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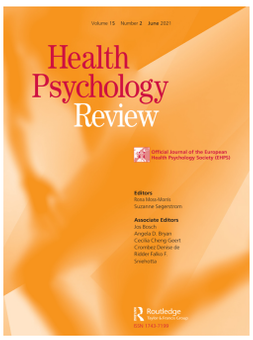

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A meta-analysis of loneliness and use of primary health care

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ABSTRACT

Loneliness is a growing public health concern that is associated with a range of negative health outcomes. The extent to which loneliness may also be associated with greater use of primary health care remains unclear. The present meta-analysis aimed to address this gap by quantifying research on the association of loneliness to primary health care use. The database searches yielded 23 eligible studies with 25 effects, total $N = 113{,}639$. A random effects meta-analysis revealed a small positive average effect size ($r_{avg} = .094$; 95% CI [.07, .12])between loneliness and the use of primary care that increased in magnitude as the proportion of females in the samples increased. Studies that used objective measures of primary care use yielded effects that were significantly larger than those using self-report measures. The effects were robust to differences in age and type of health-care systems, and the type of loneliness scale (single versus multi-item). The findings from this first comprehensive meta-analysis of the association of loneliness with use of primary care indicate that people who experience loneliness make a greater number of visits to primary-care practitioners. This evidence highlights the practical impact of loneliness on health-care use when viewed at the population level.

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Loneliness; primary care; physician visits

Introduction

Loneliness is the subjective feeling of social isolation that arises from a perceived lack of closeness in interpersonal relationships (de Jong-Gierveld, 1987; Hawkley & Cacioppo, 2010). The subjectivity of loneliness means people can live solitary lives and not feel lonely; alternatively, they may have a relatively rich social life and experience loneliness (Cornwell & Waite, 2009; Hawkley & Cacioppo, 2010). Inequalities in the physical and social environment can further increase risk for feelings of loneliness for some groups of individuals (Marmot et al., 2020; Wilkinson & Marmot, 2003). Indeed, there are multiple factors that can contribute to feelings of loneliness and the risk of being socially isolated. For example, having poor physical or mental health (Whitley & Campbell, 2014), an impairment, living alone, being a carer, or a new parent, a young person leaving care, living in sub-standard housing, experiencing poverty, stigma, marginalisation, a lack of social support, and belonging to certain minority groups (Public, 2016; Walker, 2018). Moreover, loneliness may arise at any time throughout the life course, affecting everyone regardless of age, sex, or other socio-demographic concepts, and is often subject to key triggers or transition points involving changes that have a detrimental impact on social networks (Kantar Public, 2016; Victor et al., 2002).

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Loneliness is highly complex and a growing concern in both the UK and globally (Yanguas et al., 2018). In the UK in 2018, a Minister for Loneliness was appointed to tackle what has been referred to as the 'greatest public health challenge of our time' (May 2018). Similarly, former U.S. Surgeon General Vivek Murthy has referred to loneliness as 'a growing health epidemic' (Murthy, 2017). A burgeoning evidence base lends support to these statements, linking loneliness and social isolation to an array of physical and mental health issues. The issues include: depression, anxiety and stress (Hawkley & Cacioppo, 2010); poor health behaviours (Hawkley et al., 2009); poor cardiovascular health (Hawkley et al., 2006, 2010); poor sleep quality (Kurina et al., 2011; Pressman et al., 2005); more severe common cold symptoms (LeRoy et al., 2017); poor physical health status (Richard et al., 2017); increased risk for metabolic syndrome (Henriksen et al., 2019) and increased risk for mortality (Luo et al., 2012). Overall, this evidence base indicates that loneliness exerts a powerful influence on health.

Ostensibly, the increased vulnerability for poor health, and poor physical health in particular, associated with loneliness may translate into increased use of medical care services. Indeed, there is some evidence that loneliness and social isolation are associated with greater use of health care, including making more frequent general practitioner (GP)/physician visits, more hospital emergency room visits, and greater use of primary care services (Cruwys et al., 2018). However, there are important distinctions to consider when assessing how and why loneliness may link to health care use. The individual usually initiates visits to the GP or emergency departments, whereas the decision to be hospitalised is under the control of a medical professional. Moreover, although it could be argued that the processes underlying the decisions to use GPs and emergency care services have some similarities, the evidence suggest that this may only be true for frequent users of emergency departments (Chan et al., 2018). Accordingly, we focused only on how and why loneliness is associated with use of primary care.

For the purposes of the current study, we define primary care as the 'provision of *integrated, accessible health care services* by *clinicians* who are *accountable for addressing a large majority of personal health care needs*, developing a *sustained partnership* with *patients*, and practicing in the *context of family and community*' (Institute of Medicine, 1996). Clinicians provide first-contact care compared to care based on referrals from other practitioners, assuming responsibility for patients over time and serve a coordinating role for patients accessing secondary and specialist care (Alpert & Charney, 1973). Primary care is a more equitable level of care than other levels of care because it spares resources that could be devoted to providing services to disadvantaged populations, making it less costly (Kringos et al., 2010; Starfield et al., 2005). Understanding the link between loneliness and primary care use has important implications for health policy and health economists, especially given the increases in older populations in many countries, and the impact of ageing and frailty on loneliness (Wright-St Clair et al., 2017; Hoogendijk et al., 2020).

Despite the growing evidence base highlighting the role of loneliness in physical health, what is currently lacking is an understanding of the extent to which loneliness may be associated with greater use of primary health care. There is not currently a systematic review of the research on loneliness/social isolation in relation to the use of primary health care. The current research aimed to address this important gap by systematically reviewing and meta-analysing the available research linking loneliness to primary health care use.

Loneliness and use of primary care

There are several reasons to expect that loneliness may be associated with greater use of primary care, and making visits to general practitioners (GPs) and physicians in particular. The socio-behavioural model of medical care utilisation (Andersen, 1995; Andersen & Newman, 1973) suggests that although predisposing, and enabling factors such as socio-demographic factors and those linked to health-care access play a role in determining who uses medical care services, the most immediate cause of using health care services is medical need. Given the current evidence linking loneliness

to poor physical health status, increased medical need is one reason for more frequent utilisation of primary care by people who are lonely (Andersen, 1995; Andersen & Newman, 1973).

Personal and social characteristics linked to loneliness may also account for why people may use primary care services more frequently. Indeed, both theory and research suggest that feelings of loneliness can impact the way that people view, interpret and interact with their internal and social environments (Cacioppo et al., 2015; Zhong & Leonardelli, 2008). For example, loneliness is associated with the experience of a greater number of stressful life events (Hawkley et al., 2008), and stress is well-known to aggravate physical symptoms (Affleck et al., 1997; Evers et al., 2014). In addition, stress can impact how people interpret and respond to their symptoms by activating physiological changes that can be viewed as signs of illness (Cohen & Williamson, 1991), and/or by causing people to be more attentive to their bodies and physical states (Fischer et al., 2016).

Loneliness may be associated with greater use of primary care due to reduced social networks and less perceived social support. Loneliness is commonly defined as feelings of social disconnection that arise from a mismatch between the perceived and actual levels of social interaction (Perlman & Peplau, 1998). Diminished social networks and fewer opportunities to connect socially with others may drive greater use of primary care because visits with physicians serve as a proxy for social support in its perceived absence. This proposition is consistent with evidence from a study that found that there was a fourfold increase in the use of out-patient health services for individuals who had both low levels of perceived social support and a high levels of distress (Kouzis & Eaton, 1998).

The present study

Current theory and evidence suggests several reasons why loneliness may be associated with greater use of primary care services. The aim of the present study was therefore to systematically review and meta-analyse current available research to assess the association between loneliness and use of primary care, and estimate the magnitude of this association. As previously noted, this review focused only on visits to physicians, general practitioners, and outpatient visits, but not in-patient care because this requires referral from a primary care physician and implies the need for specialised or emergency medical care.

A secondary aim was to examine the extent to which the link between loneliness and primary care was robust to factors known to influence loneliness, health-care use, or both. The set of *a priori* identified moderators examined included participant age, sex, and the format of the loneliness scale, and measure of primary care use. Age has been associated with both the prevalence of loneliness (Yang & Victor, 2011), and greater use of primary care (Gerst-Emerson & Jayawardhana, 2015), and was, therefore, was considered a potential moderator of the effects. Similarly, participant sex was investigated as a moderator, because females live longer and tend to use health care to a greater degree than males (Chrisler et al., 2016; The Kings Fund, 2018). We hypothesised that the magnitude of the relationship between loneliness and primary care use would be stronger among females and as age increased. Although loneliness is most often measured with multi-item scales such as the UCLA loneliness scale (Russell, 1996; Russell et al., 1980), researchers also often employ other measures out of convenience that are comprised of a single item. There is some controversy as to whether single item measures are as effective as multi-item measures for capturing the core qualities of a construct (Bergkvist & Rossiter, 2007; Gardner et al., 1998; Millner et al., 2015; Zimmerman et al., 2006). Therefore, we also explored whether the format of the loneliness scale (multi-item versus single item) moderated the associations between loneliness and use of primary care. Lastly, we examined whether the magnitude of the association between loneliness and primary care use would differ depending on whether GP contact was assessed with self-reported measures or via objective means, such as through administrative medical records. Self-report measures are susceptible to biases that may inflate the frequency of actual behaviour (Paulhus, 1991; Streff & Wagenaar,

1989). Therefore, it was expected that the associations would be larger among those studies that used self-reported primary care use rather than medical records.

Methods

Search strategy and study selection. The protocol for this meta-analysis was registered on PROSPERO (https://www.crd.york.ac.uk/PROSPERO/; registration ID: CRD42019158074CRD42019158074). Formal literature searching was conducted using online databases (Medline, Web of Science, Current Contents Connect, Scopus, Psych INFO and Cochrane databases) to identify suitable empirical studies from inception until 20 January 2020, written in English on loneliness and use of primary health care to include in the meta-analysis. All authors discussed and decided on inclusion and exclusion criteria and the keywords for searching. The keywords 'loneliness', 'social isolation', social disconnection', along with the positively worded terms 'social connectedness', 'group membership' and 'belonging', which were combined with a variety for synonyms for 'primary care' (see full search strategy on PROPSPERO). Although loneliness and social isolation/disconnection are often noted as distinct constructs, meta-analytic evidence suggests that each have relate to health-related outcomes in a similar manner (e.g., Holt-Lunstad et al., 2015). For the purpose of this meta-analysis we included measures of both loneliness and social isolation/disconnection as they are often used by researchers as proxies for loneliness (Cornwell & Waite, 2009).

A three-stage process was employed for the papers; one author (JO) screened all retrieved records identified through initial searches against inclusion and exclusion criteria and forward and backward searched to identify any additional relevant literature to include. At this stage, removal of duplicate papers and data sets occurred. The second stage involved initial screening based on titles, abstracts and keywords by one author (JO) with the other author (FS) screening a random 10% of the total titles and abstracts to ensure relevance based on the inclusion criteria and as a check of the initial screening. Disagreements or uncertain inclusions were resolved by discussion or by retrieval of the full paper to make a definitive judgment. Out of the 1544 articles, 1497 were excluded because they did not fit the inclusion criteria. This left 47full text articles to be assessed for eligibility. Excluding 24 articles for various reasons left 23 articles (reporting effects from 25 studies) for retention in the meta-analysis (See Figure 1 for PRISMA diagram).

Papers were judged as acceptable to include in the meta-analyses if they: (1) reported usable effect size information, that is quantitative rather than qualitative data; (2) included effects of loneliness or social isolation with a measure or index of use of primary care, e.g., the frequency or number of physician and GP visits; (3) reported unique effects not reported in other published papers; (4) were in English; (5) reported findings with adult human populations; (6) provided effects that could be obtained by contacting the author if not reported directly in the paper or thesis. Given the paucity of research on the topic during an initial scan of the literature, measures of loneliness/social isolation that used a multi-item scale or a single item were included.

Implementing these criteria garnered 23articles reporting effects from 25studies for inclusion in the meta-analysis. One paper (Cruwys et al., 2018) included data from three separate studies, each of which met the inclusion criteria. However, the effects reported were multivariate; contacting the author obtained the simple bivariate effects. A total of 25 effects were extracted and screened by a second researcher (FS), to be included in the meta-analysis (see Table 1).

A coding sheet recorded essential information for the meta-analyses (effect and sample sizes) and planned moderator analysis for each of the eligible studies retrieved. We chose the Pearson's product-moment correlation coefficient (r) as the effect size metric because it was the statistic reported across the majority of the studies. Other effects that were not reported as Pearson's r were transformed to an r value. For longitudinal studies, intervention studies, and randomised controlled trials (RCTs) that reported multiple effects sizes across different time points, the first effect size in the time series was recorded so that the data analysed would be equivalent in design to that obtained from cross-sectional studies. Moderator information recorded for each study included a

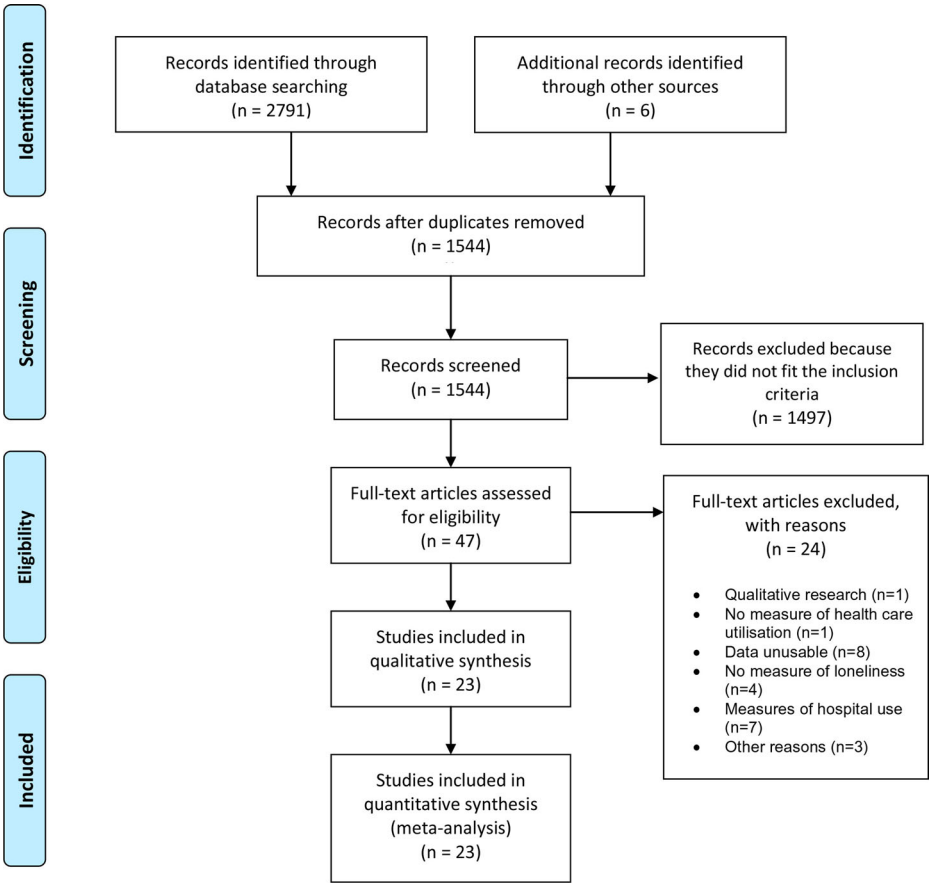

Figure 1. PRISMA flow diagram for the search strategy.

methodological moderator, the scales used to measure loneliness/social isolation (single item versus multi-item), and sample characteristics as moderators, specifically the percentage of female participants in the sample, and their age. The authors performed all coding of effects independently. The agreement rate from the double coding was high (97%), and the single discrepancy settled via discussion.

Quality appraisal

Evaluation of the methodological quality of the studies included in the meta-analysis was accomplished using a quality assessment tool adapted for the current study. Eleven questions from the Appraisal tool for Cross Sectional Studies (AXIS; Downes et al., 2016) were chosen as being most relevant for the current study, as suggested by Quintana (2015). These were supplemented with an additional question relevant for correlational studies regarding the minimum sample size for detecting a medium effect using r that was significant at $p < .05$ (Cohen, 1992). Together the 12 questions assessed aspects of the study procedures, design, and quality of the measures used to produce a total score that was categorised as low (< 6), moderate (7 –9), or high (10 –12) quality. Two authors independently rated the quality of the studies and inter-rater agreement was calculated and assessed using Cohen's Kappa coefficient (Cohen, 1992), with any discrepancies resolved through discussion.

Table 1. Study characteristics.

Study authors and year	Sample size and type	Study design	Country	Mean age	Primary care measure: Objective or self-report and description	Loneliness measure	Type of health-care system
1. Bath and Gardiner (2005)	*N* = 1,042 Representative sample of adults aged > 65	Cross-sectional	England	75.2	Self-reported dichotomous question about GP visits in the past month.	20-item measure of social engagement, reverse keyed. Dichotomous yes (1), no (0) rating.	Beveridge model
2. Berg et al. (1981)	*N* = 989 Population-based sample of adults aged 70	Cross-sectional	Sweden	70.0	Self-reported frequency of visiting physicians (unknown time frame).	Single item measure, rated on a 4-point scale.	Beveridge model
3. Beutel et al. (2017)	*N* = 15,010 Population-based sample	Cross-sectional	Germany	54.9	Self-reported number of GP visits in the past month.	Single item measure, rated from 0–4.	Bismarck model
4. Bock et al. (2018)	*N* = 6,882 Population-based sample of adults aged >40	Longitudinal	Germany	—	Self-reported number of GP visits in the past month.	11-item loneliness measure. Dichotomous yes (1), no (0) rating.	Bismarck model
5. Cheng (1992)	*N* = 112 Females aged 65–85	Cross-sectional	USA	73.0	Self-reported use of GP services in t e past 12 months.	Adapted 6-item measure, taken from 10-item UCLA measure. Rated from 0-4.	Private insurance model
6. Cohen-Mansfield et al. (2009)	*N* = 1 147 Population-based sample of adults aged > 75	Longitudinal	Israel	83.1	Self-reported number of GP visits in the past month.	Single item measure taken from the 20-item CES-D10, rated from 0–3.	National Health Insurance model
7. Cruwys et al. (2018, p. 1)	*N* = 1,752 Community sample	Cross-sectional	Scotland	57.6	Objective: Frequency of GP visits in the last 6 months (chart data)	Four-item measure of social connectedness, reverse keyed. Rated from 1-7.	National Health Insurance model
8. Cruwys et al. (2018, p. 2)	*N* = 79 Sample of international students	Longitudinal	Australia	22.0	Self-reported change in appointment frequency with the GP in the last month.	Four-item measure of social group connectedness, reverse keyed. Rated from 1-7.	National Health Insurance model
9. Cruwys et al. (2018, p. 3)	*N* = 46 Sample of disadvantaged adults	Quasi-experimental	Australia	44.7	Self-reported change in appointment frequency with the GP in last 3 months.	Four-item measure of social group connectedness, reverse keyed. Rated from 1-7.	National Health Insurance model
10. Denkinger et al. (2012)	*N* = 1,056 Population- based sample of adults aged > 65	Cross-sectional	Germany	75.8	Self-reported number of GP contacts in the past year.	Single item measure, rated from 0-10.	Bismarck model
11. Gerst-Emerson and Jayawardhana (2015)	*N* = 3,530 Population- based sample of adults aged > 65	Cross-sectional	USA	71.0	Self-reported number of GP contacts in the past 2 years.	3-item loneliness measure. Rated from 1- 3.	Private insurance model.
12. Hector-Taylor (1997)	*N* = 289 Adults aged >60	Cross-sectional	New Zealand	71.0	Self-reported number of GP visits in past 12 months.	3-item UCLA loneliness measure. Rated from 1-5.	Beveridge model
13. Houle et al. (2001)	*N* = 7,112 Population- based sample of adults aged > 65	Cross-sectional	Canada	72.7	Objective: Number of GP visits in the past year.	Single item measure, dichotomous yes (1), no (0) rating.	National Health Insurance model
14. Lauder et al. (2006)	*N* = 1,241 Population-based sample	Cross-sectional	Australia	45.1	Self-reported number of GP visits in the past year.	11-item loneliness measure. Dichotomous yes (1), no (0) rating.	National Health Insurance model

15. Kellezi et al. (2019)	*N* = 630 Patients presenting for out-patient care	Longitudinal	England	52.7	Objective: Self-reported number of visits to GP over a 3-month period.	8-item UCLA loneliness measure. Rated from 1 - 5	Beveridge model
16. Lim and Chan (2017)	*N* = 2,738 Population- based sample of adults aged > 60	Longitudinal	Singapore	73.1	Self-reported number of GP visits in the past month.	3-item UCLA loneliness measure. Rated from 1–5.	National Health Insurance model
17. Mullen et al. (2019)	*N* = 1,246 Patients presenting for outpatient care	Longitudinal	USA	52.0	Self-reported number of primary care visits in a 12-month period.	3-item UCLA loneliness scale. Rated from 1–3.	Private insurance model
18. Newall et al. (2015)	*N* = 954 Population-based sample of adults aged > 45	Longitudinal	Canada	63.5	Objective: Number of physician visits from administrative health care records over a 2.5-year period.	Single item measure, rated from 1-4.	National Health Insurance model
19. Peltzer and Pengpid (2019)	*N* = 31,447 Population – based sample	Cross-sectional	Indonesia	35.0	Self-reported dichotomous question about outpatient health care visits in the past month	Single item measure from the CES-D 10, rated from 1-4.	Out-of-pocket model
20. Pitkala et al. (2009)	*N* = 235 Random sample of older adults	RCT	Finland	80.0	Objective: Number of GP visits over 12-month period reported as cost units.	Loneliness reducing intervention vs control group.	National Health Insurance model
21. Richard et al. (2017)	*N* = 20,007 Population-based sample	Cross-sectional	Switzerland	47.0	Self-reported dichotomous question about GP visits in the past 12 months.	Single item measure. Dichotomous yes (1), no (0) scoring.	National Health Insurance model
22. Taube et al. (2015)	*N* = 153 Adults aged > 65	RCT	Sweden	81.5	Objective: Number of physician visits in past 12 months taken from patient administrative registers.	4-item measure created by the authors. Dichotomous yes (1), no (0) scoring.	Beveridge model
23. Theeke (2009)	*N* = 8932 Population-based sample of adults aged >50	Cross-sectional	USA	74.0	Self-reported number of GP visits over 2-year period.	Single item measure of loneliness. Rated from 1-3.	Private insurance model
24. Wyke et al. (2003)	*N* = 1477 Adults aged >40	Longitudinal	Scotland	—	Self-reported number of GP visits over 12-month period.	Single item measure of loneliness. Rated from 1-5.	Beveridge model
25. Zhang et al. (2018)	*N* = 5,514 Population-based sample of adults aged > 65 from rural areas	Cross-sectional	China	69.7	Self-reported number of GP visits over a two-week period.	Single item measure created by the authors. Rated from 1-4.	National Health Insurance model

Note: Beveridge model – Universal coverage with single-payer system fully funded by the government as single payer. Bismarck model – Multi-payer system with no universal coverage, usually reliant on employers and employees to pay into a not-for-profit fund. National Health Insurance model – Blend of Beveridge and Bismarck models with universal coverage supplemented by multi-payer system in the form of not-for-profit insurance policies. Private insurance model – Multi-payer system in the form of for-profit insurance policies, no universal coverage. Out-of-pocket model – No national health-care infrastructure, only for those who can afford healthcare (Reid, 2009).

Data synthesis

As the majority of the studies reported effect sizes as *r*-values, all other effects (odds ratios, chi-square, *t*-values) were first converted to *r*-values. According to Cohen's (1992) guidelines, effects of $r = .10$ are considered to be small, $r = .30$ to be medium, and $r = .50$ to be large. These guidelines were used to assess the magnitude of the effects.

A random effects meta-analysis was used to estimate the average effect size of the relationship between loneliness/social isolation and frequency of making physician visits/primary care us using the Comprehensive Meta-Analysis (CMA) software (Borenstein et al., 2005). CMA first transforms the individual correlation coefficients into Fisher's *z* scores, and weights the effects before meta-analysing them.

Estimates of the between-studies variability in effect sizes were calculated using two approaches to determine whether moderator analyses were warranted. The first approach used the heterogeneity statistic, *Q*, to assess the degree of variability among the pool of effects sizes (Card, 2012), with moderator analysis warranted if this statistic is associated with a large confidence interval. The second approach used the I^2 statistic to estimate the proportion of variability present that was not due to sampling error within studies (Slosar, 2009). In general, I^2 values of 25 percent reflect low heterogeneity, 50 percent reflect moderate heterogeneity, and 75 percent or more reflect high heterogeneity (Viechtbauer, 2010).

Planned moderator analyses assessed the potential influences of the measure used to assess loneliness/social isolation, participant gender and age on any significant average effects. For analyses of the categorical moderator loneliness scale type (multi-items versus single item scale), analyses were only conducted if there were three or more studies in each subgroup. Card's (2012) caution regarding the difficulties in detecting meaningful group differences and the reduction of statistical power when there are too few studies in a subgroup, guided this decision. Moderator analyses were conducted using a mixed effects approach where the combined subgroups were first analyzed with a random effects model to further assess heterogeneity within each subgroup, and then combined using a fixed effects model to assess the heterogeneity between subgroups. Gender was recorded as a continuous variable (percent female), and therefore a mixed effects meta-regression (method of moments) analysis was used to assess the potential moderating effects of this variable. The potential moderating effect of age was similarly evaluated using a meta-regression in CMA.

We used a multi-pronged approach, as recommended by Card (2012), for assessing publication bias, that is, to assess the extent to which the 'file drawer' problem – that is the absence of unfound studies – may bias the results from the meta-analysis. This was especially important given the relatively small number of studies included in the meta-analysis and that only published research was included in the analysis. Firstly, a fail-safe *N* was calculated for each effect size using the Rosenthal (1979) method. This statistic provides an estimate of the number of studies with non-significant results ($p > .05$) that would need to be included in the meta-analysis to threaten the conclusion of a significant association (Rosenthal, 1979). As a guideline, Rosenthal (1979) suggests that an adequately high fail-safe *N* should be greater than $5k + 10$, where $k =$ the number of studies included. Secondly, we examined the funnel plots for the meta-analysis, as they provide a graphical representation of publication bias. If a visual inspection reveals asymmetry in the funnel plot shape from the expected triangular configuration, then there is a possibility of publication bias (Card, 2012). This was accompanied by a quantitative estimate of potential scatterplot asymmetry and therefore publication bias, using Duval and Tweedie's (2000) 'trim and fill' approach. This approach first 'trims' any studies contributing to funnel plot asymmetry, then reinstates the trimmed studies and imputes values to 'fill' in the funnel plot so that symmetry is achieved, then compares the filled results to the original estimates. If discrepant, this would suggest publication bias. If found to be comparable, then the original results are considered robust to publication bias (Card, 2012). Thirdly, we used Egger's regression test (Egger et al., 1997) to assess the asymmetry of the funnel plots. In this test, the intercept reflects publication bias, with a significant test

suggesting the presence of publication bias. When these multiple approaches are used in tandem and there is consensus among the results, Type 1 error in assessing publication bias can be reduced (Card, 2012; Ferguson & Brannick, 2012).

Results

Study characteristics

Of the 23 studies (including 25 effects) identified for inclusion, six were conducted in North America, six in the United Kingdom, five in Europe, four in Australia/New Zealand, three in Asia, and one in Israel (see Table 1). The majority of the studies used large representative population-based samples (15/25), with middle-aged (6 studies) or older adults aged 65 or older (11 studies). With respect to research design, 14 studies employed a cross-sectional design, eight were longitudinal, two were randomised controlled trials, and one was an intervention pilot study using a quasi-experimental design. Twenty studies used self-report measures of primary care use, and five used an objective measure of primary care use. The timeframe for which the frequency of GP/physician visits was reported ranged from two weeks to two and half years across the 25 studies that reported a time frame, with the mean between studies time frame being 9.0 months. The majority of studies measured loneliness/social isolation with multi-item measure (13 studies), and eleven studies used a single item measure. Most studies measured loneliness (20 studies) with only four studies using a measure of social isolation. One study did not measure loneliness and instead tested the effects of a loneliness reducing intervention RCT on primary care use.

Methodological quality

Twenty-three of the 25 studies were rated as having high quality, with only two receiving ratings placing them in the moderate quality category (Berg et al., 1981; Richard et al., 2017). No studies were rated as having low quality. Inter-rater agreement was high, Cohen's Kappa = 0.779.

Meta-analysis results

Table 2 presents the correlations, study coding, and results for the meta-analyses of loneliness/social isolation with GP/physician visits. The data analysed from 23 studies with 25 effects included a pooled total sample of 113,639participants. The meta-analysis revealed a significant, small positive average association between loneliness/social isolation and making physician visits (r_{avg} = .094; 95% CI [.07, .12]).

The tests of heterogeneity of the effect sizes were significant, $Q_{total}(24) = 325.157$, $p < .001$; I^2 = 92.62%. Because the I^2 value was above the 75% threshold, conducting moderator analyses were conducted to probe the source of heterogeneity among the associations of loneliness and use of primary care.

Moderator analyses

There were 24 studies that used either a multi-item ($k = 13$) or a single item ($k = 11$) measure of loneliness/social isolation. One study tested the effect of a loneliness reducing intervention in relation to physician visits, rather than using a loneliness scale (Pitkala et al., 2009), and so was excluded from this moderator analyses. The subgroup analyses revealed that the effects garnered from studies that used a multi-item measure of loneliness/social isolation (r_{avg} = .08, 95% CI: [.04, .13]) were not significantly different in magnitude from those obtained from studies that used a single item measure of loneliness/social isolation (r_{avg} = .11; 95% CI: [.08, .14]; Q (1) = 0.86, p = .36).

Table 2. Meta-analyzed effect sizes between loneliness and use of primary care across 25 samples (Total $N = 113,639$).

Study	*N*	Mean Age	Percent female	*r*	95% CI
1. Bath and Gardiner (2005)	1,042	75.21	61.0	.023†	[-.04, .08]
2. Berg et al. (1981)	989	70.0	53.4	.121†	[.06, .18]
3. Beutel et al. (2017)	15,010	54.9	49.4	.130†	[.11, .15]
4. Bock et al. (2018)	6,882	63.1	51.2	.025	[.00, .05]
5. Cheng (1992)	112	72.72	100.0	.460	[.30, .60]
6. Cohen-Mansfield et al. (2009)	1,147	83.1	44.9	.131	[.07, .19]
7. Cruwys et al. (2018, p. 1)	1,752	57.55	57.3	.11	[.06, .16]
8. Cruwys et al. (2018, p. 2)	79	22.04	67.1	.31	[.10, .50]
9. Cruwys et al. (2018, p. 3)	46	44.67	73.9	.33	[.04, .57]
10. Denkinger et al. (2012)	1,056	75.84	44.9	.067	[.01, .13]
11. Gerst-Emerson and Jayawardhana (2015)	3,530	71.0	59.2	.063	[.03, .10]
12. Hector-Taylor (1997)	289	71.0	56.0	.173†	[.06, .28]
13. Houle et al. (2001)	7,112	72.69	58.6	.153	[.13, .18]
14. Kellezi et al. (2019)	630	52.7	54.0	.080	[.00, .16]
15. Lauder et al. (2006)	1,241	45.1	49.7	.035†	[-.02, .09]
16. Lim and Chan (2017)	2,738	73.1	53.1	-.078†	[-.12, .14]
17. Mullen et al. (2019)	1,235	52.0	63.0	.027†	[-.03,.08]
18. Newall et al. (2015)	954	63.5	53.8	.120	[.06, .18]
19. Peltzer and Pengpid (2019)	31,447	35.0	50.8	.034†	[.02, .05]
20. Pitkala et al. (2009)	235	80.0	73.6	.128†	[.00, .25]
21. Richard et al. (2017)	20,007	47.0	50.9	.115†	[.10, .13]
22. Taube et al. (2015)	153	81.5	66.7	.155†	[-.00, .31]
23. Theeke (2009)	8,932	74.0	58.8	.071†	[.05, .09]
24. Wyke et al. (2003)	1,477	—	55.7	.180†	[.13, .23]
25. Zhang et al. (2018)	5,514	69.7	57.1	.091†	[.04, .09]
Meta-analysis results	Average *r*			.094	[.07, .12]
			Total *N*	113,639	
			k	25	

†original effects size reported as odds ratio, R^2, chi-square, or *t* value.

Five of the 25studies used objective rather than self-report measures of primary care use. The moderator analysis found that the effects obtained from objective measures of primary care use ($r_{avg} = .14$, $k = 5$, 95% CI: [.12, .16]) were significantly larger than those from studies used self-report measures($r_{avg} = .09$, $k = 20$, 95% CI: [.06, .11]) (Q (1) = 11.04 $p = .001$). This finding was contrary to what was expected.

The meta-regression of the influence of sex revealed that the associations between loneliness/social isolation and physician visits varied significantly as a function of respondent sex, $b = .54$[.21, .86], $Q_{model}(1) = 10.49$, $p = .001$, $Q_{residual}$ (23) = 28.45, $p = .20$. This indicated that as the proportion of females in the samples increased the positive association between loneliness and use of primary care increased in magnitude.

In contrast, the meta-regression for age was non-significant, indicating that the magnitude of the effects across the studies did not vary as a function of participant age, $b = -.000$ [-.00, .00], $Q_{model}(1) = 0.06$, $p = .81$, $Q_{residual}$ (21) = 34.32, $p = .03$. This finding may be due to the majority of studies being conducted with samples that were mostly post retirement age (age > 65; $k = 14$), as opposed to mostly pre-retirement age (young and middle-aged; $k = 11$). We therefore conducted and additional moderator analysis across these two broad age groups. This analysis was also non-significant (Q (1) = 0.20, $p = .66$), indicating that the magnitude of the effects for studies conducted with mostly pre-retirement age samples ($r_{avg} = .09$, 95% CI: [.06, .13]), did not differ from those conducted with mostly post-retirement age samples ($r_{avg} = .10$, 95% CI: [.06, .14]).

Supplemental analyses

To further understand the sources of heterogeneity across the samples, we conducted additional unplanned moderator analyses. We examined whether the type of health care system used in the country the study was conducted in impacted the findings. Studies were grouped into one of the four basic health-care systems that differ with respect to financial and practical access (Reid,

2009): The Beveridge model ($k = 6$), the Bismarck model ($k = 3$), The National Health Insurance model ($k = 11$), Private Insurance model ($k = 4$), and the Out-of-Pocket model ($k = 1$; see Table 1). Because there was an insufficient number of studies, the Out-of-Pocket model group was not included in the moderation analysis. The moderator analysis of the effect of health-care system was non-significant (Q (3) = 1.07, $p = .78$), suggesting that the effects from countries with either a Beveridge model ($r_{avg} = .12$, 95% CI: [.07, .17]), Bismarck model ($r_{avg} = .08$, 95% CI: [-.01, .15]), National Insurance model ($r_{avg} = .10$, 95% CI: [.05, .15]), or a Private Insurance model ($r_{avg} = .09$, 95% CI: [.03, .15]), did not differ in magnitude. Given that two of the subgroups were relatively small and that access differences can be subtle between several of these different systems (Reid, 2009), a follow-up moderator analysis was conducted collapsing the health-care systems into those that provide more open ($k = 17$; Beveridge, and National Insurance models), versus restricted access ($k = 8$; Bismarck, Private insurance, and out-of-pocket models) with respect to financial access, to compare the effects. The moderator analysis was also non-significant, (Q (1) = 1.27, $p = .26$), with the effects for studies from countries with a more financially accessible health-care system ($r_{avg} = .11$, 95% CI: [.07, .14]), not being significantly different from those with restricted financial access to health care ($r_{avg} = .08$, 95% CI: [.04, .11]).

Sensitivity analysis

To explore whether the observed effects were robust to minor methodological variances, we conducted several sensitivity analyses. One of the studies included in the overall analyses did not measure loneliness but rather examined physician visits after a loneliness reducing intervention (Pitkala et al., 2009). After removing the study by Pitkala et al. (2009), the average association between loneliness and use of primary care was essentially unchanged, $r_{avg} = .093$; $k = 24$; 95% CI [.07, .12], supporting the decision to include this study in the meta-analysis. Three studies assessed GP/physician visits using a dichotomous question rather than by assessing the frequency of the visits made (Bath & Gardiner, 2005; Peltzer & Pengpid, 2019; Richard et al., 2017). Reporting GP visits/primary care use in terms of frequency of use (e.g., number of visit made) within a time frame could be viewed as a more accurate assessment of how loneliness may link to primary care use. For example, making one GP visit is not qualitatively the same as making a number of visits, as the former might reflect occasional use whereas the latter could reflect frequent use. We therefore conducted a sensitivity analysis to examine whether the decision to include these three studies influenced the overall effects. Removal of these three studies resulted in a very slight increase in the overall estimate of the association of loneliness to primary care use, $r_{avg} = .102$; $k = 22$; 95% CI [.07, .13], which supported the decision to retain these studies in the analyses.

A further sensitivity analysis was conducted to examine whether the inclusion of two studies from developing countries impacted the magnitude of the effects found. After removing the studies by Peltzer and Pengpid (2019) from Indonesia, and Zhang et al. (2018) from rural China, the magnitude of the association between loneliness and primary care use was only slightly increased $r_{avg} = .098$; $k = 23$; 95% CI [.07, .13], indicating that their inclusion in the overall analyses did not significantly impact the results.

Publication Bias tests

The tests were unanimous in suggesting the absence of publication bias. The fail-safe N analysis revealed that an additional 3,380 studies with null results would need to be included in the meta-analysis to increase the p value above .05. This was well above the threshold value of 135. The funnel plot showed minor signs of asymmetry and the trim and fill test resulted in 6 studies being trimmed, and a similar value for the imputed effects ($r = .077$ [.07, .08]). Egger's test of the intercept was also non-significant, $b_0 = 1.12[-1.30, 3.51]$, t (23) = 0.98, $p = .34$, further supporting the absence of publication bias.

Discussion

This study provides the first comprehensive meta-analysis to date of the association of loneliness with use of primary care. The results from 25studies (total $N = 113, 009$), many of which used large representative population-based samples, indicate that people who experience loneliness and feelings of social isolation make a greater number of visits to their physician or general practitioner. Although the average association found was small, it was robust to differences in age and the type of health-care system, as well as to the format of the loneliness scale used. However, the associations from studies that used objective measures of primary care use were larger than from studies in which primary case was self-reported. The effects also increased in magnitude as the proportion of females in the sample increased. Consistent with Cumming's (2014) recommendations for improving psychological research, the findings from this meta-analysis make an important contribution by building cumulative quantitative research within the loneliness literature on a topic that has implications for policy and practice, as well as expanding our current understanding of how loneliness is linked to important health-related behaviours.

Although there was a significant degree of variance across the effects analysed, only two of the four moderators tested explained this variance. However, participant sex accounted for some of the variance in the association between loneliness and primary care use, and was consistent with research findings that females use health care to a greater degree than males (Chrisler et al., 2016; The Kings Fund, 2018). That the link between loneliness and primary care use was stronger for females than males is also consistent with research on distress and use of health-care. For example, a five-year longitudinal cohort study of the predictors of primary care consultations found that changes in psychological distress were more strongly associated with increased rates of consultation for women than they were for men (Kapur et al., 2005).

That age did not moderate the associations of loneliness with primary care use is unexpected and somewhat surprising. Research indicates that older adults experience higher levels of loneliness due in part to restricted social networks, and that use of primary care tends to increase with age due to increased medical need (Gerst-Emerson & Jayawardhana, 2015; Yang & Victor, 2011). However, there are boundary conditions that affect each of these relationships and which may explain why age did not moderate the association between loneliness and primary care use in the current study. There is some evidence that the association between loneliness and age can be heterogeneous, even amongst European countries. A study of loneliness rates among different age cohorts across 25 European countries found that there was no consistent pattern of association between age and rates of loneliness (Yang & Victor, 2011). In some countries, rates of loneliness were low (below 10%) until age 70, whilst in other countries there was a more linear relationship with age with loneliness steadily increasing from age 30–50. The lack of a moderating effect of age could be attributed in part to the multinational nature of the current study as 11of the included studies were from European countries and the remainder were other parts of the world. In addition, it is also possible that the link between loneliness and greater use of primary care was not stronger for older adults (or those post retirement) due to the barriers that this cohort often face when attempting to access health-care. For example, in a population-based study of older Australian adults (Temple & Williams, 2018), long wait times and lack of available appointments were the main barrier to health-care access, and were associated with lower trust in the health-care system, which can further reduce health care use (Gille et al., 2021).

The high degree of unexplained variability in the current study points to the possibility that other variables exert an impact the association between loneliness and physician visits beyond participant sex and age. Using international, national and local disaggregated data may assist in pinpointing these variables. Furthermore, the way that primary care visits were operationalised and measured may have contributed to the high degree of variability among the associations found, because a number of different measures and time frames were used to assess use of primary care.

Our findings also suggest that single-item measures of loneliness may provide an adequate measure of loneliness in situations where participant burden is an important consideration. Indeed, research comparing scores on a single item measure of loneliness with the multi-item UCLA loneliness scale (Russell et al., 1980) in a sample of older adults found that they were highly correlated ($r = .72$) (Perlman et al., 1978).

Contrary to what was expected, the studies with self-reported GP visits had effects that were significantly smaller in magnitude than those using objective means to track GP visits. Although this finding conflicts with research suggesting that self-reports tend to overestimate the degree to which people engage in preventive behaviours (Streff & Wagenaar, 1989), it is consistent with research which found that older adults who tended to make more physician visits were more likely to underreport the actual number of visits made rather than over-report visits (Schmitz et al., 2002). Nonetheless, our findings should be interpreted with caution as there were only five studies that used objective means to assess GP visits.

The growing evidence base demonstrating the health risks of loneliness highlights medical need as a reason why people who feel lonely may seek medical care. Nonetheless, the average association found in the current meta-analysis was relatively small with a significant degree of unexplained heterogeneity. This could reflect differences in medical need across the study populations that were also operating to drive seeking medical care. In support of this suggestion, one study found that loneliness predicted a greater number of physician visits over 2.5 years, and that having a greater number of health conditions explained this association (Newall et al., 2015). Additionally, the unexplained variance among the effects could also be due to reciprocal and mutually reinforcing linkages between loneliness, physical health, health perceptions, and use of primary care. Longitudinal and multivariate research is needed to account for physical health status and other contributing factors when assessing how loneliness relates to use of primary care to provide greater clarity into the complex factors linking loneliness to use of primary care.

Ostensibly, the association of loneliness with greater use of primary care found in the current study have a number of implications for policy and practice. For example, poor lifestyle and health behaviours are often prioritised by public health policies aimed at improving health and reducing health-care utilisation, whereas social connection factors such as loneliness receive less attention. If we assume that increased medical need due to loneliness is a key driving force for use of greater primary care among those who are lonely, then addressing the issue of loneliness at both the societal and the community levels could improve health and reduce the use of health services. With respect to practice, acknowledging a link between loneliness and greater use of primary care highlights the need for equipping physicians with the knowledge, time, and resources to help their lonely patients by connecting them to the appropriate services and community support (Royal College of General Practitioners, 2021).

Given the small association between loneliness and primary care use found in the current study, it is tempting to conclude that any health-related benefits from tackling loneliness are trivial and therefore not worth addressing. However, if we consider loneliness at the population level rather than the individual level, then the small association between loneliness and greater primary care use is far from trivial. Ozer and Benet-Martínez (2006) have argued that although the effects of individual differences on important outcomes, such as health, are often small, when considered on a population level any non-zero effects are actually large from a practical perspective. For example, recent estimates suggest that 3.7 million adults in Great Britain feel lonely 'often' or 'always' (Office for National Statistics, 2021). In line with this perspective, even small reductions in the mean levels of loneliness could reduce by thousands the number of people using health care services. Such apparently small effects when aggregated at the population level can therefore be considered 'routinely consequential' (p. 416; Ozer & Benet-Martínez, 2006).

Limitations and strengths

There are several limitations and strengths to consider when interpreting the findings of the current study. The conclusions drawn regarding the linking of loneliness to higher use of primary care should

be considered with caution because the research included in the current meta-analysis viewed loneliness as a broader construct that included feelings of social isolation and social disconnection. This was due in part to wanting to ensure sufficient power to be able to conduct moderator tests because there was limited research on loneliness and primary care that only used measures of loneliness. However, feelings of social disconnection and isolation are often viewed as being closely related to loneliness and may therefore serve as reasonable proxies in the absence of other measures of loneliness (Cornwell & Waite, 2009).

Although a causal direction was assumed from loneliness to use of primary care, the cross-sectional nature of the studies analysed means that causality cannot be determined. Indeed, many studies relied upon retrospective reports of physician and GP visits. Nonetheless, the weight of current theory supports the proposed direction from loneliness to primary care use, as does research in which an intervention targeting loneliness led to decreased physician visits over time (Cruwys et al., 2018). Further longitudinal research that investigates how loneliness relates to primary care use over time after accounting for medical need would be well placed to provide more definitive evidence regarding the issue of causality.

The current meta-analysis also has several strengths worth noting. The variety in the range of ages in the samples included in the analyses is a clear strength that lends confidence to the generalisability of the findings, especially in light of the moderator analysis for age being non-significant. Although several studies focused on older adult samples, there were also middle-aged, younger, and general community samples included, suggesting that the potential impact of loneliness on primary care visits is not isolated to certain age groups or to being male or female. In addition, 16 of the 25samples included in the analysis used large population-based representative samples rather than small convenience samples. This was reflected in the quality ratings of the studies, which overall were categorised as having high quality. The studies included were from a variety of geographical locations including Europe, the UK, the US, Canada, Australia, Singapore, and China, that reflected five different health-care systems. Taken together, these strengths of the current research increase confidence that the findings can be generalised to other similar samples, and to those from different cultural and health-care contexts.

Conclusions

The findings from this first meta-analysis of the associations of loneliness with primary care use indicate that loneliness is linked to making more visits to primary care providers such as physicians and GPs. This association was obtained predominantly from studies with large, population-based samples, and was robust to the influence of age, type of health-care system, and the format of the loneliness scale used. Although the overall average effect can be considered small statistically (Cohen, 1992), the practical effects can be considered 'routinely consequential' when viewed at a population level (Ozer & Benet-Martínez, 2006). With loneliness becoming a growing public health concern, and demands on health-care systems increasing as the population ages, further research is needed to better understand the factors and processes that might explain why people who feel lonely use primary health-care more frequently.

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