

Overall, emotional and social loneliness and their associated factors: a large-scale cross-sectional study of young and middle-aged adults in Germany

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Abstract

Background

Loneliness is increasingly recognized as a major public health concern, yet little is known about the distinct patterns and associated factors of emotional and social loneliness during young and middle adulthood. This study examined age-related differences in overall, emotional, and social loneliness and associated sociodemographic, social, health-related, and personality factors among adults in Germany.

Methods

We analyzed nationally representative data from the German Family Demography Panel Study (FReDA), including 14,443 adults aged 18 to 51 years. Loneliness was assessed using the validated De Jong Gierveld Loneliness Short Scale, distinguishing overall, emotional, and social loneliness. Multivariable regression models examined associations with sociodemographic, social, health-related, and personality factors. Analyses were stratified by age and gender.

Results

High levels of loneliness were common, with 24.3% of participants reporting intense emotional loneliness, 29.6% intense overall loneliness, and 35.9% intense social loneliness. Overall loneliness remained relatively stable across age groups. In contrast, emotional loneliness decreased with age, whereas social loneliness increased. Social relationships showed the strongest protective associations, particularly for social loneliness: Discussing personal matters within one's social network ($\beta = -0.32$, 95% CI -0.37 to -0.28) and having a partner ($\beta = -0.21$, 95% CI: -0.26 to -0.16) were associated with lower social loneliness, while first-generation migration background was associated with higher social loneliness ($\beta = 0.31$, 95% CI 0.24 to 0.38). Mental health burdens were consistently associated with higher loneliness, especially emotional loneliness, with depressed mood showing the strongest association ($\beta = 0.22$, 95% CI 0.17 to 0.27). Among personality traits, agreeableness was associated with lower social loneliness ($\beta = -0.19$, 95% CI -0.22 to -0.17), whereas neuroticism was associated with higher emotional loneliness ($\beta = 0.17$, 95% CI 0.14 to 0.20). Gender differences were generally small, and physical health conditions were not significantly associated with loneliness.

Conclusions

Loneliness in young and middle adulthood is multidimensional, with emotional and social loneliness showing distinct age-related patterns and associated factors. Social relationships appear to be the most important protective factors, while mental health problems and migration background are associated with increased vulnerability. Public health strategies should address different loneliness dimensions and strengthen social connections.

Background

Loneliness - defined as the subjective perception of insufficient quality or quantity of social relationships (1, 2) - is increasingly recognised as a public health concern (3, 4). It has been linked to a wide range of adverse health outcomes, including cardiovascular disease, depression, and premature mortality (5–7). Importantly, loneliness can both precede and result from poor health, reflecting a dynamic, bidirectional relationship with both physical and mental health (7, 8).

Most empirical studies have treated loneliness as a unidimensional construct, typically focusing on overall loneliness as the primary outcome (9–11, 6). Findings on age-related trajectories remain inconsistent, shaped by differences in measurement approaches (e.g., single-item vs. multi-item scales (12, 9)), the inclusion of relevant predictors (13, 14), study design (13, 10), and national or cultural context (13). Reported patterns range from U-shaped curves (15, 10, 16, 17), to non-linear trajectories (18, 19, 17), linear declines (20), and stable levels of overall loneliness (13). Yet, studies specifically focused on young and middle adulthood remain scarce, even though this life phase (often described as the “rush hour of life”) is marked by career development, family formation, and frequent mobility (14), all of which may increase vulnerability to loneliness (21, 14). The COVID-19 pandemic added an additional layer to these dynamics, as social restrictions and psychological stressors have been shown to affect both the experience of loneliness and its associated factors (22–26).

Despite this body of evidence, loneliness is more accurately conceptualised as a multidimensional construct, comprising emotional and social loneliness (27–29, 17, 30, 31). Emotional loneliness arises from the absence of close, intimate relationships (such as a partner, best friend, or confidant) who provide affection and attachment. Social loneliness reflects a perceived lack of broader social integration, such as companionship, belonging, and group membership (32, 33). These dimensions are theoretically independent, but may co-occur. However, only a limited number of studies have examined them separately, restricting insights into their distinct age- and gender-related patterns and their associated protective and risk factors (28, 34).

From a theoretical perspective, the distinction between emotional and social loneliness can be further informed by Granovetter's theory of the “strength of weak ties” (35). Granovetter distinguishes between strong ties, such as close friends, partners, or family members, which are characterised by emotional intimacy and frequent contact, and weak ties, such as acquaintances, colleagues, or more peripheral social contacts, which connect individuals to broader social networks and social structures. Applied to loneliness research, this framework suggests that emotional loneliness is primarily related to the absence or perceived inadequacy of strong ties, whereas social loneliness reflects deficits in weak ties and reduced integration into wider social networks. This perspective highlights that different types of social relationships may fulfil distinct social and emotional functions and provides a theoretical rationale for expecting divergent associations between emotional and social loneliness and their correlates across the life course. This network-based perspective can be further extended by incorporating Cacioppo's conceptualization of loneliness as perceived social isolation (2, 36), which emphasizes individuals' subjective evaluations of relationship quality in addition to objective network characteristics. From this integrated perspective, social loneliness arises mainly from

insufficient weak ties that facilitate social embeddedness, whereas emotional loneliness reflects deficits in close, emotionally meaningful relationships, even when the overall social network remains structurally intact.

Research on these protective and risk factors has primarily focused on overall loneliness (10, 37). Findings suggest that demographic factors, socio-economic and socio-cultural contexts, as well as physical and mental health problems, are often correlated with overall loneliness, with personality traits such as neuroticism also playing an important role (37). Much less is known, however, about factors associated with emotional and social loneliness. However, the distinction of weak and strong ties by Granovetter suggests that emotional and social loneliness are triggered by distinct characteristics (35). Existing studies have mainly examined sociodemographic and social variables, but findings are heterogeneous (34, 38, 29). Within sociodemographic variables, education shows mixed evidence: some studies report no association (38), others find protective effects limited to social loneliness in younger adults (29), and still others show modest protective effects in older adults (34). Evidence on migration background is likewise inconsistent, ranging from no association (34), to links with both dimensions (29), or with only one (38, 39). Previous research has described partnership as a protective factor, particularly for emotional loneliness (29, 34, 38), while having children appears to have no effect on either dimension (29). By contrast, the role of broader social networks in alleviating loneliness has been noted (40), but remains largely unexplored. While mental and physical health have been well studied in relation to overall loneliness (37), their influence on emotional and social loneliness is less clear. The limited available evidence suggests that subjectively diagnosed mental disorders are linked to higher levels of both emotional and social loneliness (29), but research based on clinically assessed conditions remains scarce and underdeveloped. Personality traits have received even less attention, with only one study among Norwegian students reporting positive correlations of neuroticism with emotional and social loneliness, while other traits were negatively associated (28). To date, however, no study has examined whether such associations also apply to middle-aged adults.

Taken together, research has provided important insights into overall loneliness but left critical gaps regarding emotional and social loneliness, particularly during young and middle adulthood. To address these gaps, this preregistered study investigates three interrelated research questions using large-scale, nationally representative data from German adults aged 18 to 51. First, we examine how overall, emotional, and social loneliness are distributed across young and middle adulthood, and whether distinct age-related differences emerge. Second, we explore associated protective factors across sociodemographic, social, health, and psychological domains, assessing whether they differ by loneliness type and strength of association. Third, we identify key associated risk factors for each dimension of loneliness and evaluate how these associations vary across emotional, social, and overall loneliness.

Methods

Dataset and Sample

We use data from the German Family Demographic Panel Study (FReDA) (41, 42), a large-scale representative survey of the German population aged 18–51. For our study, we focus on wave 1B (autumn/winter 2021/22), which includes 20,2 respondents and include information on depressed mood and partnership status from wave 1A (spring/summer 2021) and Big 5 personality traits from wave 2B (autumn/winter 2022/23). We excluded respondents who identified their gender as diverse ($N = 46$) due to the insufficient sample size, which did not allow for separate analyses. Analyses were conducted on complete cases, resulting in the exclusion of respondents with missing values for any of the variables of interest ($N = 5,732$). This results in a final sample size of $N = 14,443$. The majority of missingness (around two-thirds) was concentrated in the Big Five personality variables, which consist of 15 items and are therefore more prone to partial nonresponse. To assess the robustness of our findings, we additionally performed multiple imputation for the Big Five variables.

Variables

Loneliness: Overall loneliness, emotional loneliness and social loneliness are our dependent variables. The measurement is based on the De Jong Gierveld Loneliness Short Scale (DJGLS), which is validated for several age groups and countries (27). Emotional loneliness is measured with the questionnaire items “(1) I experience a general sense of emptiness”; “(2) I miss having people around”; “(3) I often feel rejected”. The items “(4) There are plenty of people I can rely on when I have problems”; “(5) There are many people I can trust completely” and “(6) There are enough people I feel close to” are used to measure social loneliness (see FReDA questionnaire and scale overview (41)(41)(41)⁴¹⁴¹(41)). The answer categories range from one to three, covering (“yes”, “more or less” and “no”). Processing the scale we follow the validated operationalization by De Jong Gierveld(43, 27). This entails counting the neutral (“more or less”) and positive (“yes”) answers on items 1, 2 and 3 for the emotional loneliness score. The neutral (“more or less”) and negative (“no”) answers on items 4, 5, and 6 are counted for the social loneliness score. Hence, for both dimensions the score ranges from zero (“not lonely”) to three (“intensely lonely”). The internal consistency, assessed using McDonald’s Omega, was acceptable for both dimensions (social loneliness: $\omega = 0.85$; emotional loneliness: $\omega = 0.71$). The overall loneliness score was calculated by summing the emotional and social loneliness scores, following the approach by De Jong Gierveld (43, 27), resulting in a total score ranging from 0 to 6. To facilitate graphical comparison of trends in emotional and social loneliness (each ranging from 0 to 3), with the trend in overall loneliness (ranging from 0 to 6), we divide the overall loneliness score by two. This rescaling results in a range from 0 (“not lonely”) to 3 (“intensely lonely”) across all three loneliness dimension studied in this paper. The distribution of respondents across each value is robust for both the original overall loneliness scale (ranging from 0 to 6) and the adjusted overall loneliness scale (ranging from 0 to 3) (see Supplement **Table A1**). To enable comparability across the three dimensions of loneliness, we conducted an analysis using standardized (z-score) values. The results remain robust (see Supplement **Table A12** to **Table A14**).

Associated Factors

To identify the protective and risk factors associated with loneliness, we analysed four distinct sets of variables, which capture socio-demographic characteristics, social relationships, health-related variables, and personality traits (Big Five). Table 1 provides an overview of these sets, their corresponding dimensions, and operationalisation. The selection of variables was guided by prior research on established protective and risk factors for overall loneliness

and the existing research gaps regarding emotional and social loneliness. Our aim was to test whether these factors, well documented for overall loneliness, apply differently to emotional and social loneliness. We also checked for multicollinearity among the variables; correlations ranged from -0.35 to 0.28 (see Supplement **Table A2**). The mean variance inflation factor across all predictors is 1.92 , suggesting minimal risk of bias due to shared variance among the predictors.

We started with the *base model* that includes age (in categories 18–25, 26–30, 31–35, 36–40, 41–45, 46–51) and binary gender, as both have consistently been discussed in the literature as relevant correlates of loneliness (10, 16, 19, 18, 20, 44).

The first extended set covered *socio-demographic variables*, with higher socio-economic status consistently identified as a protective factor against overall loneliness (10, 45, 18, 17). Household financial security ("Making ends meet") was assessed using respondents' subjective evaluation on a six-point-scale, ranging from (1) "great difficulties" to (6) "very good". Educational background was classified according to the International Standard Classification of Education (ISCED) 2011 and summarised on a three-point scale: low (ISCED 0–2), middle (ISCED 3–4), and high (ISCED 5–8). Migration was also considered, given mixed evidence on its role in loneliness across different age groups and loneliness (29, 34, 38, 39). We distinguish between respondents with no migration background and those who are first- or second-generation migrants (see Table 1).

The second set captured *social relationships variables*, repeatedly identified as strong protective factors against overall loneliness (10, 45, 18, 17, 13). These includes partnership status (single, living-apart-together, cohabiting), as evidence highlights this variable as a leading protective factor for overall loneliness (10, 45, 18, 17, 13), while the association has been mainly described with emotional loneliness (29, 34, 38). The role of having children remains unclear across all dimensions of loneliness (18, 46) in the current literatures and was incorporated as a yes/no variable. Furthermore, the role of respondents' social networks (measured by whether personal matters are discussed with friends, acquaintances, neighbors, or colleagues; yes/no) is insufficiently researched. Current literature supports a crucial role of friend-based social support in alleviating loneliness (40), however, its association with emotional and social loneliness remains unclear. Following Granovetter's distinction between strong and weak ties, partnership status and broader social network indicators were conceptually mapped onto different types of social relationships.

The third set included *health-related variables*, as both mental and physical conditions have consistently been associated with overall loneliness (10, 17, 37) and partly with emotional and social loneliness (29). Mental health was captured through anxiety disorder (established medical diagnoses, self-reported) and depressed mood, assessed by asking about past-week experiences ([1] "never" to [4] "most/all of the time."), which was recoded into a binary variable ([1] and [2] = [0] "no"; [3] and [4] = [1] "yes"). Overall life satisfaction was measured with the validated 11-point Likert scale (47), given that higher life satisfaction may reduce loneliness (48). However, evidence regarding its association with emotional and social loneliness is scarce (49). Physical health was assessed based on common diseases in the target population according to the Global Burden of Disease Study (50, 51), including type 2 diabetes, hypertension, cancer, and asthma (all-self-reported medical diagnoses). These indicators were included to examine associations between physical health and loneliness in young and middle adulthood, given heterogeneous and partly inconclusive evidence in prior studies (10, 37, 29), particularly with respect to diagnosis-based indicators and emotional and social loneliness dimensions. Obesity was classified using the World Health Organization's Body Mass Index (BMI) threshold of > 30 (52). In addition, two variables addressed perceived burden and positive experiences during the COVID-19 pandemic, as data collection occurred during the later phase of the pandemic and potential effects could not be excluded (22–26).

The fourth variable set comprised the Big Five *personality traits*, each of which may function as either a risk or a protective factor (53, 28). We applied the validated Big Five Inventory – 2 Extra Short Form (BFI-2-XS) (54). Instead of the 60-item BFI-2 scale, the BFI-2 Extra Short Form assesses each of the five personality domains (extraversion, agreeableness, conscientiousness, neuroticism and openness to experience) with three items - one per facet - resulting in total of 15 items. Although its brevity is

Table 1
Overview of variable sets, dimensions and variables

Variable Sets	Dimension	Operationalization	
		Variable	Values
Base Model	Age	Age categories	18–25
			26–30
			31–35
			36–40
			41–45
			46–51
	Gender	Gender (binary)	(1) men (2) female
Socio-Demographic Variables	Income	Subjective evaluation of household financial security (Making ends meet)	(1) great difficulties (6) very good
	Educational background	ISCED Categories	(1) low: ISCED 0–2
			(2) middle: ISCED 3–4
			(3) high: ISCED 5–8
	Migration Background	Migration Background	(0) no migration background
			(1) 1st generation migrant
			(2) 2nd generation migrant
Social Relationships	Children	Respondent has children	(0) no (1) yes
	Partnership	Partnership Status	(1) single
			(2) Living Apart Together
			(3) cohabitation
	Social Network	Discuss personal matters with friends, acquaintances, neighbours, and colleagues	(0) no (1) yes
Health-Related Variables	Mental Health	Doctor has diagnosed anxiety disorder	(0) no (1) yes
		Depressed Mood	(0) no (1) yes
		Life Satisfaction	(0) not at all satisfied (10) completely satisfied
	Physical Health	Doctor has diagnosed type 2 diabetes	(0) no (1) yes
		Doctor has diagnosed hypertension	(0) no (1) yes
		Doctor has diagnosed cancer	(0) no (1) yes
		Doctor has diagnosed asthma	(0) no (1) yes
		Obesity (self-reported BMI)	(0) BMI < 30 (1) BMI ≥ 30

COVID-19 Pandemic	Personally heavily burdened	(1) strongly disagrees
		(5) strongly agree
	Can also see a positive aspect	(1) strongly disagrees
		(5) strongly agree
Personality	Big Five Inventory	Extraversion
		(1) not at all
		(5) absolutely
		Agreeableness
		(1) not at all
		(5) absolutely
		Conscientiousness
		(1) not at all
		(5) absolutely
		Neuroticism
		(1) not at all
		(5) absolutely
		Openness to new experiences
		(1) not at all
		(5) absolutely

Source

FReDA Panel, wave 1 (autumn/winter 2021/22).

known to reduce internal consistency compared to the full scale (McDonald’s Omega ranging from ω 0.43 to ω 0.68 across domains), the BFI-2-XS has been validated for domain-level assessment, and our large sample size provides sufficient statistical power to detect meaningful associations (55). Response options for all items ranged from (1) “not at all” to (5) “absolutely” (see Table 1). The full item battery can be found in the supplement (**Table A3**).

Analyses

We employed multiple ordinary least squares (OLS) regressions to examine the occurrence of three dimensions of loneliness – overall, emotional, and social – across age groups and gender, as well as their associations with different sets of variables. Separate regression models were estimated for each loneliness dimension. For each dimension, the variable sets were included stepwise in the following order: (1) age and gender (base model), (2) socio-demographic variables, (3) social relationship variables, (4) health-related variables, and (5) personality traits. Variable were entered stepwise to assess the contribution of loneliness while accounting for the interplay between multiple, potential intersecting risk factors. This stepwise approach allowed us to assess the unique contribution of each variable set while accounting for potential overlaps and interdependencies.

To illustrate predicted levels of loneliness by age and gender, we calculated marginal means, estimating values for each age category and sex while holding all other variables at their sample means. These estimates were used to produce the graphical trends shown in the results.

Statistics and Reproducibility

The analyses were conducted using STATA 18. The code used for the analyses will be made publicly available on the Open Science Framework (OSF) upon publication.

Results

Characteristics of Participants

Table 2
Prevalence and Gender Composition of Individuals Experiencing Intense Loneliness (overall, emotional and social loneliness)

Full Sample	Intense overall loneliness	Intense emotional loneliness	Intense social loneliness
	29.61%	24.30%	35.85%
Gender			
Female	14.16%	13.29%	17.73%
Male	15.45%	11.01%	18.12%

Note

Percentages under gender indicate the share of individuals reporting intense loneliness in each category (overall, social, emotional). Intense loneliness corresponds to a score of 3 on a scale ranging from 0 to 3. The high levels of loneliness reported in our study may, at least partly, reflect the timing of data collection during the COVID-19 pandemic.

Source

FReDA Panel, wave 1 (autumn/winter 2021/22). Weighted prevalence. Authors' own calculations.

The final sample comprised 14,443 participants (mean age of 34.8 years) with a near-equal gender distribution (49.8% male, 50.2% female). 29.61% of respondents report intense overall loneliness, representing the highest score on the 0–3 loneliness scale. The prevalence of intense loneliness is higher for social loneliness (35.9%). While both overall and social loneliness are fairly evenly distributed across genders, females report intense emotional loneliness slightly more often than males, with a prevalence in the full sample of 24.3% (see Table 2).

These prevalence rates reflect extreme loneliness scores, while mean values capture the full distribution (see Table 3). Respondents' ratings of overall loneliness (mean = 1.52) and emotional loneliness (mean = 1.49) are fairly evenly distributed across the 0 to 3 scale. Social loneliness, however, is more polarized, with many scoring 0 (31.0%) or 3 (35.8%). The frequency and mean values for variables relating to sociodemographic characteristics, social relationships, health and personality traits are listed in Table 3.

Table 3
Overview of Participant Characteristics

Variables		Proportions/ Mean (SD)	Min	Max
Loneliness Variables	Overall Loneliness	Mean: 1.52	0	3
	0 (Not lonely)	11.9%		
	0.5	17.0%		
	1	14.3%		
	1.5	14.6%		
	2	12.7%		
	2.5	12.8%		
	3 (Intensely Lonely)	16.8%		
	Emotional Loneliness	Mean: 1.49	0	3
	0 (Not Lonely)	22.8%		
	1	29.8%		
	2	23.1%		
	3 (Intensely Lonely)	24.3%		
	Social Loneliness	Mean:1.56	0	3
	0 (Not lonely)	31.0%		
	1	17.8%		
	2	15.3%		
	3 (Intensely Lonely)	35.9%		
Base Model	Age	Mean: 34.77	18	51
	18–25	20.1%		
	26–30	14.9%		
	31–35	17.1%		
	36–40	16.8%		
	41–45	15.5%		
	46–51	15.5%		
	Sex		0	1
	Male	49.8%		
	Female	50.2%		
Socio-Demographic Variables	Subjective Evaluation of HH Financial Security	4.43 (1.26)	1	6
	Educational Background		1	3
	Low	10.7%		
	Middle	56.3%		
	High	33.0%		
	Migration Background		0	2
	No Migration Background	72.1%		
	1. Generation Migrant	16.2%		
	2. Generation Migrant	11.7%		
Social Relationships	Children		0	1
	No Children	52.6%		
N = 14,443				

	Kids	47.4%		
	Partnership Status		1	3
	Single	28.9%		
	Living Apart Together	12.2%		
	Cohabitation	58.9%		
	Discuss Personal Matters with Social Network		0	1
	No	39.3%		
	Yes	60.7%		
Health-Related Variables	Anxiety		0	1
	No	89.3%		
	Yes	10.7%		
	Depressed Mood		0	1
	No	85.7%		
	Yes	14.3%		
	Life Satisfaction	7.21 (1.87)	0	10
	Type 2 Diabetes		0	1
	No	97.4%		
	Yes	2.6%		
	Hypertension		0	1
	No	89.1%		
	Yes	10.9%		
	Cancer		0	1
	No	98.2%		
	Yes	1.8%		
	Asthma		0	1
	No	91.1%		
	Yes	8.9%		
	Obesity		0	1
	No	82.2%		
	Yes	17.8%		
	COVID-19 Pandemic: See a Positive Side	3.50 (1.13)	1	5
	COVID-19 Pandemic: Negatively Affected	3.20 (1.17)	1	5
Big Five	Extraversion	3.03 (0.74)	1	5
	Agreeableness	3.63 (0.73)	1	5
	Conscientiousness	3.65 (0.78)	1	5
	Neuroticism	2.95 (0.65)	1	5
	Openness to Experience	3.30 (0.79)	1	5
N = 14,443				

Source

FReDA Panel, wave 1 (autumn/winter 2021/22). Descriptive statistics are weighted. Authors' own calculations.

Base Model Estimates of Overall, Emotional, and Social Loneliness

Figure 1 presents mean levels of overall, emotional, and social loneliness across age groups from the base model, which includes age and gender only. The main results are based on complete-case analyses. A robustness check using multiple imputation yielded consistent findings (see Supplement **Table A4 - A6**). Overall loneliness was most pronounced among 18-25-year-olds (*mean: 1.50; 95% CI: 1.46, 1.53, $p < .001$*), lower in the 26–30 age group (*mean: 1.38; 95% CI: 1.34, 1.42, $p < .001$*), and somewhat higher again in older age groups, with a mean of 1.47 (95% CI: 1.42, 1.51, $p < .001$) in the 46-51-year-olds. Emotional loneliness was highest in the youngest group (18–25 years; *mean: 1.65; 95% CI: 1.61, 1.69, $p < .001$*) and lower in the 26–30 group, with successively lower values in subsequent age groups, reaching the lowest levels in the 46–51 years age group (*mean: 1.33; 95% CI: 1.28, 1.38, $p < .001$*). Levels were relatively stable thereafter. In contrast, social loneliness was lowest among 18-25-year-olds (*mean: 1.35; 95% CI: 1.30, 1.39, $p < .001$*) and 26–30-year-olds (*mean: 1.28; 95% CI: 1.23, 1.34, $p < .001$*), and higher in older groups, with the highest mean observed in the 46–51 age group (*mean: 1.60; 95% CI: 1.55, 1.66, $p < .001$* ; see Supplementary **Table A7**).

Note

Base model includes age (categorical) and gender (binary). Loneliness was measured on a scale ranging from 0 to 3. To enhance interpretability, the y-axis was restricted to the observed value range; the full scale is provided in Supplementary **Figure A1** with corresponding regression table in Supplementary **Table A7**.

Source

FReDA Panel, wave 1 (autumn/winter 2021/22). Authors' own calculations.

Associations with Protective and Risk Factors for Overall, Emotional, and Social Loneliness

In the next step, the variable sets (1) socio-demographic variables, (2) social relationships, (3) health-related variables, and (4) personality traits were added sequentially to the base model. The stepwise regression results for all included variables are provided in Supplementary **Tables A8 – A10**. In Table 4, we report the variables included in the full model that were statistically significant ($p < 0.05$).

Social relationships showed the most consistent negative associations with loneliness across all dimensions, with the strongest associations observed for social loneliness (e.g., social network: β : -0.32; 95% CI: -0.37, -0.28, $p < .001$, $R^2 = .15$; partnership [living apart together]: β : -0.23; 95% CI: -0.29, -0.16, $p < .001$, $R^2 = .15$; partnership [cohabitation]: β : -0.21; 95% CI: -0.26, -0.16, $p < .001$, $R^2 = .15$). Life satisfaction showed a stable, though less pronounced, negative association with all loneliness dimensions (β : -0.12; 95% CI: -0.13, -0.11, $p < .001$, $R^2 = .20$ for overall loneliness, $R^2 = .19$ for emotional loneliness, $R^2 = .15$ for social loneliness). Older age (from approximately 36 years onward) was associated with lower levels of emotional loneliness (β ranging from -0.14 to -0.12, $p < .001$). Among the Big Five personality traits, agreeableness showed the most pronounced association with lower levels of social (β : -0.19; 95% CI: -0.23, -0.15, $p < .001$, $R^2 = .15$) and overall loneliness (β : -0.12; 95% CI: -0.14, -0.10, $p < .001$, $R^2 = .20$). A better subjective evaluation of household financial security was associated with lower levels of loneliness (β ranging from -0.07 to -0.06, $p < .001$). Additionally, perceiving positive aspects during the COVID-19 pandemic was negatively associated with loneliness, although effect sizes were small (β ranging from -0.04 to -0.02, $p < .01$).

A first-generation migration background was positively associated with higher levels of social (β : 0.31; 95% CI: 0.24, 0.38, $p < .001$, $R^2 = .15$) and overall loneliness (β : 0.21; 95% CI: 0.15, 0.26, $p < .001$, $R^2 = .20$). In contrast, second-generation migrants showed substantially smaller associations, as exemplified by social loneliness (β : 0.08; 95% CI: 0.01, 0.14, $p = .014$, $R^2 = .15$). Indicators of mental health burden (depressed mood and anxiety disorders) were consistently associated with higher levels of loneliness across all dimensions, particularly in emotional loneliness [(depressed mood: β : 0.22; 95% CI: 0.17, 0.27, $p < .001$, $R^2 = .19$); (anxiety disorder: β : 0.11; 95% CI: 0.06, 0.17, $p < .001$, $R^2 = .19$)]. Age showed a positive association with social loneliness, with stronger associations observed in older age groups (β ranging from 0.18 to 0.32, $p < .001$). Among the Big Five, neuroticism was positively associated with all loneliness dimensions, with the comparatively highest association with emotional loneliness (β : 0.17; 95% CI: 0.14, 0.20, $p < .001$, $R^2 = .19$). In addition, personal burden experienced during the COVID-19 pandemic was positively associated with emotional loneliness (β : 0.13; 95% CI: 0.11, 0.14, $p < .001$, $R^2 = .19$) and, to a lesser extent, overall loneliness (β : 0.07; 95% CI: 0.06, 0.08, $p < .001$, $R^2 = .20$). Finally, female gender was positively associated with emotional (β : 0.09; 95% CI: 0.05, 0.12, $p < .001$, $R^2 = .19$) and overall loneliness (β : 0.04; 95% CI: 0.01, 0.07, $p < .01$, $R^2 = .20$).

Neither physical health indicators, educational attainment, nor parental status were associated with any dimension of loneliness (Supplementary **Tables A8 – A10**). With regard to explained variance (R^2), the health status variable set contributed notably to the variance in overall and emotional loneliness. Further details are presented in Supplementary **Tables A8 – A10**.

Table 4
Factors Associated with Overall, Emotional, and Social Loneliness (n = 14,443)

	Overall Loneliness		Emotional Loneliness		Social Loneliness	
	β -Coefficient	95% CI	β -Coefficient	95% CI	β -Coefficient	95% CI
Protective Factors (negative associations)						
Social Network	-0.20	-0.23, -0.16	-0.07	-0.10, -0.03	-0.32	-0.37, -0.28
Partnership (living apart together)	-0.18	-0.23, -0.13	-0.14	-0.19, -0.08	-0.23	-0.29, -0.16
Partnership (cohabitation)	-0.18	-0.23, -0.14	-0.16	-0.21, -0.12	-0.21	-0.26, -0.15
Age 46–51 years	-	-	-0.14	-0.21, -0.07	-	-
Age 41–45 years	-	-	-0.14	-0.21, -0.08	-	-
Age 36–40 years	-	-	-0.12	-0.19, -0.06	-	-
Agreeableness	-0.12	-0.14, -0.10	-0.05	-0.07, -0.02	-0.19	-0.22, -0.17
Life Satisfaction	-0.12	-0.13, -0.11	-0.12	-0.13, -0.11	-0.12	-0.13, -0.11
Satisfaction with household income	-0.06	-0.08, -0.05	-0.06	-0.07, -0.04	-0.07	-0.09, -0.05
Extraversion	-0.05	-0.07, -0.03	-	-	-0.08	-0.11, -0.05
Openness for Experience	-	-	-	-	-0.04	-0.07, -0.02
Conscientiousness	-0.05	-0.07, -0.03	-0.07	-0.09, -0.04	-0.04	-0.07, -0.02
COVID-19: Positive Aspects	-0.03	-0.04, -0.01	-0.02	-0.04, -0.01	-0.04	-0.05, -0.02
Risk Factors (positive associations)						
Migration (1st generation)	0.21	0.15, 0.26	0.10	0.05, 0.16	0.31	0.24, 0.38
Depressed Mood	0.19	0.14, 0.24	0.22	0.17, 0.27	0.16	0.10, 0.22
Neuroticism	0.12	0.10, 0.15	0.17	0.14, 0.20	0.07	0.04, 0.10
Anxiety Disorder	0.11	0.06, 0.16	0.11	0.05, 0.17	0.10	0.04, 0.17
Age 46–51 years	0.09	0.03, 0.15	-	-	0.32	0.24, 0.40
Age 41–45 years	0.08	0.02, 0.14	-	-	0.30	0.21, 0.37
Age 36–40 years	0.06	0.03, 0.12	-	-	0.24	0.17, 0.32
COVID-19: Personal burden	0.07	0.06, 0.08	0.13	0.11, 0.14	-	-
Age 31–35 years	0.06	0.01, 0.12	-	-	0.18	0.11, 0.25
Migration (2nd generation)	0.05	0.00, 0.09	-	-	0.08	0.02, 0.14
Gender female	0.04	0.01, 0.07	0.09	0.05, 0.12	-	-

Socio-demographic variables Social relationships Health status Personality (Big Five)

Note

Coefficients and 95% CI (confidence intervals) are based on Model 4, which includes socio-demographic variables, social relationships, health status, and personality traits. The factors are presented in descending order based on the magnitude of their coefficients in overall loneliness and include only those that are statistically significant ($p < 0.05$). Protective and risk factors are defined based on the direction of their associations with loneliness; given the cross-sectional design, these associations do not imply causal effects.

Source

FReDA Panel, wave 1 (autumn/winter 2021/22). Authors' own calculations.

Full Model Estimates of Overall, Emotional, and Social Loneliness

Next, we stratified each loneliness dimension again by age in the fully adjusted model to analyse whether the inclusion of the variables was associated with differences in loneliness across age groups. The results show that the previously observed higher mean of overall loneliness among individuals aged 18–25 years in the base model was less pronounced in the fully adjusted model, resulting in only minor age-related differences (β ranging from 1.39 to 1.48, $p < .001$; Fig. 2, Supplement **Table A11**). However, differences across age groups in emotional and social loneliness remained, though at a reduced magnitude. Emotional loneliness was highest among 18-25-year-olds (mean: 1.51; 95% CI: 1.47–1.55, $p < .001$) and showed lower means in older age, with the lowest mean observed in the 46-51-year age group (mean: 1.37; 95% CI: 1.32–1.42, $p < .001$). Conversely, social loneliness was lowest in the youngest age group (mean: 1.28; 95% CI: 1.23–1.33, $p < .001$) and was higher in older groups, with the highest mean observed in the 46-51-year group (mean: 1.60; 95% CI: 1.54–1.65, $p < .001$).

Note

Full model including age (categorical) and gender (binary), and all variable sets from Models 1–4: socio-demographic characteristics, social relationships, health variables, and personality traits. Loneliness was measured on a scale ranging from 0 to 3. To enhance interpretability, the y-axis was restricted to the observed value range; the full scale is provided in Supplementary **Figure A2** with corresponding regression table in Supplementary **Table A11**.

Source

FReDA Panel, wave 1 (autumn/winter 2021/22). Authors' own calculations.

Loneliness by Gender: Overall, Emotional, and Social Loneliness

Gender-stratified analyses revealed no statistically significant differences in overall or social loneliness across any age group in the full model (Fig. 3, Supplement **Table A15**). For emotional loneliness there is a tendency for women to experience higher levels than men, with significant differences in the 31–35 and 36–40 age groups. In gender-specific models of associated protective and risk factors, only the Big Five personality trait 'openness to experience' showed a statistically significant difference, showing a small negative association with social loneliness in men (β : -0.09; 95% CI: -0.12, -0.05, $p < .001$) compared to women (β : -0.01; 95% CI: -0.05, 0.03, $p = .64$). No further statistically significant gender differences were identified. Detailed results are available in Supplementary **Table A16–17**.

Note

Full model including age (categorical) and gender (binary), and all variable sets from Models 1–4: socio-demographic characteristics, social relationships, health variables, and personality traits. Loneliness was measured on a scale ranging from 0 to 3. To enhance interpretability, the y-axis was restricted to the observed value range; the full scale is provided in Supplementary **Figure A3**, with corresponding regression tables in Supplementary **Tables A13–A14**.

Source

FReDA Panel, wave 1 (autumn/winter 2021/22). Authors' own calculations.

To examine potential interaction effects, we interacted gender and age with our predictor variable sets to examine whether different associated protective and risk factors are relevant depending on the specific age group or gender (see Supplementary **Table A18 and A19**).

Discussion

This study provides evidence on the age-related distribution of overall, emotional, and social loneliness as well as variables associated with these dimensions among adults aged 18 to 51 in Germany. Three key findings emerge: (1) Prevalence rates of intense loneliness among young and middle-aged adults were high, ranging from 24.3% for emotional loneliness to 29.6% for overall loneliness and 35.6% for social loneliness. (2) Emotional and social loneliness showed distinct and opposing patterns across age groups: Emotional loneliness was lower in older adults, whereas social loneliness was higher. In contrast, overall loneliness showed little variation across age categories. (3) Social relationships were consistently associated with lower loneliness levels across all dimensions, whereas mental health burdens and migration background were associated with higher loneliness levels. Concurrently, detailed analyses revealed that the loneliness dimensions were associated with different variables with varying associations, underscoring their conceptual distinction. However, given the large sample size, even small associations reached statistical significance. It is therefore crucial to consider the magnitude of the associations alongside p-values, as trivial effects may lack practical relevance despite statistical significance (56, 57). Throughout the discussion, we therefore focus on the magnitude of regression coefficients (β) when interpreting associations.

In our study, approximately one quarter to one third of young and middle-aged adults reported high levels of emotional, social, or overall loneliness, based on the validated DJGLS (43, 27). Although comparability with earlier research is limited by differences in measures and study designs, longitudinal evidence indicates that loneliness reached its peak, particularly among adolescents and young adults, during the COVID-19 pandemic in Germany. Although levels have since declined, evidence suggests that they remain elevated compared with pre-pandemic levels.(58). As our data collection coincided with the COVID-19 pandemic, the absolute prevalence reported here may partly reflect these exceptional circumstances. Nevertheless, the observed associations with socio-demographic, social, and psychological factors are likely to extend beyond the pandemic (37). In particular, the quantity and quality of social relationships, such as partnership status, living arrangements, and personal networks, emerge as the most consistently associated factors related to loneliness across contexts, including during the pandemic (37, 26). Pandemic-specific variables in our analyses complement this picture: perceiving the pandemic as burdensome was associated with higher levels of loneliness, while identifying positive aspects showed small negative associations with loneliness. This

pattern aligns with prior evidence that pandemic-related stress was associated with higher vulnerability, while resilience-related factors were associated with lower loneliness levels (25).

Age-related differences in overall loneliness were minimal in our study, indicating relative stability across young and middle adulthood. This finding is consistent with several large-scale studies reporting stable levels of loneliness among middle-aged adults (13, 10, 59, 15). However, it contrasts with research suggesting that loneliness peaks in young adulthood and declines thereafter (10, 59, 15). In our analysis, these apparent age-related differences were largely reduced after adjusting for social relationship variables (Model 2), resulting in relatively stable loneliness scores. This observed stability during a pivotal life stage aligns with the findings of Mund et al. (13), who conducted a meta-analysis of 75 longitudinal studies spanning the adult life course. Importantly, Mund and colleagues noted the lack of differentiation between emotional and social loneliness as a key limitation in the existing literature. Addressing this gap, our study disaggregated overall loneliness into its emotional and social components, revealing that the apparent age-related stability may mask divergent differences within its distinct dimensions. Specifically, we observed that emotional loneliness was lower in older age groups, whereas social loneliness was higher. Early adulthood is typically characterized by transitions such as leaving home, starting work or education, and forming new social ties, which may coincide with changes in social connectedness and perceived loneliness. At the same time, identity development and the search for autonomy may make young adults especially sensitive to social exclusion and unmet relational needs (20, 60). To date, only a limited number of studies have examined these distinct patterns during young and middle adulthood. Existing evidence on emotional loneliness within this age range generally shows lower levels in older age groups (29, 61, 62, 38), in line with our findings. In contrast, the evidence on social loneliness is more heterogeneous, with some studies reporting higher levels in older groups (62, 29) (consistent with our results) while others suggest relative stability (61) or lower levels (38).

Gender differences in overall loneliness among adults aged 18 to 51 were statistically significant but modest in magnitude, with women reporting slightly higher levels than men. This aligns with prior research showing that gender effects, when present, are typically small, albeit inconsistent in direction (17, 63, 10, 64, 65) and may vary by measurement instrument (e.g., single-item vs. multi-item scales) (11). For example, a meta-analysis by Maes et al. (64), synthesizing 751 effect sizes from nearly 400,000 individuals, found negligible gender differences in loneliness (Hedges' $g = 0.07$). When stratified by loneliness dimension, emotional loneliness was slightly but significantly higher among women aged 31–40, even after adjusting for covariates. Prior studies differentiating emotional and social loneliness are limited and mixed: some report higher emotional loneliness among women (38, 34, 39) (consistent with our findings), others find higher social loneliness (29) or no consistent differences (28).

Social networks and partnership status were the most consistently associated factors with lower loneliness across all dimensions in our study. This aligns with prior large-scale research showing that social and relational resources are among the strongest and most consistently associated social resources linked to lower loneliness across the life span (10, 13, 18, 17, 29). Our findings add nuance by highlighting dimension-specific variations in associations: social network ties showed the strongest negative association with social loneliness, were more modestly negatively associated with overall loneliness, and were only weakly negatively associated for emotional loneliness. A similar pattern was observed for partnership status, which was meaningfully associated with lower social loneliness but showed progressively weaker associations with overall and emotional loneliness. These findings contrast with earlier studies that reported stronger protective associations of partnership with emotional loneliness (29, 34, 38, 39), suggesting that relationship status may play a more complex, context-dependent role than previously assumed. In our study, having children was not associated with lower loneliness, consistent with other studies reporting no systematic associations between parenthood and loneliness (18). Instead, parenthood may also be associated with higher loneliness during transitional phases such as the empty-nest period (17).

Taken together, these findings can be interpreted in light of Granovetter's theory of strong and weak ties (35), which distinguishes between emotionally close relationships that fulfil attachment needs and broader, weaker ties that support social integration and a sense of belonging. Consistent with this framework, social network ties showed the strongest association with social loneliness in our study. Migration background further supports a weak-tie interpretation: first-generation migrants exhibited markedly higher levels of social loneliness, with substantially weaker associations for emotional loneliness, a pattern consistent with reduced access to or participation in weak-tie networks such as workplace or neighborhood contexts. Individual characteristics also align with this pattern, as agreeableness was strongly associated with lower social loneliness but only weakly related to emotional loneliness, suggesting that cooperative interpersonal styles may be conducive to maintaining broader weak-tie networks. By contrast, emotional loneliness aligned less clearly with strong-tie mechanisms. Partnership status was not more associated with emotional loneliness than with social loneliness, indicating that the presence of a partner alone may not be sufficient to offset emotional disconnection. Instead, emotional loneliness showed its strongest associations with psychological vulnerability, as depressed mood was most strongly associated with this dimension. Together, these findings underscore that social and emotional loneliness are shaped by partially distinct relational and psychological processes, reinforcing the value of a multidimensional, theory-informed approach.

Differences in loneliness based on migration background have been the subject of increasing attention, with studies reporting higher loneliness levels among individuals with a migration background compared to those without (39, 66–68). In line with this evidence, our study identified a notable association between first-generation migration background and both social and overall loneliness, with a less pronounced association for emotional loneliness. These findings are broadly consistent with results from a Dutch study, which also reported a first-generation migration background as being positively associated with overall loneliness (39). However, in our study, associations were most pronounced for social loneliness, with weaker associations for emotional loneliness. This pattern may reflect factors such as the loss of close familial and cultural ties to one's country of origin (69), as well as potential experiences of exclusion, racism, or discrimination (70). Additionally, the associations between second-generation migration background and loneliness were substantially smaller, but still significant in our study, especially for women. Socioeconomic advantages have also been identified in previous studies as protective factors, with higher educational attainment (45, 10, 29, 34) and higher income (10, 18, 17) linked to lower levels of loneliness. In contrast to prior findings, our analyses did not reveal any significant association between education and loneliness, while the financial security of the household showed only a marginal negative association across the dimensions.

Our study contributes to the literature on health and loneliness by incorporating both clinically diagnosed conditions and self-reported measures of life satisfaction. Previous research has primarily relied on self-rated health status, identifying better physical and mental health (18, 45, 10, 71, 17, 29, 39) as well as higher life satisfaction and subjective well-being (9, 45, 17) as factors associated with lower loneliness. However, few studies have examined these associations across emotional and social dimensions of loneliness using clinical diagnoses (even if they are self-reported) (39, 29). In our analyses, mental health impairments, particularly depressed mood and anxiety disorders, were meaningfully associated with higher levels of loneliness across all dimensions, with the most pronounced associations observed for emotional loneliness; a pattern consistent with earlier findings on psychological distress (29). Additionally, life satisfaction was consistently and inversely associated with all loneliness dimensions. Notably, physical health conditions (e.g., hypertension, type 2 diabetes, asthma, obesity) showed no significant association with loneliness in our study and have yielded inconsistent effect sizes in previous research (39), particularly among younger populations. The lack of significant associations between most physical health conditions and loneliness in our study is consistent with previous population-based research differentiating social and emotional loneliness. For example, Hofman et al. (2022) found that while poor perceived health (for emotional and social loneliness) and higher body mass index (for emotional loneliness) were weakly associated with loneliness, chronic diseases and functional limitations showed small, inconsistent, or non-significant associations across loneliness dimensions (29). Together with our findings, this suggests that in young and middle adulthood, physical health conditions may be less salient correlates of loneliness in young and middle adulthood than psychosocial and mental health factors, whereas stronger associations may emerge later in the life course.

This may be due to the relatively low prevalence of severe physical illnesses in our (young) panel sample (50), suggesting that such associations might emerge more clearly at later stages of the life course (72). Given that data collection occurred during the COVID-19 pandemic (autumn/winter 2021/22), we accounted for perceived pandemic-related experiences. Reporting positive aspects was marginally associated with lower loneliness levels across all dimensions, while perceiving the pandemic as a personal burden was positively associated with emotional and overall loneliness. However, associations were considerably smaller than those observed for the main associated factors identified in our study.

Further, our findings align with previous research on personality traits (Big Five), confirming that extraversion, agreeableness, conscientiousness, and (partially) openness are associated with lower levels of loneliness, while neuroticism remains consistently positively associated with all loneliness dimensions (28, 53). Notably, in contrast to earlier studies, agreeableness showed the strongest negative association with loneliness in the fully adjusted models, particularly for social loneliness.

Our findings highlight the need to address loneliness as a complex public health issue, increasingly recognised by institutions such as the WHO (4), the UK government (73), and Germany's national strategy (74, 75). Despite this attention, evidence on intervention effectiveness remains limited. Psychological and social interventions show some promise (particularly for older adults effects) (76, 77, 59, 78, 79), while digital approaches yield mixed results (78, 80, 81). Overall, the quality of existing intervention studies remains limited, and few interventions are tailored to different types or age groups of loneliness (79, 59). Yet, most approaches do not reflect the distinction between emotional and social loneliness, and vulnerable groups identified in our study remain underserved. To improve prevention and care, public health strategies should address the multidimensional nature of loneliness. Strengthening individuals' "social convoy" by investing in meaningful relationships, as outlined in established theoretical models by De Jong Gierveld and Fokkema, has been proposed as a potential approach to supporting resilience (82).

Taken together, these findings underscore the multifactorial and context-sensitive nature of loneliness during early and mid-adulthood. The age-related differences in loneliness dimensions and variable variation highlight the need for further research that more clearly distinguishes between these dimensions. Our study reinforces that vulnerability to loneliness is not equally distributed: individuals who are single or have limited social networks, those with mental health conditions, and people with a migration background are more likely to report higher levels of loneliness, even during life stages typically viewed as socially connected. These findings challenge simplistic age-based assumptions and emphasize the importance of individualized, multidimensional approaches to prevention and intervention; tailored not only to age, but also to social context, relationship quality, and psychological resources. From a clinical and public health perspective, such approaches are critical given the well-established links between chronic loneliness and adverse health outcomes, including increased risks for depression, cardiovascular disease, and all-cause mortality. Integrating loneliness screening and relational health promotion into routine healthcare and community services could contribute to more comprehensive, health-oriented care throughout the life course.

A major strength of our study is the multidimensional assessment of loneliness, distinguishing between emotional and social aspects; particularly relevant for young and middle adulthood. Drawing on large, representative panel data, we incorporated a broad set of validated measures (e.g., loneliness, Big Five personality traits, life satisfaction), along with detailed sociodemographic variables, clinically diagnosed health conditions, and migration background. However, some limitations need to be acknowledged. First, the cross-sectional design of our study limits causal interpretation and precludes differentiation between age and cohort effects, restricting conclusions about developmental trajectories over time (83). It also does not account for potential bidirectional relationships between variables and outcomes. Nevertheless, the large, age-diverse sample (spanning nearly four decades) enables a comprehensive analysis of a wide range of relevant factors. Second, while many associations reached statistical significance, effect sizes and explained variances (R^2) were modest, which is common in population-based studies of psychosocial phenomena (84). Third, additional limitations include the use of self-reported measures for income and BMI, which may not fully reflect objective experiences. In this vein, due to the ultra-short nature of the BFI-2-XS, internal consistency for the Big Five domains was modest. However, this is an expected trade-off between brevity and reliability (55). Fourth, as data were collected during the COVID-19 pandemic, prevalence may reflect exceptional circumstances, which should be considered when interpreting generalizability. Lastly, as emotional and social loneliness items differ in wording direction (negative vs. positive), the results may be partly influenced by different response styles or mood activation, although we expect such bias to be small given the prior validation of the scale.

Conclusion

In conclusion, this study advances the understanding of loneliness in young and middle adulthood by demonstrating its multidimensional nature. By disaggregating emotional and social loneliness, we uncover distinct age-related differences that challenge simplified models of loneliness across the life course. Our findings reaffirm the central role of social relationships as key factors associated with lower loneliness and point to groups more likely to report higher levels of loneliness, including individuals with mental health conditions, limited social bonds, or a migration background. These insights highlight the need for dimension-specific, evidence-informed public health strategies and support the development of targeted interventions tailored to both age and psychosocial context.

Declarations

Ethics approval and consent to participate

The survey planning, conduct and reporting was in line with the Declaration of Helsinki and German laws. The data collection is subject to the ethical oversight of the GGP Ethics Board and the Data Protection Office of the Royal Netherlands Academy of Arts and Sciences (KNAW).

Consent for publication

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Author contributions

HLW, PK, SD and MB designed the study concept. PK and HLW mainly developed the methodology. PK conducted the analyses and visualized the results. HLW and PK wrote the first draft of the paper; all other authors contributed to the revision and finalisation of the paper. HLW and PK coordinated the research process. The corresponding authors were responsible for submitting the article for publication.

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Competing interests

The authors declare no competing interests.

Availability of data and materials

The scientific use files of FReDA are online available at www.gesis.org : FReDA – The German Family Demography Panel Study. GESIS, Cologne. ZA7777 Data file Version 4.1.0, <https://doi.org/10.4232/1.14698>. The code used for the analyses will be made publicly available on the Open Science Framework (OSF) upon publication.

Clinical trial number

Not applicable.

References

1. Perlman D, Peplau L. Toward a social psychology of loneliness. *Personal relationships in disorder* 1981; 3:31–43.
2. Cacioppo JT, Patrick W. *Loneliness: Human nature and the need for social connection*. New York, London: W. W. Norton; 2009.
3. eClinicalMedicine. The epidemic of loneliness. *eClinicalMedicine* 2023; 66:102395.
4. World Health Organization. WHO launches commission to foster social connection. Geneva; 2023 [cited 2025 Feb 14]. Available from: URL: https://www.who.int/news/item/15-11-2023-who-launches-commission-to-foster-social-connection?utm_source=chatgpt.com.
5. Leigh-Hunt N, Bagguley D, Bash K, Turner V, Turnbull S, Valtorta N et al. An overview of systematic reviews on the public health consequences of social isolation and loneliness. *Public health* 2017; 152:157–71.
6. Surkalim DL, Luo M, Eres R, Gebel K, van Buskirk J, Bauman A et al. The prevalence of loneliness across 113 countries: systematic review and meta-analysis. *BMJ (Clinical research ed.)* 2022; 376:e067068:1–17.
7. Wang J, Mann F, Lloyd-Evans B, Ma R, Johnson S. Associations between loneliness and perceived social support and outcomes of mental health problems: a systematic review. *BMC Psychiatry* 2018; 18:156.

8. Caple V, Maude P, Walter R, Ross A. An exploration of loneliness experienced by people living with mental illness and the impact on their recovery journey: An integrative review. *Journal of psychiatric and mental health nursing* 2023; 30(6):1170–91.
9. Mund M, Maes M, Drewke PM, Gutzeit A, Jaki I, Qualter P. Would the Real Loneliness Please Stand Up? The Validity of Loneliness Scores and the Reliability of Single-Item Scores. *Assessment* 2023; 30(4):1226–48.
10. Graham EK, Beck ED, Jackson K, Yoneda T, McGhee C, Pieramici L et al. Do We Become More Lonely With Age? A Coordinated Data Analysis of Nine Longitudinal Studies. *Psychological science* 2024; 35(6):579–96.
11. Nicolaisen M, Thorsen K. Who are lonely? Loneliness in different age groups (18-81 years old), using two measures of loneliness. *International journal of aging & human development* 2014; 78(3):229–57.
12. van den Broek T, Lam J, Potente C. Do middle-aged and older people underreport loneliness? experimental evidence from the Netherlands. *European journal of ageing* 2024; 21(1):29.
13. Mund M, Freuding MM, Möbius K, Horn N, Neyer FJ. The Stability and Change of Loneliness Across the Life Span: A Meta-Analysis of Longitudinal Studies. *Personality and social psychology review : an official journal of the Society for Personality and Social Psychology, Inc* 2020; 24(1):24–52.
14. Buecker S, Denissen JJA, Luhmann M. A propensity-score matched study of changes in loneliness surrounding major life events. *Journal of Personality and Social Psychology* 2021; 121(3):669–90.
15. Pyle E, Evans D. Loneliness – What characteristics and circumstances are associated with feeling lonely?: Office for National Statistics, UK [cited accessed 2025 May 21]. Available from: URL: <https://www.ons.gov.uk/peoplepopulationandcommunity/wellbeing/articles/lonelinesswhatcharacteristicsandcircumstancesareassociatedwithfeelinglo> 04-10.
16. Lasgaard M, Friis K, Shevlin M. “Where are all the lonely people?” A population-based study of high-risk groups across the life span. *Social Psychiatry and Psychiatric Epidemiology* 2016; (51):1373–84. Available from: URL: <https://link.springer.com/article/10.1007/s00127-016-1279-3>.
17. Klein EM, Zenger M, Tibubos AN, Ernst M, Reiner I, Schmalbach B et al. Loneliness and its relation to mental health in the general population: Validation and norm values of a brief measure. *Journal of Affective Disorders Reports* 2021; 4:100120.
18. Hawkey LC, Buecker S, Kaiser T, Luhmann M. Loneliness from Young Adulthood to Old Age: Explaining Age Differences in Loneliness. *International Journal of Behavioral Development* 2022; 46(1):39–49.
19. Luhmann M, Hawkey L. Age differences in loneliness from late adolescence to oldest old age. *Developmental Psychology* 2016; 52(6):943–59. Available from: URL: <https://pubmed.ncbi.nlm.nih.gov/27148782/>.
20. Barreto M, Victor C, Hammond C, Eccles A, Richins MT, Qualter P. Loneliness around the world: Age, gender, and cultural differences in loneliness. *Personality and individual differences* 2021; 169:110066.
21. Bittman M, Rice JM. The Spectre Of Overwork: An Analysis Of Trends Between 1974 And 1997 Using Australian Time-Use Diaries. *Labour & Industry: a journal of the social and economic relations of work* 2002; 12(3):5–25.
22. Ernst M, Niederer D, Werner AM, Czaja SJ, Mikton C, Ong AD et al. Loneliness before and during the COVID-19 pandemic: A systematic review with meta-analysis. *The American psychologist* 2022; 77(5):660–77.
23. Rebecchi A, Lepinteur A, Clark AE, Rohde N, Vögele C, D'Ambrosio C. Loneliness during the COVID-19 pandemic: Evidence from five European countries. *Economics and human biology* 2024; 55:101427.
24. Köster F, Lipps O. How loneliness increased among different age groups during COVID-19: a longitudinal analysis. *European journal of ageing* 2024; 21(1):2.
25. Reinwarth AC, Ernst M, Gerstorf D, Brähler E, Wild PS, Münzel T et al. Results of a multi-perspective examination of loneliness trajectories and its determinants in German adults during the COVID-19 pandemic. *Scientific reports* 2025; 15(1):17889.
26. Entringer T. Epidemiologie von Einsamkeit in Deutschland: KNE Expertise 4/2022. Berlin: Kompetenznetz Einsamkeit; 2022. Available from: URL: https://kompetenznetz-einsamkeit.de/wp-content/uploads/2022/07/KNE_Expertise04_220629.pdf.
27. Jong Gierveld J, van Tilburg T. The De Jong Gierveld short scales for emotional and social loneliness: tested on data from 7 countries in the UN generations and gender surveys. *European journal of ageing* 2010; 7(2):121–30.
28. Erevik EK, Vedaa Ø, Pallesen S, Hysing M, Sivertsen B. The five-factor model's personality traits and social and emotional loneliness: Two large-scale studies among Norwegian students. *Personality and individual differences* 2023; 207:112115.
29. Hofman A, Overberg RI, Schoenmakers EC, Adriaanse MC. Social and emotional loneliness in a large sample of Dutch adults aged 19-65: Associations with risk factors. *Psychiatry research* 2022; 313:114602.
30. Russell D, Cutrona CE, Rose J, Yurko K. Social and emotional loneliness: an examination of Weiss's typology of loneliness. *Journal of Personality and Social Psychology* 1984; 46(6):1313–21.
31. Weiss RS. Loneliness : the experience of emotional and social isolation. MIT Press; 1973.
32. Weiss RS, Bowlby J, Riesman D. Loneliness: The experience of emotional and social isolation. First MIT Press paperback edition. Cambridge, Massachusetts, London, England: The MIT Press; 1975. (The MIT Press classics).
33. Perlman D, Peplau L. Toward a Social Psychology of Loneliness. In: Duck S, Gilmour R, editors. *Personal relationships in disorder*. London: Academic Pr; 1981. p. 31–56 (Personal relationships / ed. by Steve Duck and Robin Gilmour; vol. 3).
34. Fierloos IN, Tan SS, Williams G, Alhambra-Borrás T, Koppelaar E, Bilajac L et al. Socio-demographic characteristics associated with emotional and social loneliness among older adults. *BMC geriatrics* 2021; 21(1):114.
35. Granovetter MS. The Strength of Weak Ties. *American Journal of Sociology* 1973; 78(6):1360–80.

36. Cacioppo JT, Hawkley LC. Perceived social isolation and cognition. *Trends in Cognitive Sciences* 2009; 13(10):447–54.
37. Barjaková M, Garneró A, d'Hombres B. Risk factors for loneliness: A literature review. *Social science & medicine* (1982) 2023; 334:116163.
38. Kenny L, Shevlin M, Cloitre M. Determinants of Social and Emotional Loneliness in a Nationally Representative Sample of US Adults. *Eur. J. Behav. Sci.* 2022; 5(3):36–49.
39. Kate RLF, Bilecen B, Steverink N. A Closer Look at Loneliness: Why Do First-Generation Migrants Feel More Lonely Than Their Native Dutch Counterparts? *The Gerontologist* 2020; 60(2):291–301.
40. Aslan Y, Koçak O, Kaya AB, Alkhulayfi AMA, Gómez-Salgado J, Yıldırım M. Roles of loneliness and life satisfaction in the relationship between perceived friend social support, positive feelings about the future and loss of motivation. *Acta psychologica* 2025; 259:105315.
41. Bujard M, Gummer T, Hank K, Neyer FJ, Pollak R, Schneider NF et al. FReDA – The German Family Demography Panel Study. Cologne; 2025.
42. Schneider NF, Bujard M, Wolf C, Gummer T, Hank K, Neyer FJ. Family Research and Demographic Analysis (FReDA): Evolution, Framework, Objectives, and Design of “The German Family-Demographic Panel Study”. *Comparative Population Studies* 2021; 46:149–86.
43. Gierveld JDJ, van Tilburg T. A 6-Item Scale for Overall, Emotional, and Social Loneliness. *Research on Aging* 2006; 28(5):582–98.
44. Soest T, Luhmann M, Hansen T, Gerstorf D. Development of loneliness in midlife and old age: Its nature and correlates. *Journal of Personality and Social Psychology* 2020; 118(2):388–406.
45. Franssen T, Stijnen M, Hamers F, Schneider F. Age differences in demographic, social and health-related factors associated with loneliness across the adult life span (19-65 years): a cross-sectional study in the Netherlands. *BMC public health* 2020; 20(1):1118.
46. Nowland R, Thomson G, McNally, L., Smith, T., Whittaker K. Experiencing loneliness in parenthood: a scoping review. *Perspectives in Public Health* 2021; (141(4)):214–25. Available from: URL: <https://journals.sagepub.com/doi/epub/10.1177/17579139211018243>.
47. Cheung F, Lucas RE. Assessing the validity of single-item life satisfaction measures: results from three large samples. *Quality of life research : an international journal of quality of life aspects of treatment, care and rehabilitation* 2014; 23(10):2809–18.
48. Kaya F, Yazıcı Çelebi G. How does loneliness affect satisfaction with life? What is the role of the perception of God in this interaction? *Frontiers in psychology* 2025; 16:1550108.
49. Salimi A. Social-Emotional Loneliness and Life Satisfaction. *Procedia - Social and Behavioral Sciences* 2011; 29:292–5.
50. Porst M, Lippe E, Leddin J, Anton A, Wengler A, Breitzkreuz J et al. The Burden of Disease in Germany at the National and Regional Level. *Deutsches Ärzteblatt international* 2022; 119(46):785–92.
51. Ward ZJ, Goldie SJ. Global Burden of Disease Study 2021 estimates: implications for health policy and research. *Lancet* (London, England) 2024; 403(10440):1958–9.
52. World Health Organization. Obesity and overweight; 2025 [cited 2025 May 23]. Available from: URL: <https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight>.
53. Buecker S, Maes M, Denissen JJA, Luhmann M. Loneliness and the Big Five Personality Traits: A Meta-Analysis. *Eur J Pers* 2020; 34(1):8–28.
54. Soto CJ, John OP. The next Big Five Inventory (BFI-2): Developing and assessing a hierarchical model with 15 facets to enhance bandwidth, fidelity, and predictive power. *Journal of Personality and Social Psychology* 2017; 113(1):117–43.
55. Soto CJ, John OP. Short and extra-short forms of the Big Five Inventory-2: The BFI-2-S and BFI-2-XS. *Journal of Research in Personality* 2017; 68:69–81.
56. Funder DC, Ozer DJ. Evaluating Effect Size in Psychological Research: Sense and Nonsense. *Advances in Methods and Practices in Psychological Science* 2019; 2(2):156–68.
57. Götz FM, Gosling SD, Rentfrow PJ. Small Effects: The Indispensable Foundation for a Cumulative Psychological Science. *Perspectives on psychological science : a journal of the Association for Psychological Science* 2022; 17(1):205–15.
58. Schobin J, Arriagada C, Gibson-Kunze M. Einsamkeitsbarometer 2024: Langzeitentwicklung von Einsamkeit in Deutschland; 2024. Available from: URL: <https://www.bmfsfj.de/resource/blob/240528/5a00706c4e1d60528b4fed062e9debcc/einsamkeitsbarometer-2024-data.pdf>.
59. Lasgaard M, Løvschall C, Qualter P, Laustsen LM, Lim MH, Maindal HT et al. Are loneliness interventions effective in reducing loneliness? A meta-analytic review of 128 studies. *The European Journal of Public Health* 2022; 32(Suppl 3).
60. Qualter P, Vanhalst J, Harris R, van Roekel E, Lodder G, Bangee M et al. Loneliness Across the Life Span. *Perspectives on Psychological Science* 2015; (10(2)):250–64. Available from: URL: <https://journals.sagepub.com/doi/epub/10.1177/1745691615568999>.
61. Manoli A, McCarthy J, Ramsey R. Estimating the prevalence of social and emotional loneliness across the adult lifespan. *Scientific reports* 2022; 12(1):21045.
62. van Tilburg TG. Residual loneliness in the Netherlands after the COVID-19 pandemic: An application of the single interrupted time series design with pre-, peri- and post-pandemic observations. *Public health* 2024; 237:238–44.
63. Nicolaisen M, Thorsen K. Gender Differences in Loneliness Over Time: A 15-Year Longitudinal Study of Men and Women in the Second Part of Life. *International journal of aging & human development* 2024; 98(1):103–32.
64. Maes M, Qualter P, Vanhalst J, van den Noortgate W, Goossens L. Gender Differences in Loneliness across the Lifespan: A Meta-Analysis. *Eur J Pers* 2019; 33(6):642–54.
65. Buecker S, Mund M, Chwastek S, Sostmann M, Luhmann M. Is Loneliness in Emerging Adults Increasing Over Time? A Preregistered Cross-Temporal Meta-Analysis and Systematic Review. *Psychological bulletin* 2021; 147(8):787–805.
66. Klok J, van Tilburg TG, Suanet B, Fokkema T, Huisman M. National and transnational belonging among Turkish and Moroccan older migrants in the Netherlands: protective against loneliness? *European journal of ageing* 2017; 14(4):341–51.

67. Hajek A, König H-H. Migrationshintergrund und Einsamkeit im mittleren und hohen Alter in Deutschland. Bundesgesundheitsblatt, Gesundheitsforschung, Gesundheitsschutz 2024; 67(10):1137–43.
68. Löbel L-M, Kröger H, Tibubos AN. How Migration Status Shapes Susceptibility of Individuals' Loneliness to Social Isolation. International journal of public health 2022; 67:1604576.
69. Castañeda H. "Over-foreignization" or "unused potential"? A critical review of migrant health in Germany and responses toward unauthorized migration. Social science & medicine (1982) 2012; 74(6):830–8.
70. Kajikhina K, Koschollek C, Bozorgmehr K, Sarma N, Hövener C. Rassismus und Diskriminierung im Kontext gesundheitlicher Ungleichheit – ein narratives Review. Bundesgesundheitsblatt, Gesundheitsforschung, Gesundheitsschutz 2023; 66(10):1099–108.
71. Buecker S, Mund M, Chwastek S, Sostmann M, Luhmann M. Is loneliness in emerging adults increasing over time? A preregistered cross-temporal meta-analysis and systematic review. Psychological bulletin 2021; 147(8):787–805.
72. Wang F, Gao Y, Han Z, Yu Y, Long Z, Jiang X et al. A systematic review and meta-analysis of 90 cohort studies of social isolation, loneliness and mortality. Nature human behaviour 2023; 7(8):1307–19.
73. Pimlott N. The ministry of loneliness. Canadian family physician Medecin de famille canadien 2018; 64(3):166.
74. Bundesministerium für Familie, Senioren, Frauen und Jugend. Strategie der Bundesregierung gegen Einsamkeit. Berlin; 2023 [cited 2025 May 23]. Available from: URL: <https://www.bmfsfj.de/resource/blob/234584/9c0557454d1156026525fe67061e292e/2023-strategie-gegen-einsamkeit-data.pdf>.
75. Schobin J, Arriagada C, Gibson-Kunze M. Einsamkeitsbarometer 2024: Langzeitentwicklung von Einsamkeit in Deutschland; 2024. Available from: URL: <https://www.bmfsfj.de/resource/blob/240528/5a00706c4e1d60528b4fed062e9debcc/einsamkeitsbarometer-2024-data.pdf>.
76. Beckers A, Buecker S, Casabianca EJ, Nurminen M. Effectiveness of interventions tackling loneliness: A literature review. Luxembourg; 2022.
77. Blodgett JM, Tiley K, Harkness F, Musella M. What works to reduce loneliness: a rapid systematic review of 101 interventions. Journal of public health policy 2025.
78. Hansen T, Nes RB, Hynek K, Nilsen TS, Reneflot A, Stene-Larsen K et al. Tackling social disconnection: an umbrella review of RCT-based interventions targeting social isolation and loneliness. BMC public health 2024; 24(1):1917.
79. Hickin N, Käll A, Shafran R, Sutcliffe S, Manzotti G, Langan D. The effectiveness of psychological interventions for loneliness: A systematic review and meta-analysis. Clinical psychology review 2021; 88:102066.
80. Seewer N, Skoko A, Käll A, Andersson G, Luhmann M, Berger T et al. Efficacy of an Internet-based self-help intervention with human guidance or automated messages to alleviate loneliness: a three-armed randomized controlled trial. Scientific reports 2024; 14(1):6569.
81. Jin W, Liu Y, Yuan S, Bai R, Li X, Bai Z. The Effectiveness of Technology-Based Interventions for Reducing Loneliness in Older Adults: A Systematic Review and Meta-Analysis of Randomized Controlled Trials. Frontiers in psychology 2021; 12:711030.
82. Jong Gierveld J de, Fokkema T. Strategies to prevent loneliness. In: Shalke A, Rokach A, editors. Addressing loneliness: Coping, prevention and clinical interventions. New York, London: Routledge Taylor & Francis Group; 2015. p. 218–30 (Researching social psychology; vol. 1).
83. Kraemer HC, Yesavage JA, Taylor JL, Kupfer D. How can we learn about developmental processes from cross-sectional studies, or can we? The American journal of psychiatry 2000; 157(2):163–71.
84. Ozili PK. The Acceptable R-Square in Empirical Modelling for Social Science Research. SSRN Journal 2022.

Figures

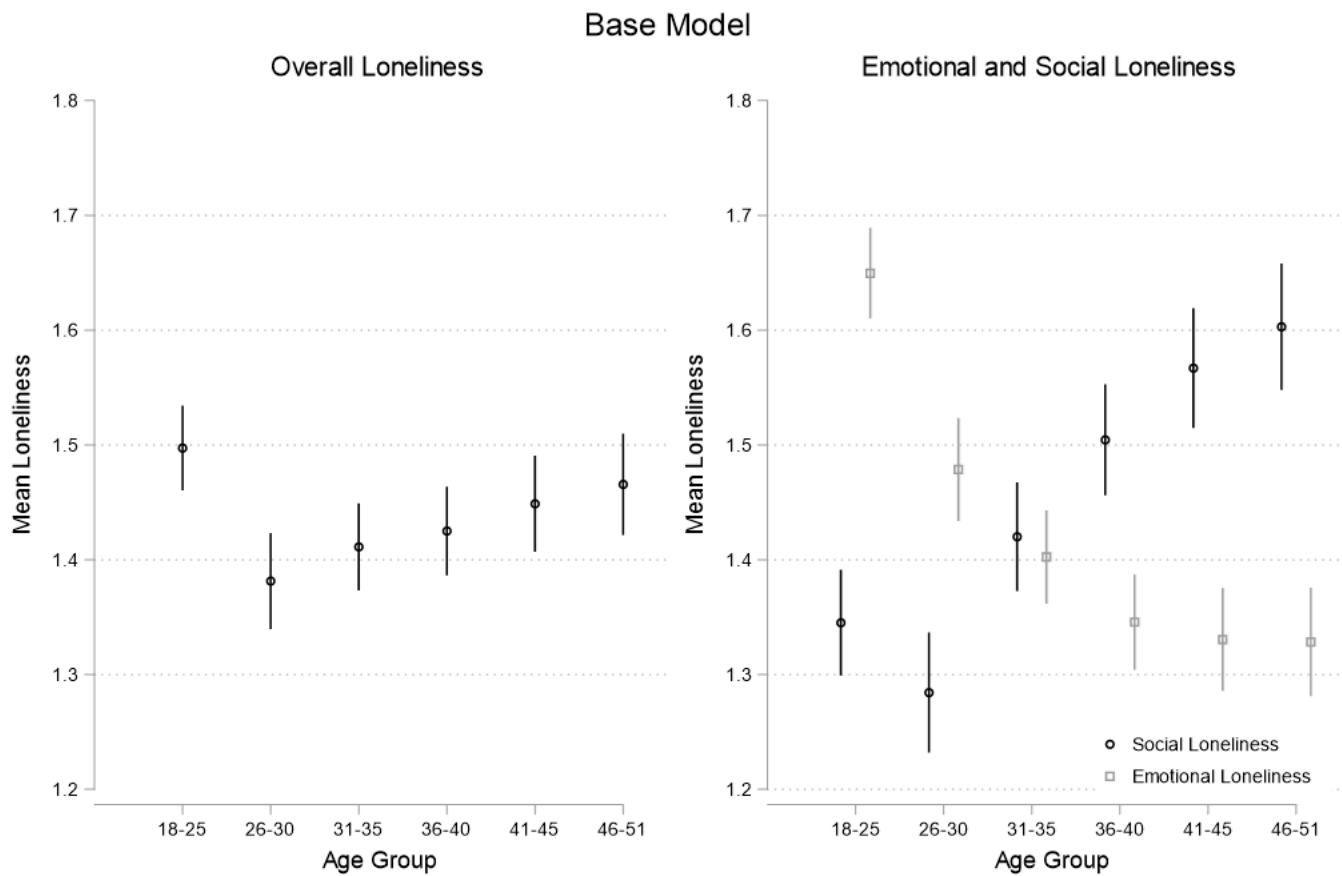


Figure 1

Base Model for Overall Loneliness, Emotional Loneliness and Social Loneliness (n = 14,443)

Note: Base model includes age (categorical) and gender (binary). Loneliness was measured on a scale ranging from 0 to 3. To enhance interpretability, the y-axis was restricted to the observed value range; the full scale is provided in Supplementary **Figure A1** with corresponding regression table in Supplementary **Table A7**.

Source: FReDA Panel, wave 1 (autumn/winter 2021/22). Authors' own calculations.

Full Model

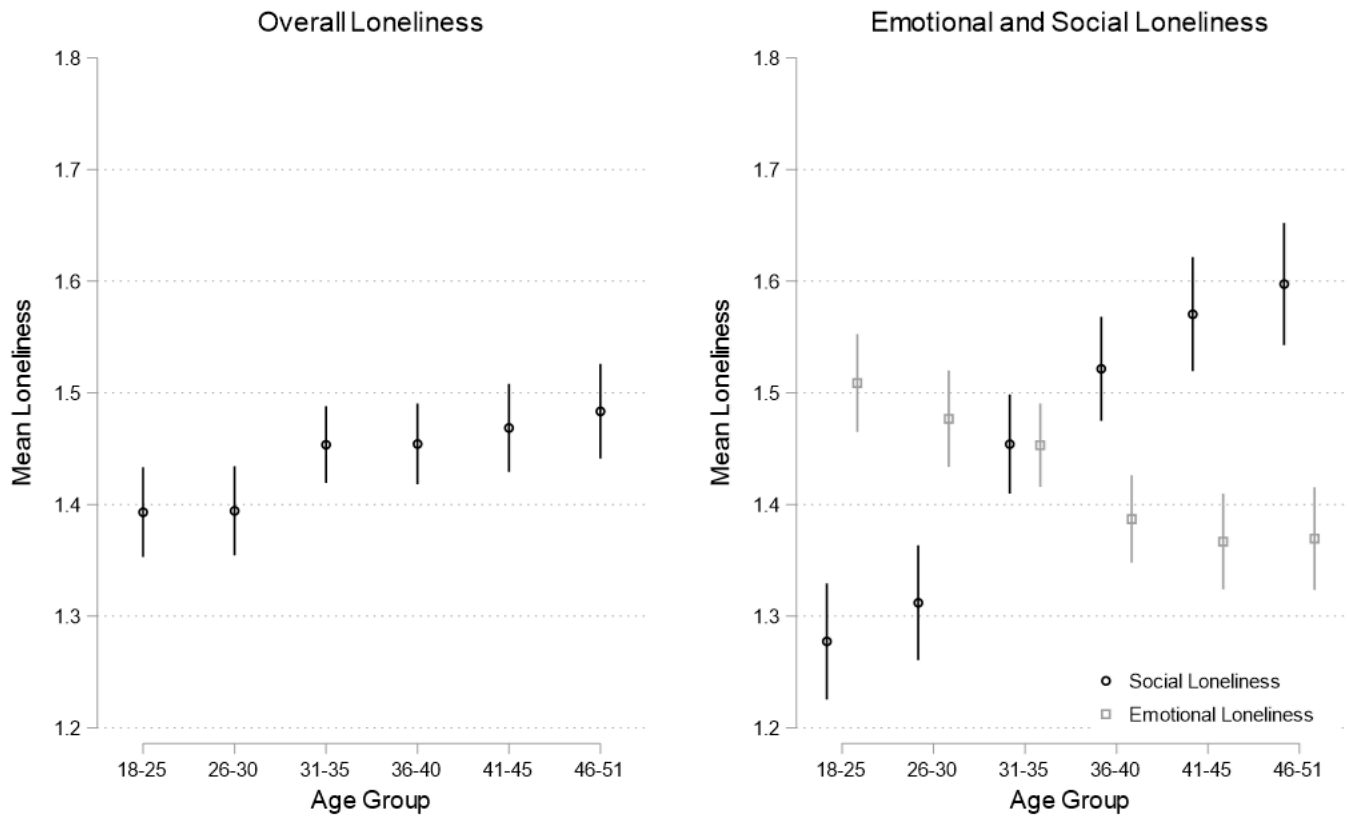


Figure 2

Full Model for Overall Loneliness, Emotional Loneliness and Social Loneliness (n = 14,443)

Note: Full model including age (categorical) and gender (binary), and all variable sets from Models 1-4: socio-demographic characteristics, social relationships, health variables, and personality traits. Loneliness was measured on a scale ranging from 0 to 3. To enhance interpretability, the y-axis was restricted to the observed value range; the full scale is provided in Supplementary **Figure A2** with corresponding regression table in Supplementary **Table A11**.

Source: FReDA Panel, wave 1 (autumn/winter 2021/22). Authors' own calculations.

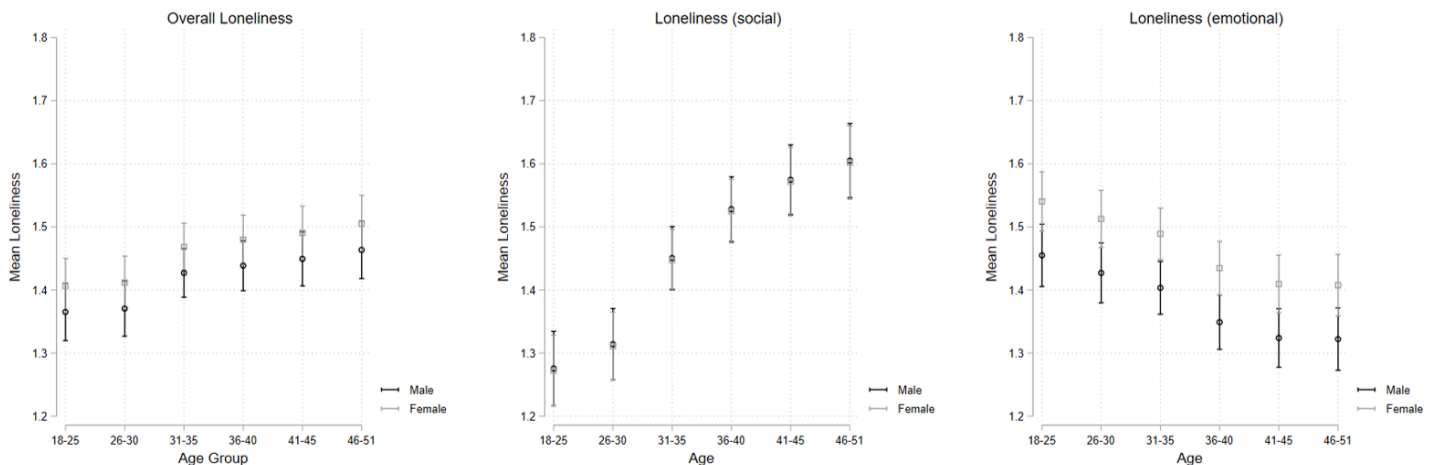


Figure 3

Comparing Loneliness by Gender: Overall, Emotional, and Social Loneliness (female n = 8,009; male n = 6,427)

Note: Full model including age (categorical) and gender (binary), and all variable sets from Models 1-4: socio-demographic characteristics, social relationships, health variables, and personality traits. Loneliness was measured on a scale ranging from 0 to 3. To enhance interpretability, the y-axis was restricted to the observed value range; the full scale is provided in Supplementary **Figure A3**, with corresponding regression tables in Supplementary **Tables A13-A14**.

Source: FReDA Panel, wave 1 (autumn/winter 2021/22). Authors' own calculations.

Supplementary Files

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