



The prevalence of loneliness across 113 countries: systematic review and meta-analysis

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ABSTRACT

OBJECTIVES

To identify data availability, gaps, and patterns for population level prevalence of loneliness globally, to summarise prevalence estimates within World Health Organization regions when feasible through meta-analysis, and to examine temporal trends of loneliness in countries where data exist.

DESIGN

Systematic review and meta-analysis.

DATA SOURCES

Embase, Medline, PsycINFO, and Scopus for peer reviewed literature, and Google Scholar and Open Grey for grey literature, supplemented by backward reference searching (to 1 September 2021)

ELIGIBILITY CRITERIA FOR SELECTING STUDIES

Observational studies based on nationally representative samples ($n \geq 292$), validated instruments, and prevalence data for 2000-19. Two researchers independently extracted data and assessed the risk of bias using the Joanna Briggs Institute checklist. Random effects meta-analysis was conducted in the subset of studies with relatively homogeneous research methods by measurement instrument, age group, and WHO region.

RESULTS

Prevalence data were available for 113 countries or territories, according to official WHO nomenclature for regions, from 57 studies. Data were available for adolescents (12-17 years) in 77 countries or territories, young adults (18-29 years) in 30 countries, middle aged adults (30-59 years) in 32 countries, and older adults (≥ 60 years) in 40 countries. Data for all age groups except adolescents were lacking outside of Europe. Overall, 212 estimates for 106 countries

from 24 studies were included in meta-analyses. The pooled prevalence of loneliness for adolescents ranged from 9.2% (95% confidence interval 6.8% to 12.4%) in South-East Asia to 14.4% (12.2% to 17.1%) in the Eastern Mediterranean region. For adults, meta-analysis was conducted for the European region only, and a consistent geographical pattern was shown for all adult age groups. The lowest prevalence of loneliness was consistently observed in northern European countries (2.9%, 1.8% to 4.5% for young adults; 2.7%, 2.4% to 3.0% for middle aged adults; and 5.2%, 4.2% to 6.5% for older adults) and the highest in eastern European countries (7.5%, 5.9% to 9.4% for young adults; 9.6%, 7.7% to 12.0% for middle aged adults; and 21.3%, 18.7% to 24.2% for older adults).

CONCLUSION

Problematic levels of loneliness are experienced by a substantial proportion of the population in many countries. The substantial difference in data coverage between high income countries (particularly Europe) and low and middle income countries raised an important equity issue. Evidence on the temporal trends of loneliness is insufficient. The findings of this meta-analysis are limited by data scarcity and methodological heterogeneity. Loneliness should be incorporated into general health surveillance with broader geographical and age coverage, using standardised and validated measurement tools.

SYSTEMATIC REVIEW REGISTRATION
PROSPERO CRD42019131448.

Introduction

Humans thrive on meaningful social connections. Feelings of loneliness set in when a discrepancy exists between one's desired and one's actual level of social relationships.¹ Loneliness is a negative, subjective experience² closely linked to the quality of social connections.³ Loneliness is similar to, but distinct from, social isolation, which is defined as a lack of social contacts, and being alone, characterised as being physically removed from social connections.⁴ Transient loneliness is a common experience,⁵ but chronic or severe loneliness pose threats to health and wellbeing.

Growing evidence has linked loneliness to various adverse health outcomes. Loneliness is associated with unfavourable cardiovascular health indicators, such as increased activation of the hypothalamic-pituitary-adrenal axis,⁶ high blood pressure, increased cholesterol levels,^{2 7} and coronary heart disease.⁸ Loneliness is associated with sleep disturbance⁹ and increased risk of mild cognitive impairment and

WHAT IS ALREADY KNOWN ON THIS TOPIC

Increasing evidence suggests that loneliness at a problematic level has serious health consequences

As loneliness is increasingly recognised as an important health and social problem, governments worldwide should aim to tackle this issue through policies and initiatives

It is still unclear how widespread loneliness is on a global scale

WHAT THIS STUDY ADDS

Loneliness at a problematic level is prevalent in many countries, and important data gaps exist, particularly in low and middle income countries

A geographical pattern for loneliness prevalence was found, with northern European countries consistently showing low levels

Data are insufficient to make conclusions about temporal trends of loneliness on a global scale

dementia.¹⁰ Loneliness may also be detrimental to behavioural, mental, and social health throughout the lifespan,² influencing outcomes such as substance misuse, suicidal ideation,¹¹ anxiety, depression,¹² and poor subjective wellbeing.⁷ According to a 2015 meta-analysis, people with chronic loneliness had a 26% increased risk of mortality.¹³ This increased risk is comparable to established risk factors such as physical inactivity¹⁴ and grade 1 obesity.¹⁵

Culture affects levels of loneliness.¹⁶ Individualism-collectivism has been long considered an important cultural determinant of loneliness.¹⁷ A recent conceptual model² postulated that risk factors, such as age, interact with triggering events, such as retirement, resulting in feelings of loneliness. Considering that some well established risk factors of loneliness, such as depression¹⁸ and chronic disease,¹⁹ are increasing, and that triggering events are part of life (eg, the covid-19 pandemic), it is likely that these risk factors would impact the prevalence of loneliness. Accordingly, loneliness is increasingly recognised as an important health and social issue, with some health professionals, including former US surgeon general Vivek Murthy, labelling it as an epidemic.²⁰ In 2018, the United Kingdom appointed the world's first minister for loneliness. Worldwide, initiatives have been launched to address "the epidemic of loneliness."²¹⁻²³

With loneliness now defined as a public health problem,^{24 25} tackling it requires public health approaches, which begin with defining the magnitude and distribution of the problem through surveillance.²⁶ A recent estimate suggests that one third of the population in industrialised countries experience loneliness, and one in 12 people experiences loneliness at a problematic level²⁵; however, the basis of this estimate is unclear. Understanding the prevalence of loneliness globally can help decision makers gauge the scope and severity of the problem. In light of the covid-19 pandemic, summarising the global prevalence of loneliness before the pandemic would help to identify a prepandemic baseline for subsequent monitoring. Identifying data gaps would also help to inform research endeavours and public health surveillance. In our systematic review and meta-analysis we identified data availability, gaps, and patterns for population level prevalence of loneliness among different age groups globally. We summarised and compared available prevalence estimates within World Health Organization regions when feasible through meta-analysis, and examined temporal trends of loneliness in countries with data.

Methods

Protocol and data sources

Our reporting conforms to the preferred reporting items for systematic reviews and meta-analyses (PRISMA) guidelines.²⁷ The reporting of meta-analysis conforms to the meta-analyses of observational studies in epidemiology (MOOSE) checklist.²⁸

We searched for scientific literature published in any language using Embase, Medline, PsycINFO, and

Scopus, supplemented by searching the grey literature using Google Scholar and Open Grey up to 1 September 2021. Search terms included "loneliness", "social isolation", and "prevalence", as well as other medical subject headings, truncations, and adjacent operators (supplementary table S1). After duplicates had been removed, additional literature was identified through backwards reference searching.

Eligibility criteria

Studies were included if they were observational, reported prevalence of loneliness, included data from January 2000 to December 2019 (pre-covid-19 pandemic), and had nationally representative study samples. To ensure population representativeness and comparability across estimates, we excluded studies if the sampling frame or process was inappropriate for assessing the general population²⁹ (eg, university students), the sample size was smaller than 292 (calculated using the formula by Naing et al,³⁰ with an expected prevalence of 5%), the measurement instrument was not validated, and the prevalence of chronic or severe loneliness could not be obtained (eg, studies asked about transient loneliness, which is a common experience and not at a problematic level).

Study selection and data extraction

References were imported into Endnote (Philadelphia, version X8.2) and duplicates removed. Two reviewers (DS, ML) independently screened articles by title and abstract followed by full text and independently extracted study characteristics, including author, population, country, study design, sample size, measurement instrument of loneliness (type, time frame, and operational definition or cut-off points), prevalence estimate, funding role, and conflicts of interest. Disagreements were discussed with a third reviewer (DD) until consensus was reached. Inter-rater agreement was high (94% for study selection and 93% for data extraction). When information was missing or ambiguous, we searched for related publications or emailed the authors. When estimates were non-comparable between studies, such as different definitions of loneliness (eg, feeling lonely "often" or "very often"), we tried to harmonise measures by manually recalculating prevalence based on available information or asking the authors to recalculate the prevalence. Risk of bias was assessed based on the Joanna Briggs Institute critical appraisal checklist for prevalence studies,³¹ which is recommended by the Systematic Review Methodology Group for critical appraisal of studies reporting prevalence data.³² Two authors (DS and DD) independently assessed risk of bias, with 91% inter-rater agreement. Differences were resolved by discussion.

Measures of loneliness

Scale and single item instruments were used to measure loneliness. Because estimates based on the two types of measures were not directly comparable, we summarised prevalence separately. Loneliness is a common experience, thus we excluded transient

experiences of loneliness⁵ and focused on problematic loneliness, defined by severity (eg, moderate to severe) or chronicity (eg, feeling lonely all the time, usually, or often).

Scale measures

All selected studies with a scale measure used either the University of California Los Angeles (UCLA) Loneliness Scale³³ or the de Jong Gierveld Loneliness Scale³⁴; both have shown good internal consistency, test-retest reliability, and convergent and discriminant validity.³⁵ The de Jong Gierveld scale measures both emotional and social loneliness but can also be used as a unidimensional construct.³⁴ Abbreviated versions have been validated for both scales and correlate strongly with their respective original versions.^{34 36} Although certain cut-off points are more commonly used than others, such as ≥ 6 for the three item UCLA Loneliness Scale, different cut-off points have been selected by authors based on various rationales. We have summarised the cut-off points, documented the differences, and extracted prevalence estimates based on the original cut-off points.

Single item direct measures

Single item direct measures are the most commonly used assessment tools of loneliness.³⁷ Questions were usually worded as “How often do you feel lonely?,” with non-substantial variations across studies. Different single item instruments have specified different recall periods, such as in the past week or year, although some did not specify a recall period and asked about general experience. Previous studies found that single item direct measures of loneliness had a moderate correlation with the UCLA Loneliness Scale³⁸ and the de Jong Gierveld Loneliness Scale.³⁹

Data synthesis

Narrative review

For all studies we summarised study characteristics, including country, study name, sample size, response rate, sample characteristics (age and sex), and conflict of interest. To demonstrate data availability and gaps, we used MapChart.net to map the availability of classification of country level prevalence of loneliness separately for four age groups (adolescents (12-17 years), young adults (18-29 years), middle aged adults (30-59 years), and older adults (≥ 60 years); fig 1). For studies that applied a scale measure, we tabulated the measurement instrument of loneliness (eg, 20 item UCLA Loneliness Scale, six item de Jong Gierveld Loneliness Scale), country level prevalence of loneliness, and the cut-off points for loneliness at a problematic level. For studies that applied a single item direct measure of loneliness, we summarised the time scale such as past week or year, and the operational definition of loneliness, such as feeling lonely “all the time” or “most of the time.”

We summarised data separately for adolescents (12-17 years), young adults (18-29 years), middle aged adults (30-59 years), and older adults (≥ 60

years). These age categories reflected the sample characteristics of most studies, although the specific age range could differ. When age categorisations were different from our defined categories, we recalculated age specific prevalence to best match our overall categories. For example, if a study reported the prevalence of loneliness for those aged 60-79 and ≥ 80 years separately, we recalculated the prevalence for all adults aged ≥ 60 years based on information presented in the study or obtained through contacting the authors. Similarly, if a study reported loneliness prevalence by sex only, we recalculated prevalence for males and females combined using available or additionally obtained information. Because most studies only reported point estimates for prevalence of loneliness nationally, we used a logit transformation⁴⁰ to obtain pooled variance estimates to calculate 95% confidence intervals. Finally, we narratively summarised studies that reported multiple measures of loneliness using identical sampling frames, procedures, and instruments over time.

Meta-analysis

Meta-analysis was conducted for relatively similar studies whenever feasible. We pooled prevalence estimates from studies that applied the same or comparable measures, followed similar study protocols (eg, Global School-Based Student Health Survey), and included similar samples (eg, adolescent school students). In cases when multiple studies reported estimates of loneliness prevalence using identical samples, measures, and surveys, we only included the estimate with the largest analytical sample in the meta-analysis, to avoid double counting. Whenever possible we pooled estimates within WHO regions (Africa, the Americas, Eastern Mediterranean, Europe, South-East Asia, Western Pacific) and conducted subgroup analysis based on the World Bank classification of country income group (low, lower middle, upper middle, and high income countries). For Europe, considering the smaller variability in country income level and the established evidence on geographical difference, particularly the divide between east and west,^{41 42} we conducted subgroup analysis based on modified geographical region classification by the United Nations standard country or area codes for statistical use (M49; <https://unstats.un.org/unsd/methodology/m49/>), which classified the WHO European region further into northern, southern, eastern, and western Europe, and central and western Asia. For pooled estimates of prevalence and variance, both overall and in subgroups, we used generalised linear mixed effects models with random intercepts by subgroup.⁴⁰ This approach has been used in about 94% of recent meta-analyses of prevalence estimates.⁴³ Binomial-normal models were specified to allow for the calculation of pooled proportion estimates. We conducted additional sensitivity analyses using a double arcsine transformation⁴⁴ to pool prevalence estimates, and reported both τ^2 and I^2 statistics to describe heterogeneity.⁴⁵ The τ^2 estimates between study variability, whereas I^2 refers to the

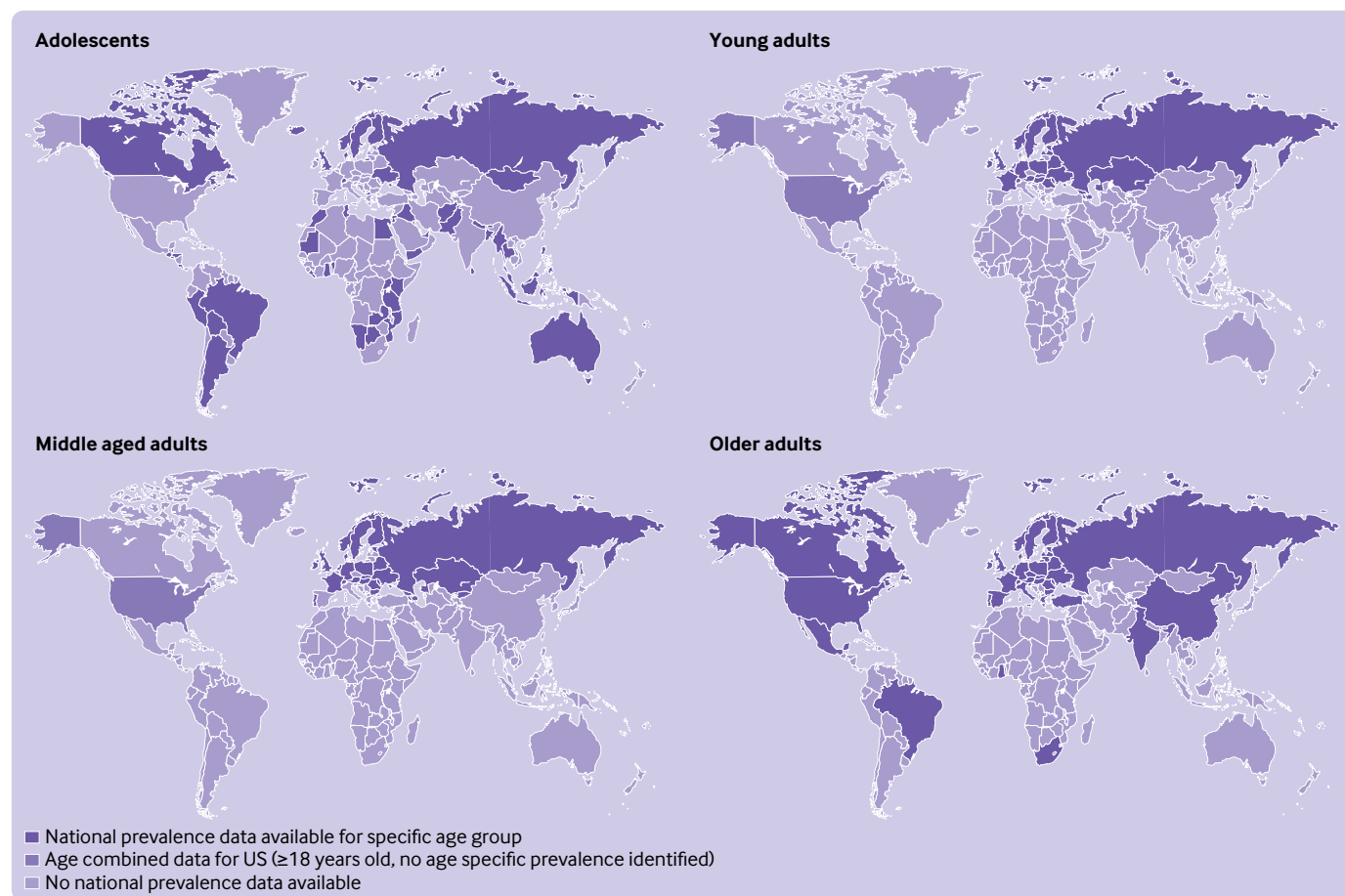


Fig 1 | International estimates for prevalence of loneliness by age groups

proportion of the total variance between studies as a result of “true” variance between populations.^{46 47} Meta-analysis was performed in R (version 4.0.3).

Patient and public involvement

Patients and members of the public were not involved in the design and execution of the study. However, we plan to engage the public in the dissemination of our findings, including media coverage, social media engagement, newsletters, and public talks and presentations.

Results

The initial database search yielded 7290 records. After the removal of duplicates, the title and abstract of 2853 were screened, resulting in 194 articles for full text screening. Supplementary figure S1 lists the reasons for exclusion, and supplementary table S2 provides further explanations. Two additional articles were identified through reference searching and three through searches of grey literature. Data on prevalence were extracted from 57 studies for 113 countries or territories.

Data availability

Eleven studies (nine using the UCLA Loneliness Scale, two using the de Jong Gierveld Loneliness Scale)

provided 30 scale based prevalence estimates for 16 countries, and 46 studies provided 295 estimates for prevalence of loneliness measured by single item instruments for 110 countries or territories (supplementary table S3). Across measures, the prevalence of loneliness was identified for adolescents in 77 countries or territories, young adults (18–29 years) in 30 countries, middle aged adults (30–59 years) in 32 countries, and older adults (≥60 years) in 40 countries (supplementary table S4). Of those, 212 estimates for 106 countries from 24 studies were included in meta-analyses (supplementary table S5). Supplementary tables S6 and S7 summarise the characteristics of each study. Overall, data showed disparities in loneliness research and surveillance across regions (fig 1) and age groups; while data on adolescents were available across all WHO regions—primarily through the Global School-Based Student Health Survey, data on adults, particularly younger and middle aged adults, were mainly concentrated in Europe.

Risk of bias assessment

All included studies scored 5–9 out of 9 based on the Joanna Briggs Institute checklist (supplementary table S8). Although all studies met criteria 1 (sampling frame), 3 (sample size), 6 (valid measures), and 7 (standardised measures) as part of this review’s

inclusion criteria, only eight studies (14%) met criterion 8 (appropriate statistical analysis), mainly because of missing confidence intervals. Around half of the studies (49%) reported using random probabilistic sampling (criterion 2), whereas the rest did not provide sufficient information on participant recruitment procedures.

Scale measures

Except for one Australian study⁴⁸ and two American studies,^{49 50} all studies using scale based measures focused on older adults (supplementary table S9). In the meta-analysis of estimates for older adults in 12 countries based on the six item de Jong Gierveld Loneliness Scale,^{42 51} prevalence of loneliness showed a clear geographical pattern (fig 2), with much lower estimates in western European countries (pooled estimate 11.1%, 95% confidence interval 9.3% to 13.2%) than eastern European countries (27.7%, 21.2% to 35.3%). Subgroup effect was statistically significant ($P<0.01$); however, variance between studies was high in western and eastern European countries ($\tau^2=0.047$ and 0.224 , respectively, $P<0.01$), with this variance mostly related to true differences between populations ($I^2=94\%$ and 99% , respectively). In the meta-analysis of 13 estimates derived from the three item UCLA Loneliness Scale for older adults (including subgroup analysis based on different cut-off points),⁵²⁻⁵⁶ four countries (England, Poland, Spain, and US) had estimates ranging from 9% to 19%. A fifth country, Finland, had a reported prevalence of 5.9% (95% confidence interval 4.7% to 7.2%). No subgroup effect by cut-off point was significant ($P=0.91$). Variance between studies was high overall and in subgroups with the same cut-off points.

Single item measures

Adolescents—Twenty eight studies reported 132 prevalence estimates of loneliness for adolescents in 76 countries (supplementary table S10). Of these, 76 estimates for 68 countries across 17 studies were included in meta-analysis (fig 3, fig 4, fig 5, fig 6), nearly all from the Global School-Based Student Health Survey. Five meta-analyses were conducted, one for each of the following WHO regions: Africa (five studies,⁵⁷⁻⁶¹ 11 countries), the Americas (five studies,⁶²⁻⁶⁶ 26 countries), Eastern Mediterranean (two studies,^{58 67} 10 countries), South-East Asia (five studies,^{58 68-71} nine countries), and Western Pacific (four studies,^{58 71-73} 12 countries). A meta-analysis was not performed for Europe owing to fewer comparable measures across a small number of countries with prevalence data for this age group. Pooled prevalence estimates ranged from 9.2% (95% confidence interval 6.8% to 12.4%) in South-East Asia to 14.4% (12.2% to 17.1%) in the Eastern Mediterranean. High heterogeneity was observed in all regions, indicated by high τ^2 and I^2 . Subgroup analysis showed no clear patterns by country income level, although a significant subgroup effect by country income group was detected in Africa and the Americas ($P<0.05$).

Young adults—Five studies reported 34 prevalence estimates for young adults (18-29 years) in 30 countries (fig 7). After removing one duplicate (same estimate reported by two studies^{74 75}), 33 estimates were meta-analysed. All but two estimates^{39 76} came from two multicountry studies: the Europe and Health in Times of Transition study⁷⁷ and the European Social Survey.⁷⁴ The overall pooled prevalence estimate was 5.3% (4.4% to 6.4%), although dispersion was high ($\tau^2=0.280$, $P<0.01$). When stratification was by the United Nations regional classification, dispersion reduced, although a large proportion remained owing to true variance between populations (I^2 range 44-85%). A statistically significant subgroup difference was detected ($P<0.01$), with pooled prevalence being the highest in eastern Europe (7.5%, 5.9% to 9.4%) and the lowest in northern Europe (2.9%, 1.8% to 4.5%).

Middle aged adults—Four studies reported 36 prevalence estimates for middle aged adults (30-59 years) in 32 countries (fig 8). Similar to studies for young adults, all estimates came from European countries, and all but one³⁹ came from the Europe and Health in Times of Transition study⁷⁷ (nine countries) and the European Social Survey⁷⁴ (additional 23 countries). After excluding one duplicate estimate,⁷⁵ 35 estimates for 32 countries were meta-analysed.^{39 74 77} The pooled prevalence estimate was 6.9% (5.6% to 8.6%), with high dispersion ($\tau^2=0.483$, $P<0.001$). Subgroup difference was significant ($P<0.01$), where the pooled prevalence was the lowest in northern Europe (2.7%, 2.4% to 3.0%) and highest in eastern Europe (9.6%, 7.7% to 12.0%) and central and western Asia (9.8%, 5.1% to 18.0%).

Older adults—Seventeen studies reported 93 prevalence estimates for 38 countries, including 30 European countries and eight non-European countries (fig 9). A total of 43 estimates from 30 European countries were included in meta-analysis. All but two estimates^{39 78} came from large multicountry studies: the Europe and Health in Times of Transition study,⁷⁷ the European Social Survey,⁷⁴ and the Survey of Health, Ageing, and Retirement in Europe.⁷⁹ Overall dispersion was high ($\tau^2=0.461$, $P<0.01$). Although less variability was shown within geographical subgroup, the proportion of observed variance due to true differences between populations remained high (I^2 range 78-89%). Subgroup difference was significant ($P<0.01$), where northern European countries had the lowest pooled prevalence (5.2%, 4.2% to 6.5%), followed by western Europe (8.7%, 7.3% to 10.5%), southern Europe (15.7%, 13.2% to 18.7%), and eastern European countries had the highest prevalence of loneliness (21.3%, 18.7% to 24.2%).

Sensitivity analysis

For meta-analysis of loneliness prevalence in younger, middle aged, and older adults in Europe, additional analysis was conducted using the World Bank country income group for subgroups. For young adults, no evidence was found for statistically significant

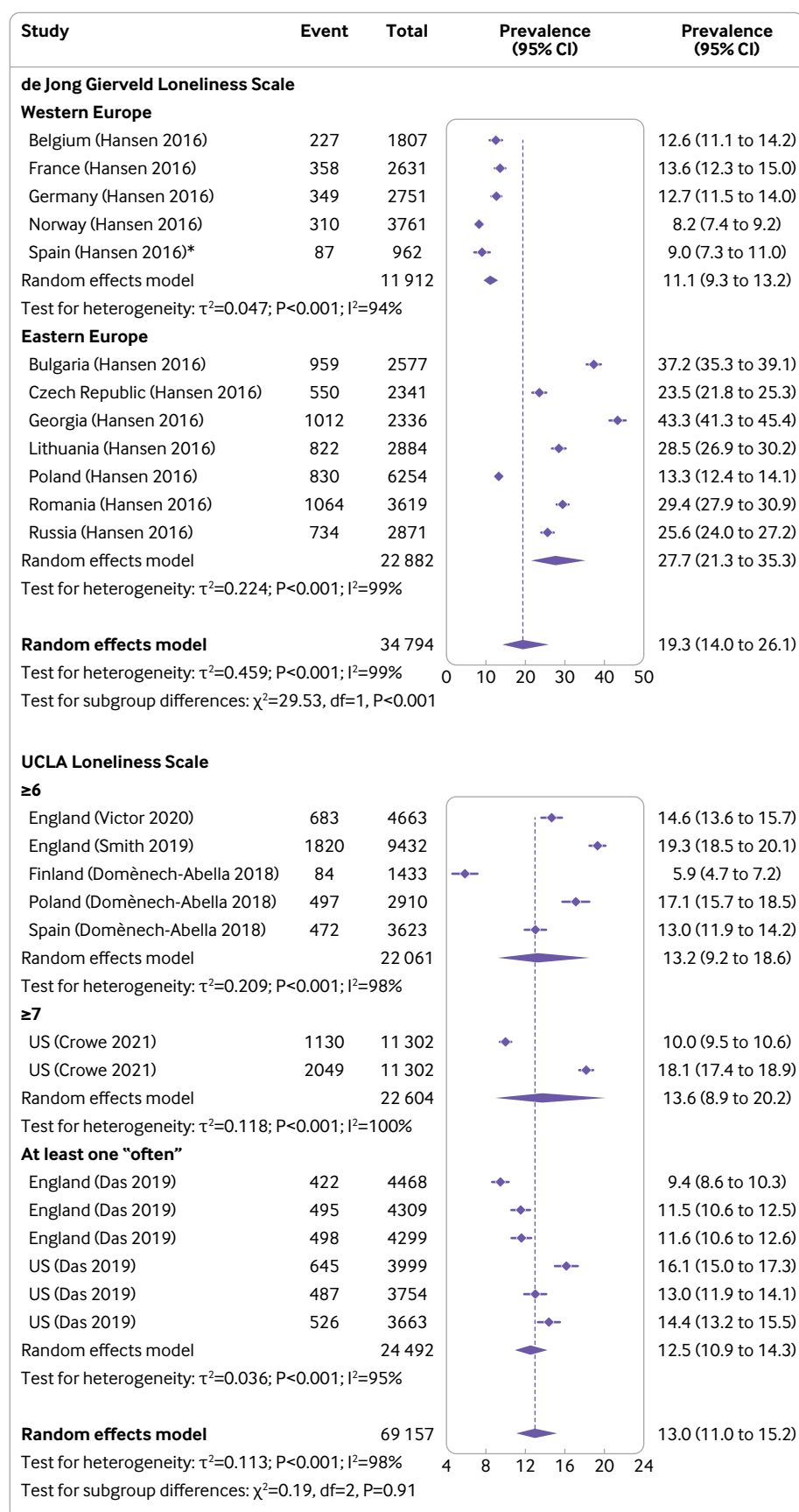


Fig 2 | Meta-analysis of loneliness prevalence using scale based measures (de Jong Gierveld Loneliness Scale, six item version, and University of California Los Angeles (UCLA) Loneliness Scale, three item version) in older adults (≥ 60 years). *Thresholds of five or six were applied. Generalised linear mixed effects models with binomial-normal distribution were used. Norway is included as part of western Europe owing to the lack of data from other northern European countries

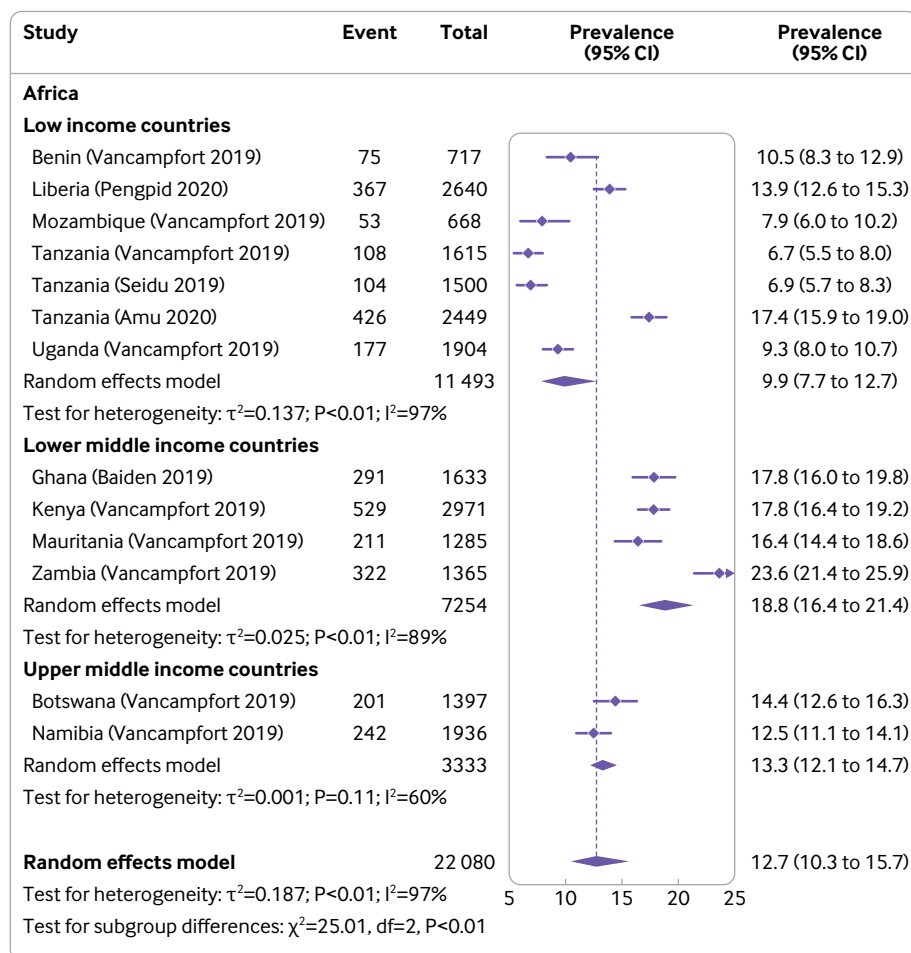


Fig 3 | Meta-analysis of loneliness prevalence based on single item measures in adolescents (12-17 years) by World Health Organization Africa region. Generalised linear mixed effects models with binomial-normal distribution were used

subgroup differences ($P=0.35$) (supplementary figure S3). For middle aged and older adults (both using the de Jong Gierveld Loneliness Scale and single item measures), high income European countries had a lower pooled prevalence than middle income European countries, and the subgroup difference was statistically significant (supplementary figures S2, S4, S5). Additional sensitivity analysis using the Freeman-Tukey double arcsine transformation approach to meta-analyses resulted in nearly identical findings⁸⁰ (supplementary figures S6-10).

Temporal trends in loneliness

Four studies reported multiple comparable prevalence estimates of loneliness based on repeated cross sectional surveys. One study in Danish school children (11-15 years old) found that the prevalence of loneliness increased from 4.4% (95% confidence interval 3.4% to 5.4%) in 1991 to 7.2% (6.4% to 8.0%) in 2014 ($P<0.001$ for trend).⁸¹ Similarly a significant and steady increase in loneliness was found in Norwegian secondary school children, from 9.0% (95% confidence interval 8.5% to 9.5%) in 2014 to 12.1% (11.7% to 12.5%) in 2018 ($P<0.001$).⁸² Additionally, a

study found no change in loneliness prevalence among adolescent school students between 2005 and 2016 in the United Arab Emirates ($P>0.05$).⁶⁷ Finally, a study in adults aged 77 years or older in Sweden found no significant trend in prevalence of loneliness from 1992 to 2014 ($P=0.71$).⁸³

Discussion

Based on data from 113 countries or territories during 2000-19, we found that loneliness at a problematic level is a common experience worldwide. We further identified important data gaps and substantial geographical variation in loneliness. Considering the physical, mental, and social health consequences of loneliness, our study findings reinforce the urgency of approaching loneliness as an important public health issue.^{24 25}

Although 113 countries or territories reported some data on loneliness prevalence, globally there is still a dearth of data across broader geographical areas. International surveillance systems, such as the Global School-Based Student Health Survey, are important for priority setting, benchmarking progress, and cross country comparisons. The Global School-Based

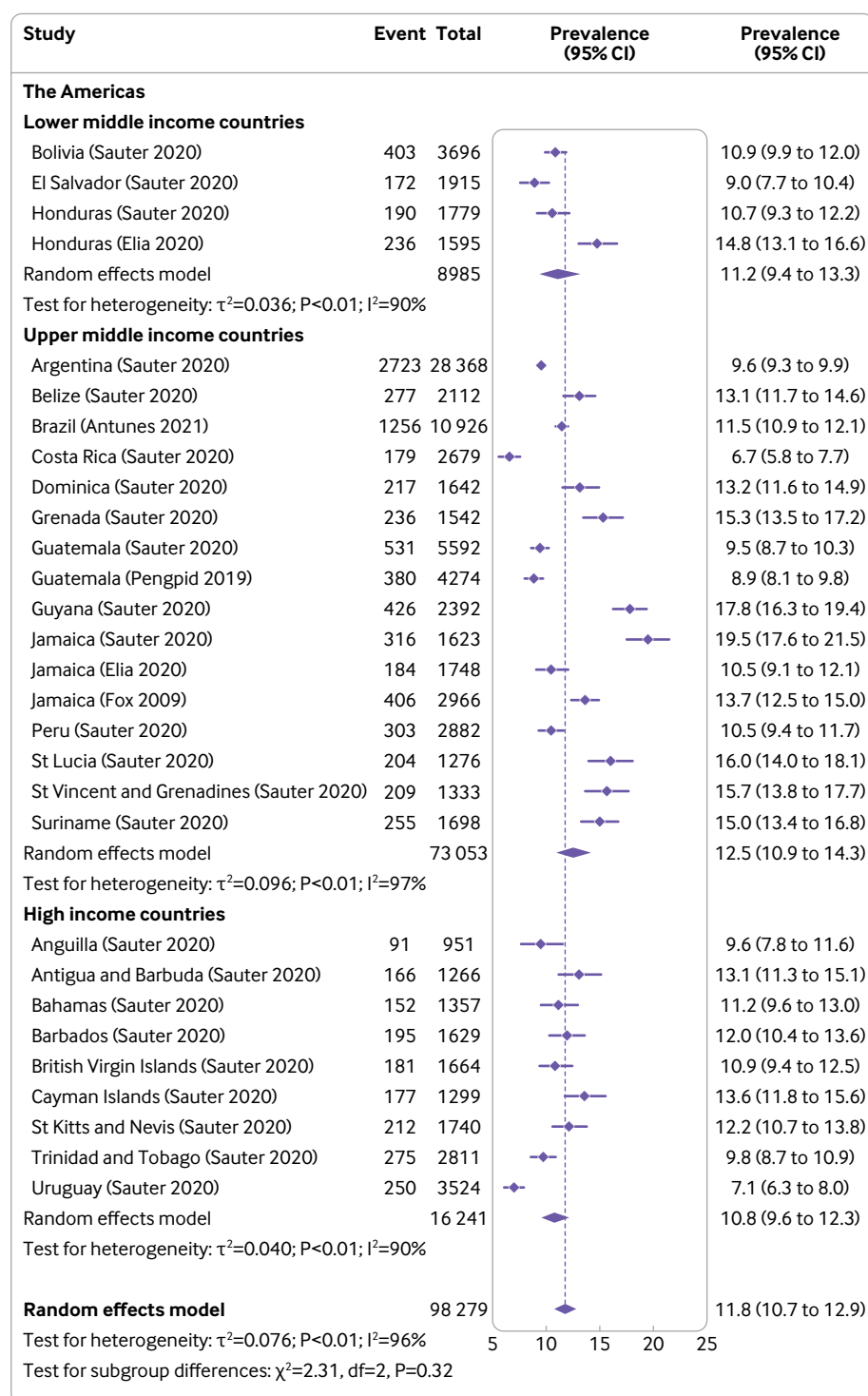


Fig 4 | Meta-analysis of loneliness prevalence based on single item measures in adolescents (12-17 years) by World Health Organization The Americas region. Generalised linear mixed effects models with binomial-normal distribution were used

Student Health Survey has provided valuable data for loneliness in children and adolescents in 67 countries or territories, most of which are low and middle income countries. Disparities still exist in data availability across WHO regions and country income levels. While Europe is leading in loneliness research and surveillance with a wealth of data sources, such as the Survey of Health, Ageing, and Retirement in

Europe, the European Social Survey, and the Europe and Health in Times of Transition study, other regions and most low and middle income countries have much less data coverage. Importantly, no low income countries and only five of all 47 lower middle income countries have reported any nationally representative data on loneliness in adults. Such data gaps might be a result of limited resources and competing priorities

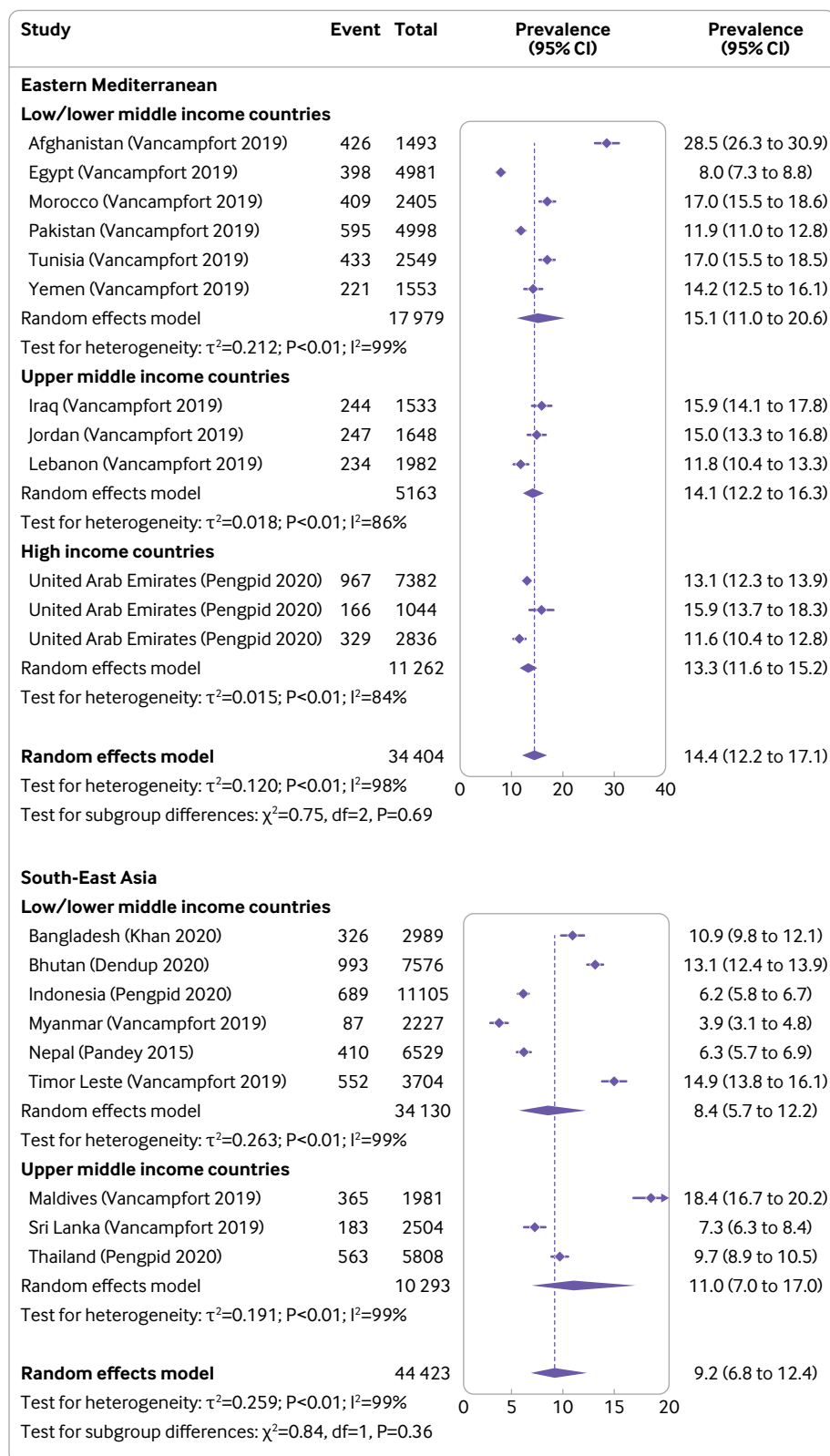


Fig 5 | Meta-analysis of loneliness prevalence based on single item measures in adolescents (12-17 years) by World Health Organization Eastern Mediterranean and South-East Asia regions. Generalised linear mixed effects models with binomial-normal distribution were used

from issues deemed more urgent, such as food security, housing, and basic provision of medical services.⁸⁴

Data on loneliness prevalence is also lacking for young and middle aged adults, compared with adolescents and older adults. Such data gaps could

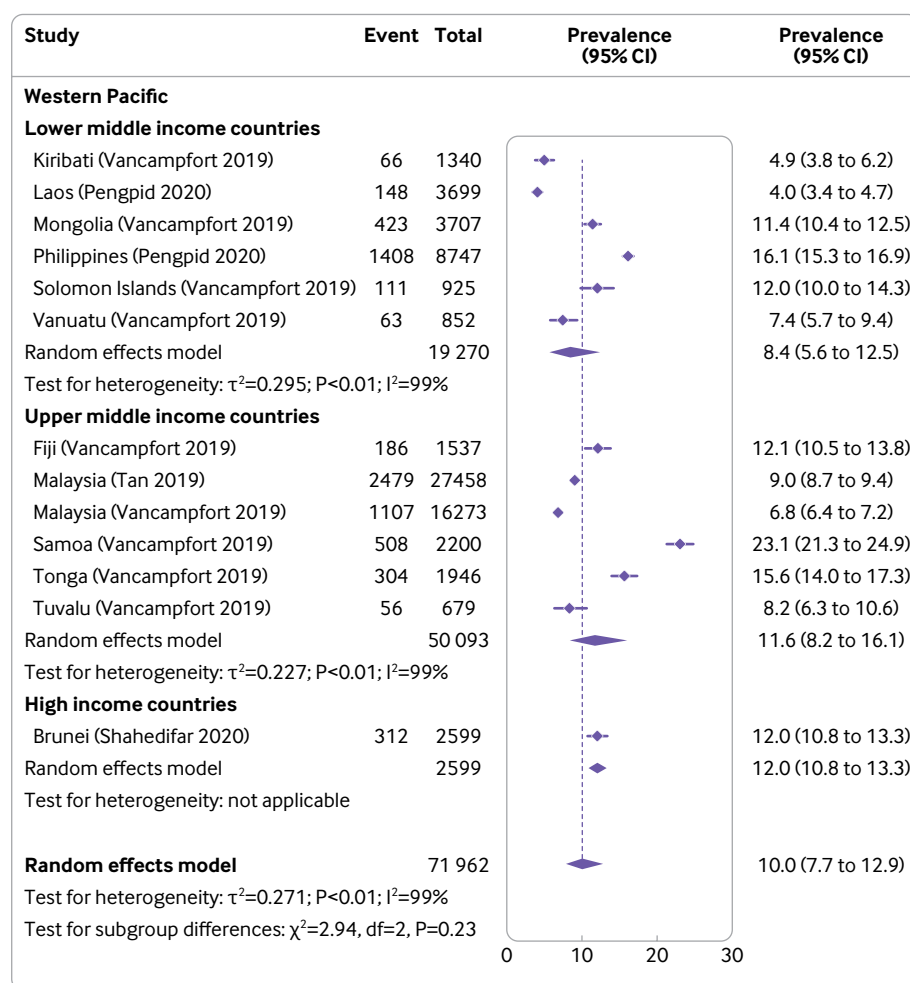


Fig 6 | Meta-analysis of loneliness prevalence based on single item measures in adolescents (12-17 years) by World Health Organization Western Pacific region. Generalised linear mixed effects models with binomial-normal distribution were used

be driven by the widely held belief that middle aged adults are the least susceptible to loneliness, and that young and old people are particularly vulnerable because of the changes experienced during these life stages.⁸⁵ Although our meta-analysis based on European data suggests that young and middle aged adults have a lower prevalence of loneliness compared with their older adult counterparts, findings from the AARP national loneliness survey⁴⁹ and the 2020 Cigna Report⁵⁰ from the US suggested otherwise. According to the Australian Loneliness Report, adults aged between 36 and 65 years reported consistently higher loneliness scores than those aged between 26 and 35 years, and those aged 65 and older.⁸⁶ Such findings suggest that the age pattern of loneliness might be context specific, although more data are needed among the general adult population to fully understand the susceptibility to loneliness throughout the lifespan.⁸⁷

Based on our meta-analysis, the prevalence of loneliness is highly heterogenous across countries, even within the same region. While insufficient data prevented us from identifying geographical patterns of loneliness outside of Europe, within Europe the pattern is clear and consistent. Across different adult

age groups, northern European countries consistently reported the lowest prevalence of loneliness, whereas eastern European countries reported the highest. One study attributed country level differences to demographic characteristics, health status, social participation, and social support.⁴¹ Others have cited welfare systems and social security schemes as contributing factors,⁴² as welfare generosity has been positively linked to social participation and inversely associated with social exclusion.⁸⁸ A previous meta-analysis found an inverse association between socioeconomic status and loneliness.⁸⁹ A combination of high socioeconomic status, overall health, welfare generosity, and high social participation could explain the low levels of loneliness in northern European countries. In contrast, eastern European countries tend to have poorer health outcomes, healthcare services, and state welfare.⁴¹ Other demographic characteristics, such as large gaps in life expectancy between men and women (hence a high proportion of widows) and increasing emigration among young people, might have contributed.⁴² Changes associated with transition from socialism, such as reductions in pensions paired with rising living expenses, change in

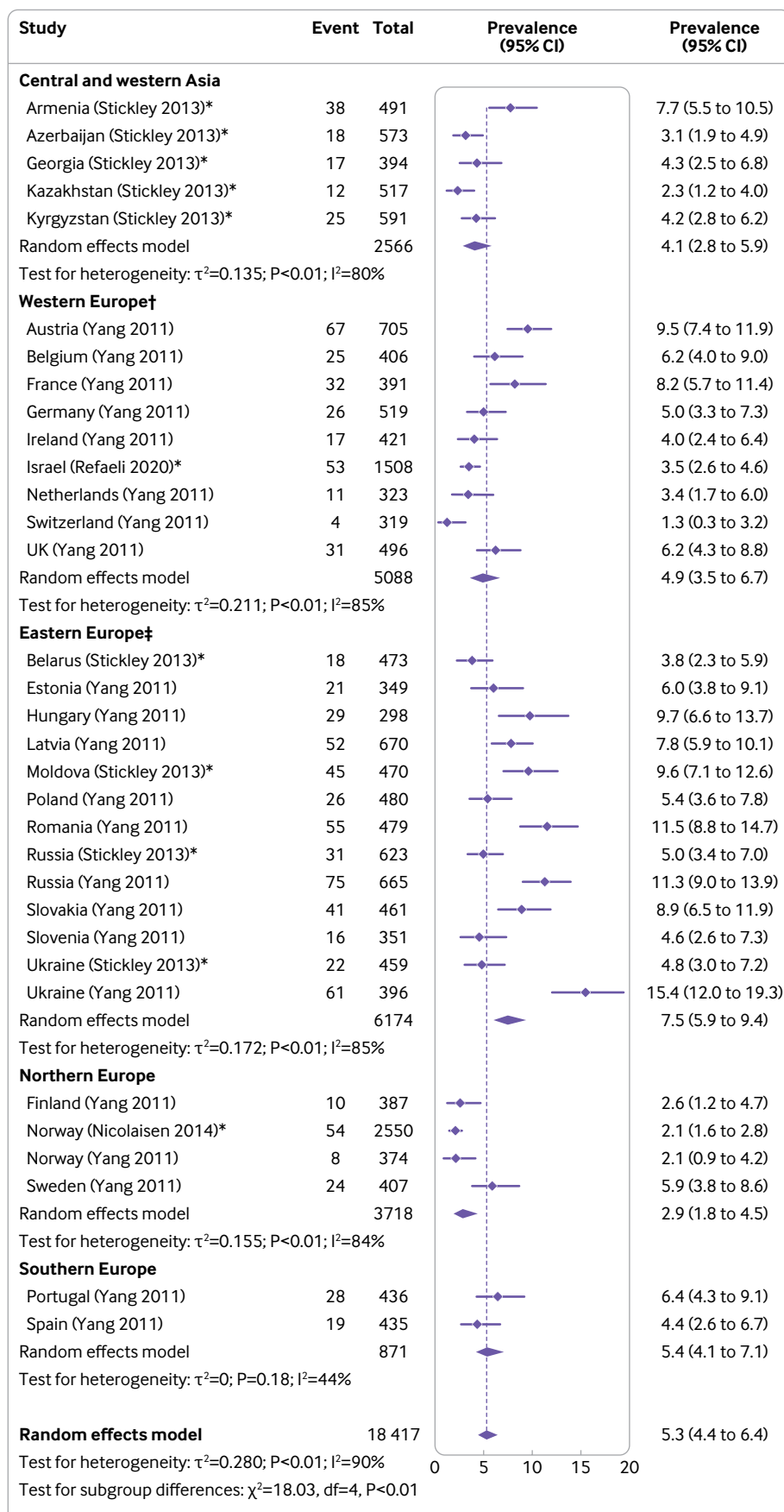


Fig 7 | Meta-analysis of loneliness prevalence based on single item measures in young adults (18-29 years) in Europe. Generalised linear mixed effects models with binomial-normal distribution were used. *Unspecified recall period; past week otherwise. †Includes Israel. ‡Includes Georgia

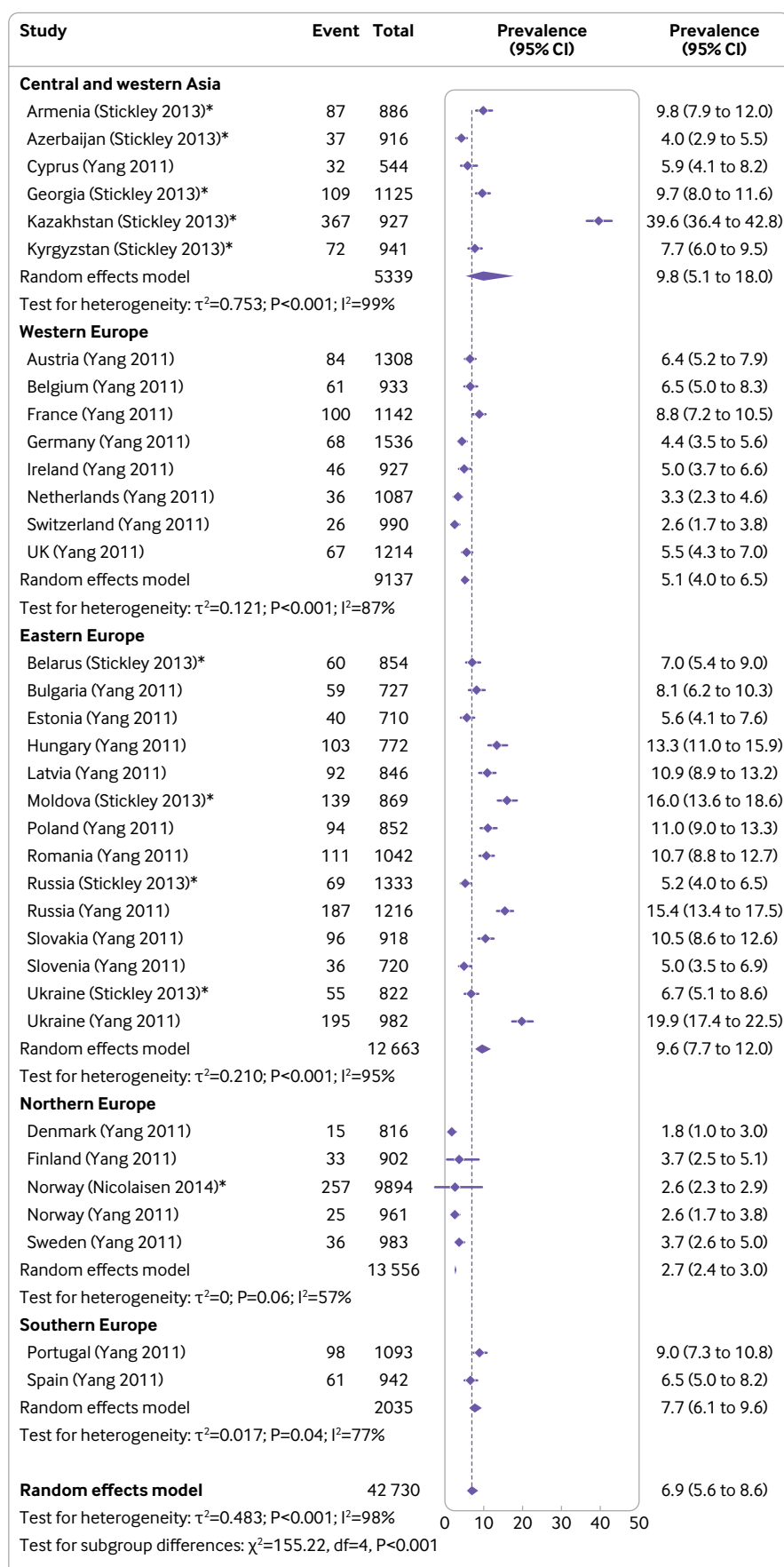


Fig 8 | Meta-analysis of loneliness prevalence based on single item measures in middle aged adults (30-59 years) in Europe. Generalised linear mixed effects models with binomial-normal distribution were used. *Unspecified recall period; past week otherwise

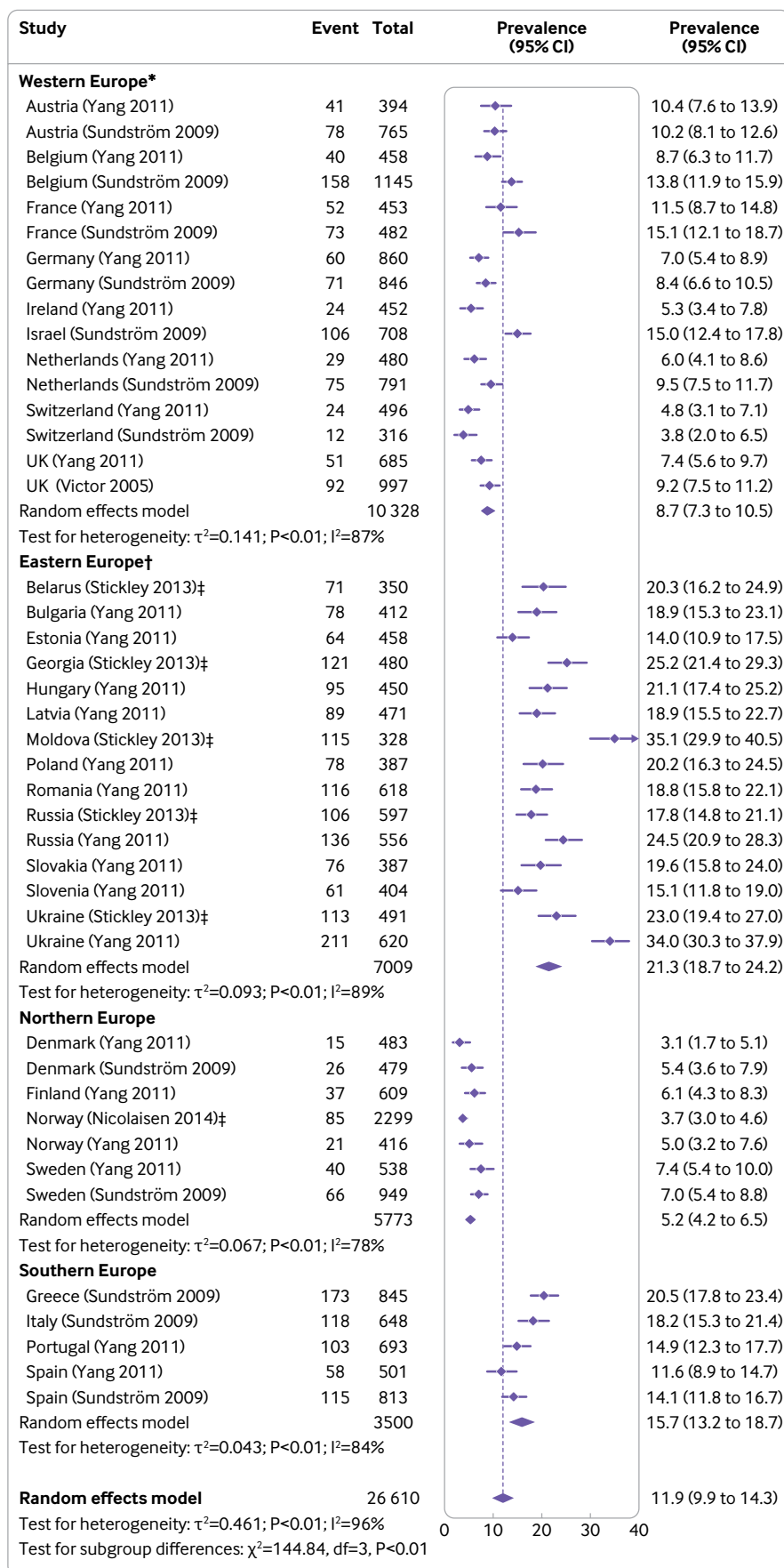


Fig 9 | Meta-analysis of loneliness prevalence based on single item measures in older adults (≥ 60 years) in Europe. Generalised linear mixed effects models with binomial-normal distribution were used. *Includes Israel. †Includes Georgia. ‡Unspecified recall period; past week otherwise

care arrangements, and reduced social trust are also potential explanations for high levels of loneliness in eastern Europe.^{41 90}

Despite media and public dialogue describing loneliness as a worsening social problem,^{91 92} we found insufficient evidence to support this claim. We only identified four studies that repeatedly examined loneliness using comparable measures over time, and the findings from these studies were mixed. Even if the problem of loneliness had not worsened during our search period (2000-19), covid-19 might have had a profound impact on loneliness.^{93 94} In this context, our review provides an important pre-pandemic baseline for future surveillance.

Strengths and limitations of this study

To maximise the validity of our findings, we limited our study selection to those based on nationally representative samples, sufficient sample sizes, and validated instruments. We maximised comparability across studies by harmonising results when feasible and summarising findings according to measurement instrument and age groups. However, our findings should be interpreted in light of weaknesses. Comprehensive global comparison and quantitative synthesis is limited by heterogeneity in study design, sampling procedures, and measurement instruments. Despite our attempts to improve comparability through harmonisation and stratification, we still found considerable evidence of heterogeneity, even within smaller subgroups of regions. Such heterogeneity is common in meta-analyses of prevalence,⁴³ and the pooled estimates should be interpreted as indicative only.

Understanding loneliness as a global health issue requires data from most countries—however, data are lacking for most regions outside of Europe. Meanwhile, the lack of repeated measurements limited our conclusions about temporal trends. Additionally, no studies explicitly reported elements of “co-design” with the intended communities. This might be the case particularly for translated instruments. Even though the instruments reviewed in our study have been translated, validated, and widely used in many countries, cross cultural adaptations of these questions could have limitations.⁹⁵ What loneliness means in one cultural and linguistic context might not be the same in another.

Differences in age groups and survey time also introduced additional complications. Although we limited study selection to those with data from 2000 to 2019, estimates in some countries could be more than 10 years older than those from other countries. Despite our attempts to provide prevalence estimates for different age groups, specific age categories differed by study, further limiting comparability across studies. Finally, different interpretation and operationalisation of loneliness (eg, cut-off points, recall time frame) across countries may lead to differential reporting biases. Because no single definition of problematic loneliness exists, what was labelled as “problematic”

varied (eg, severity versus chronicity). This poses further challenges in interpreting prevalence across countries.

Strengths and limitations in relation to other studies

Another systematic review on the prevalence of loneliness has been performed.⁹⁶ This review, however, was of a narrower scope than ours, as it only synthesised studies among older adults in high income countries published between 2008 and 2020. This review was subject to methodological limitations, such as not considering population representativeness and not accounting for different measurement instruments or operational definitions of loneliness across studies.

In early 2021, researchers reported the prevalence of loneliness for adults in 237 countries and territories based on the BBC loneliness experiment dataset.⁹⁷ As a primary study (in contrast with our systematic review and meta-analysis), it benefited from being able to apply the same measurement instrument to all participants and directly model predictors of loneliness, such as age, sex, and individualism, of the country of residence. Participants were, however, recruited as a convenience sample through BBC programmes (presumably in English only) and thus were not representative of populations—32% of the participants were men and 74% were UK residents. Therefore, prevalence estimates derived from this study are unlikely to be representative of the countries and territories.

Meaning of the study

We advocate among health professionals, decision makers, and the general public for better awareness of widespread loneliness. The data gaps in low and middle income countries raised an important issue of equity. Public health efforts to prevent and reduce loneliness require well coordinated ongoing surveillance across different life stages and broad geographical areas. High quality data based on validated and comparable instruments are urgently needed to tackle loneliness. Sizeable differences in prevalence of loneliness across countries and regions call for in-depth investigation to unpack the drivers of loneliness at systemic levels and to develop interventions to deal with them.

Recommendations for future research

Measurement is an ongoing challenge in loneliness research and surveillance. Researchers have previously documented the difficulty in comparing estimates of loneliness prevalence across studies and advocated for maximising comparability across survey instruments.³⁹ Conflicting evidence resulting from different definitions and measurements of loneliness has been identified as a major challenge.⁸⁴ One fundamental difference between measures is that single item questions directly asked about “loneliness,” but scales exclude direct reference to loneliness. Therefore, single item estimates might consistently misclassify loneliness. The UK Office for National Statistics recommends

using both direct and indirect scale measures of loneliness when possible, and using direct single item questions when constrained by space.³⁷ Future studies could benefit from probabilistic sampling, repeated measures, and sufficient reporting of prevalence (eg, including uncertainty in addition to point estimates). Finally, considering the potential impact of covid-19 on social health worldwide, we encourage more studies to track long term trends of loneliness across the lifespan using the estimates we summarised as a prepandemic baseline for comparison.

Contributors: DS, KG, and DD conceived the study. DS, AB, and DD developed the review protocol. DS and DD conducted the literature search. DS and ML independently screened the studies, extracted data, and discussed results with DD. DS, RE, and DD conducted the literature search. JvB conducted the meta-analysis. DS and DD drafted the manuscript. All authors provided critical input during the writing and revision of the paper. DD supervised the study. DS, ML, and DD are the guarantors. The corresponding author attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted.

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Data sharing: No additional data available.

The lead author (DS) affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

Dissemination to participants and related patient and public communities: The authors plan to disseminate the findings of this research to the public communities through media outlets, social media engagement, talks, and presentations.

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Supplementary information: Tables S1-S10 and figures S1-S10