Comparing loneliness in England and the United States, 2014–2016: Differential item functioning and risk factor prevalence and impact

Louise C. Hawkley [a,*], Andrew Steptoe [b], L. Philip Schumm [c], Kristen Wroblewski [c]

[a] Academic Research Centers, NORC at the University of Chicago, USA
[b] Research Department of Behavioural Science and Health, University College London, UK
[c] Department of Public Health Sciences, University of Chicago, USA

ABSTRACT

The purpose of this study is to compare mean levels of loneliness, and correlates of loneliness, among older adults in the U.S. and England. Comparisons are conducted after attending to comparability of the loneliness measure between countries based on tests for discriminatory capacity and differential item functioning of the 3-item UCLA Loneliness Scale. Cross-sectional data from the 2015–16 wave of the National Social Life, Health and Aging Project (NSHAP) and the 2014–2015 wave of the English Longitudinal Study on Ageing (ELSA) were analyzed using graded item response models and multiple indicators and multiple causes (MIMIC) models. Risk factors included demographic variables, health characteristics, and social characteristics that were harmonized across surveys. Because of differences in the racial-ethnic composition of the U.S. and England, analyses were limited to white respondents (N = 2624 in NSHAP; N = 6639 in ELSA). Only respondents born 1925–1965 were included in analyses. Discriminatory capacity was evident in each item being able to distinguish a lonely from a nonlonely individual. Differential item functioning (DIF) was evident in country differences in the likelihood of endorsing the "lack companionship" item at a given level of trait loneliness, and in DIF among marital status, education, and gender subgroups that were comparable across countries. Overall loneliness levels are equivalent in England and the U.S. Risk factor impact did not differ between countries, but differences in risk factor prevalence between countries combined to produce a net result of slightly lower mean levels of loneliness in older adults in England than in the U.S. after risk factor adjustment. The fact that the impact of risk factors were similar across countries suggests that evidence of successful interventions in one country could be leveraged to accelerate development of effective interventions in the other.

Credit author statement

Louise C. Hawkley: Conceptualization, Writing - original draft preparation & revision, Supervision. Andrew Steptoe: Conceptualization, Writing - review & editing. L. Philip Schumm: Methodology, Formal analysis, Writing Original draft preparation & revision. Kristen Wroblewski: Formal analysis, Writing - original draft preparation & revision.

1. Introduction

Public attention to the issue of loneliness in Western countries has been growing to the point that, in early 2018, the British government announced the appointment of a Minister for Loneliness. The report from the Jo Cox Commission on Loneliness that triggered this appointment (Kennedy and Reeves, 2017) capitalized on a growing body of evidence linking inadequate social relationships with poor health outcomes, and included a highly cited meta-analysis showing that having few or poor social connections is associated with premature mortality at a risk level equivalent to or larger than that associated with established health risks such as smoking, drinking, physical inactivity, and obesity (Holt-Lunstad et al., 2010). Loneliness is one manifestation of inadequate social relationships, and has been defined as the distress that accompanies a perceived mismatch between desired and actual social relationships (Peplau and Perlman, 1982). As a subjective state, loneliness is the feeling of social isolation, and is not synonymous with being isolated. Loneliness and social isolation do not differ, however, in the magnitude of risk they pose for early mortality (Holt-Lunstad et al.,

2015). In addition, a growing literature documents associations between loneliness and multiple health-related outcomes, including mortality, cardiovascular, endocrine, and immune dysfunction and disease; cognitive decline; depression; poor sleep quality; poor health behaviors; pro-inflammatory gene transcription profiles; and altered neurological activity (Cacioppo et al., 2014; Shankar et al., 2011; Yin et al., 2019).

Although not unique to older adults, loneliness is prevalent in this population. In the United States (U.S.), estimates of loneliness prevalence range from 19% to 43% of older adults (Perissinotto et al., 2012; Theeke, 2009). In the United Kingdom (UK), estimates range from 18% to 29% of the older adult population (Steptoe et al., 2013; Yang and Victor, 2011). This study uses a 3-item loneliness measure to compare directly the mean level of loneliness among older adults in the U.S. to that of older adults in England based on data from two, high-quality national surveys. Careful attention is paid to comparability of the measure between countries, and both overall differences and differences adjusting for known socio-demographic correlates of loneliness are presented. We also examine possible between-country differences in the extent to which individual socio-demographic characteristics are associated with loneliness. Identifying similarities and differences between countries in the level of loneliness and its correlates will facilitate the development, evaluation, and dissemination of interventions in both countries.

1.1. Background

1.1.1. Cross-country comparisons of loneliness: measurement issues

One of the main differences between loneliness measures is in whether they ask about loneliness directly or indirectly. Direct questions are often single items that ask about loneliness explicitly (e.g., "have you felt lonely during the last week?"). Direct measures of loneliness are prone to reporting biases (Nicolaisen and Thorsen, 2014), however, and for this reason indirect measures are often preferred. Indirect measures ask about experiences related to loneliness without invoking potentially stigmatizing terms such as "lonely" or "loneliness." The 20-item UCLA Loneliness Scale (Russell, 1996) is an indirect measure and the origin of the validated 3-item UCLA Loneliness Scale (Hughes et al., 2004) designed for use in large-scale surveys. Respondents are asked to report how often they "lack companionship," "feel left out," and "feel isolated," with response options of "hardly ever" (1), "some of the time" (2), and "often" (3).

Loneliness prevalence estimates require that scale scores be dichotomized to distinguish between lonely and nonlonely individuals. For example, using the 20-item UCLA Loneliness Scale with four response choices (never, rarely, sometimes, always) administered to a sample of U.S. older adults, Wilson and Moulton (2010) defined loneliness as scoring 44 or greater on the resulting 20–80 point summed scale; this yielded estimated prevalences of 41% for 50-59 year-olds, 32% for 60-69 year-olds, and 25% for 70+ year-olds. Using the 3-item UCLA Loneliness Scale and 2005 data from the U.S. National Social Life, Health and Aging Project (NSHAP), Hawkley and Kocherginsky (2018) defined lonely individuals as those whose averaged score across items was 1.5 or greater (equivalent to a summed score of 5 or greater for a score ranging from 3 to 9), corresponding to a "some of the time" response for at least 2 items or an "often" response for at least 1 item. This resulted in 30% of 57–85 year-olds being classified as lonely. Applying a less stringent cutoff to the same 3-item scale (i.e., respondents were classified as lonely if they reported "some of the time" or "often" to any one of the items), 43% of adults at least 60-years-old in the U.S. Health and Retirement Study were lonely (Perissinotto et al., 2012).

As the foregoing indicates, differences in measures, response options, and classification criteria have resulted in wide variability in estimates of loneliness. The challenge of comparability across studies is exacerbated when also trying to compare across countries and cultures. Valid cross-cultural comparisons require that loneliness be conceived

similarly across cultures/countries (construct validity), and that a scale's psychometric properties are similar across countries (Van Tilburg, Havens, & De Jong Gierveld, 2004). Prior research has demonstrated that the UCLA Loneliness Scale has robust construct validity across several countries (Hawkley et al., 2005; Hawkley et al., 2015; Hawkley et al., 2012). However, it is unknown whether the 3-item version operates in a similar fashion across countries and across subpopulations within countries. If some subgroups understand or respond to individual items differently from other subgroups, their responses to the item would not have an equivalent interpretation, nor would the corresponding scale scores be directly comparable (Walker, 2011). Analyses of the De Jong Gierveld (DJG) Loneliness Scale, which includes items similar to those in the UCLA Loneliness Scale, showed that most items behaved differently in the three countries examined (the Netherlands, Italy, and Canada), and that there was evidence of differential item functioning (DIF) by gender and partner status (Van Tilburg et al., 2004), suggesting that an examination of DIF in the UCLA Loneliness Scale is warranted.

1.1.2. U.S./England differences in loneliness prevalence and severity

To the best of our knowledge, a direct comparison of loneliness levels (i.e., using the same loneliness measure) among older adults in the U.S. and England has not been undertaken to date. One exception is a recent privately funded study that compared loneliness in the U.S., United Kingdom, and Japan (DiJulio et al., 2018). However, the loneliness measure was not directly comparable with past research because both direct and indirect assessments were combined, and loneliness was defined as often or always feeling at least one aspect of the loneliness experience (i.e., lonely, lack of companionship, left out, or isolated). Using this definition, this study found that roughly equal proportions of adults over the age of 18 years were lonely in the U.S. (22%) and the UK (23%). Limiting the comparison to those over the age of 65, however, revealed a higher prevalence of loneliness in the UK (25%) than in the U.S. (16%).

Why might loneliness differ between the U.S. and England? Dykstra (2009) identified three factors that could give rise to country differences in loneliness, of which we focus on two. First, differences in the distributions of individual characteristics associated with loneliness, such as wealth, health, and marital status may yield between-country overall differences in loneliness. Second, the effects of these characteristics on loneliness may vary between the U.S. and England. For example, poor health may lead to greater risk for loneliness in the U.S. than in England because health care access and affordability is poorer in the U.S. (He et al., 2016). We elaborate on both of these possibilities by discussing cross-country differences in the *prevalence* of risk factors for loneliness and in the *impact* of these risk factors. Dykstra (2009) identified country-level differences in cultural systems and policies as a third factor that could contribute to loneliness differences, but this is beyond the scope of the present study.

1.2. Risk factor prevalence

Meta-analyses and systematic reviews have identified a range of risk factors consistently associated with loneliness in older age (De Jong Gierveld, Van Tilburg and Dykstra, 2006; Pinquart, 2003; Pinquart and Sörensen, 2003). Prominent among these are low socioeconomic status, widowhood, poor physical health, disability (e.g., functional limitations), and few and/or poor quality social contacts. Among 60-80 year-olds in 11 European countries, about half of the variation in loneliness among countries was explained by population differences in partnership status, satisfaction with personal finances, and subjective health and disability (Hansen and Slagsvold, 2016). In the SHARE study of 14 European countries (Fokkema et al., 2012), those countries with an older population, a higher proportion of women, and a higher proportion of never and formerly married older adults had a significantly higher prevalence of loneliness than the others. Population differences

in socioeconomic status, health, disability, and familial support accounted for additional differences in loneliness prevalence among specific European countries.

England and the U.S. are relatively similar in many of these loneliness risk domains. However, to the extent population composition differences exist, these differences may contribute to loneliness differences between the two countries. For instance, national data indicate that the health and physical functioning of older adults is generally worse in the U.S. than England (Crimmins et al., 2010; Solé-Auró and Crimmins, 2014), which would tend to increase loneliness levels in the U.S. relative to England. Conversely, education levels are on average lower among English than U.S. older adults. Education has been shown to protect against loneliness (Pinquart and Sörensen, 2003), which would tend to increase loneliness levels in England relative to the U.S.

1.3. Risk factor impact

From a theoretical perspective, the impact of individual characteristics on loneliness is dependent on context such that societal norms help to determine individual expectations, and unmet expectations contribute to loneliness (De Jong Gierveld and Tesch-Römer, 2012; Luhmann and Hawkley, 2016). The societal contextualization of individual differences has been used to explain why loneliness is higher in more socially integrated and familial Eastern societies than in more individualistic Western societies (Fokkema et al., 2012). The U.S. and England do not differ significantly in their levels of individualism/collectivism, and thus may not exhibit the dramatic differences in loneliness that have been seen between Eastern and Western European countries. However, the U.S. exhibits a greater degree of socioeconomic inequality than the UK, as evident in an ever-increasing difference in the two country's GINI index (World Bank, 2017). Income- and wealth-inequities give rise to perceptions of relative deprivation and distrust which, together with the perception of inequity itself, foster a sense of exclusion and loneliness (Schirmer and Michailakis, 2018). Greater inequity in the U.S. implies that this scenario may be exaggerated in the U.S. relative to the UK. Other individual risk factors for loneliness may exert comparable influences regardless of country or culture. For instance, the association between being married and having lower levels of loneliness did not differ in magnitude across 17 countries in the World Values Survey, including the U.S. and Britain (Stack, 1998).

2. Method

2.1. Data

We use data from the 2015–2016 wave of NSHAP and the 2014–2015 wave of the English Longitudinal Study of Aging (ELSA) to generate cross-sectional loneliness estimates for each country over a roughly equivalent time period. Analyses are restricted to those respondents born 1925–65. Due to differences in the racial-ethnic composition of the two countries as well as limited sample size for each minority subgroup, analyses are also restricted to white respondents.

2.1.1. NSHAP

NSHAP is funded by the National Institute on Aging and is fielded by the NORC at the University of Chicago (NORC). NSHAP is a population-based longitudinal study of health, social life, and well-being among older Americans. A national area probability sample of older adults drawn from surplus households screened for the 2004 round of the Health and Retirement Study (HRS) was selected. One individual born during 1920–1947 was randomly selected from each household. Black and Hispanic adults were oversampled, and the selection probabilities were also adjusted to achieve approximate balance among gender by age subgroups (O'Muircheartaigh et al., 2009). This study was approved by the Institutional Review Boards of NORC and the University of Chicago. All respondents provided written, informed consent.

In-home interviews were conducted in English and Spanish between July 2005 and March 2006, yielding a total of 3005 respondents (1454 men and 1551 women; weighted response rate of 75.5%) (O'Muircheartaigh et al., 2009). In 2010–2011, all surviving respondents were re-interviewed along with their co-resident spouses or partners and those originally-sampled respondents who were not interviewed in 2005–6 (O'Muircheartaigh et al., 2014). In 2015–2016, all previous respondents were re-interviewed, and a second cohort born 1948–65 together with their co-resident spouses/partners was added. This resulted in a total of 4777 respondents (weighted response rate of 71%). All respondents received a leave-behind questionnaire, in which the loneliness items were administered. This leave-behind questionnaire was returned by 85.2% of respondents in 2015–2016 (N = 4072). Among the subsample of white respondents born 1925–65, 2624 respondents provided complete loneliness data and constituted the analytic sample. This sample includes 1182 men and 1442 women. The average age of the sample is 68.4 (SD = 10.1) years old.

2.1.2. ELSA

ELSA is a population-based longitudinal study of the health, social, and economic circumstances of a probability sample of English adults aged 50 years and older. Sample members were drawn from respondents to the Health Survey for England in 1998, 1999, and 2001, a sample that consisted of 11,578 households containing 18,813 age-eligible individuals. The household response rate was 70%. Of these, 11,392 age-eligible individuals ("core members") were interviewed in Wave 1 of ELSA in 2002–03. The individual response rate was 96% of eligible individuals in responding households. Refresher samples added new core members in Waves 3 (n = 787), 4 (n = 1606), 6 (n = 665), and 7 (n = 301). For the period under study, 2014–15 (Wave 7), the total sample of 8253 core members included the new cohort of 301 core members, and 7952 core members who were re-interviewed. Re-interview rates exceeded 80% for each cohort. Additional information on sample design, response rates, and weights is provided in the publicly-available online ELSA user guides and technical reports (https://www.elsa-project.ac.uk/study-documentation). The study was approved by the London Multicentre Research Ethics Committee, and all participants provided informed consent.

As was the case for NSHAP, all respondents received a self-completion questionnaire which included the loneliness items. The questionnaire was completed while the other person in a couple completed sections in a "private" component of the questionnaire, or before or after the in-home interview date. The self-completed questionnaire was returned by 87% of respondents. Among the subsample of white core member respondents who were born 1925–1965 (N = 7748), 6639 respondents had complete loneliness data and constituted the analytic sample. This sample includes 2917 men and 3722 women. The average age of the sample is 68.0 (SD = 8.8) years old.

2.2. Measures

2.2.1. Loneliness

In both NSHAP and ELSA, loneliness was assessed using a 3-item scale based on the 20-item UCLA Loneliness Scale (Russell, 1996) and validated for use in large-scale surveys (Hughes et al., 2004). The three items asked respondents to report how often they "feel that they lack companionship," "feel left out," and "feel isolated from others.," Response options for ELSA and NSHAP 2005–2006 deviated slightly from the original response scale by adding "never" as a parenthetical response to "hardly ever." As such, the response options were "hardly ever (*OR* never)" (1), "some of the time" (2), and "often" (3). Starting in 2010–2011, NSHAP, but not ELSA, split the first response option into two ("never" and "hardly ever"); these were combined for analysis as recommended by Payne et al. (2014) and to be consistent with ELSA.

2.2.2. Loneliness risk factors

Survey differences in question wording and response options required post hoc harmonization procedures. These procedures are described in Supplementary Table 1. To the extent possible, procedures replicated those employed by Minicuci et al. (Minicuci et al., 2016) in their harmonization of variables in ELSA, HRS, SHARE (Survey of Health, Ageing and Retirement in Europe), and SAGE (Study on global AGEing and adult health). Some of this work was facilitated by ELSA in their release of variables harmonized to correspond as closely as possible to the RAND HRS variables. NSHAP uses many of the same variables as HRS, so the harmonized ELSA variables were preferentially selected when available.

Demographic variables consisted of age (in years, top coded at 90), gender, education (less than high school (HS in the US, including completion of the Graduate Record Examination) or compulsory school (CS in the UK), high/compulsory school graduate or equivalent, some college or vocational school, bachelor's degree or more), and marital status (currently married/cohabiting, widowed, separated/divorced, never married), where the latter was coded as a single contrast comparing those married/cohabiting to all other statuses combined. *Living arrangements* include living alone, living with a spouse or partner, and living with non-spousal others. *Health variables* include self-reported health (1 = poor, to 5 = excellent) and the Activities of Daily Living (ADLs; Katz, Ford, Moskowitz, Jackson and Jaffe, 1963), for which we compared those reporting 2 or more limitations to those with one or no limitations. *Social activity variables* included separate items for (a) the frequency of socializing with friends and family and (b) the frequency of attending a group meeting or church in the past year.

2.3. Statistical analytic strategy

2.3.1. Psychometrics of 3-item UCLA Loneliness Scale

Cronbach's alpha (internal consistency estimate of reliability), item-test correlations (correlation between an item and the full scale), and item-rest correlations (correlation between an item and the scale formed by all other items) were calculated overall and separately by country. We then fit a graded response model (GRM) to the three items in which the response to each item is modeled as a function of the individual's underlying level of loneliness via an ordinal logistic regression (also known as the cumulative logit model), which is a natural extension of the two-parameter logistic (2 PL) item response theory (IRT) model for ordinal items. As with the 2 PL model, the distribution of the latent loneliness values is assumed to be standard Normal (mean 0, variance 1). This model was fit separately to the data for each country, and was also fit to the NSHAP data from 2005 to 2006 for comparison to 2015–2016, to see if the behavior of the three-category response set created by combining the responses "never" and "hardly ever" is similar to that of the three response options used in ELSA. Estimates of each item's discrimination (i.e., the slope from the ordinal logistic regression) and difficulty (the threshold parameters) are presented. In addition, we used the Mantel–Haenszel test to evaluate uniform differential item functioning, both by country and according to age, gender, marital/partner status, and education. This tests the hypothesis that conditional on the underlying level of loneliness, respondents from different groups respond similarly to a given item. Analyses were performed using the commands `irt` and `difmh` in Stata version 16.

2.3.2. Between-country differences in loneliness

To compare loneliness between the U.S. and England, we expanded the GRM described above to include covariates predicting the underlying level of loneliness (known as a multiple indicators and multiple causes (MIMIC) model; see Supplementary Figure 2). We began with a model including only an indicator for ELSA (versus NSHAP), then added covariates in steps (first demographics, then health measures, and finally social factors) to examine how increasing adjustment for each group of covariates alters the estimated difference in loneliness between

countries. Since we found evidence for differential item functioning, we also used ordinal logistic regression to regress each of the three loneliness items separately on the country indicator and the full set of covariates. We chose this strategy because with only three loneliness items, separate regressions is no less parsimonious and easier to present than augmenting the MIMIC model to account for differential item functioning by country and covariates. Still, we present the MIMIC model for comparison with all of the previous work that has been done using the 3-item scale. Finally, to determine whether there were country differences in the impact of risk factors for loneliness, we refit the MIMIC model separately by country and plotted both sets of coefficients and their confidence intervals; differences were assessed by adding the corresponding interaction terms to the full model (including both countries), and the estimated interaction terms were also plotted. The MIMIC models were fit using Stata's gsem command.

2.3.3. Weighting and variance estimation

Both the NSHAP and ELSA datasets are distributed with weights that account for differential probabilities of selection and differential non-response (documentation provided in the study descriptions above); these were used in all analyses except when calculating Cronbach's α. In addition, both datasets are distributed with survey design variables (stratum and PSU), and these were used to obtain design-based variance estimates for the ordinal logistic regressions using the linearization method. Variance estimates for the GRM and MIMIC models were obtained using the robust (i.e., sandwich) estimator.

3. Results

3.1. Psychometric properties of 3-item UCLA Loneliness Scale

Cronbach's alpha across the three loneliness items was 0.82 overall (NSHAP = 0.81; ELSA = 0.83) indicating good internal consistency. Item-test correlations were all above 0.8 and were similar across countries (Supplementary Table 2). Item-rest correlations were all above 0.6 and had similar patterns across countries (lowest value for "lack companionship"). Of those who reported often lacking companionship, 49% reported often on at least one of the other items (29% reported often on both). Of those that reported often feeling isolated, 73% reported often on at least one other item (44% were often on both). Of those who reported often feeling left out, 81% reported often on at least one of the other items (50% reported often on both).

Table 1 shows results from the GRM. Discrimination was substantially higher for "feel left out" and lowest for "lack companionship," a pattern that was consistent across all three datasets. Estimates of discrimination were similar for NSHAP 2005–2006 (which used 3

Table 1

Graded response model fit to the 3-item UCLA Loneliness Scale, separately for the two analytic samples (NSHAP, 2015–2016 and ELSA, 2014–2015) and for NSHAP data from 2005 to 2006.

	Lack companionship	Feel isolated	Feel left out
NSHAP 2005–2006[a]			
Discrimination[b]	2.31	3.24	11.51
Difficulty (≥2, = 3)[c]	0.61, 2.08	0.93, 2.39	0.58, 2.13
NSHAP 2015–2016			
Discrimination[b]	2.37	2.97	10.22
Difficulty (≥2, = 3)[c]	0.55, 1.73	0.70, 2.03	0.54, 1.72
ELSA 2014–2015			
Discrimination[b]	2.36	3.32	11.38
Difficulty (≥2, = 3)[c]	0.65, 2.01	0.73, 1.96	0.52, 1.81

[a] Includes only white respondents born 1925–47.

[b] Estimated change in the log odds of responding above a given cutpoint associated with a one SD increase in the latent loneliness value.

[c] Estimated latent loneliness value at which an individual has a 50% probability of responding at a given category or higher (2 = "some of the time," 3 = "often").

response categories) and NSHAP 2015–2016 (which used 4 response categories), however the estimated difficulties are somewhat higher for 2005–2006. Estimates of discrimination are also similar between NSHAP 2015–2016 and ELSA, as are the estimated difficulties for "feel isolated" and "feel left out." However, both difficulties for "lack companionship" are higher for ELSA, indicating that English respondents were less likely to endorse this item. This is reflected in the tests for uniform differential item functioning (Table 2), which show that for a given underlying level of loneliness, English respondents are less likely to say that they lack companionship (OR = 0.44, 95% CI = [0.33, 0.59]).

There was also evidence for differential item functioning according to demographic characteristics (Table 2). For a given level of loneliness, women were less likely than men to say they felt isolated, while those who completed high school *or* compulsory school were more likely to say they lacked companionship and less likely to say they felt left out. As might be expected, those who were married or living with a partner were considerably less likely to say they lacked companionship, though they were also more likely to say they felt isolated or left out (all for a given level of loneliness). These patterns of differential item functioning across demographic subgroups were similarly observed within both NSHAP and ELSA.

3.2. Between-country differences in loneliness, risk factor prevalence and impact

Table 3 displays country-specific means for the total loneliness score and proportions within each sample that endorsed each response to the individual loneliness items. Total loneliness scores did not differ between the U.S. and England (p = 0.39), and were low (means of 4.1 and 4.0, respectively, on a scale of 3–9), indicating that most of the population in each country is not lonely. Loneliness item-level responses did not differ significantly for "feel isolated" or "feel left out," but did differ for "lack companionship" (p = 0.03). The difference was small and consisted of a smaller proportion of ELSA than NSHAP individuals reporting frequent lack of companionship (6% vs. 8%) and, correspondingly, a larger proportion reporting hardly ever or never lacking companionship (68% vs. 66%).

Table 3 also displays national estimates of the means or percentage

Table 2

Assessment of uniform differential item functioning based on country and demographic characteristics among adults born 1925–1965 (odds Ratio [95% CI] and *p*-value from Mantel-Haenszel test).

	Lack companionship[a]	Feel isolated[a]	Feel left out[a]
ELSA (vs. NSHAP)	0.44 [0.33, 0.59] <0.001	1.34 [0.93, 1.95] 0.14	1.00 [0.66, 1.52] 0.92
Demographics			
Age (≥ 70 vs. <70)	1.12 [0.85, 1.48] 0.44	1.38 [0.98, 1.95] 0.08	0.97 [0.65, 1.44] 0.94
Women (vs. men)	1.09 [0.82, 1.44] 0.61	0.64 [0.45, 0.92] 0.02	0.79 [0.53, 1.18] 0.30
Married or living with partner (vs. not)	0.36 [0.27, 0.48] <0.001	1.76 [1.23, 2.51] 0.002	2.12 [1.41, 3.20] <0.001
Education (>HS/CS vs. <=HS/CS)	1.51 [1.13, 2.01] 0.006	0.86 [0.60, 1.23] 0.46	0.65 [0.43, 0.99] 0.05
Among those with >HS/CS: (Bachelors or more vs. <Bachelors)	1.03 [0.66, 1.63] 0.97	0.87 [0.49, 1.54] 0.73	0.84 [0.40, 1.73] 0.76

[a] Item responses split into "often" versus "some of the time" or "hardly ever (or never)."

Table 3

Estimated means (or percentages) of loneliness and selected covariates for the U.S. and English white adult population born 1925–1965.

Variable	NSHAP	ELSA	*p*-value[a]
Loneliness score (3–9)	4.1	4.0	0.39
Individual items			
Lack companionship			0.03
Hardly ever (or never)	66%	68%	
Some of the time	26%	26%	
Often	8%	6%	
Feel isolated			0.54
Hardly ever (or never)	72%	73%	
Some of the time	24%	23%	
Often	4%	4%	
Feel left out			0.35
Hardly ever (or never)	70%	68%	
Some of the time	26%	28%	
Often	4%	4%	
Demographics			
Age (years)	64.6	64.9	0.29
Women	54%	52%	0.05
Married or living with partner	72%	68%	0.01
Education			<0.001
< HS/CS	7%	27%	
HS/CS	23%	44%	
Voc cert/some college/assoc.	37%	13%	
Bachelors or more	33%	16%	
Health characteristics			
Self-rated health			<0.001
Mean (1–5)	3.4	3.3	
Good or better	80%	76%	
Two or more ADLs	11%	7%	<0.001
Social characteristics			
Living arrangements			0.06
Living alone	19%	21%	
Living with spouse or partner	71%	67%	
Living with others	10%	12%	
Socialize with friends/family at least monthly	82%	87%	<0.001
Attending group meeting or church in the last year	83%	31%	<0.001
Number of respondents[b]	2624	6639	

[a] *p*-values obtained from linear, logistic or ordinal regression models comparing NSHAP to ELSA.

[b] Number with data available for all loneliness items.

distributions of several loneliness risk factors among white adults born 1925–1965. While the mean ages are nearly identical, the distributions of the other variables differ between countries, sometimes substantially so. Older adults in England are somewhat less likely to be married or living with a partner (68% versus 72%) and more likely to be living alone (21% versus 19%). A substantially higher percentage of them have not completed high/compulsory school (27% versus 7%) while fewer have completed a Bachelors degree (16% versus 33%). English older adults also report somewhat worse health (76% rating their health as "Good" or better versus 80% among U.S. older adults), though fewer of them report experiencing two or more ADL limitations (7% versus 11%). Finally, a larger proportion of English older adults report socializing at least monthly with friends and family (87% versus 82%), and a much smaller proportion report attending a group meeting or church in the last year (31% versus 83%).

Table 4 shows results from a series of MIMIC models comparing loneliness between ELSA and NSHAP, each successive model incorporating an additional set of covariates. Consistent with the comparison of the summed loneliness scores in Table 3, the unadjusted comparison (Model 0) shows no difference between countries. This changes however once we adjust for age, gender and education such that English older adults appear somewhat less lonely; the magnitude of the difference increases further and is consistent across Models 2–4. The difference of −0.09 (95% CI = [-0.16, −0.03]) estimated in Model 4 corresponds to

Table 4
MIMIC models comparing loneliness between ELSA and NSHAP and adjusting for demographic, health and social characteristics, fit to the data from white respondents born 1925–1965 (estimated coefficients and 95% CIs).

Covariates	Model 0	Model 1	Model 2	Model 3	Model 4
ELSA (vs. NSHAP)	0.00 (−0.05, 0.06)	−0.06 (−0.12, −0.01) *	−0.10 (−0.16, −0.05) ‡	−0.09 (−0.14, −0.03) †	−0.09 (−0.16, −0.03) †
Demographics					
Age		−0.03 (−0.06, −0.002)*	−0.06 (−0.09, −0.04) ‡	−0.10 (−0.13, −0.07) ‡	−0.10 (−0.13, −0.07) ‡
(per decade from 70)					
Age squared		0.05 (0.03, 0.08) ‡	0.04 (0.01, 0.06) †	0.03 (0.01, 0.06) *	0.02 (−0.00, 0.05)
Women (vs. men)		0.12 (0.07, 0.16) ‡	0.08 (0.04, 0.13) ‡	0.10 (0.05, 0.15) ‡	0.13 (0.07, 0.18) ‡
Education (vs. <HS/CS)					
HS/CS		−0.13 (−0.19, −0.08) ‡	−0.12 (−0.19, −0.06) ‡	−0.03 (−0.09, 0.04)	−0.04 (−0.11, 0.04)
Voc cert/some college/assoc.		−0.20 (−0.27, −0.13) ‡	−0.18 (−0.25, −0.11) ‡	−0.06 (−0.14, 0.02)	−0.06 (−0.14, 0.03)
Bachelors or more		−0.34 (−0.41, −0.26) ‡	−0.34 (−0.41, −0.27) ‡	−0.15 (−0.22, −0.07) ‡	−0.13 (−0.21, −0.04) †
Health characteristics					
Self-rated health (1–5)				−0.23 (−0.26, −0.20) ‡	−0.21 (−0.24, −0.19) ‡
Two or more ADLs				0.21 (0.12, 0.31) ‡	0.20 (0.10, 0.30) ‡
(vs. <2)					
Social characteristics					
Married or living with partner (vs. not)			−0.66 (−0.73, −0.60) ‡	−0.65 (−0.71, −0.59) ‡	−0.68 (−0.74, −0.61) ‡
Socialized with friends/family at least monthly (vs. not)					−0.35 (−0.42, −0.28) ‡
Attended group meeting or church in the last year (vs. not)					−0.07 (−0.13, −0.01) *
Factor Loadings					
Lack companionship	2.35	2.34	2.65	2.54	2.53
Feel isolated	3.20	3.16	3.54	3.47	3.42
Feel left out	11.00	10.60	4.48	4.02	3.95

*p < 0.05; †p < 0.01; ‡p < 0.001.

odds ratios of exp (-0.09 x 2.53) = 0.80 for lack companionship, exp (-0.09 x 3.42) = 0.74 for feel isolated, and exp (-0.09 x 3.95) = 0.70 for feel left out. A slightly different view is provided by the individual ordinal logit models in Table 5. Adjusting for all of the covariates (Model 4), the estimated odds ratios comparing ELSA to NSHAP are exp (-0.33) = 0.72 (95% CI = [0.61, 0.85]), exp (-0.13) = 0.88 (95% CI = [0.76, 1.03]) and exp (-0.05) = 0.95 (95% CI = [0.82, 1.11]) for lack companionship, feel isolated and feel left out, respectively. Finally, we conducted a parallel analysis to that reported in Table 4, Model 4, that focused on the extreme end of the loneliness distribution (i.e., scores of 7 or higher on a scale from 3 to 9) using logistic regression. Consistent with the reported results, the comparison between countries revealed lower odds of extreme loneliness in ELSA than in NSHAP (OR = 0.72, SE = 0.10, p = 0.017).

When adjusting for all covariates, loneliness decreased steadily with age in both NSHAP and ELSA (Fig. 1), consistent with our prior work (Hawkley et al., 2019). Women were more lonely than men, though this effect was greatest for lack companionship and smallest for feel isolated (consistent with the DIF associated with gender noted above). Education, while associated with reduced loneliness in Models 1–2 (Table 4), loses most of its association when adjusting for health characteristics. Better self-rated health and fewer ADLs are both associated with reduced loneliness, and these effects are present across all 3 items (except for ADLs where the effect is much lower and not statistically significant for lack companionship). As expected, being married or living with a partner is associated with a substantial reduction in loneliness, which is greatest for lack companionship (again consistent with the DIF noted above). Similarly, socializing with friends/family monthly or more is associated with a reduction in loneliness that is present across all three items. Finally, having attended group meetings or church in the last year is also associated with a modest reduction in loneliness for lack companionship and feel isolated. These effects are in general quite similar across both studies (Fig. 2 and Supplementary Figure 1), with the one exception that the linear decrease with age was slightly higher for NSHAP (Fig. 1).

4. Discussion

In this study, the first to compare loneliness among white older adults in the U.S. to that among their white age-peers in England, we find no evidence of an overall difference in loneliness between the two populations, and weak evidence of a modest difference—with older adults in England being less lonely—when adjusting for between-country differences in the distribution of demographic, health and social covariates. Risk factors for loneliness such as low education, poor health, not having a spouse or cohabiting partner, and not attending church or other group meetings are indeed more prevalent among English older adults and have similar associations with loneliness in the two countries. However, when comparing individuals with similar values for these variables, English older adults are, if anything, slightly less lonely than those in the U.S. Moreover, older adults in England also have fewer ADLs and are more likely to report socializing with friends/family at least monthly, both of which are associated with a reduction in loneliness. Thus, overall loneliness in the two populations is similar.

We note that ELSA and NSHAP differed in how they asked about group activities. Whereas ELSA asks about frequency of attendance across all organizations and activities, including religious services, NSHAP has a separate question about religious service attendance. To examine whether this difference impacted on our analysis of country differences in loneliness, we conducted ancillary analyses in which we (a) dropped NSHAP's religious service attendance from the group meeting variable, and (b) dropped the group meeting attendance from the model entirely. In each case, our results were not substantively affected; ELSA continued to show comparable if not somewhat lower levels of loneliness than NSHAP.

Our results replicate prior research regarding the association of loneliness with age, gender, and education, as well as with health and social risk factors (Hawkley et al., 2008; Pinquart and Sorensen, 2003). Moreover, these associations are similar between older adults in England and the U.S. Married and more educated individuals are known to be healthier and less lonely (Adams, 2002; Pinquart and Sorensen, 2001;

Table 5

Ordinal logistic regression models for each loneliness item comparing ELSA and NSHAP and adjusting for demographic, health and social characteristics, fit to the data from white respondents born 1925–1965 (estimated coefficients and 95% CIs).
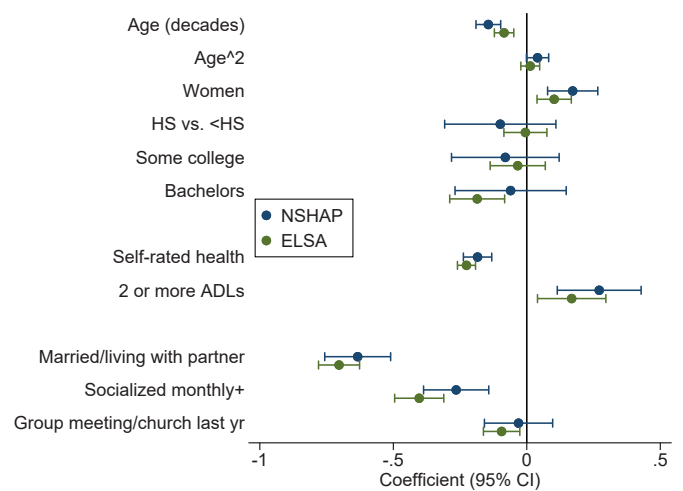
Covariates	Model 0			Model 4		
	Lack companionship	Feel isolated	Feel left out	Lack companionship	Feel isolated	Feel left out
ELSA (vs. NSHAP)	−0.14 (-0.27, −0.02) *	−0.04 (-0.15, 0.08)	0.06 (-0.06, 0.18)	−0.33 (-0.50, −0.16) ‡	−0.13 (-0.28, 0.03)	−0.05 (-0.20, 0.10)
Demographics						
Age (per decade from 70)				−0.14 (-0.20, −0.08) ‡	−0.15 (-0.21, −0.09) ‡	−0.22 (-0.28, −0.15) ‡
Age squared				0.02 (-0.04, 0.08)	0.07 (0.01, 0.13)*	0.00 (-0.06, 0.06)
Women (vs. men)				0.31 (0.20, 0.43) ‡	0.14 (0.01, 0.26)*	0.21 (0.09, 0.33) †
Education (vs. <HS/CS)						
HS/CS				−0.03 (-0.20, 0.14)	−0.06 (-0.23, 0.12)	−0.05 (-0.22, 0.11)
Voc cert/some college/assoc.				−0.04 (-0.24, 0.16)	−0.07 (-0.25, 0.12)	−0.13 (-0.32, 0.07)
Bachelors or more				−0.11 (-0.31, 0.10)	−0.13 (-0.33, 0.07)	−0.26 (-0.46, −0.07) †
Health characteristics						
Self-rated health (1–5)				−0.32 (-0.38, −0.25) ‡	−0.39 (-0.46, −0.32) ‡	−0.34 (-0.40, −0.27) ‡
Two or more ADLs (vs. <2)				0.15 (-0.06, 0.35)	0.44 (0.23, 0.66) ‡	0.30 (0.09, 0.50) †
Social characteristics						
Married or living with partner (vs. not)				−1.56 (-1.69, −1.44) ‡	−0.88 (-1.01, −0.75) ‡	−0.80 (-0.92, −0.68) ‡
Socialized with friends/family at least monthly (vs. not)				−0.38 (-0.55, −0.22) ‡	−0.67 (-0.82, −0.52) ‡	−0.57 (-0.72, −0.41) ‡
Attended group meeting or church in the last year (vs. not)				−0.14 (-0.28, −0.00)*	−0.17 (-0.31, −0.02)*	−0.08 (-0.21, 0.05)

*$p < 0.05$; †$p < 0.01$; ‡$p < 0.001$.
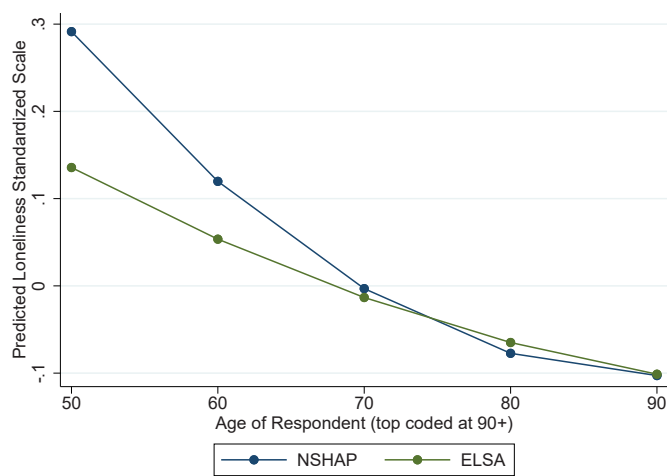
Fig. 1. Estimated quadratic effect of age on loneliness from a linear regression model fit to the empirical Bayes means of the latent loneliness construct including age and age^2 by study interactions in addition to the demographic, health and social covariates from Table 4, Model 4. All other covariates were fixed at their means.

Fig. 2. Forest plot of estimated coefficients and 95% CIs from two separate MIMIC models corresponding to Model 4 in Table 4, one for each study.

Stack, 1998; Waite and Gallagher, 2000). We find that while adjusting for marriage had no impact on the association between education and loneliness, adjusting for just two health characteristics (self-rated health and ADLs) accounted for a majority of the education effect. Adjusting for health did not affect the association between marriage and loneliness, and further adjusting for socializing with friends/family and attending church or other group meetings did not affect the association between health and loneliness. Thus, it appears that while better health and physical functioning may account primarily for the benefits of higher

levels of education, the effects of health and social characteristics on loneliness are distinct.

Ours is also the first study to examine item-level functioning of the 3-item UCLA Loneliness Scale. We found that the item "feel left out" has substantially higher discrimination than the other two items, meaning that it does a better job at distinguishing between different levels of loneliness. We also found evidence for differential item functioning both by country and by various individual characteristics, meaning that different individuals with the same underlying value of loneliness respond differently to specific items. For example, ELSA respondents were less likely to report that they lacked companionship, though with only 3 items in the scale, we cannot distinguish between the possibilities

that: (1) the lack companionship item really exhibits DIF by country, and there is little or no difference in loneliness between the U.S. and UK; or (2) the lack companionship item captures a subdomain of loneliness which does differ modestly between the two countries. Put another way, comparing the U.S. and UK using the three items together (the approach typically used with these items) shows a modestly lower level of loneliness in the UK when adjusting for covariates (Table 4), whereas the results in Table 5 show that this difference is largely due to a between-country difference in the lack companionship item (Table 5). This may be interpreted either as DIF by country (in which case, Table 5 suggests no difference in loneliness between the countries adjusting for covariates) or as a true difference in lacking companionship per se—the current data cannot distinguish between the two. To the limited extent DIF is evident, it may include a cultural difference in the understanding of the item unrelated to differences in loneliness. This finding warrants replication, possibly in a younger cohort since language use may have become more homogenous across the U.S. and UK with successive generations. In any event, there necessarily remains some uncertainty about the exact magnitude of the difference in loneliness between older adults in England and the U.S.

Differential item functioning may also be attributable to methodological differences between studies. Both NSHAP and ELSA asked the loneliness items in a self-administered paper-and-pencil questionnaire, and while this eliminates interviewer effects as a potential source of DIF, it may introduce contextual effects that differentially affect responses including where, when, and in whose presence the questionnaire was completed. In addition, the location of the loneliness items relative to other items in the self-administered instrument could contribute to differential responses.

One concern we had at the outset was the potential impact of harmonizing the response choices for the loneliness items (i.e., collapsing "never" and "hardly ever" for NSHAP) on the between-country comparison. Comparing the NSHAP data collected in 2015–2016 (with the collapsed categories) to those collected in 2005–2006 (which used the same three-choice response set as ELSA), we find that each item has similar discrimination but systematically lower difficulties (i.e., greater loneliness in 2015–2016). This is the opposite of what we might expect if introducing the additional response option pulled responses from the option "some of the time." Thus, we do not believe that this difference in the response choices had a significant impact on the cross-country comparison.

Finally, our finding of differential item functioning by demographic characteristics and marital status is consistent with past research showing DIF among gender and partner status subgroups using the De Jong Gierveld Loneliness Scale (Van Tilburg et al., 2004). Moreover, these subgroup differences in DIF were equivalent in both NSHAP and ELSA. Despite these differences, the patterns of association with demographic, health and social characteristics are largely similar across at least two of the three loneliness items. Thus, while attending to DIF may have a small impact on estimates of the magnitude of the association between loneliness and these characteristics, it does not call into question the basic findings which previous work has reported and which we replicate here. Nevertheless, we recommend that further work using this 3-item scale pay attention to the possible impact that DIF may have on their results.

4.1. Limitations

This study limited analyses to data from white respondents due to differences in the racial-ethnic composition of the two countries as well as limited sample size for individual minority subgroups, each of which may have distinct experiences related to loneliness. This limits the generalizability of our between-country comparison to whites. Virtually nothing is known about the social relationships experienced by the ethnically diverse and growing subpopulations of non-whites in these countries. Racial and ethnic minorities may have a different risk for

loneliness, and it is not a stretch to speculate that their feelings of social connectedness may be affected by recent increases in attacks on minorities and politicians singling them out. Future work should absolutely be done on loneliness among racial and ethnic minorities, both to remedy our lack of knowledge about loneliness in these groups, but also because their different experiences may lead to new insights about general factors that increase the risk for and protect against loneliness.

While cross-sectional data are useful in understanding the state of loneliness at a particular point in time (in this case in the years 2014–2016), longitudinal data are necessary to understand the factors that gave rise to the current state of loneliness, and how loneliness trajectories unfold over time. A recent study using ELSA data found considerable temporal stability of loneliness over an 8-year period, but a quarter of the sample became lonelier over that time interval. A deterioration in the closeness of the marital relationship was associated with increases in loneliness over time (Yang, 2018). Both England and the U.S. have undergone social, political and economic changes that may shape distinctive trajectories of loneliness over time. Future research would do well to consider not only individual risk factors, but also environmental and societal risk factors that may shape loneliness trajectories differently for different subgroups and different birth cohorts. A recent study using NSHAP and HRS data found no evidence for birth cohort differences in loneliness among U.S. adults over the age of 50 between 2005 and 2016 (Hawkley et al., 2019); younger cohorts (born 1948–1965) were no more or less lonely than those born earlier (1920–1947). Moreover, individual-level risk factors were not differentially associated with loneliness in these two cohorts. However, trajectories of loneliness were not examined, nor were risk factors that may uniquely affect more recent generations, including changes in health care delivery and new communication options afforded older adults by the advance of technology. Including a variety of types of risk factors would help to identify segments of the population that are at greatest risk for chronic or increasing loneliness.

Loneliness and social isolation have achieved higher visibility in England than in the U.S. (DiJulio et al., 2018); whereas 34 percent of UK adults reported having heard "a lot" and 12 percent having heard "nothing at all" about "the problems of loneliness and social isolation," only 22 percent of U.S. adults had heard "a lot" and almost an equal percentage (21 percent) had heard "nothing at all." This difference in exposure could itself have affected our comparison of loneliness between the two countries. However, this possibility may be reduced by the fact that the UCLA Loneliness Scale, although it does use the term "isolation," does not use the term "loneliness."

Adults in the UK were much more likely to believe that loneliness and social isolation are public health problems (66% versus 47% in the U.S.) than individual problems (DiJulio et al., 2018). Moreover, whereas 63 percent of adults in the UK believe the government "should play a major role in helping to reduce loneliness and social isolation in society," only 27% of adults in the U.S. held to this belief. Indeed, public health services and programs designed specifically to reduce loneliness and isolation are more prevalent at the national level in the UK than in the U.S., and these programs may have directly or indirectly benefited the older adults in the ELSA sample, thus possibly contributing to lower levels of loneliness in England than in the U.S.

5. Conclusions

In sum, among white adults born between 1925 and 1965, we find no evidence of an overall difference in loneliness between the two countries, and weak evidence that older adults in England are slightly less lonely when adjusting for between-country differences in the distribution of demographic, health and social covariates. We also replicate prior results showing that better health, as well as being married or living with a partner, socializing with family and friends and attending church or other group meetings are all associated with less loneliness. These associations were similar in England and the U.S. Longitudinal

data, particularly in the context of interventions that seek to increase these protective factors, would be helpful in understanding whether these intervention targets are effective in reducing loneliness in one or both countries. The fact that the association between these factors and loneliness are similar across countries should facilitate learning from each other's intervention efforts. In this regard, it is informative to learn that a pilot loneliness reduction program launched by "Age UK" has preliminary evidence showing that a befriending service that provides support and helps older adults find and access local organizations and resources can reduce the risk of loneliness and isolation. Among those who initially reported feeling lonely some of the time or often, up to 88 percent experienced a reduction in loneliness (Age UK, 2016). Comparable services are not yet available in a systematic fashion across the U. S., but evidence of their effectiveness, and their cost-effectiveness in the UK context (McDaid et al., 2017), could be leveraged to accelerate development of similar services in the U.S. As of this writing, coronavirus-related social distancing and "stay-at-home" directives are exposing entire populations to the experience of isolation and its potential to engender feelings of loneliness. A role for government and policy in addressing the need for socialization has rarely been as clear.

Acknowledgements

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.socscimed.2020.113467.

References

Adams, S.J., 2002. Educational attainment and health: evidence from a sample of older adults. Journal of Education Economics 10, 97–109.

Age UK, 2016. Testing Promising Approaches to Reducing Loneliness: Results and Learnings of Age UK's Loneliness Pilot. Campaign to End Loneliness, London, UK. https://www.ageuk.org.uk/globalassets/age-uk/documents/reports-and-publications/reports-and-briefings/health–wellbeing/rb_2016_testing_promising_approaches_to_reducing_loneliness_report.pdf. (Accessed 16 January 2019).

Cacioppo, S., Capitanio, J.P., Cacioppo, J.T., 2014. Toward a neurology of loneliness. Psychol. Bull. 140, 1464–1504.

Crimmins, E.M., Garcia, K., Kim, J., 2010. Are international differences in health similar to international differences in life expectancy? In: Crimmins, E.M., Preston, S.H., Cohen, B. (Eds.), International Differences in Mortality at Ages: Dimensions and Sources. The National Academies Press, Washington, DC, pp. 68–101. https://doi.org/10.17226/12945.

De Jong Gierveld, J., Tesch-Römer, C., 2012. Loneliness in old age in Eastern and Western European societies: theoretical perspectives. Eur. J. Ageing 9, 285–295.

De Jong Gierveld, J., Van Tilburg, T., Dykstra, P.A., 2006. Loneliness and social isolation. In: Vangelisti, A., Perlman, D. (Eds.), Cambridge Handbook of Personal Relationships. Cambridge University Press, Cambridge, pp. 485–500.

DiJulio, B., Hamel, L., Muñano, C., Brodie, M., 2018. Loneliness and Social Isolation in the United States, the United Kingdom, and Japan: an International Survey. Kaiser Family Foundation, Publication #9229. San Francisco, CA: Kaiser Family Foundation.

Dykstra, P.A., 2009. Older adult loneliness: myths and realities. Eur. J. Ageing 6, 91–100.

Fokkema, T., De Jong Gierveld, J., Dykstra, P.A., 2012. Cross-national differences in older adult loneliness. J. Psychol. 146 (1–2), 201–228.

Hansen, T., Slagsvold, B., 2016. Late-life loneliness in 11 European countries: results from the Generations and Gender Survey. Soc. Indicat. Res. 129, 445–464.

Hawkley, L.C., Browne, M.W., Cacioppo, J.T., 2005. How can I connect with thee? Let me count the ways. Psychol. Sci. 16, 798–804.

Hawkley, L.C., Duvoisin, R., Ackva, J., Murdoch, J.C., Luhmann, M., 2015. Loneliness in Older Adults in the USA and Germany: Measurement Invariance and Validation. Paper 2015-002. NORC Working Papers.

Hawkley, L.C., Gu, Y., Luo, Y.-J., Cacioppo, J.T., 2012. The mental representation of social connections: generalizability extended to Beijing adults. PloS One 7 (9), e44065.

Hawkley, L.C., Hughes, M.E., Waite, L.J., Masi, C.M., Thisted, R.A., Cacioppo, J.T., 2008. From social structural factors to perceptions of relationship quality and loneliness: the Chicago Health, Aging, and Social Relations Study. J. Gerontol.: Soc. Sci. 63B, S375–S384.

Hawkley, L.C., Kocherginsky, M., 2018. Transitions in loneliness among older adults: a five-year follow-up in the National Social Life, Health, and Aging Project. Res. Aging 40, 365–387.

Hawkley, L.C., Wroblewski, K., Kaiser, T., Luhmann, M., Schumm, L.P., 2019. Are U.S. older adults getting lonelier?: age, period, and cohort differences. Psychology and Aging. Psychology and Aging 34, 1144–1157.

He, W., Goodkind, S., Kowal, P., 2016. An Aging World: 2015. International Population Reports. United States Census Bureau.

Holt-Lunstad, J., Smith, T.B., Baker, M., Harris, T., Stephenson, D., 2015. Loneliness and social isolation as risk factors for mortality: a meta-analytic review. Perspect. Psychol. Sci. 10, 227–237.

Holt-Lunstad, J., Smith, T.B., Layton, J.B., 2010. Social relationships and mortality risk: a meta-analytic review. PLoS Med. 7 (7), e1000316.

Hughes, M.E., Waite, L.J., Hawkley, L.C., Cacioppo, J.T., 2004. A short scale for measuring loneliness in large surveys. Res. Aging 26, 655–672.

Katz, S., Ford, A.B., Moskowitz, R.W., Jackson, B.A., Jaffe, M.W., 1963. Studies of illness in the aged. J. Am. Med. Assoc. 185, 914–919.

Kennedy, S., Reeves, R., 2017. Combatting Loneliness One Conversation at a Time: A Call to Action. Jo Cox Commission on Loneliness, London, UK. https://www.ageuk.org.uk/globalassets/age-uk/documents/reports-and-publications/reports-and-briefings/active-communities/rb_dec17_jocox_commission_finalreport.pdf. (Accessed 16 August 2019).

Luhmann, M., Hawkley, L., 2016. Age differences in loneliness from late adolescence to oldest old age. Dev. Psychol. 52, 943–959.

McDaid, D., Bauer, A., Park, A.L., 2017. Making the Economic Case for Investing in Actions to Prevent and/OR Tackle Loneliness: A Briefing Paper. Personal Social Services Research Unit (PSSRU), London School of Economics and Political Science, London, UK. http://www.lse.ac.uk/business-and-consultancy/consulting/assets/documents/making-the-economic-case-for-investing-in-actions-to-prevent-and-OR-tackle-loneliness-a-systematic-review.pdf. (Accessed 13 August 2019).

Minicuci, N., Naidoo, N., Chatterji, S., Kowal, P., 2016. Data resource profile: cross-national and cross-study sociodemographic and health-related harmonized domains from SAGE plus ELSA, HRS and SHARE (SAGE+, Wave 1). Int. J. Epidemiol. 45 (5), 1403. https://doi.org/10.1093/ije/dyw181, 1403j.

Nicolaisen, M., Thorsen, K., 2014. Who are lonely? Loneliness in different age groups (18–81 years old), using two measures of loneliness. Int. J. Aging Hum. Dev. 78, 229–257.

O'Muircheartaigh, C., Eckman, S., Smith, S., 2009. Statistical design and estimation for the National Social Life, Health and Aging Project (NSHAP). J. Gerontol. Psychol. Sci. Soc. Sci. 64, i12–i19.

O'Muircheartaigh, C., English, N., Pedlow, S., Kwok, P.K., 2014. Sample design, sample augmentation, and estimation for wave II of the National Social Life, Health and Aging Project (NSHAP). J. Gerontol. Psychol. Sci. Soc. Sci. 69B, S15–S26.

Payne, C., Hedberg, E.C., Kozloski, M., Dale, W., McClintock, M.K., 2014. Using and interpreting mental health measures in the National Social Life, Health, and Aging Project. J. Gerontol. B Psychol. Sci. Soc. Sci. 69 (8), S99–S116.

Peplau, L.A., Perlman, D. (Eds.), 1982. Loneliness: A Sourcebook of Current Theory, Research and Therapy. John Wiley & Sons, New York.

Perissinotto, C.M., Cenzer, I.S., Covinsky, K.E., 2012. Loneliness in older persons: a predictor of functional decline and death. Arch. Intern. Med. 172, 1078–1083.

Pinquart, M., 2003. Loneliness in married, widowed, divorced, and never-married older adults. J. Soc. Pers. Relat. 20, 31–53.

Pinquart, M., Sörensen, S., 2001. Influences on loneliness in older adults: a meta-analysis. Basic Appl. Soc. Psychol. 23, 245–266.

Pinquart, M., Sörensen, S., 2003. Risk factors for loneliness in adulthood and old age—a meta-analysis. Advances in Psychology Research 19, 111–143.

Russell, D.W., 1996. UCLA loneliness scale (version 3): reliability, validity, and factor structure. J. Pers. Assess. 66, 20–40.

Schirmer, W., Michailakis, D., 2018. Inclusion/exclusion as the missing link. A Luhmannian analysis of loneliness among older people. Syst. Res. Behav. Sci. 35, 76–89.

Shankar, A., McMunn, A., Banks, J., Steptoe, A., 2011. Loneliness, social isolation, and behavioral and biological health indicators in older adults. Health Psychol. 30, 377–385.

Solé-Auró, A., Crimmins, E.M., 2014. Who cares? A comparison of informal and formal care provision in Spain, England and the USA. Ageing Soc. 34, 495–517.

Stack, S., 1998. Marriage, family and loneliness: a cross-national study. Socio. Perspect. 41, 415–432. https://doi.org/10.2307/1389484.

Steptoe, A., Shankar, A., Demakakos, P., Wardle, J., 2013. Social isolation, loneliness and mortality in older men and women. Proc. Natl. Acad. Sci. Unit. States Am. 110, 5797–5801.

Theeke, L.A., 2009. Predictors of loneliness in U.S. adults over age sixty-five. Arch. Psychiatr. Nurs. 23, 387–396.

Van Tilburg, T., Havens, B., De Jong Gierveld, J., 2004. Loneliness among older adults in The Netherlands, Italy, and Canada: a multifaceted comparison. Can. J. Aging 23, 169–180.

Waite, L.J., Gallagher, M., 2000. The Case for Marriage: Why Married People Are Happier, Healthier, and Better off Financially. Random House Inc, New York, NY.

Walker, C.M., 2011. What's the DIF? Why differential item functioning analyses are an important part of instrument development and validation. J. Psychoeduc. Assess. 29, 364–376. https://doi.org/10.1177/0734282911406666.

Wilson, C., Moulton, B., 2010. Loneliness Among Older Adults: A National Survey of Adults 45+. Prepared by Knowledge Networks and Insight Policy Research. AARP, Washington, DC.

World Bank, 2017. GINI Index (World Bank Estimate). https://data.worldbank.org/indicator/SI.POV.GINI?locations=US-GB. (Accessed 16 January 2019).

Yang, K., 2018. Longitudinal loneliness and its risk factors among older people in England. Can. J. Aging 37, 12–21.

Yang, K., Victor, C., 2011. Age and loneliness in 25 European nations. Ageing Soc. 31, 1368–1388.

Yin, J., Lassale, C., Steptoe, A., Cadar, D., 2019. Exploring the bidirectional associations between loneliness and cognitive functioning over 10 years: the English Longitudinal Study of Ageing. Int. J. Energy Econ. Pol. https://doi.org/10.1093/ije/dyz085.