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## Review Paper

# An overview of systematic reviews on the public health consequences of social isolation and loneliness



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## ABSTRACT

**Objectives:** Social isolation and loneliness have been associated with ill health and are common in the developed world. A clear understanding of their implications for morbidity and mortality is needed to gauge the extent of the associated public health challenge and the potential benefit of intervention.

**Study design:** A systematic review of systematic reviews (systematic overview) was undertaken to determine the wider consequences of social isolation and loneliness, identify any differences between the two, determine differences from findings of non-systematic reviews and to clarify the direction of causality.

**Methods:** Eight databases were searched from 1950 to 2016 for English language reviews covering social isolation and loneliness but not solely social support. Suitability for inclusion was determined by two or more reviewers, the methodological quality of included systematic reviews assessed using the a measurement tool to assess systematic reviews (AMSTAR) checklist and the quality of evidence within these reviews using the grading of recommendations, assessment, development and evaluations (GRADE) approach. Non-systematic reviews were sought for a comparison of findings but not included in the primary narrative synthesis.

**Results:** Forty systematic reviews of mainly observational studies were identified, largely from the developed world. Meta-analyses have identified a significant association between social isolation and loneliness with increased all-cause mortality and social isolation with cardiovascular disease. Narrative systematic reviews suggest associations with poorer mental health outcomes, with less strong evidence for behavioural and other physical

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health outcomes. No reviews were identified for wider socio-economic or developmental outcomes.

**Conclusions:** This systematic overview highlights that there is consistent evidence linking social isolation and loneliness to worse cardiovascular and mental health outcomes. The role of social isolation and loneliness in other conditions and their socio-economic consequences is less clear. More research is needed on associations with cancer, health behaviours, and the impact across the life course and wider socio-economic consequences. Policy makers and health and local government commissioners should consider social isolation and loneliness as important upstream factors impacting on morbidity and mortality due to their effects on cardiovascular and mental health. Prevention strategies should therefore be developed across the public and voluntary sectors, using an asset-based approach.

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## Introduction

Alone and feeling sick: do isolation and loneliness carry specific risks to health? In populations throughout the world, social isolation (defined as an objective lack of interactions with others or the wider community) and loneliness (defined as the subjective feeling of the absence of a social network or a companion) are common. Surveys in Europe and the USA estimate the prevalence of loneliness ranges from 5% to 43% in the elderly,<sup>1–4</sup> with similar figures for China.<sup>5</sup> While loneliness may be more common in the elderly, it also affects younger age groups.<sup>6</sup> Precise estimates for the prevalence of loneliness and social isolation are difficult to obtain due to variation across the life course; cultural and gender differences with respect to how prepared individuals are to talk about them from a personal perspective and the use of many different measurement scales, some of which are based on self-report questionnaires while others involve more objective assessment of social contact or networks (or a combination of both).

Loneliness and social isolation have both been associated with ill health, but determining causality is difficult as much of the research in this area involves observational studies. Researchers have primarily focused on the association with mortality, mental and cardiovascular health. Biological pathways have been suggested as an explanation for the effect of loneliness and social isolation on health including reduced levels of protective hormones leading to adverse effects on heart rate, blood pressure and the repair of blood vessel walls; downregulation of the immune system and neuroendocrine dysregulation from a paucity or poor quality of sleep.<sup>7–10</sup> Lonely individuals may be more likely to initiate harmful health behaviours such as smoking, excess alcohol consumption, overeating or transient sexual encounters as a psychological relief mechanism. They may then go on to maintain these harmful behaviours if they are less exposed to healthy behavioural norms or have less access to health advice as a result of fewer social contacts.<sup>7,11</sup> While social networks of friends and family can support healthy behaviours, they may also allow unhealthy behaviours to become normative.<sup>12</sup> Stress responses as a result of perceived social isolation can adversely precondition the neuroendocrine

system, with genetic differences determining the degree to which this might occur.<sup>13</sup> Socially isolated individuals may suffer more stress than others due to their lack of social networks and support, and when they do, they might be more likely to withdraw into themselves.<sup>7</sup>

Although the exact causal pathways remain unclear, given the prevalence of social isolation and loneliness, it is important to have a clear understanding of their consequences to the individual and society. The evidence base on the impact of social isolation and loneliness has expanded over recent decades and now includes many reviews with different health foci. To provide decision-makers with the evidence they need to assess and tackle the public health challenge associated with weaker social relationships, we conducted an overview of reviews on the health implications of loneliness and social isolation. Our aims were to provide a clear summary of the evidence on the wider consequences of social isolation and loneliness based on systematic principles; identify any differences from findings of the many non-systematic reviews that have been published; clarify the direction of causality; and determine whether there are clear differences in consequences observed for the perceived state of loneliness vs the objective state of social isolation.

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## Methods

Methodology for this overview followed recognised guidance for conducting systematic overviews.<sup>14,15</sup> The following databases were searched from 1950 to March 2016: Web of Knowledge; SCOPUS; EMBASE; ASSIA; Medline; PsycINFO; Campbell Collaboration and Database of Abstracts of Reviews of Effects, using the terms social environment; social isolation; social vulnerability; social engagement; loneliness and psychosocial support.

Systematic reviews (including narrative reviews and meta-analyses) written in English were included. Well researched (as judged by two reviewers) non-systematic reviews were also included for a comparison of findings but not as part of the primary synthesis. Reviews of interest were those that contained studies of individuals from any population of any age or gender, where any health or socio-economic outcome as a result of social isolation or loneliness was studied. For the

purpose of this overview, the term social isolation was defined as the objective state of lack of social contact with others, whereas loneliness was defined as the subjective feeling of being unhappy with one's relationships. Reviews focussing on social support were excluded, although those that did not set out to study loneliness or social isolation explicitly but did in fact consider the concepts as defined previously were included. References in included reviews were inspected to identify any other potential reviews.

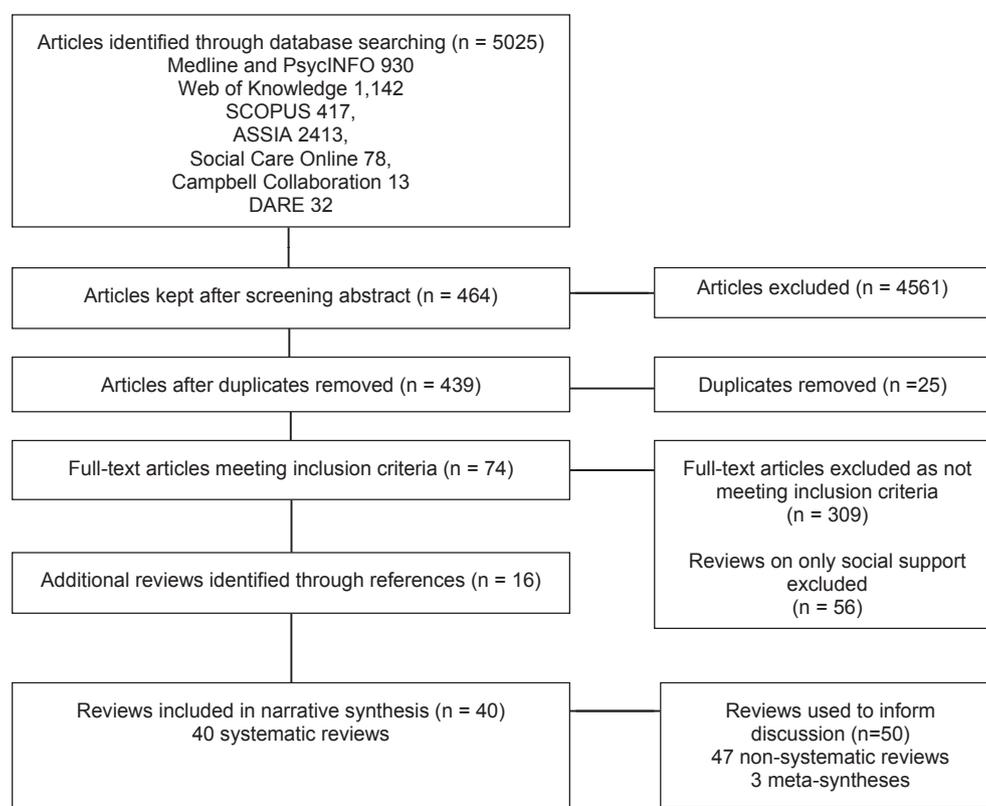
Reviews were selected from the search process according to whether they met the criteria as previously described. The process was confirmed by a second reviewer to ensure validity of inclusion. Differences of opinion were discussed and consensus reached over inclusion or exclusion of the study. The methodological quality of the reviews selected for inclusion was also assessed by two reviewers for each review, using the AMSTAR checklist<sup>16</sup> and the quality of the evidence in these reviews was assessed using the GRADE approach.<sup>17</sup>

Data were extracted from the selected reviews using a predesigned data extraction sheet to standardise reporting of results across the included reviews. Extracted data were review characteristics, including both the design of the review and design of included studies, geographical location of included studies and duration of longitudinal studies; participant characteristics including age range, gender and comorbidities; measurement scales used for social isolation and loneliness; health and social outcomes and their associated measures and summary findings.

## Results

The search process of eight databases identified 90 papers (40 systematic reviews, 47 non-systematic reviews and three metasyntheses) that considered social isolation, loneliness, social relationships or networks (Fig. 1). Of the forty systematic reviews included in this overview, ten involved a meta-analysis. Eight reviews were undertaken in two or more countries, while the rest were carried out by teams from single countries, all from the developed world except one. All were published between 2000 and 2015, with eighteen of them declaring their sources of funding, which included government funding, charitable funding, universities and other private institutions. Age range was not identified in twelve of the systematic reviews, seven of them considered only individuals over 65 years of age, five exclusively studied adolescents while 16 considered individuals of any age. Two systematic reviews looked exclusively at one gender; 16 looked at both genders while 22 did not identify gender proportions. Most reviews contained studies that contained between 10 and 100,000 participants. In half of the reviews, loneliness or social isolation was identified as a factor associated with the variable of interest, but a validated scale was not used (Table 1).

Sixty-two different self-report questionnaires were used to measure loneliness, social isolation, and related concepts (Table 2). For forty-nine measures, information could be sourced which allowed mapping using a two-dimensional framework<sup>18</sup> (Fig. 2). Fig. 2 illustrates the diversity of tools both in terms of their



**Fig. 1 – PRISMA flow diagram. Moher D, Liberati A, Tetzlaff J, Altman DG. Preferred reporting items for systematic reviews and meta-analyses: The PRISMA Statement. PLoS Medicine. 2009; 6:e1000097.**

content and how their items are phrased. A majority of instruments were concerned more with the function of relationships (e.g. whether people might have access to a confidant or help if they need it) than with their structural characteristics (e.g. the frequency with which people interact).

When assessed using the AMSTAR checklist, 17 of the systematic reviews without a meta-analysis were of moderate quality (score 5–7) and 13 of low quality (score 0–4). Those reviews which scored poorly using AMSTAR also tended to have low GRADE scores. Seven of the meta-analyses were of moderate or high quality (score 8–10); the majority were also assessed as containing evidence of moderate GRADE quality (Table 3). Generally, the meta-analyses were of superior methodological quality to the systematic reviews. Nevertheless, whilst these scores suggest the findings of these reviews can be accepted with some degree of confidence, significant clinical heterogeneity existed between both the reviews and the primary studies they contained.

## Synthesis of evidence

### Mortality and general health

Two meta-analyses of cohort studies identified a significant association between social isolation, loneliness and social network size with all-cause mortality, identifying odds ratios of increased likelihood of mortality for social isolation (excluding suicide) of 1.29 (95% confidence interval [CI] 1.06, 1.56), for loneliness 1.26 (95% CI 1.04, 1.53) and living alone 1.32 (95% CI 1.14, 1.53);<sup>19</sup> and hazard ratios for all-cause mortality for greater social participation of 0.87 (95% CI 0.82, 0.91) and for better social networks of 0.91 (95% CI 0.86, 0.97).<sup>20</sup> This is comparable to findings from a prospective study, which identified an odds ratio of increased likelihood of survival of 1.50 (95% CI 1.42 to 1.59) for stronger social relationships (excluding suicide)<sup>21</sup> and a hazard ratio for mortality of 1.13 (95% CI 1.09, 1.17) for lower social contact frequency from a meta-analysis of mixed studies.<sup>22</sup> The similar odds ratios for loneliness and social isolation<sup>19</sup> suggest no difference between subjective or objective measures of social isolation. The impact of gender on the association was unclear as there were mixed findings from subgroup analyses in the aforementioned reviews.

An association between loneliness and fewer social relationships with poor health and well-being was suggested in three systematic reviews of worldwide studies using different methodologies and assessment measures in individuals aged over 50–55 years. The relative importance of the quality vs the quantity of such social relationships with respect to this association may vary depending on whether they are between family or friends.<sup>23–25</sup> In older adults attending emergency departments, social isolation and living alone were found to be associated with hospital admission in a systematic review of 14 studies.<sup>26</sup>

### Health behaviours

Loneliness and social isolation were found to be associated with increased tobacco use in three systematic reviews; in one

of these reviews, a positive association between loneliness and tobacco use was reported in half of the included studies, whereas the other half reported no association or a negative association.<sup>27</sup> A review of observational studies of tobacco use in Brazilian adolescents reported one study demonstrating an association between loneliness and increased tobacco use in adolescents.<sup>28</sup> Consistent evidence that more socially isolated adolescents were more likely to use tobacco was found in a review of 10 studies, although causality could not be proven and other variables may have confounded the relationship.<sup>29</sup>

A systematic review of observational studies reported mixed findings regarding an association between behaviour change and social isolation in the context of cardiovascular disease.<sup>30</sup> Only two systematic reviews were identified that looked at social isolation and physical activity; these reported an association between social isolation and low levels of physical activity in two well-defined patient groups (individuals with bipolar disorder and schizophrenia) but noted that only a minority of the included studies assessed this relationship.<sup>31,32</sup> Only one systematic review of observational studies was identified which looked at diet; this found strong evidence of no association between social isolation and loneliness and malnutrition in older people living in community dwellings.<sup>33</sup>

Two systematic reviews relating to sexual health behaviours were identified, one of which found that social isolation was associated with HIV infection as a contextual risk factor in transsexuals, possibly mediated through feelings of discomfort or being unsafe in public.<sup>34</sup> Loneliness of parents and social isolation of adolescent sex offenders have been associated with child abuse in another systematic review and a meta-analysis.<sup>35,36</sup>

Two systematic reviews made comments on the relationship between adherence to treatments and social isolation; one suggested that social isolation may lead to reduced interaction and increased use of online sources of advice, potentially leading to suboptimal adherence to treatments;<sup>37</sup> another found increased social isolation was associated with non-adherence to treatment in adult renal transplant patients.<sup>38</sup>

### Physical health

The evidence base was strongest for the relationship between social isolation, loneliness and cardiovascular disease, with reviews that considered hypertension, cardiovascular risk and postmyocardial infarction mortality (PMIM). One meta-analysis of prospective cohort studies identified an increased cardiovascular relative risk of 1.5 (95% CI 1.2, 1.9) in adults with high levels of social isolation.<sup>39</sup> This is supported by findings of a systematic overview, which found strong and consistent evidence for an independent causal association between levels of social isolation and the risk of CVD.<sup>40</sup> Two other systematic reviews suggested that adults with social isolation have an increased likelihood of PMIM, with individuals with stronger social relationships having a 50% increased likelihood of survival, with no variation between gender<sup>41</sup> and those with the highest levels of social isolation having two to three times the risk of PMIM.<sup>42</sup> The evidence for an association between social isolation with hypertension is more mixed.<sup>43</sup>

**Table 1 – Characteristics of included systematic reviews.**

Article	Topic	Included studies	Population characteristics	Loneliness and/or social isolation measure(s) <sup>a</sup>	Outcome
Aminzadeh and Dalziel, 2002, Canada <sup>26</sup>	Use of accident and emergency services by the elderly	11 studies: six retrospective and five prospective	Age: ≥65 years Gender: mixed M/F Size: 455–2,126,578	Not identified in review	Percentages of ≥65 years admitted and readmitted via accident and emergency
Annear et al., 2014, New Zealand <sup>23</sup>	Environmental influences on ageing	83 studies: 72 quantitative studies and 11 qualitative or mixed methods studies	Age: ≥50 years Gender: 10 F, 73 mixed M/F Size: Not identified	Not identified in review	Mortality and longevity, mental health outcomes, morbidity and functional ability, and activity participation
Barbosa et al., 2012, Brazil <sup>28</sup>	Alcohol and tobacco use among Brazilian adolescents	59 observational studies	Age: 10–19 years Gender: mixed M/F Size: 281–60,973	Not identified in review	Prevalence of tobacco and alcohol use, prevalence of frequent tobacco and alcohol use
Barton et al., 2015, Australia <sup>46</sup>	Chronic obstructive pulmonary disease	31 studies: mainly cross-sectional but three prospective, two before and after, and three randomised trials	Age: not identified Gender: not identified Size: 30–1475	5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17	Depression, anxiety, stress, self-efficacy and self-care behaviour, and functional status
Black et al., 2000, USA <sup>35</sup>	Risk factors for child abuse	46 case control studies	Age: not identified Gender: not identified Size: 16–148	4	Child abuse, parent to child aggression measured by: conflict tactics scale, parent and child conflict tactics scale, and diagnostic interview schedule
Boss et al., 2015, USA <sup>57</sup>	Loneliness and cognitive function in the elderly	10 studies: five cross-sectional, five longitudinal	Age: mean age ≥60 years Gender: mixed M/F Size: 466–13,176	18, 19, Likert scales	Cognitive function
Bunker et al., 2003, Australia <sup>40</sup>	Psychosocial risk factors for coronary heart disease	15 systematic reviews	Age: not identified Gender: not identified Size: not identified	Not identified in review	Coronary heart disease
Chen et al., 2014, UK <sup>24</sup>	Loneliness in the elderly	26 studies: 25 cross-sectional, one longitudinal	Age: >60 years Gender: mixed M/F Size: 91–20,083	18	Health status
Cuffee et al., 2015, USA <sup>43</sup>	Psychosocial risk factors for hypertension	Three prospective cohort studies covering social isolation	Age: ≥18 years Gender: not identified Size: 229–4724 participants	Not identified in review	Diagnosis of hypertension
De Freitas et al., 2013, USA <sup>37</sup>	Vulnerabilities to misinformation in online pharmaceutical marketing	All study types	Age: not identified Gender: not identified Size: not identified	Not identified in review	Factors of vulnerability to online pharmaceutical misinformation

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Table 1 – (continued)

Article	Topic	Included studies	Population characteristics	Loneliness and/or social isolation measure(s) <sup>a</sup>	Outcome
Denhaerynck et al., 2009, Belgium and Switzerland <sup>38</sup>	Adherence to renal transplant medication	Four prospective cohort studies covering determinants of non-adherence	Age: >18 years Gender: not identified Size: 60–196	Not identified in review	Measures of non-adherence to immunosuppressive drug therapy
Dyal and Valente, 2015, USA <sup>27</sup>	Loneliness and smoking	25 studies, design not specified	Age: 11 studies ≤18 years, 14 studies >18 years Gender: mixed M/F Size: 103–89,348	18, 33, 34	Various measures of smoking
Fässberg et al., 2012, Sweden, Israel, Canada, USA, Australia <sup>53</sup>	Social risk factors for suicide in the elderly	14 observational studies in 16 papers	Age: >65 years Gender: mixed M/F Size: <100 to ≥1000	28, 29, 30, 31, 32	Death wishes, suicide, ideation, deliberate self-harm, non-fatal suicidal behaviour
Glozier et al., 2013, Australia <sup>41</sup>	Psychosocial risk factors for coronary heart disease	Systematic reviews	Age: not identified Gender: not identified Size: not identified	Not identified in review	Coronary heart disease
Hatcher et al., 2013, Canada and New Zealand <sup>52</sup>	Suicide	16 cross-sectional studies	Age: not identified Gender: not identified Size: not identified	22, 23, 24, 25, 26, 27	Suicidal ideation, suicide attempts
Herbst et al., 2008, USA <sup>34</sup>	HIV risk behaviours in transgendered individuals	29 studies, design not specified	Age: teens to 60s Gender: transgender Size: 19–515	Not identified in review	HIV seropositivity or risk factors
Holt Lunstad et al., 2010, USA <sup>21</sup>	Mortality risk	148 studies—design not specified, although 60% involved community cohorts.	Age: 6–92 years Gender: 49% F, 51% M Size: 37–22,236	18, 36, 37, 38, 39, 19, 40, 3, 41, 35	Mortality
Holt Lunstad et al., 2015, USA <sup>19</sup>	Mortality risk	70 prospective cohort studies	Age: mean 66 years Gender: mixed M/F (mean 52.6% F) Size: mean 48,673	3, 18, 35, 19	Mortality
Kita et al., 2015, Japan <sup>50</sup>	Physical, mental, social, and economic problems of perinatal immigrant women	36 studies—12 quantitative, 15 qualitative, three mixed methods, five expert opinions, one brief report	Age: not identified Gender: all female Size: 1–706	Not identified in review	Psychological outcomes
Kuiper et al., 2015, Netherlands <sup>58</sup>	Dementia risk	19 prospective cohort studies	Age: 55 to ≥ 90 years Gender: most mixed M/F, 1 M, 1 F Size: 732–5447	Not identified in review	Dementia incidence
Mezuk et al., 2014, USA <sup>55</sup>	Suicide in long term care facilities	37 studies - 21 cross-sectional, eight cohort, three qualitative, and five interventional	Age: mean 76–87 years Gender: 2 F, 2 M, three not identified, rest mixed M/F Size: 57–294592	Not identified in review	Completed and attempted suicide, suicidal ideation
Mollinson et al., 2014, UK <sup>56</sup>	Suicide and learning disability	11 studies—two cohort, three reviews, four qualitative, rest not reported	Age: 8–63 years Gender: not identified Size: 2–2369	Not identified in review	Completed and attempted suicide, suicidal ideation

Mookadam et al., 2004, USA <sup>42</sup>	Morbidity and mortality after myocardial infarction	5 prospective cohort studies	Age: not identified Gender: not identified Size: 194–1234	1, 2, 3	Mortality and morbidity associated after acute myocardial infarction
Murray et al., 2012, UK <sup>30</sup>	Behaviour change for cardiovascular risk	31 observational studies, one RCT	Age: not identified Gender: mixed M/F Size: not identified	Not identified in review	Barriers and facilitators to behavioural change
Nyqvist et al., 2013, Finland and Sweden <sup>20</sup>	All-cause mortality	20 observational cohort studies	Age: 18–102 years Gender: 2 M, rest mixed M/F Size: 1060–17433	Not identified in review	All-cause mortality
Ouimet et al., 2001, Canada <sup>49</sup>	Depression after stroke	Nine prospective cohort studies	Age: 25–100 years Gender: not identified Size: 90–486	20, 21	Major or minor depressive episode following stroke
Pinquart and Rubenstein, 2010, USA and Germany <sup>44</sup>	Cancer mortality	94 prospective community-based studies (87 in meta-analysis)	Age: mean 65.9 years Gender: 57% female Size: 40–10,789,239	10, 3	Mortality in cancer patients
Pinquart and Sorensen, 2000, USA and Germany <sup>25</sup>	Subjective well-being in the elderly	286 studies, design not specified	Age: 18–109 years Gender: not identified Size: 20–4350	Not identified in review	Subjective well-being and ability to live independently
Pompili, 2012, Italy <sup>54</sup>	Suicide risk in multiple sclerosis	12 studies: four cohort, five retrospective, two observational	Age: not identified Gender: not identified Size: 11–10,174	Not identified in review	Completed and attempted suicide, suicidal ideation
Santini et al., 2015, UK and Spain <sup>47</sup>	Depression and social relationships	51 studies: 28 cross-sectional, 23 prospective	Age: ≥18 years Gender: not identified Size: 971–40659	Social network and engagement measures	Depression as measured by 15–20 validated scales
Schwarzbach et al., 2014, Germany and Switzerland <sup>48</sup>	Depression in the elderly	37 studies: 25 cross-sectional, 12 longitudinal	Age: ≥60 years Gender: mixed M/F Size: 207–4391	Standardised questionnaires and self-report questions	Depression as measured by four validated scales
Seo et al., 2012, USA <sup>29</sup>	Tobacco adolescent smoking	10 studies—eight quantitative, two mixed	Age: mean ≥ 13 < 18 years Gender: mixed M/F Size: 44–6695	Not identified in review	Smoking behaviour
Seto and Lalumiere, 2010, Canada <sup>36</sup>	Sexual offending in male adolescents	59 studies, design not specified	Age: 11–20 years Gender: male only Size: not identified	42, 43, 44, 45, 46, 47, 48	Differences between adolescent sexual offenders and adolescent non-sexual offenders
Shor and Roelfs, 2015, Canada <sup>22</sup>	All-cause mortality	91 studies, design not specified	Age: not identified Gender: not identified Size: 119–30070	Not identified in review	All-cause mortality
Steenstra et al., 2005, Netherlands <sup>45</sup>	Musculoskeletal low back pain	14 studies—eight retrospective, six prospective	Age: working-age adults Gender: mixed M/F Size: 120–8628	Not identified in review	Duration of sick leave or time to return to work
Stephoe et al., 2013, UK <sup>39</sup>	Cardiovascular Disease	27 prospective cohort studies	Age: not identified Gender: not identified Size: not identified	Not identified in review	Relative risk of incident coronary heart disease

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Table 1 – (continued)

Article	Topic	Included studies	Population characteristics	Loneliness and/or social isolation measure(s) <sup>a</sup>	Outcome
Teo et al., 2013, USA <sup>51</sup>	Social isolation and social anxiety disorder	34 studies three cross-sectional, 11 population based, 14 case control, three uncontrolled trial, one randomised trials, one prospective cohort, one case series	Age: ≥13 years Gender: mixed M/F Size: 27–33368	3, 9, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 46, 60, 61, 62	Social anxiety disorder as measured by a validated scale
Vancampfort et al., 2013, Belgium <sup>32</sup>	Physical activity and bipolar disorder	11 cross-sectional studies	Age: ≥15 years Gender: not identified Size: 18–9522	Not identified in review	Self-reported physical activity
Vancampfort et al., 2012, Belgium <sup>31</sup>	Physical activity and schizophrenia	25 cross-sectional studies	Age: 28–54.9 years Gender: mainly M Size: 8–1704	Not identified in review	Self-reported physical activity, objective measure of physical activity levels
Van der Pols-Vijlbrief et al., 2014, Netherlands <sup>33</sup>	Protein energy malnutrition in elderly	28 studies: 10 longitudinal, 18 cross-sectional	Age: ≥ mean 65 years Gender: not identified Size: 45–12883	Not identified in review	Low body mass index, weight loss, low appetite, low intake, low mid-upper arm circumference

<sup>a</sup> Please see Table 2 for key to measurement scales.

**Table 2 – Key to measurement scales used in Table 1.**

1. Mannheim Interview on Social Support	32. Recent Life Change Questionnaire
2. Multidimensional Scale of Perceived Social Support (MSPSS)	33. University of California, Los Angeles (UCLA) Three-Item Loneliness Scale
3. Berkman-Syme Social Network Index (SNI)	34. Direct single item question about loneliness with Likert scale answer
4. Child Abuse Potential Inventory Loneliness Scale	35. Social Isolation Scale
5. McKay 13-item Social Support Index	36. Inventory of Socially Supportive Behaviour (ISSB)
6. Social Support Questionnaire	37. University of California, Los Angeles (UCLA) Social Support Inventory (SSI)
7. Rheumatoid Arthritis Social Support Scale	38. Established Populations for Epidemiologic Studies of the Elderly (EPESE) Support Questions
8. Perceived Social Support from Friends and Family Scale	39. Malmo Support Scale
9. Duke Social Support Index (DSSI)	40. Malmo Influence, Contact and Anchorage Measure
10. Medical Outcome Study (MOS) Social Support Questionnaire	41. RAND Social Health Battery
11. Family Assessment Device – General Family Functioning Subscale	42. California Personality Inventory Revised (CPI-R)–Sociability Scale
12. Positive and Negative Social Exchanges Scale	43. California Personality Inventory Revised (CPI-R)–Internality Scale
13. Personal Resource Questionnaire (PRQ2000)	44. Fundamental Interpersonal Relations Orientation (FIRO-B) Expressed Inclusion Scale
14. Utrecht Coping List	45. Millon Adolescent personality Inventory (MAPI) Introversive Scale
15. Social Support List–Interactions Subscale	46. Minnesota Multiphasic Personality Inventory (MMPI) Social Introversion Scale
16. Older Americans Resources and Services (OARS) Social Resources Scale	47. Piers-Harris Self-Concept (PIERS)–Popularity Scale
17. Enhancing Recovery in Coronary Heart Disease (ENRICHD) Social Support Inventory (ESSI)	48. Inventory of Peer and Parent Attachment (IPPA) Peer Attachment Scale
18. University of California, Los Angeles (UCLA) Loneliness Scale	49. Asher Loneliness Scale
19. De Jong Gierveld Loneliness Scale	50. Liebowitz Social Anxiety Scale–Avoidance Subscale
20. Social Activities Index	51. Liebowitz Social Anxiety Scale
21. Interview Schedule for Social Interaction	52. Eysenck Personality Inventory–Extraversion Score
22. Interpersonal Needs Questionnaire	53. Sheehan Disability Scale–Social Life Item
23. Sense of Belonging Instrument	54. Anxiety Disorder Interview
24. Provision of Social Relations Scale	55. Disability Profile–Social Phobia Subscale
25. Wellness Circles Survey	56. Empowerment Scale
26. Interpersonal Support Evaluation List	57. Fear Questionnaire
27. Interpersonal Relationships Inventory–Social Support Subscale	58. Illness Intrusiveness Rating Scale
28. Social Network Questionnaire	59. Inventory of Interpersonal Problems
29. Social Contact Schedule	60. Retrospective Self-report of Inhibition
30. Lubben Social Network Scale	61. Short-form (SF) 36–Social Functioning Subscale
31. Neighbourhood Quality Index	62. Social Adjustment Self-rating Scale

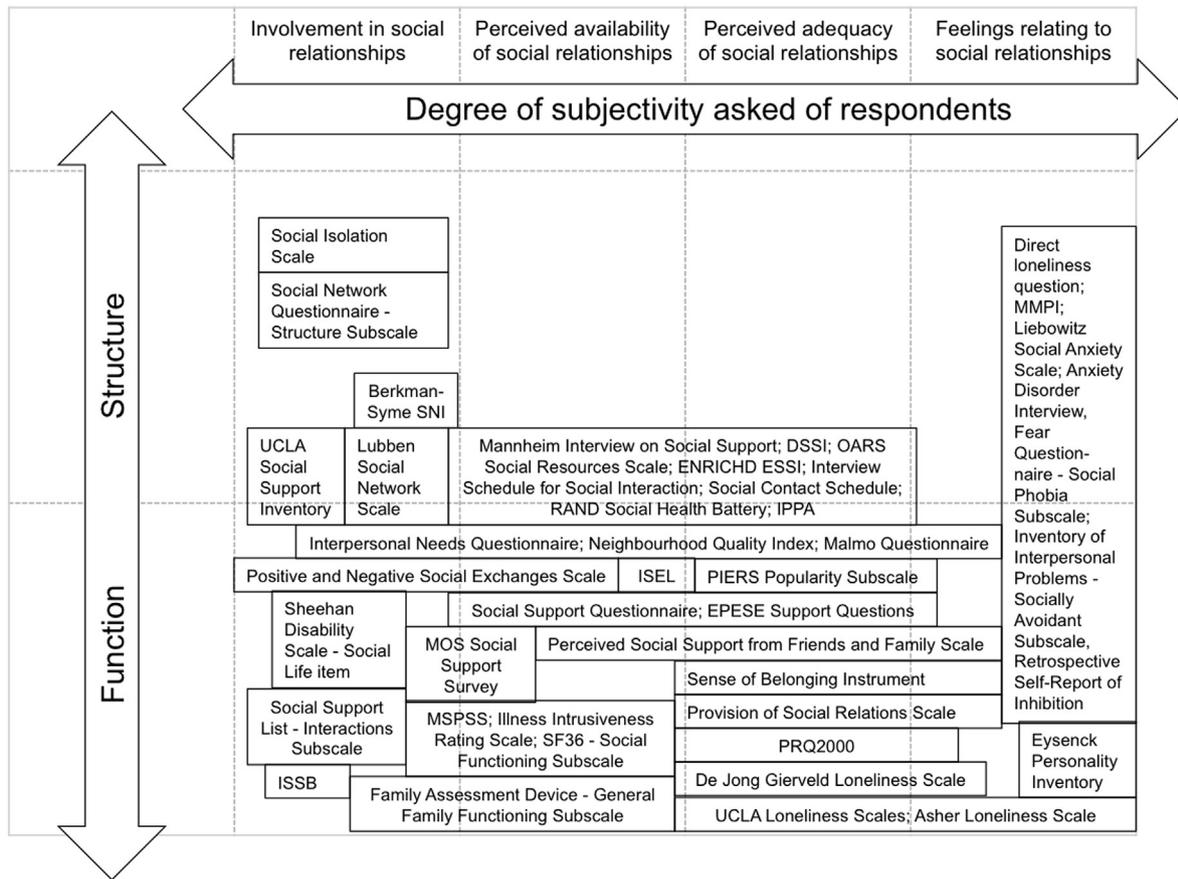
The evidence base for an association with other physical health conditions was less strong with reviews identified for cancer, low back pain and chronic obstructive pulmonary disease. One systematic review focussing on the risk of mortality in cancer patients found that those with the largest network size had a reduced relative risk of mortality of 0.80 (95% CI, 0.72, 0.89).<sup>44</sup> Another systematic review of cohort studies looking at the duration of sick leave for individuals with low back pain found social isolation to be associated with longer sick leave,<sup>45</sup> whereas two studies in another systematic review found a positive association between social network size and chronic obstructive pulmonary disease.<sup>46</sup>

### Mental health

For mental health, there was a moderately strong evidence base, with reviews identified for well-being, depression, suicide and dementia. One meta-analysis found an association

between subjective mental well-being and social relationships, with the quality of relationships more important than the quantity of them.<sup>25</sup> Two other systematic reviews suggested an association between social networks and depression, with large and diverse social networks with high quality relationships protecting against depression.<sup>47,48</sup> These findings were also true in relation to poststroke depression, with diverse social networks of friends and family associated with a reduction in reported depression.<sup>49</sup> In keeping with this, a systematic review of immigrant women in the perinatal period in Japan identified an association between social isolation and negative mental health outcomes after childbirth such as anxiety, stress and regret.<sup>50</sup> A meta-analysis identified an association between social isolation and social anxiety disorder, although causality was unclear.<sup>51</sup>

Five systematic reviews covering suicide (ideation, behaviour, attempted and completed) were identified. One review found that a low sense of belonging was associated with a



**Fig. 2 – Mapping of social relationships measures identified in the review, based on the framework developed by Valtorta et al., 2016.**

higher risk of suicidal ideation and suicide attempts, and another that found levels of social integration affected non-fatal suicidal behaviour amongst the elderly population.<sup>52,53</sup> In specific population groups, social isolation was associated with suicidal ideation amongst individuals with multiple sclerosis<sup>54</sup> and nursing and care home residents,<sup>55</sup> while mixed outcomes were seen amongst those with learning disabilities.<sup>56</sup>

Two systematic reviews identified that loneliness and low social participation were associated with an increased risk of dementia, with two included longitudinal studies showing an association between loneliness and the incidence of Alzheimer's disease and dementia.<sup>57,58</sup>

**Summary of evidence**

Combining these findings alongside the hierarchy of evidence, taking into account the number, quality of the reviews (from the AMSTAR scores) and the evidence contained within them (from the GRADE scores) shows that there is strong evidence that both social isolation and loneliness are associated with increased all-cause mortality and social isolation with cardiovascular disease and depression (Table 4).

**Discussion**

**Main findings**

This overview has identified that there is strong evidence that both social isolation and loneliness are associated with increased all-cause mortality. Although proof of causality cannot be confirmed, this may be mediated through the cardiovascular system and mental health. Only limited evidence was identified for an association with other physical health conditions, including cancer, and evidence for the effects of social isolation and loneliness being mediated through behaviours is less strong. The pattern of health risk appears similar for both the subjective state of loneliness and the objective state of social isolation, but the most consistent significant effects were reported in relation to measures of isolation.

Although evidence was identified across the life course, this overview did not find any systematic reviews considering an association between social isolation and loneliness with physical and psychological developmental outcomes or educational achievement in children. Whilst abuse in both childhood and adulthood is associated with some of the

**Table 3 – AMSTAR scores for included systematic reviews.**

	Author and date	AMSTAR score	GRADE score	
Systematic reviews	Aminzadeh and Dalziel, 2002 <sup>26</sup>	7	Moderate	
	Annear et al., 2014 <sup>23</sup>	6	Moderate	
	Barbosa et al., 2012 <sup>28</sup>	7	Moderate	
	Barton et al., 2015 <sup>46</sup>	7	Moderate	
	Black et al., 2000 <sup>35</sup>	4	Moderate	
	Boss et al., 2015 <sup>57</sup>	5	Moderate	
	Bunker et al., 2003 <sup>40</sup>	6	Moderate	
	Chen et al., 2014 <sup>24</sup>	7	Moderate	
	Cuffee et al., 2015 <sup>43</sup>	5	Low	
	De Freitas et al., 2013 <sup>37</sup>	4	Low	
	Denhaerynck et al., 2009 <sup>38</sup>	2	Low	
	Dyal and Valente 2015 <sup>27</sup>	5	Low	
	Fässberg et al., 2012 <sup>53</sup>	4	Low	
	Glozier et al., 2013 <sup>41</sup>	6	High	
	Hatcher et al., 2013 <sup>52</sup>	2	Low	
	Herbst et al., 2008 <sup>34</sup>	3	Very low	
	Kita et al., 2015 <sup>50</sup>	4	Low	
	Mezuk et al., 2014 <sup>55</sup>	3	Low	
	Mollinson et al., 2014 <sup>56</sup>	1	Low	
	Mookadam et al., 2004 <sup>42</sup>	1	Moderate	
	Murray et al., 2012 <sup>30</sup>	7	Moderate	
	Ouimet et al., 2001 <sup>49</sup>	5	Moderate	
	Pompili 2012 <sup>54</sup>	6	Moderate	
	Santini et al., 2015 <sup>47</sup>	5	Moderate	
	Schwarzbach et al., 2014 <sup>48</sup>	3	Low	
	Seo et al., 2012 <sup>29</sup>	5	Low	
	Steenstra et al., 2005 <sup>45</sup>	5	Low	
	Vancampfort et al., 2013 <sup>32</sup>	4	Low	
	Vancampfort et al., 2012 <sup>31</sup>	4	Low	
	Van der Pols-Vijlbrief et al., 2014 <sup>33</sup>	5	Low	
	Meta-analysis	Holt Lunstad et al., 2010 <sup>21</sup>	8	Moderate
		Holt Lunstad et al., 2015 <sup>49</sup>	6	Moderate
		Kuiper et al., 2015 <sup>58</sup>	6	Moderate
Nyqvist et al., 2013 <sup>20</sup>		7	Moderate	
Pinquart and Sorensen 2000 <sup>25</sup>		3	Moderate	
Pinquart and Duberstein 2010 <sup>44</sup>		4	Moderate	
Seto and Lalumiere 2010 <sup>36</sup>		6	Moderate	
Shor and Roelfs 2015 <sup>22</sup>		9	Moderate	
Stephoe et al., 2013 <sup>39</sup>		2	Low	
Teo et al., 2013 <sup>51</sup>		8	Low	

outcomes identified, such as depression and suicide, this review could not demonstrate the role of social isolation in a causal pathway between them, such as, for example, previous abuse causing withdrawal from social networks and subsequent depression.

### What is already known

Non-systematic reviews have identified similar findings with respect to increased risk of mortality,<sup>59–64</sup> cardiovascular disease and outcomes<sup>62,65–72</sup> and mental health,<sup>61,62,64,73–90</sup> with less evidence for other physical health conditions and behaviours.<sup>72,76,80,91–93</sup> There is no clear evidence from non-systematic reviews as to whether parental social isolation or loneliness is associated with child abuse or adverse parenting behaviours,<sup>94–98</sup> although social isolation and loneliness of children may be associated with abuse or poorer developmental and educational outcomes.<sup>65,87,97,99–101</sup>

Although no systematic reviews were identified in this overview that looked at causal physiological mechanisms by which social isolation and loneliness may influence health, a number of non-systematic reviews have identified associations with changes to brain structure and processes, sympathetic neural tone, vascular stress responses, altered sleep and reduced sleep quality, cortisol secretion patterns, impaired cellular and humoral immunity and reduced inflammatory responses.<sup>7,61,80,96,102–105</sup>

### Limitations

Most of the research in this overview came from developed countries and only English language publications were considered, so this may limit applicability of findings elsewhere. No reviews considered health economic considerations, so this review is not able to give insight into wider socio-economic consequences of social isolation and

**Table 4 – Strength of evidence by topic.**

Topic	Social Isolation	Loneliness	Social networks and relationships
<b>All-cause mortality</b> (Holt Lunstad et al., 2010 <sup>21,*</sup> ; Holt Lunstad et al., 2015 <sup>19,*</sup> ; Nyqvist et al., 2013 <sup>20,*</sup> ; Shor & Roelfs, 2015 <sup>22</sup> )	++	++	++
<b>General health and well-being</b> (Aminzadeh and Dalziel, 2002 <sup>26</sup> ; Annear et al., 2014 <sup>23</sup> ; Chen et al., 2014 <sup>24</sup> ; Pinquart and Sorensen, 2000 <sup>25</sup> )	+	+	
<b>Tobacco use</b> (Barbosa et al., 2012 <sup>28</sup> ; Dyal and Valente, 2015 <sup>27</sup> ; Seo et al., 2012 <sup>29</sup> )	+	+	
<b>Behaviour change</b> (Murray et al., 2012 <sup>30</sup> )			+
<b>Physical activity</b> (Vancampfort et al., 2012 <sup>31</sup> ; Vancampfort et al., 2013 <sup>32</sup> )	+		
<b>Diet</b> (Van der Pols-Vijlbrief et al., 2014 <sup>33</sup> )		+	
<b>Sexual health behaviours</b> (Black et al., 2000 <sup>35</sup> ; Herbst et al., 2008 <sup>34</sup> ; Seto and Lalumiere, 2010 <sup>36,*</sup> )	+	+	
<b>Adherence to treatment</b> (De Freitas et al., 2013 <sup>37</sup> and Denhaerynck et al., 2009 <sup>38</sup> )	+		
<b>Cardiovascular disease</b> (Bunker et al., 2003 <sup>40</sup> ; Cuffee et al., 2015 <sup>43</sup> ; Glozier et al., 2013 <sup>41</sup> ; Mookadam et al., 2004 <sup>42</sup> and Steptoe et al., 2013 <sup>39</sup> )	++		
<b>Cancer</b> (Pinquart and Duberstein, 2010 <sup>44,*</sup> )			+
<b>Other physical health</b> (Barton et al., 2015 <sup>46</sup> and Steenstra et al., 2005 <sup>45</sup> )	+		+
<b>Depression and anxiety</b> (Ouimet et al., 2001 <sup>49</sup> ; Kita et al., 2015 <sup>50</sup> ; Santini et al., 2015 <sup>47</sup> ; Schwarzbach et al., 2014 <sup>48</sup> and Teo et al., 2013 <sup>51</sup> )	++		+
<b>Suicide</b> (Fässberg et al., 2012 <sup>53</sup> ; Hatcher et al., 2013 <sup>52</sup> ; Mezuk et al., 2014 <sup>55</sup> ; Mollinson et al., 2014 <sup>56</sup> and Pompili, 2012 <sup>54</sup> )	+	+	+
<b>Dementia</b> (Boss et al., 2015 <sup>57</sup> and Kuiper et al., 2015 <sup>58,*</sup> )		+	
+Association in one review, or multiple lower quality reviews.			
++Association in one or more higher quality reviews.			
*Meta-analysis.			

loneliness. The effect of age was not analysed in the majority of the included reviews, with the exception of two meta-analyses; one of which<sup>21</sup> reported no age effect while the other<sup>19</sup> found a stronger effect for individuals aged less than 65 years. Therefore, this overview cannot provide firm conclusions with regard to the impact of age on any associations.

Similarly this review cannot infer any associations with ethnicity, as it was infrequently recorded in the included reviews. Most of the systematic reviews were of moderate quality but none were of high quality, which most likely is a reflection of them containing predominantly observational studies; very few of the reviews contained longitudinal studies so causality cannot be inferred from the associations identified. As all of the tools used in the reviews were self-report measures which depend on the degree of subjectivity from respondents, findings should also be considered with caution.

### Implications for research

As this overview identified only limited evidence for an association with physical health conditions other than cardiovascular disease, more research is needed on the association with other conditions, using longitudinal studies or designs that could provide more information on causality. Further research is also needed on the association with health behaviours, the impact across the life course and wider socio-economic consequences. It may also be helpful to undertake systematic reviews on the impact of parental or child social isolation and loneliness on child abuse and developmental outcomes.

### Implications for practice

In the meantime, policy makers and health and local government commissioners should consider social isolation and

loneliness as important upstream factors impacting on morbidity and mortality due to their effects on cardiovascular and mental health; their possible influence on behavioural change should also be taken note of. Taking an asset-based approach,<sup>106</sup> resources and skills in communities and individuals that maintain and sustain health should be utilised to promote resilience and develop prevention strategies across the public and voluntary sectors.

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All authors state that they have no competing interests.

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N.L.H., D.B., K.B., S.T. and V.T. undertook the overview, N.V. provided input into the analysis of measures using the framework and W.C. provided guidance on the overall analysis. All authors contributed to the drafting, reviewing of the article, and have approved the final article.

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