Social Isolation and Loneliness: Health Impacts and Risk Factors

A Rapid Review

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" I will not live in a country where thousands of people are living lonely lives forgotten by the rest of us"

Jo Cox

"Our social relationships are widely considered crucial to emotional well-being; however, the possibility that social connection may be a biological need, vital to physical well-being and even survival, is commonly unrecognised"

Julianne Holt-Lunstad

1.0 Research Questions:

This rapid review aimed to address the following two research questions:

1. What are the impacts of loneliness and social isolation on physical and mental health and well-being?

2. What are the factors associated with loneliness and social isolation (who is more likely to be isolated)?

2.0 Introduction

There has been increasing awareness of the health impacts of a lack of social connection both in terms of social isolation, a structural component of social connection (measured using indicators of number of social relationships and frequency of social contact) and loneliness which is more a subjective functional measure of the feeling of loneliness, where social connections do not meet an individual's needs. The concepts are related but distinct although many studies have used composite measures which has complicated analysis. However, whilst there is a need to attend to the potential conceptual differences and to appraise the evidence and tailor interventions accordingly, given the totality of the evidence presented in this review and the significant health impacts identified, it is important that a focus on definitional issues does not impede the urgent effort needed to attenuate the health and health system impacts of loneliness and social isolation and to recognise the crucial importance of social connection in terms of our health and wellbeing. It is with this need in mind that this rapid review was undertaken by the Research and Intelligence team at Sandwell Council (with assistance from Dudley Knowledge Services) in order to inform the work of the Health & Adult Social Care Scrutiny Review.

3.0 Methods

Two main methods of initial literature review were undertaken. Dudley Knowledge Services conducted a review of the literature in respect of both impacts and risk factors for loneliness and social isolation using; Psychinfo, Emcare, Embase and Google Advance. The search was date limited to 2019 to the present (other than for the Google Advance search) due to the large number of results. The search included a search of grey literature. In addition a member of the Research & Intelligence team at Sandwell Council undertook an OvidSP search of Medline and Embase (date limited to the previous 10 years) using a search strategy comprising relevant terms, a full copy of the search strategy is available in Appendix 1. The initial search was conducted between the 10th and 17th of November 2022 and the OvidSP search was updated and run again on 30/01/2023 in order to capture all recent relevant publications. A review of citations in key papers and grey literature was also undertaken including a further review of citations associated with healthcare system impacts. Screening of articles identified was undertaken initially using Rayyan © online systematic review software and subsequently using Excel. Duplicates were removed and title and abstracts were screened. Those studies meeting inclusion criteria were retrieved for full text screening. In respect of studies relating to health impacts, inclusion criteria were: (i) longitudinal studies examining impacts of loneliness and/or social isolation where loneliness and/or social isolation was an exposure variable and physical and/or mental health and/or well-being were outcome measures or a systematic review and/or meta-analysis of studies examining such impacts and (ii) published in English language in peer reviewed journal in the last 10 years. Following review of citations one large meta-analyses from 2010 was also

included. In respect of risk factors the inclusion criteria were necessarily broader and included cross-sectional survey data and grey literature considering risk factors for social isolation and/or loneliness.

4.0 Search and Screening Results

An adapted flow diagram is included at Appendix 2 showing the results of the literature search and screening. Following the initial searches by Dudley Knowledge Services and the Research & Intelligence team member 424 sources were identified for initial screening. Title and abstract screening yielded 82 reports for retrieval. One report was not retrieved in full however the abstract was included with a note as to this limitation. A further 2 sources were identified following the updated review on 30/01/2023 and a further 3 additional studies following a further review of citations. Overall 33 studies were included on health and healthcare system impacts and 14 on risk factors. The table of sources included for health impacts is set out in Appendix 3 and that for the risk factors in Appendix 4. Note that for ease of reference one study referred to in relation to both impacts and risk factors appears in both tables.

5.0 Key Findings: Health Impacts of Social Isolation and Loneliness

5.1 Mortality Impacts

There is now robust and longstanding evidence over several decades of an association between a lack of social connections and a 'significantly increased risk of premature mortality' [1]. A seminal meta-analysis of 148 prospective studies in 2010 [2] considered structural measures (for example living alone, network size), functional measures (e.g. feeling of loneliness) and a combination of these factors and found that there was a 50 percent greater odds of survival associated with adequate compared to poor social relationships [2]. Importantly, the findings were found to be consistent 'across age, sex, initial health status, cause of death, and follow-up period' [2]. There is also some evidence that the size of this effect is the same or greater than other well-known risk factors such as obesity, smoking and lack of physical activity [1],[2],[3]. A subsequent meta-analysis of 70 studies in 2015 which analysed the different elements of social connection [3] found an average 29% increased likelihood of mortality for social isolation (odds ratio (OR) = 1.29, [CI: 1.06-1.56]); a 26% increased likelihood of mortality for loneliness OR = 1.26 [CI: 1.04-1.53] and a 32% increased likelihood of mortality for living alone OR = 1.32 [CI: 1.14-1.53] [3]. The authors also found that social deficits were 'more predictive of death in samples with an average age younger than 65 years' [3] which emphasises the need to attend to younger and middle aged populations.

Subsequent meta-analysis have continued to provide evidence for an independent effect of both loneliness and social isolation on mortality [3],[4] however the strongest evidence is for social isolation/lack of social network [1]. A very recent meta-analysis and systematic review published in early 2023, including data from studies involving 1.30 million individuals provides a further 7 years of evidence for an increased risk of mortality as a result of social isolation [5]. This analysis found a 33% (95% CI; 1.26-1.41) [5] higher hazard of all-cause mortality among socially isolated participants which was consistent with narrative review of the 9 studies not included in the meta-analysis [5]. The effect sizes were similar 'using different assessment tools and in studies conducted in different country income levels providing reassurance of the universal importance of social isolation' [5].

More studies are needed which consider loneliness and social isolation in the same sample so that the relationships and the relative contributions of structural and functional elements of social connection

can be further understood [1] however given the overall weight of the totality of the evidence it can be argued that this should not delay the development of interventions targeted at addressing poor social health in both its functional and structural aspects. A study in the UK in 2013 [6] found increased mortality in both socially isolated and lonely people, however this association remained for social isolation in an adjusted model '(hazard ratio 1.26, 95% confidence interval, 1.08–1.48 for the top quintile of isolation)' [6] but not for loneliness which did not increase the risk of social isolation, leading the authors to conclude that loneliness was not a key mechanism contributing to increased mortality in this study [6]. Similarly a study of 466 901 men and women in the UK biobank study [7] found that lonely and isolated people were at increased risk of death, but that in a fully adjusted model the hazard ratio for all-cause mortality for social isolation compared to no social isolation showed an increased risk (hazard ratio 1·26 (95% CI 1·20-1·33)'[7] however this was not the case for loneliness after adjusting for baseline risks (hazard ratio 0·99 (95% CI 0·93-1·06) [7]. Significantly, from a public health perspective, the authors also found that 'most of the excess mortality among socially isolated and lonely people could be attributed to adverse socioeconomic conditions, an unhealthy lifestyle, and lower mental wellbeing' [7] and suggested that policies aimed at addressing these factors were key [7]. In addition a recent study of 35,254 participants in Chinese Longitudinal Healthy Longevity Survey suggests that specific policies may need to be aimed at different age groups [8]. This study found that social isolation was associated with increased mortality among older adults [8] whilst loneliness was associated with an increased mortality only among participants under 80 [8].

There is evidence from a large meta-analysis in 2018 (n=77220 participants) as to an association between increased all-cause mortality and loneliness [4]. In this meta-analysis loneliness was found to be 'a risk factor for all-cause mortality [pooled HR = 1.22, 95% CI = (1.10, 1.35), p < 0.001] for both genders together, and for women [pooled HR = 1.26, 95% CI = (1.07, 1.48); p = 0.005] and men [pooled HR = 1.44; 95% CI = (1.19, 1.76); p < 0.001] separately [4] and these findings are consistent with the findings of an earlier comprehensive meta-analysis [3]. There are smaller studies however which are inconsistent and the evidence base for an association between loneliness and mortality is less strong than that for social isolation. There may be reasons for caution when interpreting the results from smaller studies however with specific geographically defined sample populations. A study of 719 men from a random sample of elderly men from an area in the eastern Netherlands did not find any 'independent associations between loneliness and risks of all-cause, cardiovascular, and non-cardiovascular death' [9] and a Swedish study found that while lonely females had a significant increased risk of mortality compared to non-lonely women (HR 1.76; 95% CI 1.31–2.34), this did not remain significant when adjusted for age [10]. In this study surprisingly lonely males were found to have 'an adjusted for age significant decreased risk of mortality (HR 0.50; 95% CI 0.32–0.80), compared with non-lonely males' [10] which the authors suggest is evidence that there may be gender and age differences which have not previously been analysed [10]. The authors specifically caution however about the small numbers involved (small number of deaths in lonely males) which affects the quality of the study and also a potential healthy survivor effect as the mean age at baseline was 62 [10]. In addition there may be issues as to generalisability of these findings which again come from a specific geographical sample of two originally rural parishes in Sweden [10]. In contrast, there are also studies of specific populations which have found evidence of an association for example a recent analysis of data from a population based cohort study of Finnish men (n= 2588) found that loneliness 'predicted all-cause mortality, even after adjustments for all covariates' [11]. Interestingly this study suggested that there may be some emerging evidence that loneliness and social isolation could have be associated with different causes of death with loneliness predicting cancer mortality (except after

adjusting for lifestyle factor scores and depression scores) [11] and social isolation predicting all-cause mortality and injury mortality [11] although clearly further research is needed.

A recent prospective study of 4467 non-institutionalised adults in Spain (which considered 'sex, age, education, physical activity, tobacco consumption, body mass index, disability, depression, living situation, and social participation' as covariates) [12] also suggests that some of the different findings as to loneliness and mortality may be related to different associations at different ages [12]. Whilst this study found that 'a higher level of loneliness was not associated with mortality risk in fully covariate-adjusted models over the entire population (HR = 1.02; 95% CI = 0.94, 1.12)' [13], the 'interaction term between loneliness and age groups was significant, indicating that the rate for survival of loneliness varied by age (HR = 1.29; 95% CI = 1.02, 1.63 for young- and middle-aged individuals; HR = 0.96; 95% CI = 0.89, 1.04 for older adults)' [12]. The authors suggest therefore that these findings may support targeted attempts to reduce mortality risk by developing interventions aimed at tackling loneliness among young and middle aged adults [12].

There is evidence that cardiovascular mortality is associated with both social isolation and loneliness [13] although much of the increased risk may be explainable by conventional risk factors in respect of loneliness [13]. A study of 479 054 participants in the UK biobank study with 7 years of follow up and which considered social isolation and loneliness in the same sample, found that socially isolated and lonely persons had a 1.4 times to 1.5 times increased risk of incident acute myocardial infarction ("AMI") or stroke [13]. Approximately '85% of this risk however was attributable to conventional risk factors' [13] including pre-existing illness, smoking, obesity and low education [13]. In those with a history of AMI however "social isolation, but not loneliness, was associated with increased mortality in participants… (HR 1.25, 95% CI 1.03 to 1.51) or stroke (HR 1.32, 95% CI 1.08 to 1.61) in the fully adjusted model"[13].

Many studies include predominantly white older participants, as can be seen by a review of baseline characteristics of many studies. There have recently been efforts to address this and a prospective cohort study in the US found that social isolation was associated with all-cause mortality in 4 subgroups (defined by ethnicity and gender) [14]. The hazard ratios for the most isolated compared to the least were '2.34 (95% confidence interval (CI): 1.58, 3.46) and 1.60 (95% CI: 1.41, 1.82) among black men and white men, respectively (P for interaction = 0.40) and 2.13 (95% CI: 1.44, 3.15) and 1.84 (95% CI: 1.68, 2.01) among black women and white women, respectively (P for interaction = 0.89)' [14]. With respect to cardiovascular mortality the study found an association between social isolation and cardiovascular disease mortality in all subgroups [14] but only an association between social isolation and cancer mortality among white participants and the authors underline the importance of further research in order to understand the reasons behind this finding, which they suggest could for example reflect the relative importance of social isolation compared to other cancer mortality risk factors in different groups of people [14].

A recent longitudinal study of birth cohort data including 524 adults aged 70 in Gothernburg Sweden examined all cause and cardiovascular mortality in men and women [15]. The study found that loneliness was 'an independent predictor of cardiovascular mortality in women' (HR 2.25 95% CI 1.14–4.45), and moreover found that 'the risk remained significant in a multivariable-adjusted model (HR 2.42 95% CI 1.04–5.65)' [15]. The study found no evidence to indicate that 'loneliness was associated with an increased risk of either cardiovascular- or all-cause mortality in men' [15] which suggests more evidence may be needed as to the impact of age and gender in specific populations and in specific local areas.

In summary therefore there is strong evidence of an association between social isolation and all-cause mortality and evidence (albeit less robust) of an association between loneliness and all-cause mortality and of an association between lack of social connection and cardiovascular mortality. There is also some emerging evidence of potential synergistic effects of loneliness and social isolation with a study in Germany following up 4838 adults for 20 years finding that higher social isolation 'was associated with a larger effect of loneliness on mortality' [16], and 'higher loneliness with a larger effect of social isolation on mortality' [16]. It is important to note that for this study only an abstract was available at the time of the review and therefore limited further conclusions can be drawn. Recent studies have demonstrated the need to consider age, gender and potentially locality in understanding the differential impacts of loneliness and social isolation. At a practical level however given the totality of the evidence as to the association between a lack of social connection (in terms of both loneliness and social isolation) on increased mortality, whilst further research is needed to unpack the exact nature of these relationships, this should not delay the development of interventions and strategies aimed at attenuating loneliness and social isolation. Such risks may pose equal or greater risks to population health than more conventionally studied risk factors such as obesity and smoking [1],[3].

5.2 Morbidity Impacts

There is a large body of observational evidence linking social isolation and loneliness to worse cardiovascular and mental health outcomes [17] which suggests the need for the prioritisation of strategies addressing and attenuating these impacts.

5.3 Mental Health and Well-Being Impacts

There is growing evidence of the mental health and well-being impacts of social isolation and loneliness. A recent longitudinal study of participants in the UK biobank study, linking hospital and mortality records [18] found for men, that 'both living alone (Hazard Ratio (HR) 2.16, 95%CI 1.51–3.09) [18] and living with non-partners (HR 1.80, 95%CI 1.08–3.00) [18] were associated with death by suicide, independently of loneliness, which had a modest relationship with suicide (HR 1.43, 95%CI 0.1.01–2.03)' [18]. In respect of women the study found no evidence that loneliness, living arrangements or emotional support were associated with death by suicide [18] however in fully adjusted models, 'loneliness was associated with hospital admissions for self-harm in both women (HR 1.89, 95%CI 1.57–2.28) and men (HR 1.74, 95%CI 1.40–2.16)' [18]. Overall therefore the authors suggest that addressing loneliness in the general population may reduce risks of self-harm [18]. The relationship between 'loneliness, living arrangements and perceived emotional support' [18] and death by suicide appears more complex and sex specific and in this study 'for men (but not for women) living alone or with a non-partner' was 'associated with increased risk of suicide, a finding not explained by perceived loneliness' [18].

There is evidence of the mental health impacts of social isolation and loneliness in middle aged to older adults although there is more research need into the particular impacts on different groups. A longitudinal analysis of data from The Irish Longitudinal Study on Ageing (TILDA) including 5066 adults aged 50 years and over found that social isolation both objective and perceived independently affected the probability of suffering from generalized anxiety disorder (GAD) and major depression disorder (MDD) 2 years later [19]. The relationship between loneliness and subsequent social isolation 2 years later was also unidirectional [19] and that between loneliness and subsequent MDD and GAD was bidirectional, however the authors reported that this relationship was stronger with loneliness as origin [19]. These results therefore support the need for joined up complementary

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interventions and policies improving the mental health of older adults which address both the functional subjective elements of social connection (loneliness) and the structural factors associated with social isolation for example social network size [19].

There is a growing recognition of the need to understand particularly high risk groups however different studies have identified different at risk sub-groups and more research is needed across the life course. A cohort study from Amsterdam [20] examining the joint effects of loneliness and depression [20] in older persons found that loneliness and depression were associated with excess mortality in bivariate analysis but not multivariate analysis [20] . The analysis however identified a particularly high risk for death in men who were socially lonely and also had concurrent severe depression (taking into account the effects of an extensive range of confounders) with the authors describing this as a 'lethal combination' [20] in men the long term [20]. Importantly they found that depression interacts with both subjective feelings of loneliness and social isolation/lack of social network [20] suggesting that both should be targets for public health interventions [20].

In the general population there was previously an absence in longitudinal research as to the impacts of loneliness on mental health, with much of the previous research having been cross-sectional [21]. A longitudinal study from the Netherlands attempting to address the gap, found evidence of a bidirectional relationship between common mental health diagnoses (CMDs) and loneliness [21]. Loneliness predicting 'the onset of severe CMD at follow-up in adults without CMDs at baseline'[21] and increasing 'the risk for persistent severe CMD at follow-up in those with CMD at baseline' [21] In addition the authors found that 'severe CMD predicted onset of loneliness at follow-up in non-lonely adults at baseline, but was not associated with persistent loneliness at follow-up in lonely adults at baseline.' [21]

Whereas historically much of the research has been in older persons there is a growing awareness of the impact on children and young people and the longer term consequences of the failure to address this. During the Covid pandemic a rapid review of the literature on mental health impacts of social isolation and loneliness on previously healthy children (designed to identify the potential longer term consequences of pandemic policies) [22] found that social isolation and loneliness increased the risk of depression, and possibly anxiety at the time at which loneliness was measured and between 0.25 and 9 years later [22]. In addition the duration of loneliness was more strongly correlated with symptoms than the intensity of loneliness [22].

5.4 Cardiovascular and other cause morbidity

In terms of cardiovascular disease (CVD) there is evidence as to an association between poor social health and CVD mortality as set out above. With regards to incident CVD, there is also growing evidence that poor social health is associated with CVD [11] although studies are again somewhat inconsistent as to whether the association is with loneliness and/or social isolation and many studies measure these concepts in different ways, some using composite measures. Interventions targeting both structural and functional elements of social connection are therefore likely to be needed based on the current evidence.

Secondary analysis of 5397 participants in the English Longitudinal Study of Ageing (ELSA) in 2018 [23] found an increased risk of CVD associated with loneliness (odds ratio 1.27, 95% confidence interval 1.01-1.57) [23] whilst finding no association between social isolation and incidence of CVD [23]. The authors suggest that primary prevention strategies aimed at loneliness could potentially help to prevent cardiovascular disease [23]. A previous systematic review and meta-analysis in 2016 found

that 'poor social relationships were associated with a 29% increase' [24] in risk of incident coronary heart disease (CHD) '(pooled relative risk: 1.29, 95% CI 1.04 to 1.59)' and a 32% increase in risk of stroke (pooled relative risk: 1.32, 95% CI 1.04 to 1.68) [24]. No gender differences were found in this study [25]. A recent prospective study in persons 70 and over in Australia found (using a composite measure) that those with poor social health were '42 % more likely to develop CVD and twice as likely to die from CVD over a five year period.' [25] The authors also considered three distinct components of social health (loneliness, social isolation and social support) and found that 'the risk of incident CVD increased by 66 % if individuals were socially isolated and doubled if individuals had low social support' [25] but found no independent association with loneliness [25]. In relation to specific CVDs, a recent study analysing data from the Framingham heart study in Massachusetts found that social isolation was associated with an increased risk of death in the absence of atrial fibrillation (AF) but was not associated with an increase in incident AF as had been predicted [26]. The authors advise caution due to the small numbers involved but also hypothesise that results may be due to the strong competing effect seen in respect of mortality which may mean that socially isolated individuals were possibly more likely to have died before developing incident AF [26].

In terms of other disease and morbidity, a recent analysis of data from English Longitudinal Study of Aging found that 'living alone was associated with a greater hazard of respiratory disease admissions even after adjusting for potential confounders' [27]. In a fully adjusted model people living alone 'had a 32% higher hazard compared with those who lived with others (HR=1.32, 95% CI 1.06 to 1.64)' [28]. In addition social disengagement was a predictor of admissions 'One SD increase in social disengagement was associated with a 24% increase in the hazard of RD admissions (HR=1.24, 95% CI 1.11 to 1.38)' [27]. In this study however no association was found between either loneliness or low social contact and admissions [27] perhaps suggesting that interventions to reduce respiratory admissions in this group should be targeted at addressing support and living conditions [27].

There is also good evidence that lack of social connection is associated with cognitive decline although the relative strength of association in terms of loneliness and/or social isolation is unclear with different studies having previously reported different findings. A recent study from across two cohorts in Sweden and the Netherlands suggests that it is loneliness that should be targeted by interventions and that previous studies may have been limited by lack of follow up [28]. This study found that persons who were lonely had an increased risk of developing dementia (RS: HR 1.34, 95%CI 1.08–1.67; SNAC-K: HR 2.16, 95%CI 1.12–4.17) [28]. A prospective cohort study in the Netherlands [29] also found in a fully adjusted model that subjective feelings of loneliness were associated with the risk of incident dementia in fully-adjusted model (OR 1.64 (95% CI 1.05 to 2.56)) [29] whereas social isolation/lack of social network was not so associated (when important confounders taken into account) [29]

With an ageing population frailty, which describes 'an individual's vulnerability to poor resolution of homoeostasis following a sudden change in health status' [30] will become increasingly significant in terms of the impacts on health and social care services [30]. With an estimated 1 in 10 people over 65 being frail [30] it is clear that the identification of modifiable risk factors is key [30]. The findings of a recent study of longitudinal data from 9171 participants in the English Longitudinal Study of Ageing Waves 2–8 support the prioritisation of attention to efforts to alleviate social isolation and loneliness [30]. Both loneliness ($\beta = 0.023$; 95% CI = 0.022, 0.025) [30] and social isolation ($\beta = 0.007$; 95% CI = 0.003, 0.010) [30] were found to be significantly associated with increased frailty as measured on the frailty index (FI) even after adjusting for key confounders including 'gender, age, marital status, smoking status and wealth' [30].

There is also good evidence as to an association between loneliness and type 2 diabetes. A study in 2020 of 4112 initially diabetes-free participants in the English Longitudinal Study of Ageing, found that loneliness 'was a significant predictor of incident type 2 diabetes (HR 1.46; 95% CI 1.15, 1.84; p = 0.002) independent of age, sex, ethnicity, wealth, smoking status, physical activity, alcohol consumption, BMI, HbA1c, hypertension and cardiovascular disease.' [31] In this study 'living alone and social isolation were not significantly associated with type 2 diabetes onset' [31]. A very recent longitudinal study in Norway published in 2023 supports this finding reporting that loneliness was associated with a 'twofold higher risk of developing type 2 diabetes relative to those who did not feel lonely (adjusted OR 2.19 [95% CI 1.16, 4.15])' [32]. The authors noted that there is was no 'strong support that the effect of loneliness on type 2 diabetes is mediated by depression or insomnia' [32] and recommended that 'loneliness should be included in clinical guidelines on consultations and interventions related to type 2 diabetes' [32].

5.5 Summary and implications for pressure on social care and health services

There is robust and consistent evidence of the significant health impacts of poor social health and evidence that some of these impacts are similar or greater than those associated with conventional risk factors. There is therefore a pressing need for strategies aimed at attenuating such impacts and addressing risk factors. In the US, a Committee of the National Academies of Sciences, Engineering, and Medicine [1] has recently issued a series of recommendations as to the prioritisation of such strategies including more routine enquiry as to risk factors in clinical consultations and more joined up and innovative strategies that involve key stakeholders (including individual communities at risk, healthcare systems, social care and public health organisations) [1]. Many studies identified in the review raise the potential issue of the resultant pressure on health care and social care services of a failure to address loneliness and social isolation and poor social health [27],[30]. It is apparent from the narrative review on health impacts set out above that the implications for services of morbidity (including cardiovascular disease, Type 2 diabetes, mental health and wellbeing impacts, self-harm, frailty and cognitive decline) associated with poor social health are likely to be considerable. There is also emerging evidence that this is the case, with a recent study in Japan of patients admitted to hospital for heart failure (HF) and followed up after discharge reporting that social isolation was significantly associated with a 'higher HF rehospitalisation rate and in further analysis that 'social isolation was one of the strongest predictors of heart failure rehospitalisation' [33]. The authors reported greater effects than other established risk factors such as 'being unemployed and living alone' [33]. In addition a prospective study in Portugal of 278 consecutive emergency admissions of patients with a hip fracture (aged 75 years or older mean age 85.5) has found that being isolated or at high risk of social isolation was associated with delayed discharge (OR 3.5 95 % CI 1.6–7.7) [34]. In summary therefore there is a clear and pressing need for strategies to attenuate both the individual and wider health and social care impacts associated with social isolation and loneliness.

6.0 Risk Factors for Social Isolation and Loneliness

6.1 National level survey data

In June 2022 a comprehensive report into factors associated with loneliness in adults in England conducted by the National Centre for Social Research (NatCen) and commissioned by the Department for Digital, Culture, Media and Sport (DCMS) was published [35]. The report analysed data from persons 16 and over using, The Community Life Survey (CLS) between 2013/14 and 2019/20 (an annual survey of a random sample of English households) and the Understanding Society (USoc) survey wave 9 (2017/19) and wave 10 (2018/20) [35]. USOc is the 'UK Household Panel study' [35] and surveys the same individuals at multiple different timepoints [35]. The former survey was used to investigate associations between 'life outcomes and loneliness' [35] while the latter was used to explore the relationships between protected characteristics, mental health and loneliness and 'to investigate factors relating to the alleviation of loneliness' [35]. These data were all collected pre-March 2020 and therefore pre-Covid lockdown restrictions [35]. The report confirmed findings from pre-existing research as to the groups at increased risk of loneliness namely; young people; women and those who lived alone and/or had been widowed. In respect of young people (who were found to have a greater than five-fold odds of chronic loneliness than individuals aged 65 or older) [35] the report was also able to take a life course approach and to provide additional evidence as to the particular 'unique risk factor profile for loneliness in young people' [35]. In contrast to other age groups partner loss/being widowed, separated or divorced did not serve as predictors of chronic loneliness in young people however income and sex did with those on the lowest incomes and women having higher odds of chronic loneliness. Age and sex did not predict chronic loneliness at any other age bracket/life stage [35] and relationship status and employment became more important as predictors in older age groups [35]. This life course approach is important in order to understand specific risk profiles and design and tailor interventions.

Consistent with previous studies [36] the report found that those with longstanding health conditions or disabilities were at increased risk and had an almost 3 fold increase of experiencing chronic loneliness compared to those without such conditions and that people living in more deprived areas were at higher risk of chronic loneliness than those living in less deprived areas (this finding was not impacted by age, sex or ethnicity) [35]. The report also identified groups at risk, previously been underrepresented in the evidence. The analysis revealed an increased risk of loneliness amongst gay, lesbian and bisexual people in addition to those who described their sexual orientation as 'other' and those who preferred not to disclose their orientation when compared to individuals identifying as heterosexual [35].

In addition the report provided new evidence as to the increased risk of loneliness for people with low wellbeing and reported a close relationship between mental wellbeing and loneliness [35]. Mental distress was found to play a role in the onset and continuation of chronic loneliness in longitudinal analysis and loneliness predicted the onset and (although to a lesser extent) the persistence of mental distress [35]. An increased risk was also reported for people not in work, people who had recently moved and people with high anxiety [35]. Risk factors were found to be broadly consistent over time in longitudinal analysis [35] and factors alleviating loneliness were scarce in the short term however individuals were more likely to report no longer experiencing loneliness if they were 'living with a partner', had good as opposed to poor wellbeing and 'did not have a chronic illness or disability' [35].

Previous analysis of the CLS in 2016/2017 [36] identified similar risk groups including young adults, women, single or widowed people and those with poor health or limiting conditions [36]. In addition this analysis found that renters reported feeling lonely more often than those who owned their own homes and found an association between an individual's relationship with place and loneliness [36]. Individuals who felt that they 'belonged' less to their neighbourhood reported feeling lonely more frequently as did those who had 'little trust of others in their local area' [36]. This analysis identified three risk profiles of those at particular risk from loneliness: " Widowed older homeowners living alone with long-term health conditions; unmarried, middle-agers with long-term health conditions and younger renters with little trust and sense of belonging to their area" [36].

Consistent with national survey analysis pre-Covid, a study of data collected from 38,217 UK adults as part of the UCL COVID -19 Social Study found high baseline levels of reported loneliness which remained 'relatively stable' but high during lockdown [37] and identified similar demographic risk factors associated with being in the highest loneliness bracket compared to the lowest including: younger age (OR = 2.17–6.81), being a woman (OR = 1.59), those with low incomes (OR = 1.3), those who were economically inactive (OR = 1.3–2.04) and those with mental health conditions (OR = 5.32) [37]. In addition the findings from the COVID-19 Psychological Wellbeing study of 1989 eligible participants are broadly consistent where younger adults were found to be at 4-5 times greater risk relative to those over 65 [38] and those separated or divorced over two times more likely to be lonely compared to being single (OR: 2.29, CI: 1.31–4.00) [38]. In addition marriage and cohabitation were associated with a lower odds of being lonely (OR: 0.35, CI: 0.26–0.46) [38]. A cross-cohort study of adults over 18 in the UK analysing data from pre-pandemic Wave 9 of the USoc survey [39] and UCL (University College London) COVID-19 Social Study (conducted during the pandemic) [39] found that apart from student status emerging as a higher risk factor than usual 'risk factors for loneliness were near identical before and during the pandemic' [39] identifying younger adults, women, those with lower income and/or education, economically inactive individuals and those living alone and in urban environments as at greater risk [39].

In addition to emerging work at a global level looking at potential associations between individualistic societies and loneliness [40] there has been increased attention to the importance and role of place at a national level and the need for local profiles of risk. The Office for National Statistics (ONS) undertook an analysis of the Opinions and Lifestyle Survey (OPN) between October and 2020 and February 2021 mapping loneliness during the pandemic [41]. The analysis found that areas with 'a higher concentration of younger people (aged 16-24) and areas with higher rates of unemployment tended to have higher rates of loneliness' [41] and that 'areas with strong local businesses and adult education tended to have lower rates of loneliness' [41]. Although this analysis was conducted during the pandemic and through periods of restriction (raising questions as to generalisability), the findings are consistent with other evidence as to younger age and unemployment and suggest possible modifiable factors and interventions. This more local analyses has also been undertaken in more focussed studies of particular life stages (as to which see further below) [42]. A recent informal review of current knowledge and gaps in evidence published by the Department for Culture Media and Sport [43] emphasised the need for an understanding for an improved understanding of the structural factors (as well as the individual level factors affecting loneliness) including societal culture and the impact of individualistic or collectivist societal structures [43]. The review called for an increased 'life course approach' [43] to risks with current evidence suggesting links between for example between experiences in early life such as childhood poverty and higher loneliness later in life [43] and also identified the need for more evidence as to the relationship between social stigma and loneliness [43]

The review underlined the gap in the evidence surrounding the 'mechanisms that link loneliness and mental health' [43] in particular for 'middle-aged adults - where suicide rates are high; those from minority ethnic backgrounds and men' [43] and identified the need for more and better evidence as to the impact of social isolation and loneliness on healthy children as a result of Covid-19 'and its impact on later depression and anxiety risk' [43]. The review was consistent with the general trend towards a recognition of the importance of place and the need for local knowledge and local solutions identifying the specific need for exploration of what 'characteristics of place facilitate social connection' [43] and 'what people need and want from their communities'[43]. Such work may be amenable to local qualitative work co-produced with local communities.

6.2 Analysis of Social Isolation and Loneliness at particular life stages

The evidence has (as previously discussed) tended historically to focus on social isolation and loneliness in older people which may be a reflection of the fact that as people age the risk factors for experiencing loneliness and/or social isolation and lack of connection increase [1]. The tendency has also been to focus on social isolation and structural measures of lack of social connectedness (which may be easier to measure using for example census data on living alone) rather than more functional measures including loneliness [1]. The focus on loneliness in the UK led by the pioneering work of Jo Cox, through the setting up a cross-party Loneliness Commission and the work that has been undertaken as a result of this, has contributed to a growing body of evidence on loneliness at the national level (as set out above) and a growing understanding of the particular risk profiles of both young persons and older persons, the need for a life course approach and an appreciation of particular life events (e.g. partner loss, migration to a new place) which may put people at increased risk.

6.3 Risks in Older Adults

A cross sectional study of 884 older (over 60) rural living adults in the South West of the UK found that '13% reported feeling lonely; 49 % isolated from family and 9% isolated from community' [44] however there was 'minimal cross-over between groups' [44] and different risk factors were associated with each variable with widowhood, deprivation and poor health predicting loneliness and higher levels of community engagement reducing the risk of isolation from the community [44]. The only 'common predictor for all three variables' [44] was ageing in place. The authors argue it is important to conceptually distinguish between social isolation and loneliness whilst also recognising that "overall social isolation did independently predict loneliness and exert a small moderating influence on the effects of widowhood and poor mental health on loneliness" [44]. This underscores the importance of recognising that at certain life stages and in specific situations (e.g partner loss and worsening health) older individuals are more at risk of both social isolation and loneliness and require more support [44] and it is argued that the focus should be on regular enquiry as to loneliness and associated risk factors particularly at vulnerable life stages [44] and as a result of particular life events (for example there is a need for more evidence of risks associated with immigration given the likely impacts of this).

The recommendation as to the need for regular assessment of loneliness and social isolation is echoed by the recent comprehensive report of a Committee of the National Academies of Sciences, Engineering, and Medicine in the US [1] which aimed to study how loneliness and social isolation affect 'health and quality of life in adults aged 50 and older' [1]. The report reviewed the evidence using the term social connection to encompass the two distinct concepts of loneliness and social isolation as reflecting functional and structural aspects of social connection respectively [1]. The report underlines

that growing older does not cause social isolation/lack of social connection or loneliness independently of other factors [1] but rather that people over-50 are more likely than younger people 'to experience many of the risk factors that can cause or exacerbate social isolation or loneliness' [1] including 'the death of loved ones, worsening health and chronic illness' and 'new sensory impairment' [1]. In addition the report underscores the way in which these relationships can be bidirectional whereby being lonely or socially isolated affects health and in turn these conditions can increase the risk of experiencing social isolation and/or loneliness [1].

A recent systematic review of longitudinal risk factors for loneliness in older adults (average age at baseline 59 to 85) identified 120 risk factors associated with loneliness [45]. Of these 120 risk factors however only a small number showed consistent association with loneliness across articles and in both bivariate and multivariate analysis leading the authors to conclude that the evidence in this area is 'broad but shallow' [45]. The risk factors that were identified as showing consistent associations with loneliness were: partner loss/not having a partner/being married; poor perception of own health; a limited social network; a low level of social activity; depression and/or depressed mood and 'an increase in depression' [45]. The authors note that partner loss was found to increase risk of loneliness 'in almost all studies' [45]. In addition previously identified associated risk factors in cross-sectional analysis such as being of greater age and/or female gender were associated in bivariate but not in multivariate analysis leading the authors to suggest that this may be because of risk factors that 'co-occur with female gender and greater age' [45] including poorer heath and function and partner loss/widowhood [45], although there is a need for greater exploration of this as studies are inconsistent. There is also evidence of a relationship in older persons between loneliness and pain [46] which could guide clinical enquiries as to risk factors for loneliness. Analysis of data from the 2008 and 2012 Health and Retirement Study in the USA (persons aged 60 years or over found a higher odds of loneliness at both time points measured 'compared to individuals who had pain at neither time point even after controlling for other covariates' [46].

There is also evidence of a relationship between loneliness and more severe mental health symptoms in older persons. In a study of 1,991 referrals to Mental Health of Older Adults services in London during 16 weeks of lockdown in 2020 and a corresponding period in 2019 [47] loneliness in the overall sample was associated with non-accidental self-injury OR 1.86 (1.10-3.15); depressed mood OR 1.73 (1.28-2.34); psychotic symptoms OR 1.65 (1.18-2.32) and antidepressant use OR 2.11 (1.63-2.73) [47]. Consistent with other evidence as to loneliness in older age, the authors reported that in the overall sample loneliness was associated with older age and being a woman [47]. Only 26.9% (n=536) of the referrals occurred during lockdown, however the authors reported that such referrals showed a higher prevalence of loneliness 22% compared to 17.7% [47]. Although the relationship behind these observed associations are likely to be complex the authors conclude that loneliness in referrals to services was associated with ''symptoms of more severe mental illness, poorer functioning and increased use of antidepressant medication'' [47] all of which, in addition to the impacts on individuals are likely to have an impact on the pressure on such services.

6.4 Risks in younger adults

The national data outlined above provide strong evidence for the increased risk of loneliness faced by young people and recent work in the UK has demonstrated the need to understand the particular risk profile of younger people and the importance of local profiles and tailored responses. A recent cross-sectional study in the UK analysing data from the Understanding Society (USoc) survey wave 9 (2017-2019) and a sample of 6503 young people between 16-24 [42] used multilevel modelling to identify

important social and ecological factors and to explore variation across geographic regions of the UK using local authority districts as the geographical region of interest [42]. The study is cross-sectional and as with all observational studies no claims as to causality can be made however the modelling found that factors associated with lower levels of loneliness included higher perceived neighbourhood quality; greater sense of belonging to community [42] and 'higher self-reported health; higher life satisfaction and more positive mental well-being' [42]. The authors emphasise the importance of these modifiable factors in terms of potential interventions and also the importance of local level place based knowledge and interventions also reporting that their modelling showed that geographic variation accounted for between 5 and 8 % of the variation in loneliness and that the 'key sociodemographic predictors of loneliness' including gender, sexual orientation and ethnic minority status were 'found to differ across geographic regions' [42].

6.5 Summary

Cross-sectional survey data in the UK identifies young people; women and those who live and/or have suffered partner loss, those with longstanding health conditions and/or disabilities and people living in more deprived areas at higher risk of chronic loneliness. There is also recent evidence of increased risk of loneliness amongst gay, lesbian and bisexual people and those who described their sexual orientation as 'other' or prefer not to disclose [35]. There is evidence of an increased risk of loneliness for people with low wellbeing and a close relationship between mental wellbeing, mental distress and loneliness [35]. Ageing itself does not cause social isolation however people over-50 are more likely than their younger people to experience many of the risk factors that can cause or exacerbate social isolation for example chronic conditions and/or disabilities, poor health, sensory impairments and partner loss [1]. Three profiles of people at particular risk from loneliness were identified by ONS in 2018 which reflect these risk factors [36]: 'widowed older homeowners living alone with long-term health conditions.; unmarried, middle-agers with long-term health conditions and 'younger renters with little trust and sense of belonging to their area' [36]. There are gaps in the evidence in relation to previously underrepresented groups including ethnic minorities and a need to understand how experiences differ across localities. A life course approach is needed in order to understand the unique risk profiles at different points in people's lives and recent evidence suggests for that age and sex predict chronic loneliness in younger people but not at any other age life stage [35] and that relationship status and employment became more important as predictors in older age groups [35]. There are calls for routine enquiry as to social isolation and loneliness by health and social care professionals which could be targeted at certain stages of the life course and also those experiencing certain life events predisposing to loneliness and/or social isolation for example partner loss or recent move/immigration [1]. Recent evidence mapping loneliness shows the importance of the local and there is a real need for place based local quantitative and qualitative work to understand the specific issues surrounding risk factors and impacts facing local communities.

7.0 Conclusion

There is now a large body of evidence as to the negative health impacts of a lack of social connection in terms of increased mortality, morbidity and mental health and well-being. It is apparent from this narrative review that in addition to the impacts on individuals and communities, the implications for pressure on health and social care services of the association between poor social health and increased early mortality and morbidity (including cardiovascular disease, Type 2 diabetes, mental health and wellbeing impacts, frailty and cognitive decline) are likely to be considerable and indeed there is evidence that this is the case. There is a call for routine clinical enquiry as to social isolation and loneliness particularly following certain life events and at certain life stages, much like current enquiries as to conventional risk factors such as obesity and smoking, and for innovative joined up strategy and policy within public health and healthcare systems aimed as attenuating the risks and health impacts. The growing body of evidence in the United Kingdom as a result of Jo Cox's legacy and pioneering work on loneliness, shows the pressing need for this work and the importance of understanding particular risk profiles, the need for a life course approach and the recognition of the importance of place. There is a need for local knowledge and local solutions and what 'characteristics of place facilitate social connection' [42] and 'what people need and want from their communities' [42]. Such work may be particularly amenable to local qualitative work co-produced with local communities.

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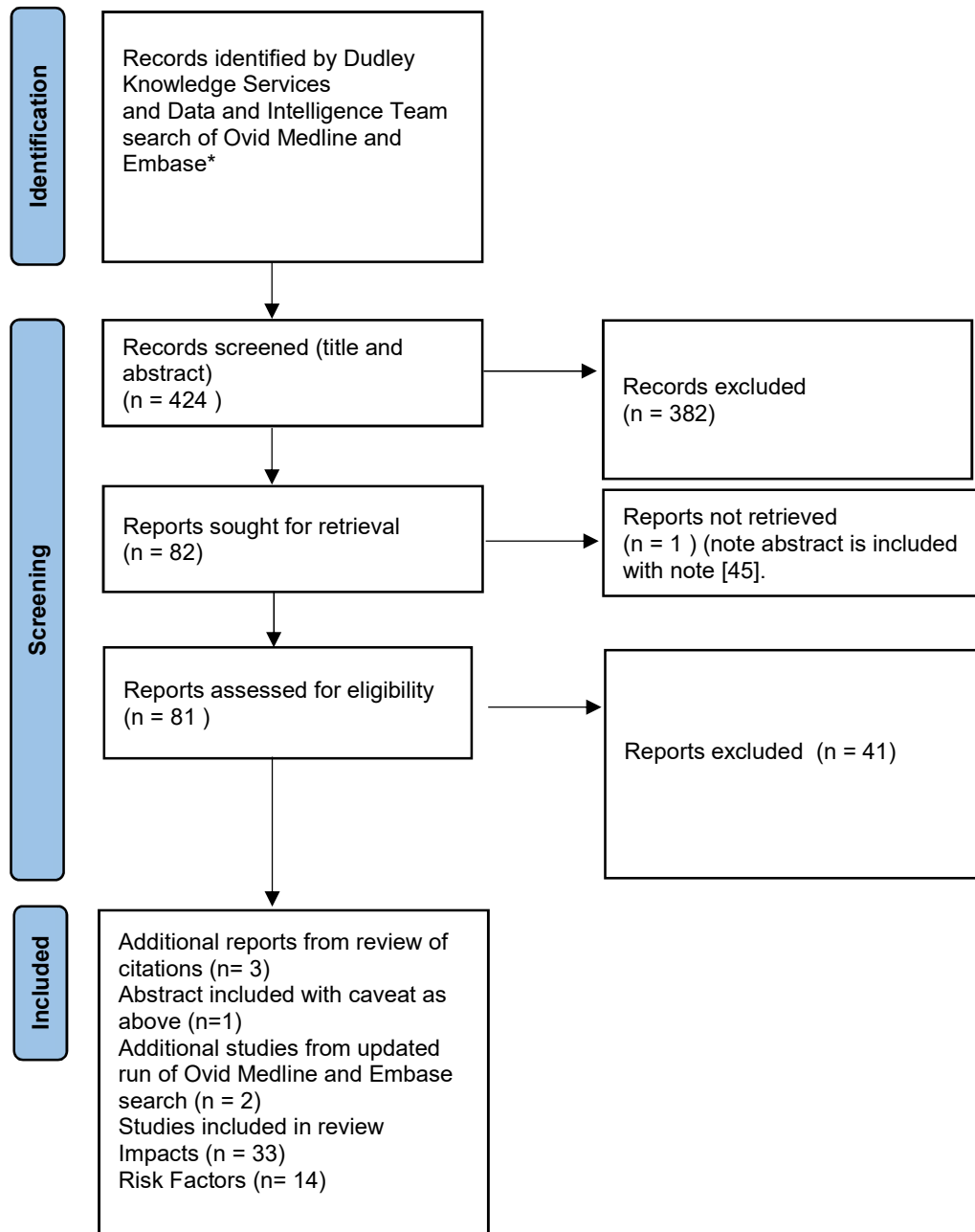
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Appendix 1: Ovid Search and terms – Ovid Medline and Embase databases

1. Loneliness/
2. Social Isolation/
3. loneliness.tw.
   (social adj1 isolation).mp. [mp=title, book title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism)
4. supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms, population supplementary concept word, anatomy supplementary concept word]
5. Mortality/
6. Morbidity/
7. mortality.tw.
8. morbidity.tw.
9. Mental Health/
10. (mental adj1 health).tw.
11. wellbeing.tw.
12. risk factors/
13. 5 or 6 or 7 or 8 or 9 or 10 or 11
14. 1 or 2 or 3 or 4
15. 12 and 13 and 14
16. limit 15 to (english language and humans and last 10 years)
17. (risk adj1 factors).tw.
18. 12 or 17
19. 13 and 14 and 18
20. 16 and 19

Appendix 2: Flow Diagram of Identification and Screening of Articles for Rapid Review (adapted from PRISMA 2020 diagram)[1]

Identification of Studies

Identification	Records identified by Dudley Knowledge Services and Data and Intelligence Team search of Ovid Medline and Embase*	

Screening	Records screened (title and abstract) (n = 424)	Records excluded (n = 382)
	Reports sought for retrieval (n = 82)	Reports not retrieved (n = 1) (note abstract is included with note [45].
	Reports assessed for eligibility (n = 81)	Reports excluded (n = 41)

Included	Additional reports from review of citations (n= 3) Abstract included with caveat as above (n=1) Additional studies from updated run of Ovid Medline and Embase search (n = 2) Studies included in review Impacts (n = 33) Risk Factors (n= 14)

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[1] Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020

Appendix 3: Table of Sources included as to Health Impacts of Social isolation and Loneliness

Reference	Study Design	Population/Age	Number	Key Findings
Domènech-Abella J et al 2019 [19]	The Irish Longitudinal Study on Ageing (TILDA). Longitudinal follow up 2 years Measurements: UCLA loneliness scale and Berkman–Syme Social Network Index (social integration) [19]	Irish residents ≥50 years Mean (SE) age at baseline 63.3 (0.16) years [19]	5066 [1]	Association between social isolation and higher likelihood of subsequent MDD or GAD and that between loneliness and subsequent deterioration of social integration are unidirectional. [19]
Elovainio M et al 2017 [7]	UK Biobank study Longitudinal – mean follow up 6.5 years [7] 3-Item loneliness scale and direct questions [7]	Mean age at baseline 56·5 years [SD 8·1]) [7]	466 901 men and women [7]	Lonely and isolated people found to be at increased risk of death. "Full adjusted hazard ratio for all-cause mortality for social isolation compared to no social isolation was 1·26 (95% CI 1·20-1·33). Loneliness minimally adjusted 1·38 (95% CI 1·30-1·47), reduced to 0·99 (95% CI 0·93-1·06) after full adjustment for baseline risks."[7]
Holwerda et al 2016 [20]	Longitudinal Ageing Study Amsterdam. 19 years of follow up – cohort study [20]. Study examined joint effects of loneliness and depression in older persons. De Jong Gierveld loneliness scale, a validated 11-item scale	Adults 55-85 [20]. Mean age 70.35 [20]	N=2878 [20]	Social loneliness and depression associated with excess mortality in bivariate but not multivariate analysis. Analysis "demonstrated high risk for death in men with severe depression who are socially lonely, when also taking into account the effects of an extensive range of confounders." [20]
Loades et al [22]	Rapid review of literature 80 studies meeting inclusion criteria.[22]	Children under 18. Mean age 15.3 years [22]	n = 51,576 [22]	Social isolation and loneliness increased the risk of depression, and possibly anxiety at the time at which loneliness was measured and between 0.25 and 9 years later [22].
Nuyen et al 2020 [21]	Netherlands Mental Health Survey and	Netherland. Adults aged 18-65. Mean age 15.3 [21]	4007 [21].	Loneliness predicted 'the onset of severe CMD at follow-up in adults without

	Incidence Study-2, - prospective cohort –study of association between loneliness and common mental disorders (CMDs). [21]			CMDs at baseline',[21] and increased 'the risk for persistent severe CMD at follow-up in those with CMD at baseline'[21]
Holt-Lunstad et al 2015 [3]	Meta-analysis of 70 studies [3]	Average age at initial data collection 66.0 years [3].	3,407,134 participants followed for an average of 7 years [3]	Increased early mortality associated with social isolation odds ratio (OR) = 1.29, [CI: 1.06-1.56] loneliness OR = 1.26 [CI: 1.04-1.53] and living alone OR = 1.32 [CI: 1.14-1.53].[3]
Naito et al 2023 [5]	Systematic review and meta-analysis 36 total 9 narrative 27 metanalyses [5]	Adults 18 and over [5].	1.30 million individuals [5]	Meta-analysis found a 33% (95% CI; 1.26-1.41) higher hazard of all-cause mortality among socially isolated participants - consistent with the narrative review of the 9 studies not included in the meta-analysis [5].
Holwerda et al 2012 [29]	AMSTEL - large population-based cohort study in the Netherlands [29].	Adults over 65 [29] Participants without dementia at baseline [29]	2173 participants [29] . 3 years follow up [29]	Multivariate analysis found association (after adjusting for confounders) between feelings of loneliness and risk of incident dementia OR in fully-adjusted model 1.64 (95% CI 1.05 to 2.56) [29].
Hakulinen et al 2018 [13]	Prospective cohort – UK biobank [13]	Adults over 18 Mean age (SD) 56.35 (8.1) [13].	479 054 individuals. 7 years follow up.	"Persons reporting social isolation and loneliness had 1.4-fold to 1.5-fold increased risk of incident AMI or stroke. However, approximately 85% of this excess risk was attributable to known risk factors" [9] "social isolation, but not loneliness, was associated with increased mortality in participants with a history of AMI (HR 1.25, 95% CI 1.03 to 1.51) or stroke (HR 1.32, 95% CI 1.08 to 1.61) in the fully adjusted model." [13]
Alcaraz et al 2019 [14]	Prospective Cohort – in USA "Adults enrolled in Cancer Prevention	Adults over 18 USA [14].	580,182 participants [14]	Social isolation was associated with all-cause mortality in all subgroups (P for trend ≤ 0.005); Social

	Study II in 1982/1983 were followed for mortality through 2012" [14]			isolation was associated with cardiovascular disease mortality in each subgroup (P for trend < 0.03) Within each sexgroup, there was no evidence of interaction by race (in men, P for interaction = 0.40; in women, P for interaction = 0.89) [14].
Bu et al 2020 [27]	English Longitudinal Study of Ageing (ELSA): biennial panel study linked to admitted patient care (APC) data from NHS Hospital Episode Statistics' maximum follow-up of 9.6 years. [27]	Men and women living in England ≥50 years [27]	7270 participants in ELSA [27]	'Living alone was associated with a greater hazard of respiratory disease (RD) admissions even after adjusting for potential confounders. People living alone had a 32% higher hazard compared with those who lived with others (HR=1.32, 95% CI 1.06 to 1.64). Social disengagement was also 'a predictor of RD admissions.' [27]
Freak-Poli et al 2021 [25]	Nested prospective cohort [25]	Australia. Adults aged 70 and over. Mean age 75.03±4.22 [25].	11,486 community-dwelling, Australians [25]	'Individuals with poor social health were 42 % more likely to develop CVD and twice as likely to die from CVD over a five year period among community-dwelling, older adults, who were free of diagnosed CVD and dementia at baseline.' [25]
Freak-Poli et al 2022 [28]	Population-based Rotterdam Study [28]	Sweden and Netherlands (71 yrs +/- 7) [28]	4,514 participants [28]	"Loneliness, not social support, predicted cognitive decline and incident dementia independently of depressive symptoms. Consistently, persons who were lonely had an increased risk of developing dementia (RS: HR 1.34, 95%CI 1.08–1.67; SNAC-K: HR 2.16, 95%CI 1.12–4.17)" [28]
Davies et al 2021 [30]	English Longitudinal Study of Ageing Waves 2–8. [30]	Adults aged ≥50 years [30]	9171 [30]	'Loneliness (β = 0.023; 95% CI = 0.022, 0.025) and social isolation (β = 0.007; 95% CI = 0.003, 0.010) were significantly associated with increased FI (frailty

				index) after adjusting for confounders (gender, age, marital status, smoking status and wealth).' [30]
Hackett et al 2020 [31]	Longitudinal observational population study English Longitudinal Study of Ageing [31]	Mean age 65.02 ± 9.05 [31]	4112 diabetes-free participants [31]	Loneliness was a significant predictor of incident type 2 diabetes (HR 1.46; 95% CI 1.15, 1.84; p = 0.002 [15]. This was "independent of age, sex, ethnicity, wealth, smoking status, physical activity, alcohol consumption, BMI, HbA1c, hypertension and cardiovascular disease"[31]
Henriksen RE et al 2023 [32]	Trøndelag Health Study (HUNT study), a large longitudinal health study in Norway[32]	Adults over 18.	n=24,024 20 years follow up period [32]	4.9% of participants developed T2DM in 20 years follow up period. "Individuals who felt most lonely had a twofold higher risk of developing type 2 diabetes relative to those who did not feel lonely (adjusted OR 2.19 [95% CI 1.16, 4.15])" [32]
Henriksen et al 2019 [10]	Community-based prospective cohort study from the Swedish Lundby Study [10]	Mean age at baseline 62 – sample from 2 parishes in originally rural area	1363 individuals [10]	Unadjusted, lonely females had a significant increased risk (HR 1.76; 95% CI 1.31–2.34) - did not remain significant when adjusted for age. Lonely males were found to have an adjusted for age significant decreased risk of mortality (HR 0.50; 95% CI 0.32–0.80), compared with non-lonely males. [10]
Julsing et al 2016 [9]	Population based cohort study of elderly men [9]	64-84 years Zutphen Netherlands [9]	719 (of 939) men who had complete data on loneliness at baseline and at least 2 years of survival were studied [9]	"No independent associations between loneliness and risks of all-cause, cardiovascular, and noncardiovascular death were found." Adjusted for sociodemographic characteristics and cardiovascular risk factors. [9].
Kornej et al 2022 [26]	Framlingham Heart Study US 11.8 ± 5.2 mean years of follow-up [26]	Mean age 67 ± 10 years [26]	3454 participants ≥ 55 years without	"Social isolation was associated with a higher rate of mortality without diagnosed AF. In contrast to hypothesis, observed

			prevalent AF [26]	that poor social connectedness was associated with a lower rate of incident AF." [26]
Kraav et al 2021 [11]	Population-based cohort of Finnish men and mortality data obtained from national population register [11].	Finnish men - 42-61 years at baseline [11]	n = 2588 followed up for an average of 23.2 years [11]	Loneliness predicted all-cause mortality, even after adjustments for all covariates [11] Social isolation predicted all-cause mortality and injury mortality [11].
Lara et al 2020 [12]	Longitudinal, prospective study of a nationally-representative sample of Spanish non-institutionalized adult population [12]	Adults over 18. Analysis considered risks in 18-59 yr olds and those 60+ years [12].	n=4467 6 year follow up [12]	Higher level of loneliness not associated with mortality risk in fully covariate-adjusted models over the entire population (HR = 1.02; 95% CI = 0.94, 1.12).The interaction term between loneliness and age groups was significant, indicating that the rate for survival of loneliness varied by age (HR = 1.29; 95% CI = 1.02, 1.63 for young- and middle-aged individuals; HR = 0.96; 95% CI = 0.89, 1.04 for older adults) [12].
Novak et al [15]	Gothenburg H70 Birth Cohort Studies [15]	70-year-olds born in 1930 and living in Gothenburg Sweden [15]	N=524 [15]	"Loneliness was shown to be an independent predictor of cardiovascular mortality in women. We found no evidence to indicate that loneliness was associated with an increased risk of either cardiovascular- or all-cause mortality in men." [15]
Rico-Uribe et al 2018 [4]	Systematic review of 35 articles. Important included sensitivity analysis for quality [4]	Adults (age range 32-103) [4]	77220 participants [4]	"Loneliness is a risk factor for all-cause mortality [pooled HR = 1.22, 95% CI = (1.10, 1.35), p < 0.001] for both genders together, and for women [pooled HR = 1.26, 95% CI = (1.07, 1.48); p = 0.005] and men [pooled HR = 1.44; 95% CI = (1.19, 1.76); p < 0.001] separately."[4]
Shaw et al 2021 [18]	UK biobank study. Longitudinal study linked to prospective hospital admission and	37-73 yrs. UK residents within range of assessment centre. [18].	n = 448,811 (self-harm)[18]	For men, both living alone (Hazard Ratio (HR) 2.16, 95%CI 1.51–3.09) and living with non-partners (HR 1.80, 95%CI 1.08–3.00) were associated with death by

	mortality records [18]			suicide, independently of loneliness, which had a modest relationship with suicide (HR 1.43, 95%CI 0.1.01–2.03). or women, there was no evidence that living arrangements, loneliness or emotional support were associated with death by suicide. In fully adjusted models, loneliness was associated with hospital admissions for self-harm in both women (HR 1.89, 95%CI 1.57–2.28) and men (HR 1.74, 95%CI 1.40–2.16). [18]
Steptoe et al 2013 [6]	English Longitudinal Study of Ageing in 2004–2005 [6]	Adults aged 52 or older [6].	6,500 participants mean follow up 7.25 years [6]	Mortality higher in socially isolated and more lonely participants this remained the case for social isolation in adjusted model "(hazard ratio 1.26, 95% confidence interval, 1.08–1.48 for the top quintile of isolation)" but not for loneliness (hazard ratio 0.92, 95% confidence interval, 0.78–1.09) [6].
Valtorta et al 2018 [23]	A secondary analysis of prospective follow-up data from the English Longitudinal Study of Ageing (ELSA).	Mean age and (SD) 65 (9), range 52–90+	5397 men and women. Mean follow-up period of 5.4 [23]	'Loneliness was associated with an increased risk of cardiovascular disease (odds ratio 1.27, 95% confidence interval 1.01-1.57 [23].
Valtorta et al 2016 [24]	'Systematic review and meta-analysis investigating the association between loneliness or social isolation and incident coronary heart disease (CHD) and stroke [24]. Follow-up between 3-21 years [24].	Inclusion criteria studies 'had to investigate new CHD and/or stroke diagnosis at the individual level as a function of loneliness and/or social isolation'[24].	23 papers reporting data from 16 longitudinal datasets, for a total of 4628 CHD and 3002 stroke events [24]. 11 CHD studies and 8 stroke studies provided data suitable meta-analysis' [24]	Poor social relationships were associated with a 29% increase in risk of incident CHD (pooled relative risk: 1.29, 95% CI 1.04 to 1.59) and a 32% increase in risk of stroke (pooled relative risk: 1.32, 95% CI 1.04 to 1.68). Subgroup analyses did not identify any differences by gender.[24]

Leigh-Hunt 2017 [17]	Systematic review of reviews [17]	Mainly observational studies from high income countries [17]	40 reviews included [17]	Consistent evidence linking social isolation and loneliness to worse cardiovascular and mental health outcomes [17]
Holt-Lunstad et al 2010 [2]	Metanalysis	Mean age at initial evaluation 63.9 yrs (participants from North America 51%, Europe (37%, Asia (11%), and Australia (1%). [2]	148 studies over 300,000 participants [2]	"The random effects weighted average effect size was OR = 1.50 (95% confidence interval [CI] = 1.42 to 1.59), which indicated a 50% increased likelihood of survival as a function of stronger social relations."[2]
Yu et al 2022 [8]	Chinese Longitudinal Healthy Longevity Survey from 1998 to 2018 [8]	Mean age of 86.63 ± 11.39 years [8]	35,254 participants [8]	Social isolation significantly associated with "increased mortality (adjusted HR 1.22; 95% CI 1.18-1.25; p < 0.01)" [8] "Association of loneliness with mortality was nonsignificant after adjustment for health indicators and low psychological well-being" [8] but "significant association of loneliness with mortality among participants aged <80 years (HR 1.15; 95% CI 1.05-1.26; p < 0.01)" [8]
**Beller & Wagner 2018 [16]	Nationally representative sample with a follow-up period of up to 20 years (longitudinal).	Middle-aged and older adults in Germany	(N = 4,838)	**Note abstract only available for analysis. Reported findings: 'effects of loneliness and social isolation synergistically interact with each other: The higher the social isolation, the larger the effect of loneliness on mortality, and the higher the loneliness, the larger the effect of social isolation.' [16].
Saito et al 2019 [33]	'Consecutive patients who were hospitalized between August 2014–August 2015 due to HF at Kameda Medical Center and The Sakakibara Heart Institute of Okayama were	Mean age 82 (range 75-86) [33]	148 patients followed up for 90 days [33]	"Within 90 days after discharge, 25 (16.9%) patients were rehospitalized due to worsening HF. Kaplan-Meier curves showed that social isolation was significantly associated with higher HF rehospitalization rate

	routinely evaluated for social isolation using the Lubben Social Network Scale (LSNS-6)' [33]			(Figure 1; log-rank test, p=0.036)."[33] 'social isolation was one of the strongest predictors of heart failure rehospitalization, showing larger effects than living alone, being unemployed, and other established risk factors.'[33]
Landeiro et al 2016 [34]	Prospective study of consecutive admissions [34]	Portugal adult aged 75 or over	Mean age 85.5	social isolation or at high risk of social isolation was associated with delayed discharge (OR 3.5 95 % CI 1.6–7.7) [34]

Appendix 4: Table of Sources as to Risk Factors and Loneliness and Social Isolation

Reference	Study Type and Measure	Population	Age	Number	Key Risk Factors/Findings
Dahlberg et al 2022 [45]	Systematic Review of Longitudinal Risk Factors Multiple measures of loneliness	Older adults OECD Country	Average age at Baseline 59-85yrs.	34 Studies	Partner loss/not having a partner/not married; Poor perception of own health; Limited social network; Low level of social activity; Depression and/or depressed mood; Increase in depression [45]
Taylor et al; NatCen 2022 [35]	Survey data Community Life Survey (CLS) Understanding Society (USOc). Direct (how often do you feel lonely?) and 3-item UCLA loneliness scale. [35]	Survey Respondents in England. Data collected pre-March 2020 (pre-Covid restrictions).	16 and over	CLS analysis - sample of 10,243 respondents USoc analysis - sample of 25,494 respondents	Women; Young people (aged 16-34); Living alone; Widowed; Gay, lesbian and bisexual people People identifying as 'other' sexual orientation and those preferring not to disclose orientation; Those not in work; Those living in more deprived areas; Recently moved; Low wellbeing; High anxiety. Disabilities or longstanding health conditions [35]
Office for National Statistics 2018 [36]	Survey data Community Life Survey (CLS) Direct (how often do you feel lonely?) and 3-item UCLA loneliness scale.	Survey Respondents in England	16 and over	10,256 adults [36]	Young adults; Women; single or widowed people; people with poor health or limiting conditions [36] Renters (compared to owner occupiers); Those who felt that they 'belonged' less to their neighbourhood and who had 'little trust of others in their local area' [36]

Bu et al 2020 [37]	Data from UCL COVID -19 Social Study – panel study [32] 3-item UCLA scale. [37]	Data collected weekly in UK during lockdown (23/03/2020– 10/05/2020) [37]	18 and over [37]	38,217 UK adults [37]	"Younger adults (OR = 2.17–6.81), women (OR = 1.59), people with low income (OR = 1.3), the economically inactive (OR = 1.3–2.04) and people with mental health conditions (OR = 5.32) were more likely to be in highest loneliness class relative to the lowest." [37]
Greig et al 2021 [47]	Study of referrals to mental health of older people (MHOA) community services. Natural language processing algorithm. [47]	Accepted referrals to mental health of older people (MHOA) services in 16 week lockdown 2020 & corresponding 16 weeks in 2019 [47]	Mean age 77.9	1,991 referrals	Overall sample loneliness associated with 'non-accidental self-injury OR 1.86 (1.10-3.15); Depressed mood OR 1.73 (1.28-2.34) Psychotic symptoms OR 1.65 (1.18-2.32) and Antidepressant use OR 2.11 (1.63-2.73)' [47].
Groarke et al 2020 [38].	Cross-sectional COVID-19 Psychological Wellbeing study [38] 3-item UCLA scale [38]	UK resident respondents to online study of mental health in the UK during the COVID-19 pandemic [38]	Over 18 years old Mean age 37.11 (SD = 12.86) [38]	1989 participants	'Younger adults at 4-5 times greater risk relative to those over 65' [34]; Separated or divorced over two times more likely to be lonely compared to being single (OR: 2.29, CI: 1.31–4.00)' [38].
Marquez et al 2022 [42]	USoc Cross-sectional data. 3-Item UCLA scale and multilevel modelling Multilevel models identified key social ecological factors and variation across geographic regions [42]	UK resident respondents to wave 9 USoc 2017-2019.	16–24 years Mean = 19.81; S.D. = 2.58 379 regions (local authority districts) [42]	6503 young people	Factors associated with lower levels of loneliness: Higher perceived neighbourhood quality ; Greater sense of belonging to community ; 'higher self-reported health; higher life satisfaction and more positive mental well-being' [42].
Office for National Statistics (2021) [41]	Opinions and Lifestyle Survey (OPN)	Respondents to OPN weekly online survey	16 and over	During period overall response of	Tendency for higher rates of loneliness in areas 'with a higher concentration

	October 2020 to February 2021 (weekly online survey)	(survey weekly in UK during pandemic)		approx 4,000 to 4,500 per week.	of younger people (aged 16-24) and areas with higher rates of unemployment' [41] Tendency for lower rates of loneliness 'in areas with strong local businesses and adult education.' [41]
De Koning et al 2017 [44]	The Grey and Pleasant Land (GaPL) study 2009 quantitative survey responses Measured: Reported loneliness; isolation from family and isolation from community using variables created from responses.	Adults over 60 in 6 rural communities in South West of UK participating in GaPL study.	Mean age = 71.5, standard deviation = 8.1 years).	884 British rural-living older adults	'13% reported feeling lonely;49 % isolated from family and 9% isolated from community' however 'minimal cross-over between groups' and different risk factors associated with different variable[44] 'Ageing in place (longer residency) was the only common predictor for all three dependent variables' and associated with decreased risk[44]
Bu et al 2020 [39]	Cross-cohort analyses of data from UK adults captured before and during pandemic.	UK resident adults responding to USoc (UK Household Longitudinal Study wave 9 2017-2019) and UCL (University College London) COVID-19 Social Study.	Over 18	Sample size = 31,064.	Younger adults, women, those with lower income and/or education, economically inactive individuals and those living alone and in urban environments as at greater risk of loneliness [39].
National Academies US 2020 [1]	Review of evidence base of risk factors and impacts of social isolation and loneliness in over-50s and opportunities for US healthcare system to respond [1]	Review of published evidence and publication of recommendations [1]	50 and over	N/A	Older adults at increased risk for social isolation and loneliness as 'more likely to face predisposing factors such as living alone, the loss of family or friends, chronic illness, and sensory impairments.' [1] Recommendations include: : HCPS should 'periodically

					perform an assessment ...to identify older adults experiencing social isolation and loneliness'' and : HCPS and systems should 'partner with other stakeholders, including those serving vulnerable communities, in order to create effective team-based care' and 'promote the use of tailored community-based services to address social isolation and loneliness in older adults.'' [1]
Emerson et al 2018 [46]	Data from the 2008 and 2012 Health and Retirement Study.	USA: Participants in 2008 and 2012 Health and Retirement Study	60 years and over who were not lonely in 2008 - in order to predict incidence	1,563 observations	Approximately 31.7% of participants reported loneliness at follow-up (2012). "Odds of loneliness 1.58 higher for those with pain at both time points, compared with those who had pain at neither time point, even after controlling for other covariates." [46]
Barretto et al 2020 [40]	Cross-sectional data from BBC Loneliness Experiment online survey. 'Each participant was assigned a score on the Hofstede's Individualism Index based on their country of residence' [40]	237 countries, islands, and territories.	Age range 16-99 Mean age and SD 49.7 (15.44) [40]	46,054 participants who had provided data on the variables of interest [40]	'Findings showed that loneliness increased with individualism, decreased with age, and was greater in men than in women' [41].. Found 'the most vulnerable to loneliness were younger men living in individualistic cultures' [40]
Department of Media Culture	Update on loneliness	N/A	N/A	N/A	Need for life course approach

and Sport 2022 [43]	knowledge published by DCMS –network of voluntary experts not formal review.				[43];evidence as to stigma & loneliness; structural factors; mental health &loneliness & place and connection [43].