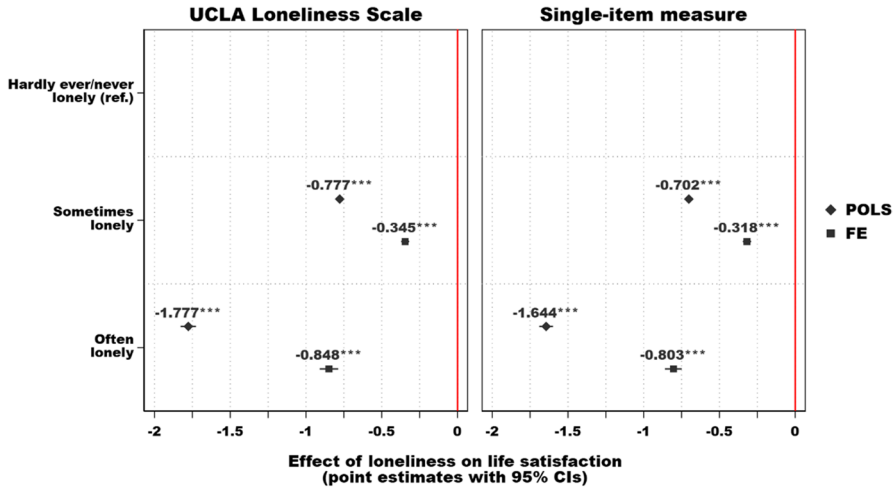
Fig. 1 Effect of loneliness on life satisfaction by measure of loneliness ($N_{obs} = 85,083$, $N_{ind} = 31,223$)

was similar for both measures of loneliness. This result provides further evidence indicating that loneliness is closely linked to well-being. However, the significantly lower well-being observed in lonely people may not reflect a negative effect of loneliness on well-being, as estimates from POLS models are potentially biased by the selection of chronically unhappy individuals into loneliness.

Second, I explored whether the association reflects a negative effect of loneliness on well-being by estimating FE models, which use only within-individual variation and thus account for selection based on stable characteristics. The results of the FE models are also shown in Fig. 1. Notably, the regression coefficients of the FE models do not reflect differences in well-being among individuals but rather differences within individuals over time. The results showed that loneliness was still associated with significantly lower levels of life satisfaction after accounting for the selection of chronically unhappy individuals into loneliness. Compared to feeling lonely 'hardly ever/never', feeling lonely 'often' was associated with decreases in life satisfaction of -0.848 and -0.803 scale points, respectively. Feeling lonely 'sometimes' was also associated with lower life satisfaction, but these differences were only -0.345 and -0.318 scale points, respectively. Overall, the differences in well-being corresponded to approximately 0.4 to 1.0 within-individual standard deviations of life satisfaction, reflecting moderate to large changes in well-being compared to the typical levels of variation observed within individuals over time. Again, the results were remarkably consistent across direct and indirect measures of loneliness.

Robustness Checks

I also performed several additional analyses to ensure the robustness of the results. First, I re-estimated the models without using the observations made during the

COVID-19 pandemic to investigate whether the results were influenced by adaptation to social and physical distancing (see Fig. 2 in the Appendix). However, the results were almost identical. Second, I stratified the models by gender to investigate whether evidence for the causation hypothesis was evident in both women and men. In particular, women's well-being may be considerably more affected by loneliness than men's well-being, for example, because women's self-construal may be more interdependent (Cross & Madson, 1997) and because women tend to overvalue the cultivation of positive social relationships, especially in more individualistic societies (Yang & Girgus, 2019). However, only small differences in the regression coefficients emerged between men and women (see Figs. 3 and 4 in the Appendix). Third, I stratified the models by age group to explore possible differences between younger (< 50 years) and older people (50+ years). This step was taken because previous studies using within estimators on panel data have found very little evidence to support the causation hypothesis among older people (Joshanloo, 2022; Luo, 2022; Griffin et al., 2022; Mayerl et al., 2022), while studies covering the entire adult life span have reported such evidence (Lim et al., 2016; McDowell et al., 2021). It is therefore important to rule out the possibility that such age differences also exist in the effect of loneliness on well-being. The results did not show any systematic differences between the age groups (see Figs. 5 and 6 in the Appendix). Fourth, I re-estimated the models without adjusting for variables that capture a person's actual social connections to rule out potential overcontrol bias. More specifically, it could be argued that loneliness affects subjective well-being by encouraging problematic behaviours that damage existing social connections (Cacioppo & Hawkley, 2009). However, the results were again almost identical (see Fig. 7 in the Appendix).

Finally, I explored the possibility that selection may operate not on people's stable levels of well-being but rather on age-related trajectories of well-being. I tested this possibility using fixed-effects individual-slopes (FEIS) regression, which allows both the intercept and the slope pertaining to the effect of age on life satisfaction to differ across individuals and to be correlated with the risk of loneliness (for more details, see Brüderl & Ludwig, 2015). When selection operates on the trajectories of well-being (i.e., on both the intercept and the slope for age), the standard FE model yields biased estimates. In the present study, the FEIS model required at least three observations for each individual. I therefore re-estimated the FE models using the reduced sample (i.e., the sample used for the FEIS models) to make a valid comparison. The results showed only negligible differences between the FE and FEIS models (see Fig. 8 in the Appendix). An artificial regression test (ART), which tests the null hypothesis that there are no systematic differences in the regression coefficients between a standard FE and an FEIS model, generally supported this conclusion. Specifically, the ART indicated that the differences between the models were either not statistically significant or significant only at a level very close to the threshold of

5% (see Table 5 in the Appendix). Overall, these results show that selection seems to operate mostly on people's stable levels of well-being (in the sample used for the FEIS models).

Discussion

Loneliness is a major challenge for contemporary society, and it affects a significant proportion of the population (Surkalim et al., 2022). Previous research has demonstrated that lonely people report significantly lower levels of well-being (Park et al., 2020), but much of this research has been based on cross-sectional data and research designs that are poorly suited to the task of clarifying whether loneliness is detrimental to well-being. Moreover, the few longitudinal studies using within estimators have analysed only psychiatric outcomes, and they have found surprisingly little evidence supporting the hypothesis that loneliness contributes to mental health problems (Joshanloo, 2022; Luo, 2022; Griffin et al., 2022; Kristensen et al., 2022; Mayerl et al., 2022). Against this backdrop, it was necessary to investigate whether loneliness has a negative effect on subjective well-being (the causation hypothesis) or whether chronically unhappy people are more likely to feel lonely (the selection hypothesis). The aim of the present study was to examine the effect of loneliness on subjective well-being while ruling out the selection of chronically unhappy people into loneliness as a competing explanation. For this purpose, I used FE models and panel data from the UKHLS 2017–2021.

Initially, I estimated POLS models, which showed that lonely people reported lower levels of life satisfaction. This result confirmed the findings of a large meta-analysis, which showed that the link between loneliness and well-being is one of the strongest links across all health outcomes analysed (Park et al., 2020). Subsequently, I proceeded to use FE models to test the causation hypothesis empirically, according to which the observed association reflects a negative effect of loneliness on well-being. The results revealed that a substantial association between loneliness and life satisfaction persisted even after accounting for the selection of chronically unhappy people into loneliness. The remaining association supports the causation hypothesis because it cannot be explained by the type of selection mentioned above. Furthermore, the present study demonstrated that loneliness is detrimental to subjective well-being in both men and women and in both younger (<50 years) and older people (50+years). Thus, robust support for the causation hypothesis can be found in all the sociodemographic groups analysed. Although this finding may not be particularly surprising, as few would doubt that lacking satisfying social relationships is detrimental to subjective well-being, this study is the first to test this

view empirically using appropriate methods of panel data analysis. This finding is in line with those of two previous studies using within estimators on panel data, which reported weak to moderate effects on depressive symptoms, (social) anxiety, and paranoia (Lim et al., 2016; McDowell et al., 2021). However, this finding contrasts with other findings of no or very weak effects on symptoms of depression and anxiety in adolescents (Kristensen et al., 2022) and on depressive symptoms in older adults (Joshanloo, 2022; Luo, 2022; Griffin et al., 2022; Mayerl et al., 2022).

The results are remarkably robust to the measurement of loneliness used. This finding is important because direct and indirect measures of loneliness, which have been widely used in loneliness research, have different strengths and weaknesses that could have affected the substantive conclusions of this study (Office for National Statistics, 2018). On the one hand, direct measures ask respondents about their feelings of loneliness directly, but they can lead to social desirability bias because people may be reluctant to openly discuss their feelings of loneliness due to stigma and feelings of shame. On the other hand, indirect measures circumvent this problem by avoiding the use of the term 'lonely'. However, as respondents are not asked about loneliness directly, it is uncertain whether they interpret items such as 'feeling left out' as reflecting experiences of loneliness. Encouragingly, the results of this study revealed that both measures yielded highly consistent results. In fact, this study is the first to show that both measures can be used reliably to investigate the impact of loneliness on well-being.

The negative effect of loneliness on well-being can be explained by several factors, such as a lack of satisfaction of the basic need to belong (Baumeister & Leary, 1995), deprivation of psychosocial resources, such as meaning in life and self-esteem (Thoits, 2011), and cognitive biases leading to problematic social behaviour and thus ultimately to interpersonal problems (Spithoven et al., 2017; Cacioppo & Hawkley, 2009). As a result, lonely people are often trapped in a vicious cycle of increasing feelings of loneliness, cognitive biases, and negative social interactions, which results in high levels of emotional distress (Cacioppo & Hawkley, 2009). In contrast, one can only speculate about the stable characteristics that drive the selection of chronically unhappy people into loneliness. Research from different fields has indicated that early traumatic experiences, genetic predispositions, and personality traits could be key drivers of selection (Bartels, 2015; Spithoven et al., 2019; de Heer et al., 2022; Buecker et al., 2020; DeNeve & Cooper, 1998). However, further research is needed to clarify the processes underlying the selection of chronically unhappy people into loneliness.

The main conclusions of this study may be affected by a number of limitations. First, the FE model uses only the variation within individuals over time, which is intended to account for stable confounders that are difficult to observe. Nevertheless,

loneliness may have a stronger effect on people who often feel lonely over longer periods. Due to the limited number of observations available for the present study, it was not possible to determine whether the duration of exposure moderates the effect of loneliness on well-being. Second, the FE model is based on the strict exogeneity assumption, which is violated, for example, when unobserved time-varying confounders (i.e., changes in other characteristics that influence both loneliness and well-being) are present. Although I accounted for social connections, employment status, and financial difficulties as a standard set of time-varying covariates, unobserved changes in other life circumstances and psychological states may be present and could thus still confound the association between loneliness and well-being. Furthermore, strict exogeneity does not hold in the case of reverse causality (i.e., when well-being increases the risk of loneliness above and beyond a person's disposition to be (un)happy). Although this possibility certainly exists, it seems plausible to assume that a general disposition towards (un)happiness is more important for the cultivation of satisfying social connections than are short-term fluctuations in well-being. Research on psychiatric outcomes has also suggested that this is likely to be the case, as limited evidence indicates that mental health problems contribute to feelings of loneliness (Lim et al., 2016; McDowell et al., 2021; Joshanloo, 2022; Luo, 2022; Griffin et al., 2022; Mayerl et al., 2022). It is also important to note that the FEIS model relaxes the strict exogeneity assumption, as it must hold only conditional on the individual-specific trajectories. Taken together, these arguments suggest that any bias resulting from a violation of the strict exogeneity assumption, if such a violation exists, is likely to be small. Finally, the exclusion of observations was slightly selective in terms of social connections and financial resources. This may have led to an underestimation of the impact of loneliness on subjective well-being, as more resilient individuals with more social and financial resources tended to remain in the sample.

Overall, the present study provides further support for the claim that social connections are a key element of happiness. The results show that when people fail to establish satisfying social connections and thus develop feelings of loneliness, this situation has a negative effect on their levels of subjective well-being. Considering the fact that hundreds of millions of people worldwide report problematic levels of loneliness (Surkalim et al., 2022), this finding is highly relevant to policymakers. In particular, replication of this finding in future studies would suggest that policies and interventions aimed at fostering social connections and reducing feelings of loneliness may also be effective in improving the overall well-being of the general population.

Appendix

Table 2 Within-individual variation in loneliness (UCLA Loneliness Scale)

Loneliness at time t	Loneliness at time t + 1			
	Hardly ever/ never lonely	Sometimes lonely	Often lonely	Total
Hardly ever/never lonely	27,445	6,228	316	33,989
	80.75	18.32	0.93	100.00
Sometimes lonely	5,187	10,430	1,383	17,000
	30.51	61.35	8.14	100.00
Often lonely	303	1,373	1,195	2,871
	10.55	47.82	41.62	100.00
Total	32,935	18,031	2,894	53,860
	61.15	33.48	5.37	100.00

Notes: Absolute and relative row frequencies are shown

Source: UK Household Longitudinal Study 2017–2021, own calculations

Table 3 Within-individual variation in loneliness (Single-item measure)

Loneliness at time t	Loneliness at time t + 1			
	Hardly ever/ never lonely	Sometimes lonely	Often lonely	Total
Hardly ever/never lonely	28,128	5,679	493	34,300
	82.01	16.56	1.44	100.00
Sometimes lonely	4,950	9,039	1,603	15,592
	31.75	57.97	10.28	100.00
Often lonely	434	1,630	1,904	3,968
	10.94	41.08	47.98	100.00
Total	33,512	16,348	4,000	53,860
	62.22	30.35	7.43	100.00

Notes: Absolute and relative row frequencies are shown

Source: UK Household Longitudinal Study 2017–2021, own calculations

Table 4 Effect of loneliness on life satisfaction by measure of loneliness (corresponds to Fig. 1)

	UCLA Loneliness Scale		Single-item measure	
	POLS (M1)	FE (M2)	POLS (M3)	FE (M4)
Loneliness				
Hardly ever/never lonely	Reference	Reference	Reference	Reference
Sometimes lonely	-0.777***	-0.345***	-0.702***	-0.318***
	(0.011)	(0.014)	(0.011)	(0.014)
Often lonely	-1.777***	-0.848***	-1.644***	-0.803***
	(0.026)	(0.031)	(0.023)	(0.028)
Age in years	-0.004***	-0.019*	-0.005***	-0.019*
	(0.001)	(0.008)	(0.001)	(0.008)
Female	0.056***		0.075***	
	(0.010)		(0.011)	
Employment status				
Employed	Reference	Reference	Reference	Reference
Unemployed	-0.218***	-0.114**	-0.206***	-0.115***
	(0.029)	(0.035)	(0.029)	(0.035)
Retired	0.280***	0.087*	0.298***	0.090*
	(0.017)	(0.038)	(0.017)	(0.038)
Sick/disabled	-0.927***	-0.281***	-0.920***	-0.281***
	(0.034)	(0.063)	(0.035)	(0.062)
Inactive/homemaker	0.053*	0.050	0.068**	0.055
	(0.025)	(0.035)	(0.025)	(0.035)
Student	0.184***	0.078*	0.204***	0.080*
	(0.027)	(0.039)	(0.026)	(0.039)
Financial deprivation				
Mild	Reference	Reference	Reference	Reference
Moderate	-0.561***	-0.206***	-0.566***	-0.210***
	(0.012)	(0.016)	(0.012)	(0.016)
Severe	-1.141***	-0.579***	-1.153***	-0.581***
	(0.022)	(0.027)	(0.022)	(0.027)
Relationship status				
Single	Reference	Reference	Reference	Reference
Living apart	0.068***	0.073*	0.059**	0.049+
	(0.020)	(0.030)	(0.020)	(0.030)
Living together	0.077***	0.167**	0.054*	0.133*
	(0.022)	(0.056)	(0.022)	(0.056)
Marital status				
Never married	Reference	Reference	Reference	Reference
Married	0.067***	-0.062	0.072***	-0.054
	(0.018)	(0.042)	(0.019)	(0.042)
Separated/divorced	0.011	-0.018	0.020	-0.014
	(0.021)	(0.050)	(0.021)	(0.050)
Widowed	0.120***	0.006	0.194***	0.042
	(0.028)	(0.072)	(0.029)	(0.072)

Table 4 (continued)

	UCLA Loneliness Scale		Single-item measure	
	POLS (M1)	FE (M2)	POLS (M3)	FE (M4)
Living alone	0.093***	-0.011	0.091	-0.014
	(0.021)	(0.046)	(0.021)	(0.046)
Single parent	-0.037	-0.047	-0.031	-0.068
	(0.034)	(0.065)	(0.035)	(0.064)
Interview mode				
Face-to-face	Reference	Reference	Reference	Reference
Telephone	0.339***	0.379***	0.353***	0.383***
	(0.027)	(0.032)	(0.027)	(0.031)
Web	-0.080***	-0.162***	-0.088***	-0.167***
	(0.011)	(0.018)	(0.011)	(0.018)
Intercept	5.775***		5.807***	
	(0.027)		(0.027)	
Adjusted R²	0.281		0.275	
Within R²		0.047		0.046
Observations	85,083	85,083	85,083	85,083
Individuals	31,223	31,223	31,223	31,223

Notes: Significance levels are $+p<0.1$, $* p<0.05$, $** p<0.01$, $*** p<0.001$. Unstandardised regression coefficients are shown with panel-robust standard errors in parentheses. All models were additionally adjusted for period effects, and the POLS models were adjusted for gender

Source: UK Household Longitudinal Study 2017–2021, own calculations

Table 5 Artificial regression test (FEIS vs. FE)

	Loneliness only			All variables		
	Chi²	df	$p (>\text{Chi}^2)$	Chi²	df	$p (>\text{Chi}^2)$
UCLA Loneliness Scale	3.89	2	0.143	21.91	21	0.405
Single-item measure	6.98	2	0.031	25.58	21	0.223

Notes: FE = fixed-effects model, FEIS = fixed-effects individual-slopes model. The ART was conducted on the full models with covariates. The first test considered only the subset of loneliness variables, while still accounting for the covariates. The second test considered all variables in the model combined

Source: UK Household Longitudinal Study 2017–2021, own calculations
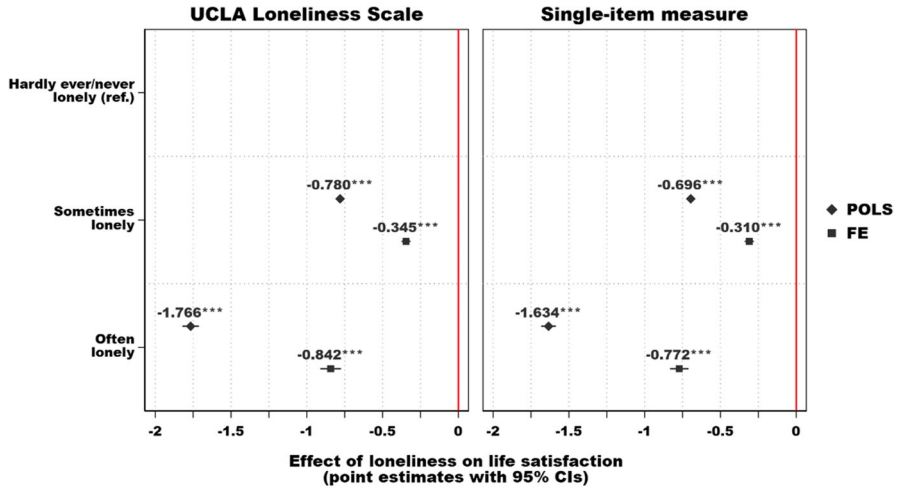
Fig. 2 Effect of loneliness on life satisfaction by measure of loneliness (excluding observations collected during the COVID-19 pandemic ($N_{obs} = 73{,}314$, $N_{ind} = 29{,}235$)
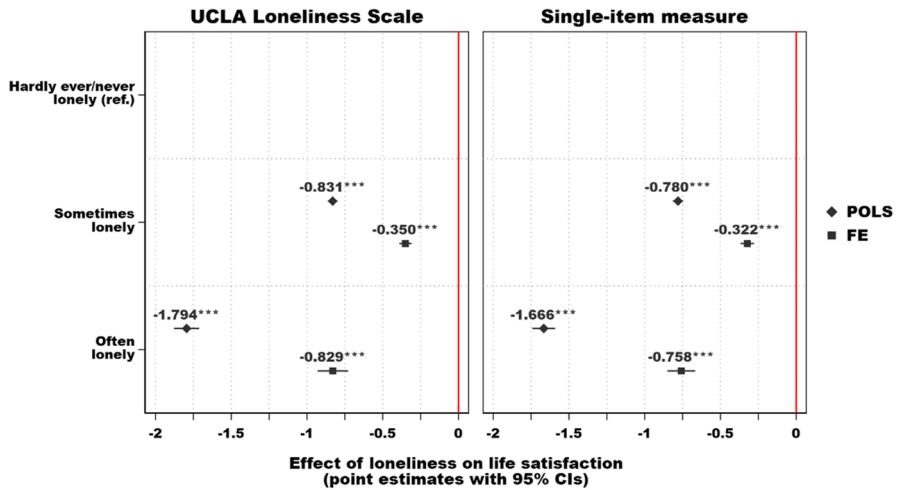
Fig. 3 Effect of loneliness on life satisfaction among men by measure of loneliness ($N_{obs} = 37{,}802$, $N_{ind} = 13{,}867$)
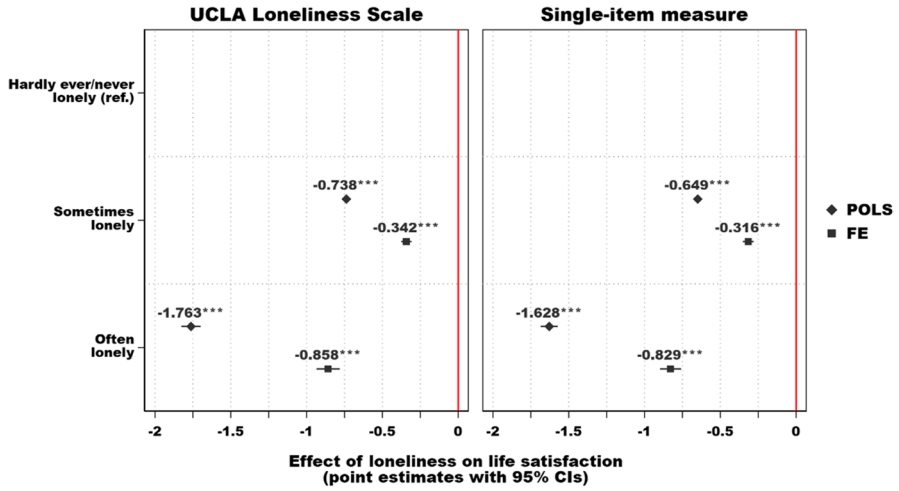
Fig. 4 Effect of loneliness on life satisfaction among women by measure of loneliness (N_{obs} = 47,281, N_{ind} = 17,356)
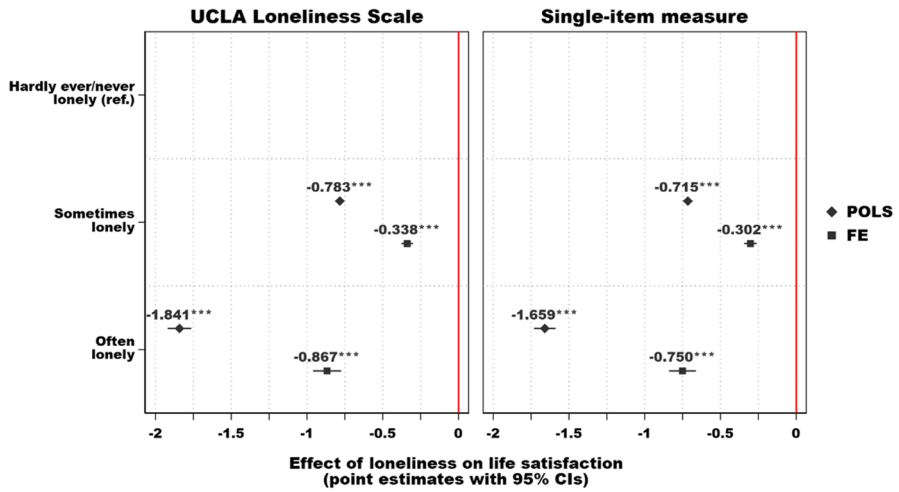

Fig. 5 Effect of loneliness on life satisfaction among individuals 50 years of age or older by measure of loneliness (N_{obs} = 45,108, N_{ind} = 16,330)
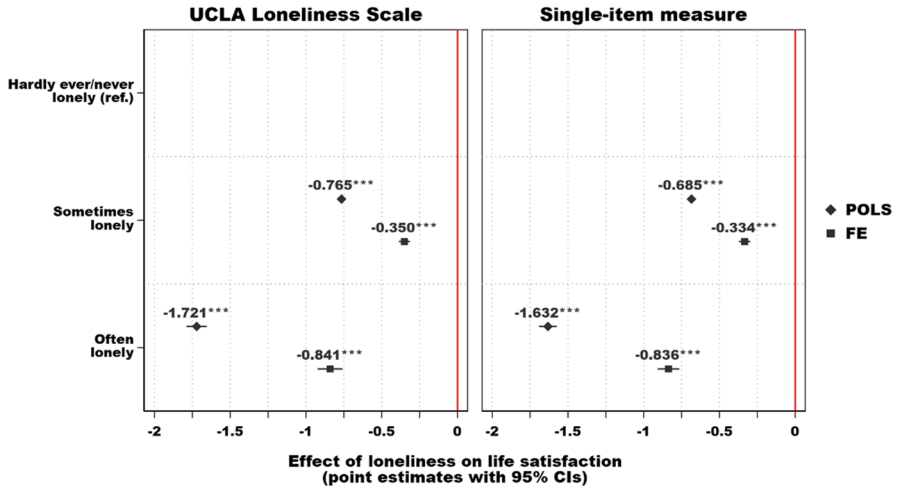
Fig. 6 Effect of loneliness on life satisfaction among individuals under 50 years of age by measure of loneliness ($N_{obs} = 38,690$, $N_{ind} = 14,673$)
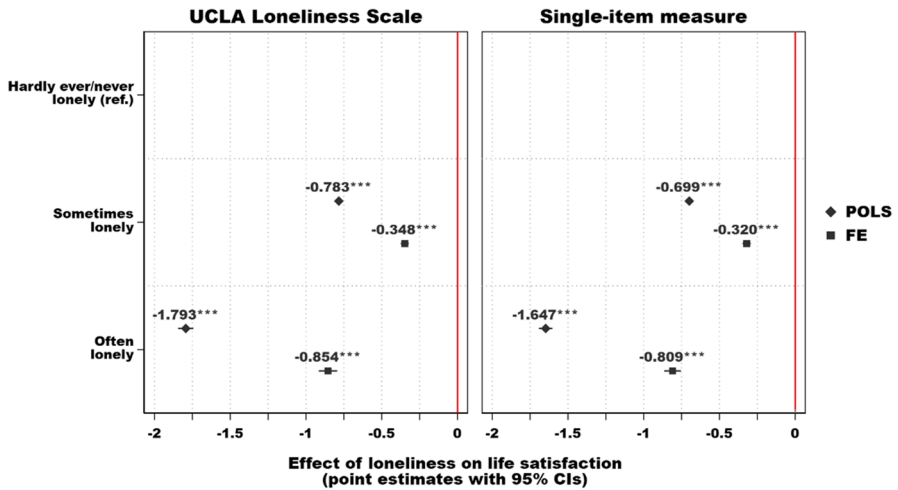
Fig. 7 Effect of loneliness on life satisfaction without adjusting for social connections by measure of loneliness ($N_{obs} = 85,083$, $N_{ind} = 31,223$)

Fig. 8 Effect of loneliness on life satisfaction in the FEIS and FE models by measure of loneliness (N_{obs} = 67,911, N_{ind} = 22,637)

Declarations

Conflict of interest The author has no conflict of interest to disclose.

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