

THE HIDDEN HEART COST OF LONELINESS: NURSING STRATEGIES FOR CARDIOVASCULAR RISK

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Abstract: *Loneliness is a subjective lack of satisfying relationships, whereas social isolation is an objective limitation in social contact or network availability. This rapid systematic review synthesized evidence published from 2021 to 5 July 2026 on loneliness, social isolation, cardiovascular outcomes, and nursing interventions. Searches included PubMed/MEDLINE, PubMed Central, publisher records, and citation tracking. Adult studies were reported using PRISMA 2020 principles and appraised with JBI tools. Of 34 candidates, five were excluded and 29 studies were narratively synthesized. Evidence linked loneliness and social isolation with cardiovascular disease incidence, heart failure, mortality, poorer adaptation, and impaired self-management, although measures and adjustment varied. Repeated or persistent social disconnection may be more informative than one-time assessment. Psychological, social-contact, home-based, telephone, and digital interventions may improve loneliness, but evidence for reducing major cardiovascular events remains insufficient. Nurses should screen both constructs, integrate findings into cardiovascular care, coordinate referrals, support rehabilitation, and monitor clinical outcomes.*

Keywords: *Loneliness; social isolation; cardiovascular disease; nursing; cardiovascular risk.*

Abstrak: Kesepian merupakan pengalaman subjektif berupa kurangnya hubungan yang memuaskan, sedangkan isolasi sosial adalah keterbatasan objektif dalam kontak sosial atau ketersediaan jaringan sosial. Tinjauan sistematis cepat ini menyintesis bukti yang dipublikasikan dari tahun 2021 hingga 5 Juli 2026 mengenai kesepian, isolasi sosial, luaran kardiovaskular, dan intervensi keperawatan. Pencarian dilakukan melalui PubMed/MEDLINE, PubMed Central, catatan penerbit, dan penelusuran sitasi. Studi pada populasi dewasa dilaporkan berdasarkan prinsip PRISMA 2020 dan dinilai menggunakan instrumen JBI. Dari 34 artikel kandidat, lima dikeluarkan dan 29 studi disintesis secara naratif. Bukti menunjukkan bahwa kesepian dan isolasi sosial berkaitan dengan kejadian penyakit kardiovaskular, gagal jantung, mortalitas, adaptasi yang lebih buruk, dan gangguan manajemen diri, meskipun terdapat variasi dalam pengukuran dan penyesuaian faktor perancu. Keterputusan sosial yang berulang atau menetap mungkin lebih informatif dibandingkan penilaian satu kali. Intervensi psikologis, kontak sosial, layanan berbasis rumah, telepon, dan digital dapat mengurangi kesepian, tetapi bukti mengenai penurunan kejadian kardiovaskular mayor masih belum memadai. Perawat perlu melakukan skrining terhadap kedua kondisi tersebut, mengintegrasikan hasilnya ke dalam perawatan kardiovaskular, mengoordinasikan rujukan, mendukung rehabilitasi, dan memantau luaran klinis.

Kata kunci: Kesepian; isolasi sosial; penyakit kardiovaskular; keperawatan; risiko kardiovaskular

INTRODUCTION

Cardiovascular disease develops within a social as well as a biological

context. Hypertension, dyslipidemia, diabetes, smoking, physical inactivity, obesity, sleep disturbance, and medication nonadherence remain central prevention

targets; however, these risks are shaped by the relationships, resources, and environments through which people manage health. Loneliness and social isolation have consequently moved from being viewed primarily as psychosocial concerns to being examined as social determinants and risk modifiers relevant to cardiovascular and brain health (Cené et al., 2022; Teshale et al., 2023).

Loneliness and social isolation are not synonymous. Loneliness is the distressing perception that the quality or quantity of existing relationships does not meet a person's needs. Social isolation is an objective condition characterized by few contacts, limited participation, or a restricted network. Social support concerns the emotional, informational, or practical assistance available through relationships, while living alone is a household arrangement that does not necessarily indicate either loneliness or isolation. Contemporary cardiovascular research increasingly separates these constructs because they may have different antecedents, mechanisms, and intervention requirements (Cené et al., 2022; Freak-Poli et al., 2022; William et al., 2025).

This conceptual distinction has direct clinical consequences. A patient who is objectively isolated may lack transport, emergency assistance, medication support, or someone who notices worsening dyspnea or neurological symptoms. A patient who feels lonely despite frequent contact may instead experience low relationship quality, grief, social anxiety, perceived rejection, or a lack of emotional intimacy. The first presentation may respond to practical network-building and care coordination, whereas the second may require psychological, relational, or grief-focused intervention. Screening only for household composition or contact frequency can therefore miss clinically important subjective loneliness, while a loneliness question alone may fail to reveal the absence of practical assistance (Freak-Poli et al., 2022; Hansen et al., 2024; William et al., 2025).

Recent epidemiological evidence supports concern about cardiovascular consequences. A meta-analysis of 90

prospective cohorts involving more than 2.2 million participants found higher all-cause and cardiovascular mortality among socially isolated participants, with substantial heterogeneity across measures and populations (Wang et al., 2023). A cardiovascular-specific meta-analysis reported mortality associations among people already living with cardiovascular disease, although estimates differed for loneliness, isolation, and living alone and remained vulnerable to publication bias and residual confounding (Long et al., 2023). In initially healthy older adults, social isolation and low social support appeared more consistently associated with cardiovascular incidence and mortality than loneliness, suggesting that objective and perceived social health should be analyzed separately (Freak-Poli et al., 2021).

The evidence has also broadened beyond coronary heart disease and stroke. A large population-based cohort linked loneliness and social isolation with incident heart failure independent of measured genetic susceptibility, while repeated assessments in the UK Biobank suggested that persistent isolation or loneliness was more strongly related to cardiovascular events, mortality, and selected measures of cardiac function than transient exposure (Chen et al., 2024; Liang et al., 2023). Chinese cohort data have similarly associated loneliness with incident cardiovascular disease among older adults, extending the evidence beyond predominantly Western settings (Tan et al., 2024). Among people with obesity, loneliness and isolation have been associated with excess cardiovascular events, indicating that social disconnection may compound established metabolic vulnerability (Zhou et al., 2025).

Biological plausibility is emerging but should not be mistaken for proof of causation. Large-scale proteomic work has identified patterns linking social isolation and loneliness to inflammatory, immune, complement, stress, and metabolic proteins, several of which prospectively predicted cardiovascular disease, stroke, diabetes, and mortality (Shen et al., 2025). Longitudinal analyses have also examined hypertension and persistent social

disconnection, supporting pathways involving sympathetic activation, vascular tone, sleep, and behavioral risk, although measurement limitations and confounding remain important (Parker et al., 2024). The current evidence is therefore compatible with interacting biological and behavioral pathways rather than a single “loneliness mechanism.”

Behavioral and health-care pathways may be especially actionable for nursing. Socially disconnected patients may be less able to obtain prescriptions, prepare appropriate food, participate in exercise, attend follow-up, recognize deterioration, or enter cardiac rehabilitation. Loneliness may coexist with depression, low self-efficacy, sleep disruption, smoking, inactivity, or avoidance of health care. Following a cardiovascular event, poor social health may impede adjustment, self-management, and recovery, while inadequate support may increase caregiver strain or unsafe reliance on a single person (Freak-Poli et al., 2022; Heaney et al., 2026; Shekelle et al., 2024).

Nurses are strategically positioned to address these pathways because they work across prevention, acute care, discharge planning, cardiac rehabilitation, primary care, community services, and home health. Nursing assessment routinely integrates symptoms, medication use, health literacy, mood, cognition, mobility, family support, transport, nutrition, finances, and safety. Adding a structured social-health assessment can reveal why an otherwise evidence-based cardiovascular plan may not be feasible. It also allows nurses to distinguish a need for practical support, psychological care, peer connection, rehabilitation, safeguarding, or social prescribing.

Nevertheless, the intervention literature requires cautious interpretation. Reviews generally report small or moderate improvements in loneliness or social connection, with marked variation in population, intervention content, delivery mode, duration, and outcome measurement (Chua et al., 2024; Duffner et al., 2024; Hansen et al., 2024; Hoang et al., 2022). Telephone-delivered behavioral activation and related psychosocial approaches have

shown promise in randomized trials, but these studies were designed primarily to change loneliness, depression, or well-being rather than cardiovascular events (Gilbody et al., 2021; Kahlon et al., 2021; Kwok et al., 2024; Tang et al., 2026). A 2026 cardiovascular-focused systematic review likewise found heterogeneous nonpharmacological programs and insufficient evidence for firm conclusions about cardiovascular protection (Heaney et al., 2026).

The clinical problem is therefore twofold: social disconnection may identify cardiovascular vulnerability, yet the field has not established that reducing loneliness independently prevents myocardial infarction, stroke, heart-failure hospitalization, or cardiovascular death. This review addresses that tension by synthesizing only recent English-language articles, separating epidemiological association from intervention effectiveness, and translating the evidence into nursing strategies that complement rather than replace established cardiovascular risk reduction.

Among adults at risk for or living with cardiovascular disease, how are loneliness and social isolation associated with cardiovascular risk and outcomes, and which nursing-deliverable or nursing-coordinated strategies may reduce the associated risk?

METHOD

Design and Reporting

A targeted rapid systematic literature review was undertaken. PRISMA 2020 guided transparent reporting of identification, screening, eligibility, and inclusion, and PRISMA-S informed description of the search approach (Page et al., 2021; Rethlefsen et al., 2021). The flow diagram follows the PRISMA 2020 sequence but reports only the final set of unique, individually identifiable and bibliographically verified records because raw database-interface totals and source-specific duplicate counts were not retained. Design-appropriate JBI checklists were used for critical appraisal, with the revised

JB1 randomized-trial tool informing assessment of randomized studies (Barker et al., 2023).

Information Sources and Date Limits

Searches were completed on 5 July 2026 using PubMed/MEDLINE, PubMed Central, publisher records, university repositories, and backward and forward citation searching from key systematic reviews and cardiovascular statements. Only English-language journal articles published from 1 January 2021 through 5 July 2026 were eligible. Reports, books, organizational webpages, protocols without results, conference abstracts, editorials, and articles published before 2021 were excluded from the synthesis and reference list.

Search Strategy

The core concepts combined terms for social health, cardiovascular outcomes, and intervention or nursing relevance. A representative PubMed search was:

(loneliness OR "social isolation" OR "social connection" OR "social support") AND (cardiovascular OR coronary OR stroke OR "heart failure" OR hypertension OR mortality) AND (nursing OR intervention OR rehabilitation OR "social prescribing" OR cohort OR "systematic review" OR meta-analysis) AND (2021:2026[dp]) AND English[lang]

Supplementary searches paired the social-health terms with blood pressure, proteomics, medication adherence, behavioral activation, telephone support, digital intervention, home-based care, and randomized trial. Citation details were verified through DOI, PMID, PubMed Central, publisher, or university-repository records.

Eligibility Criteria

Criterion	Eligibility requirement
Population	Adults aged 18 years or older, including community populations and adults at risk for or living with cardiovascular disease.

Criterion	Eligibility requirement
Exposure or intervention	Loneliness, social isolation, social support, social connection, living alone when analyzed as a social-health exposure, or an intervention explicitly intended to improve these constructs.
Outcomes	Cardiovascular incidence, coronary disease, stroke, heart failure, cardiovascular or all-cause mortality in a cardiovascular context, blood pressure or related cardiovascular mechanisms, self-management, health-care use, or intervention outcomes relevant to nursing.
Design	Prospective or longitudinal observational studies, randomized trials, systematic reviews, meta-analyses, umbrella reviews, and evidence maps.
Language and publication type	English-language peer-reviewed journal articles only.
Date	Publication from 1 January 2021 through 5 July 2026.

Selection, Extraction, and Synthesis

Only unique articles that could be individually identified and bibliographically verified were entered into the selection flow. The 34-record working set was screened and each report was successfully retrieved for eligibility assessment. Five reports were excluded at full-text assessment, leaving 29 included evidence articles. Extracted fields included design, population or review scope, exposure or intervention, outcomes, principal contribution, limitations, DOI or PMID, and relevance to nursing. Because populations, constructs, instruments, and outcomes were heterogeneous, a new meta-analysis was not conducted. Published pooled estimates were reported only when directly available from included reviews.

Critical Appraisal

Systematic reviews and evidence syntheses were appraised against JBI domains concerning review questions, inclusion criteria, search adequacy, appraisal methods, data extraction, synthesis, publication bias, and recommendations. Cohort studies were assessed for recruitment, exposure measurement, confounding, outcome validity, follow-up, and analysis. Randomized trials were assessed for randomization, allocation concealment, baseline comparability, blinding where

feasible, follow-up, intention-to-treat analysis, outcome measurement, and statistical appropriateness. Ratings were summarized as high, moderate, or low methodological confidence; these ratings are single-reviewer judgments, not independently adjudicated scores.

RESULT AND DISCUSSION

Study Selection

The identifiable working set contained 34 unique, bibliographically verified candidate records. All 34 records were screened, sought, retrieved, and assessed for eligibility. Five reports were excluded: three were published before 2021, one was not an eligible journal article, and one lacked sufficient cardiovascular or nursing relevance. Twenty-nine English-language evidence articles published from 2021 to 2026 were therefore included in the narrative synthesis and design-appropriate JBI appraisal. Three methodological journal articles used to describe PRISMA, PRISMA-S, and JBI

procedures remain outside the evidence-selection flow.

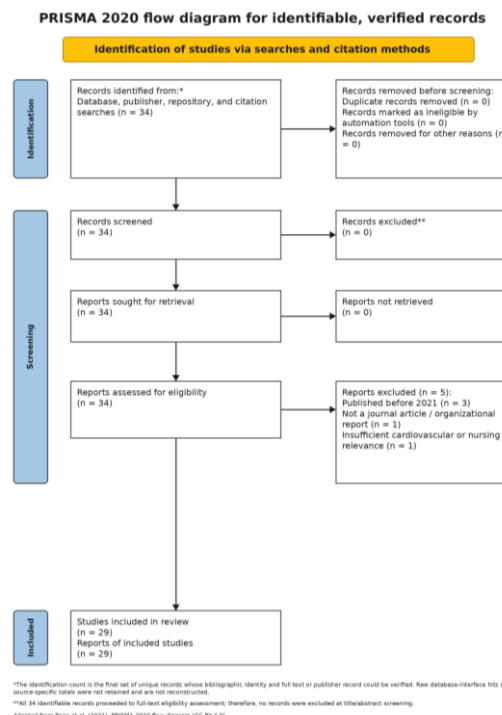


Figure 1. PRISMA 2020 flow diagram for identifiable, verified records. Adapted from Page et al. (2021).

Table 1. Characteristics and principal contributions of all 29 included evidence articles.

Study	Design	Population / focus	Principal contribution to this review
Albasheer et al. (2024)	Systematic review, meta-analysis, and bibliometric investigation	Social isolation/loneliness and cardiovascular risk factors	Synthesized an adverse relationship between poor social health and cardiovascular risk; heterogeneity and observational confounding limited causal interpretation.
Cené et al. (2022)	AHA scientific statement with systematic scoping review	Cardiovascular and brain health	Evidence was most consistent for CHD and stroke, while direct evidence that social interventions improve cardiovascular endpoints was insufficient.
Chua et al. (2024)	Systematic review and meta-analysis	Home-based interventions for older adults	Home-based approaches improved some loneliness or social-connectedness outcomes, but trials and delivery models were heterogeneous.
Dahlberg et al. (2022)	Systematic review of longitudinal studies	Risk factors for loneliness in older adults	Identified health, functional, psychological, and social predictors of later loneliness, supporting assessment of upstream vulnerability.
Duffner et al. (2024)	Systematic review and meta-analysis	Interventions for loneliness/social isolation in older adults	Intervention effects varied across approaches, intensity, and follow-up; no single strategy was consistently superior.
Freak-Poli et al. (2022)	Narrative thematic systematic review	Health and well-being after a cardiovascular event	Social isolation, low support, and loneliness were relevant after CVD events, although exposure definitions and outcomes were inconsistent.
Hajek et al. (2025)	Systematic review, meta-analysis, and meta-regression	Chronic loneliness and chronic social isolation in older adults	Showed that persistent social disconnection affects a clinically relevant subgroup, while estimates varied by definitions and study context.
Hansen et al. (2024)	Umbrella review of RCT-based interventions	Interventions targeting isolation and loneliness	Social-contact approaches appeared more relevant to objective isolation, whereas psychological approaches were more relevant to subjective loneliness.
Heaney et al. (2026)	Systematic review	Older adults with cardiovascular disease	Cardiovascular-specific intervention evidence was small and heterogeneous, with stronger support for psychosocial outcomes than cardiovascular endpoints.

Study	Design	Population / focus	Principal contribution to this review
Hoang et al. (2022)	Systematic review and meta-analysis	Interventions for older adults	Several intervention types were associated with reduced loneliness or isolation, but heterogeneity was high and evidence within categories was limited.
Long et al. (2023)	Systematic review, meta-analysis, and meta-regression	People living with cardiovascular disease; mortality	Loneliness, isolation, or living alone were associated with mortality risk, but heterogeneity and publication bias reduced certainty.
Shekelle et al. (2024)	Systematic review and meta-analysis	Community-living older adults	Interventions produced variable, generally modest improvements in loneliness; durability and clinical outcome effects remained uncertain.
Teshale et al. (2023)	Umbrella review	Social determinants of cardiovascular disease	Placed social relationships within the broader social-determinants evidence base for CVD, while source-review quality and overlap varied.
Wang et al. (2023)	Systematic review and meta-analysis of 90 cohorts	Social isolation, loneliness, and mortality	Both constructs were associated with mortality; social isolation showed a consistent relationship with cardiovascular mortality.
Welch et al. (2023)	Evidence and gap map	Digital interventions for older adults	Mapped a growing but uneven evidence base and highlighted gaps in equity, long-term follow-up, and clinically meaningful outcomes.
William et al. (2025)	Systematic review	Assessment instruments in adults with heart failure	Instrument selection and psychometric reporting were inconsistent, limiting comparison and implementation of social-health screening in HF.
Chen et al. (2024)	Prospective cohort with repeated social-health measures	Changes in isolation/loneliness; cardiovascular events and mortality	Persistent or worsening social disconnection was more informative than a single measurement and was associated with adverse cardiovascular outcomes.
Freak-Poli et al. (2021)	Prospective cohort	Older adults initially free of CVD; incidence and mortality	Social isolation and low social support were more consistently predictive of cardiovascular outcomes than loneliness.
Liang et al. (2023)	Population-based prospective cohort	Incident heart failure	Social isolation and loneliness were independently associated with incident HF after multivariable adjustment and genetic-risk stratification.
Nakagomi et al. (2024)	Prospective community cohort	Social isolation and mortality across sociodemographic groups	The isolation–mortality relationship varied across population subgroups, supporting targeted rather than uniform risk assessment.
Parker et al. (2024)	Longitudinal cohort analysis	Social isolation and hypertension in early middle adulthood	Social isolation was prospectively related to hypertension risk or trajectory, although residual confounding and bidirectionality remained possible.
Shen et al. (2025)	Large prospective proteomic cohort	Proteomic signatures, morbidity, and mortality	Isolation and loneliness were associated with inflammatory, immune, metabolic, and stress-related proteins, providing biological plausibility without proving causality.
Tan et al. (2024)	Prospective cohort	Older adults in China; incident CVD	Loneliness was associated with higher incident CVD after adjustment, extending evidence beyond predominantly Western cohorts.
Yang et al. (2025)	Prospective cohort with causal triangulation	Social isolation/loneliness and CHD	Prospective and complementary genetic analyses supported an association with CHD, while causal inference remained dependent on analytic assumptions.
Zhou et al. (2025)	Prospective cohort	Adults with obesity; cardiovascular events	Loneliness and social isolation identified excess cardiovascular-event risk in a high-risk metabolic population.
Gilbody et al. (2021)	Pilot randomized controlled trial	Socially isolated older adults with long-term conditions	Behavioral activation was feasible and showed psychosocial benefit signals, but the pilot was not designed to test cardiovascular outcomes.
Kahlon et al. (2021)	Randomized clinical trial	Adults receiving layperson empathy-focused telephone calls	The brief telephone program reduced loneliness and selected psychological symptoms during the pandemic; follow-up was short and non-cardiovascular.
Kwok et al. (2024)	Randomized clinical trial	Low-income older adults; telephone behavioral activation	Lay-delivered telephone behavioral activation improved loneliness-related and well-being outcomes, but cardiovascular endpoints were not measured.
Tang et al. (2026)	Randomized clinical trial	Older adults; behavioral activation and mindfulness	Behavioral activation and mindfulness were evaluated for loneliness and well-being; the trial did not establish cardiovascular-event reduction.

Note. The included evidence set comprises 16 systematic reviews or evidence syntheses, 9 observational studies, and 4 randomized trials. CVD = cardiovascular disease; CHD = coronary heart disease; HF =

heart failure; RCT = randomized controlled trial. The three methodological references used for PRISMA, PRISMA-S, and JBI reporting are not included in this table or in the PRISMA count.

JBI Critical Appraisal: Reviews and Syntheses

Table 2 summarizes design-appropriate JBI judgments. “High”

indicates that most core domains were clearly met; “moderate” indicates usable evidence with one or more important limitations; no article was excluded solely for a moderate rating.

Study	Key strengths	Key limitations	Confidence
Albasheer et al. (2024)	Broad multi-database synthesis; quantitative pooling	Heterogeneous constructs; bibliometric and meta-analytic aims combined	Moderate
Cené et al. (2022)	Systematic scoping and multidisciplinary interpretation	Not a conventional pooled review; limited intervention evidence	Moderate
Chua et al. (2024)	Randomized evidence; home-based focus	Small, heterogeneous studies and outcomes	Moderate
Dahlberg et al. (2022)	Comprehensive determinants synthesis	Substantial heterogeneity and older-adult focus	Moderate
Duffner et al. (2024)	Recent intervention synthesis	Variable intervention dose, quality, and follow-up	Moderate
Freak-Poli et al. (2022)	CVD-specific qualitative thematic synthesis	Heterogeneous exposures and outcomes; no pooled effect	Moderate
Hajek et al. (2025)	Focus on chronic/persistent exposure	Definitions of chronicity varied across studies	Moderate
Hansen et al. (2024)	Broad database coverage; overlap matrix; randomized evidence	Dependent on quality and overlap of included reviews	High
Heaney et al. (2026)	Direct relevance to older adults with CVD	Small evidence base; heterogeneous interventions	Moderate
Hoang et al. (2022)	Randomized trials and meta-analysis	High heterogeneity; few trials per intervention type	High
Long et al. (2023)	CVD-specific mortality synthesis	Publication bias and construct heterogeneity	Moderate
Shekelle et al. (2024)	Systematic review supporting clinical implementation	Broad populations; limited cardiovascular outcomes	Moderate
Teshale et al. (2023)	Places social health within cardiovascular SDOH	Overlap and variable quality of source reviews	Moderate
Wang et al. (2023)	Very large prospective mortality evidence base	Substantial heterogeneity; observational evidence	High
Welch et al. (2023)	Systematic mapping of digital interventions	Evidence map does not estimate one pooled effect	Moderate
William et al. (2025)	Heart-failure-specific measurement review	Instrument evidence and psychometrics were inconsistent	Moderate

JBI Critical Appraisal: Observational Studies

Study	Key strengths	Key limitations	Confidence
Chen et al. (2024)	Repeated exposure measures; prospective outcomes; extensive adjustment	Residual confounding; healthy-volunteer bias	High
Freak-Poli et al. (2021)	Prospective design; distinct social-health domains	Older, relatively healthy cohort	High
Liang et al. (2023)	Large sample; heart-failure outcome; genetic-risk stratification	Self-reported exposures; observational mediation	High
Nakagomi et al. (2024)	Large community cohort; subgroup heterogeneity examined	Social isolation measurement and context-specific generalizability	High
Parker et al. (2024)	Longitudinal hypertension analysis	Exposure and BP pathways may remain bidirectional	Moderate
Shen et al. (2025)	Large-scale proteomics and longitudinal outcomes	Protein associations do not establish clinical causality	High
Tan et al. (2024)	Prospective non-Western evidence	Single-wave loneliness measure; self-reported conditions	Moderate
Yang et al. (2025)	Prospective cohort with complementary genetic analyses	Instrument assumptions and residual confounding	Moderate
Zhou et al. (2025)	Addresses high-risk obesity subgroup; prospective events	Generalizability and self-reported social exposure	Moderate

JBICritical Appraisal: Randomized Trials

Study	Key strengths	Key limitations	Confidence
Gilbody et al. (2021)	Randomized pilot; defined behavioral-activation intervention; follow-up	Pilot size; pandemic context; psychosocial endpoints	Moderate
Kahlon et al. (2021)	Pragmatic telephone intervention; rapid implementation	Short duration; pandemic-specific context	Moderate
Kwok et al. (2024)	Active comparator; structured interventions; follow-up	Low-income older-adult sample; no CVD endpoints	High
Tang et al. (2026)	Behavioral activation and mindfulness comparison; extended outcomes	No cardiovascular event endpoint; context-specific sample	High

Appraisal note: The JBI tables are transparent single-reviewer summaries based on the published methods. They should be independently duplicated before journal submission.

Cardiovascular Incidence, Heart Failure, and Mortality

Across recent syntheses, social isolation showed the most consistent relationship with mortality, including cardiovascular mortality, while loneliness estimates were more variable (Long et al., 2023; Wang et al., 2023). This difference may reflect the practical consequences of having few available contacts, but it may also arise from measurement error: objective isolation indices often aggregate several behaviors, whereas loneliness is frequently measured with a single question. The findings do not establish that isolation is intrinsically more harmful in every patient.

Incident cardiovascular disease findings were generally directionally consistent but modest. Meta-analytic evidence indicated higher CVD risk among socially isolated or lonely adults, but heterogeneity was high and adjustment strategies differed (Albasheer et al., 2024). Prospective studies suggest that persistent or cumulative exposure may carry greater risk than a transient episode, an important observation because bereavement, hospitalization, disability, and recovery can alter social health over time (Chen et al., 2024; Hajek et al., 2025).

Heart failure deserves specific attention because successful management relies heavily on daily medication, weight and symptom monitoring, diet, timely escalation, and access to care. Social isolation and loneliness were independently associated with incident

heart failure in a large cohort, yet the study could not demonstrate that improving connection would prevent heart failure (Liang et al., 2023). Measurement reviews in heart failure further show that instruments are inconsistently selected and reported, limiting comparison across studies and clinical programs (William et al., 2025).

Behavioral, Psychological, and Biological Pathways

The behavioral pathway is clinically plausible and partly supported by attenuation after adjustment for lifestyle and health conditions. Social disconnection can reduce physical activity, disrupt sleep, increase smoking or unhealthy eating, and undermine adherence, appointment attendance, rehabilitation participation, and early symptom reporting. Depression and anxiety can act as confounders, mediators, consequences, or interacting conditions, making simple adjustment difficult (Cené et al., 2022; Teshale et al., 2023).

Psychophysiological mechanisms include sustained threat perception, sympathetic activation, hypothalamic–pituitary–adrenal signaling, vascular resistance, and inflammatory activity. Longitudinal hypertension research supports attention to blood-pressure pathways, although associations may be reciprocal and influenced by socioeconomic conditions and pre-existing illness (Parker et al., 2024). Proteomic findings strengthen biological plausibility by linking social isolation and loneliness with inflammatory, immune, complement, stress, and metabolic proteins; however, these findings remain mechanistic clues rather than validated clinical biomarkers (Shen et al., 2025).

Intervention Evidence

Interventions appear more effective when the targeted mechanism matches the patient’s problem. Social-contact, social-support, and participatory group approaches are conceptually suited to objective isolation. Cognitive-behavioral, interpersonal, mindfulness, or behavioral-activation approaches may be more relevant when loneliness persists despite available contact or is maintained by avoidance, grief, negative social expectations, or low self-efficacy (Hansen et al., 2024; Hoang et al., 2022).

Home-based and telephone approaches may overcome transport, mobility, and access barriers. Meta-analytic evidence suggests that some home-based programs improve loneliness, social support, engagement, or depressive symptoms, although effects are not uniform (Chua et al., 2024). Randomized trials of telephone behavioral activation, befriending, and mindfulness demonstrate feasibility and psychosocial benefit among socially vulnerable older adults (Gilbody et al., 2021; Kahlon et al., 2021; Kwok et al., 2024; Tang et al., 2026). Digital approaches can broaden reach, but evidence maps identify uneven evaluation and persistent concerns about digital literacy, sensory impairment, privacy, and access (Welch et al., 2023).

The decisive limitation is outcome selection. Most trials measure loneliness, depression, well-being, or social participation, not blood pressure, medication adherence, cardiac rehabilitation, hospitalization, myocardial infarction, stroke, or mortality. The cardiovascular-specific intervention review found too little consistent evidence to conclude that loneliness interventions reduce cardiovascular risk independently of conventional care (Heaney et al., 2026).

Nursing Strategies for Cardiovascular Risk Reduction

1. Assess both Perceived Loneliness and Objective Isolation

A social-health assessment should ask about relationship quality, practical support, frequency of contact,

participation, and emergency assistance. Brief validated tools may be used when consistent with local policy, but a positive screen should lead to a person-centered conversation rather than an automatic referral. Heart-failure measurement research emphasizes the need to select instruments deliberately and to report how they are interpreted (William et al., 2025).

- Ask how often the patient lacks companionship, feels left out, or feels disconnected from others.
- Identify who can help with transport, medication access, meals, monitoring, appointments, or emergencies.
- Assess recent bereavement, retirement, migration, caregiving, disability, sensory loss, poverty, and unsafe relationships.
- Clarify whether the patient wants more contact, better-quality relationships, practical assistance, or psychological support.

2. Integrate Social Findings with Established Cardiovascular Prevention

Loneliness screening is not a substitute for blood pressure, lipid, diabetes, smoking, weight, activity, sleep, nutrition, or medication assessment. Its value lies in identifying barriers and amplifiers. A positive screen should prompt nurses to determine whether social conditions are affecting self-management, attendance, rehabilitation, symptom recognition, or the feasibility of the treatment plan (Cené et al., 2022; Freak-Poli et al., 2022).

Match The Response To The Mechanism

Identified mechanism	Evidence-informed nursing response
Objective isolation or absent practical support	Warm referral to community, peer, volunteer, cultural, faith, or social-prescribing services; confirm the connection occurred.
Loneliness despite frequent contact	Therapeutic communication; assess grief, depression, anxiety, relationship quality, and social cognition; consider psychological referral.
Post-discharge vulnerability	Document an emergency contact, reconcile medications, use teach-back, arrange early follow-up, and verify transport, food,

Identified mechanism	Evidence-informed nursing response
	monitoring, and rehabilitation access.
Low activity plus disconnection	Offer clinically appropriate group walking, supervised exercise, or cardiac rehabilitation with peer contact.
Mobility, hearing, vision, or digital barriers	Arrange accessible communication, sensory assessment, transport, home visits, or non-digital alternatives.
Unsafe or coercive relationships	Undertake safeguarding and risk assessment; do not equate increased contact with beneficial support.
Persistent distress or self-neglect	Assess depression and suicide risk, escalate mental-health care, and coordinate multidisciplinary follow-up.

3. Use Active Social Prescribing and Care Navigation

A passive list of telephone numbers is unlikely to overcome anxiety, transport, cost, disability, or uncertainty. An active referral includes shared selection of an acceptable service, consent to exchange information, a warm handoff, practical barrier resolution, and follow-up to determine whether the patient attended and found the service useful. Potential options include peer cardiac groups, walking groups, community meals, volunteer programs, bereavement support, culturally appropriate organizations, and telephone or home-based programs.

4. Strengthen Transitional and Home-Based Cardiovascular Care

Hospital discharge and the early recovery period can magnify isolation. A nurse-led pathway should include a social-support and emergency-contact assessment before discharge; medication reconciliation and teach-back; timely telephone, clinic, or home follow-up; confirmation of access to prescriptions, food, transport, monitoring equipment, and rehabilitation; and repeated assessment after major changes. Home-based and telephone evidence supports feasibility, but contact should be meaningful, desired, and linked to clinical goals rather than treated as a universal solution (Chua et al., 2024; Kwok et al., 2024).

5. Measure Social and Cardiovascular Outcomes

Programs should measure whether the intervention reached the patient and whether it changed the intended pathway. Short-term outcomes can include loneliness, network support, service uptake, depressive symptoms, self-efficacy, physical activity, sleep, adherence, and rehabilitation attendance. Intermediate outcomes include blood-pressure, glycemic and lipid control, appointment completion, emergency use, and readmission. Definitive trials should include myocardial infarction, stroke, heart-failure hospitalization, cardiovascular death, and all-cause mortality.

Discussion

1. Principal Interpretation

This review found a consistent recent signal that loneliness and social isolation identify people with elevated cardiovascular vulnerability, but the evidence does not support a simple deterministic claim that loneliness directly causes cardiovascular disease. Associations have been demonstrated across mortality syntheses, cardiovascular-specific reviews, heart-failure cohorts, repeated-exposure studies, and non-Western populations (Chen et al., 2024; Freak-Poli et al., 2021; Liang et al., 2023; Long et al., 2023; Tan et al., 2024; Wang et al., 2023). The breadth of evidence increases clinical relevance, while heterogeneity and observational design limit causal certainty.

The magnitude of risk is generally modest after multivariable adjustment. At an individual level, loneliness should therefore not be interpreted as equivalent to a diagnosis of hypertension or diabetes. At a population level, however, even modest associations can matter when exposure is common and interacts with smoking, inactivity, depression, poverty, disability, and limited access to care. The appropriate clinical interpretation is that poor social health can modify risk and undermine the delivery of evidence-based prevention.

2. Why Objective Isolation and Loneliness Should Remain Separate

The review reinforces the distinction between objective and subjective social health. Some studies found stronger associations for isolation or low support than for loneliness, while other cohorts identified loneliness as the more relevant predictor (Freak-Poli et al., 2021; Tan et al., 2024). These differences are not necessarily contradictory. Objective isolation may affect practical assistance and emergency response, whereas loneliness may influence distress, sleep, social threat, and motivation. Their relative importance is likely to vary by age, culture, disease stage, household arrangement, and the quality of available relationships.

This distinction also explains why one intervention cannot fit every patient. Increasing the number of contacts may benefit a person with few opportunities for interaction but may not resolve loneliness associated with grief, social anxiety, conflict, or perceived lack of intimacy. Conversely, psychological intervention cannot provide transportation or a person to assist during acute deterioration. Mechanism-matched care is therefore more defensible than universal “socialization.”

3. Temporal Exposure and The Risk Of Reverse Causation

A central challenge is reverse causation. Cardiovascular disease can reduce mobility, income, confidence, and social participation, producing isolation after disease onset. Depression, fatigue, breathlessness, or stroke-related disability can similarly increase loneliness. Studies using a single baseline measure cannot fully distinguish whether social disconnection precedes disease or reflects early illness. Repeated-measure studies are valuable because they show that persistent or cumulative exposure may be more strongly associated with events than transient exposure, although they still cannot eliminate all confounding (Chen et al., 2024; Hajek et al., 2025).

For nursing, this bidirectionality is not a reason to ignore the issue. Whether social disconnection is a cause,

consequence, or both, it can still interfere with treatment and recovery. The clinical response should focus on the current pathway—such as missed medication, lack of transport, depression, inactivity, or absence of emergency support—rather than requiring proof of etiological direction before intervention.

4. Biological Plausibility and Limits of Biomarker Interpretation

Proteomic and blood-pressure findings provide plausible biological links through inflammation, immune regulation, metabolic stress, vascular function, and autonomic activity (Parker et al., 2024; Shen et al., 2025). These findings are valuable because they move the field beyond purely behavioral explanations. Nevertheless, the identified proteins are not validated clinical tests for loneliness-related cardiovascular risk. Many are influenced by age, obesity, kidney function, infection, and chronic disease, and observational protein associations may reflect shared causes rather than mediation.

The most credible model is therefore multilevel. Social conditions influence behavior and access to care; psychological distress affects sleep, motivation, and neuroendocrine activity; chronic illness alters social participation; and socioeconomic factors shape all of these processes. A nursing assessment that focuses on one biomarker or one loneliness score would miss this interaction.

5. Interpretation of Intervention Evidence

The intervention literature is promising but not mature. Systematic and umbrella reviews consistently conclude that effects vary by intervention type and outcome, with small-to-moderate average improvements and substantial heterogeneity (Chua et al., 2024; Duffner et al., 2024; Hansen et al., 2024; Hoang et al., 2022). Randomized trials demonstrate that structured telephone behavioral activation, mindfulness, or befriending can be delivered to vulnerable older adults and can improve psychosocial outcomes (Gilbody et al., 2021; Kahlon et al., 2021; Kwok et

al., 2024; Tang et al., 2026). This is clinically useful evidence, but it is not evidence of cardiovascular event prevention.

Intervention success may also depend on patient preference. Unwanted or stigmatizing referral can worsen disengagement. Some people value solitude, and living alone is not inherently pathological. Programs should define a personally meaningful goal—such as having help after discharge, returning to rehabilitation, managing grief, or building one dependable relationship—rather than assuming that a larger network is always better.

6. Implications for Cardiovascular Nursing Practice

The strongest immediate implication is integration rather than creation of a separate “loneliness clinic.” Nurses can embed brief social-health questions into existing cardiovascular assessments, then connect findings to risk-factor control and self-management. This approach uses established nursing competencies and reduces the danger of screening without an actionable response. It also recognizes that social-health needs often become visible at transitions: diagnosis, admission, discharge, bereavement, functional decline, or failure to attend rehabilitation.

A practical minimum standard is to identify whether the patient has desired emotional connection, dependable practical help, transport and medication access, and someone who can respond in an emergency. Patients with a positive screen should receive a pathway assessment and a documented plan. The plan may involve a family member, peer program, community navigator, psychologist, social worker, rehabilitation team, primary-care clinician, or safeguarding service. Follow-up should determine whether the referral was accepted and whether the identified cardiovascular barrier changed.

The evidence also supports a more careful interpretation of digital care. Telephone and digital interventions can extend reach, especially for homebound patients, but technology is not inherently connective. Hearing loss, limited data,

unfamiliarity, cognitive impairment, and privacy concerns can turn a digital solution into another barrier. Digital delivery should be offered as one modality within a choice of accessible options (Welch et al., 2023).

7. Equity and Cultural Considerations

Social disconnection is embedded in structural conditions. Poverty, unsafe neighborhoods, rurality, disability, discrimination, migration, caregiving, and limited transport can restrict opportunities for connection and cardiovascular care. A referral that ignores these constraints may place responsibility on the patient without changing the conditions producing isolation. Nursing strategies should therefore include practical advocacy and coordination, not only counseling.

Cultural meanings of family, independence, privacy, and community participation also differ. Measures developed in one setting may not capture meaningful connection in another, and group programs may be unacceptable or inaccessible to some patients. Evidence from China and other non-Western settings improves generalizability but remains insufficient to assume universal thresholds or intervention preferences (Tan et al., 2024; Yang et al., 2025).

8. Research Implications

Future trials should recruit cardiovascular populations with clearly characterized social-health profiles, match intervention content to the mechanism, and measure both psychosocial and clinical outcomes. Adequate follow-up is essential because cardiovascular effects are unlikely to appear over a few weeks. Trials should report intervention fidelity, referral completion, digital access, adverse effects, cost, and subgroup effects. Mechanistic studies should use repeated social measures and temporal mediation analyses rather than assuming that one baseline loneliness score represents chronic exposure.

Research should also test complete nurse-led pathways. A screening trial is insufficient if there is no warm referral, service capacity, or follow-up. The relevant intervention is the entire sequence:

identification, shared interpretation, tailored action, uptake, cardiovascular self-management, and outcome monitoring. Hybrid effectiveness–implementation designs may be particularly appropriate for determining whether such pathways can be sustained in primary care, cardiac rehabilitation, heart-failure services, and home-health programs.

9. Overall Balance of Evidence

Taken together, the evidence justifies clinical attention but not exaggerated causal language. Loneliness and social isolation are markers and potential mechanisms of cardiovascular vulnerability. They can reveal practical and psychological barriers that conventional risk calculators do not capture. Nursing strategies that address these barriers are reasonable, person-centered, and compatible with established cardiovascular prevention. The claim that treating loneliness will independently prevent cardiovascular events, however, remains a research hypothesis rather than an established treatment effect.

Limitations

This review used a targeted rapid-search approach rather than a complete export from every bibliographic database. The selection flow therefore counts only the 34 unique articles whose bibliographic identity and full-text or publisher record could be verified individually. It does not claim to represent the total number of raw search-result hits returned by database or web interfaces. Screening, extraction, and appraisal were performed by one reviewer, and no protocol was registered. These limitations increase the risk of missed studies and judgment error.

The date restriction improves contemporaneity but excludes influential earlier longitudinal studies and conceptual work. The English-language restriction may introduce language bias. Within the included literature, loneliness, isolation, support, and living alone were measured inconsistently; many studies were observational; intervention trials were heterogeneous and generally lacked cardiovascular endpoints; and older adults

in higher-income settings were overrepresented.

Recommendations for Research

Future research should prioritize protocol-registered, multi-database systematic reviews that use duplicate screening, data extraction, and JBI or other appropriate risk-of-bias assessments. Studies should standardize the definitions and repeated measurement of loneliness, objective social isolation, social support, and relationship quality to improve comparability across populations and settings. Nurse-led, mechanism-matched interventions should be tested in patients with hypertension, coronary artery disease, stroke, and heart failure. Outcomes should include medication adherence, participation in rehabilitation, blood-pressure control, hospitalization, myocardial infarction, stroke, heart-failure events, and mortality. Researchers should also report patient preferences, intervention reach, fidelity, referral uptake, costs, digital exclusion, cultural adaptation, and adverse effects. In addition, mediation and implementation study designs are needed to clarify how changes in social health influence cardiovascular behaviors, access to care, and clinical outcomes.

CONCLUSION

Recent English-language evidence published from 2021 to 2026 consistently links loneliness and social isolation with cardiovascular vulnerability, including incident cardiovascular disease, heart failure, mortality, and barriers to recovery. The association is biologically and behaviorally plausible but remains heterogeneous and predominantly observational. Intervention evidence supports the possibility of improving loneliness or social connection, not yet the conclusion that such improvement

independently prevents cardiovascular events.

Nurses can act without overstating the evidence. They can assess subjective loneliness and objective support, connect these findings to conventional risk management, identify practical and psychological pathways, provide active referral and transitional follow-up, and measure whether both social and cardiovascular barriers improve. In this way, loneliness becomes neither an ignored emotional complaint nor an exaggerated standalone diagnosis, but a clinically meaningful part of person-centered cardiovascular prevention.

REFERENCES

- Alghamdi, S. M., Alqahtani, A. S., Alenazi, A. M., Alqahtani, B., Alhowimel, A., Uddin, S., Khalafalla, H. E. E., & Medani, I. E. (2024). The impact of social isolation and loneliness on cardiovascular disease risk factors: A systematic review, meta-analysis, and bibliometric investigation. *Scientific Reports*, 14, 12871. <https://doi.org/10.1038/s41598-024-63528-4>
- Barker, T. H., Stone, J. C., Sears, K., Klugar, M., Tufanaru, C., Leonardi-Bee, J., Aromataris, E., & Munn, Z. (2023). The revised JBI critical appraisal tool for the assessment of risk of bias for randomized controlled trials. *JBI Evidence Synthesis*, 21(3), 494–506. <https://doi.org/10.1112/JBIES-22-00430>
- Cené, C. W., Beckie, T. M., Sims, M., Suglia, S. F., Aggarwal, B., Moise, N., Jiménez, M. C., Gaye, B., & McCullough, L. D. (2022). Effects of objective and perceived social isolation on cardiovascular and brain health: A scientific statement from the American Heart Association. *Journal of the American Heart Association*, 11(16), e026493. <https://doi.org/10.1161/JAHA.122.026493>
- Chen, Y., Xue, H., Nie, Y., Zhou, Y., Ai, S., Liu, Y., Zhang, J., & Liang, Y. Y. (2024). Evaluation of changes in social isolation and loneliness with incident cardiovascular events and mortality. *Journal of Epidemiology and Global Health*, 14, 962–973. <https://doi.org/10.1007/s44197-024-00243-3>
- Chua, C. M. S., Chua, J. Y. X., & Shorey, S. (2024). Effectiveness of home-based interventions in improving loneliness and social connectedness among older adults: A systematic review and meta-analysis. *Aging & Mental Health*, 28(1), 1–10. <https://doi.org/10.1080/13607863.2023.2237919>
- Dahlberg, L., McKee, K. J., Frank, A., & Naseer, M. (2022). A systematic review of longitudinal risk factors for loneliness in older adults. *Aging & Mental Health*, 26(2), 225–249. <https://doi.org/10.1080/13607863.2021.1876638>
- Duffner, L. A., Janssen, N., Deckers, K., Schroyen, S., de Vugt, M. E., Köhler, S., Adam, S., Verhey, F. R. J., & Veenstra, M. Y. (2024). Facing the next "geriatric giant": A systematic literature review and meta-analysis of interventions tackling loneliness and social isolation among older adults. *Journal of the American Medical Directors Association*, 25(9), 105110. <https://doi.org/10.1016/j.jamda.2024.105110>
- Freak-Poli, R., Hu, J., Phyto, A. Z. Z., & Barker, F. (2022). Does social isolation, social support or loneliness influence health or well-being after a cardiovascular disease event? A narrative thematic systematic review. *Health & Social Care in the Community*, 30(1), e16–e38. <https://doi.org/10.1111/hsc.13427>
- Freak-Poli, R., Ryan, J., Neumann, J. T., Tonkin, A., Reid, C. M., Woods, R. L., Nelson, M., Stocks, N., Berk, M., McNeil, J. J., Britt, C., & Owen, A. J. (2021). Social isolation, social support and loneliness as predictors of cardiovascular disease incidence and mortality. *BMC Geriatrics*, 21, 711.

- <https://doi.org/10.1186/s12877-021-02602-2>
- Gilbody, S., Littlewood, E., McMillan, D., Chew-Graham, C. A., Bailey, D., Gascoyne, S., Sloan, C. E., Burke, L., Coventry, P., Crosland, S., Fairhurst, C. M., Henry, A., Hewitt, C. E., Joshi, K., Ryde, E., Shearsmith, L., Traviss-Turner, G., Woodhouse, R., Clegg, A., ... Ekers, D. (2021). Behavioural activation to prevent depression and loneliness among socially isolated older people with long-term conditions: The BASIL COVID-19 pilot randomised controlled trial. *PLOS Medicine*, 18(10), e1003779. <https://doi.org/10.1371/journal.pmed.1003779>
- Hajek, A., Sutin, A. R., Posi, G., Stephan, Y., Peltzer, K., Terracciano, A., Luchetti, M., & König, H.-H. (2025). Chronic loneliness and chronic social isolation among older adults. A systematic review, meta-analysis and meta-regression. *Aging & Mental Health*, 29(2), 185–200. <https://doi.org/10.1080/13607863.2024.2385448>
- Hansen, T., Nes, R. B., Hynek, K., Nilsen, T. S., Reneflot, A., Stene-Larsen, K., Tornes, R. A., & Bidonde, J. (2024). Tackling social disconnection: An umbrella review of RCT-based interventions targeting social isolation and loneliness. *BMC Public Health*, 24, 1917. <https://doi.org/10.1186/s12889-024-19396-8>
- Heaney, S., Collins, K., Blassey, A., Lee, C., Pearson, I., Van Wijk, J., Brown, A., & Brown, L. J. (2026). Impact of interventions targeting social isolation and loneliness for older adults with cardiovascular disease: A systematic review. *BMC Public Health*, 26, 801. <https://doi.org/10.1186/s12889-025-26169-4>
- Hoang, P., King, J. A., Moore, S., Moore, K., Reich, K., Sidhu, H., Tan, C. V., Whaley, C., & McMillan, J. (2022). Interventions associated with reduced loneliness and social isolation in older adults: A systematic review and meta-analysis. *JAMA Network Open*, 5(10), e2236676. <https://doi.org/10.1001/jamanetworkopen.2022.36676>
- Kahlon, M. K., Aksan, N., Aubrey, R., Clark, N., Cowley-Morillo, M., Jacobs, E. A., Mundhenk, R., Sebastian, K. R., & Tomlinson, S. (2021). Effect of layperson-delivered, empathy-focused program of telephone calls on loneliness, depression, and anxiety among adults during the COVID-19 pandemic: A randomized clinical trial. *JAMA Psychiatry*, 78(6), 616–622. <https://doi.org/10.1001/jamapsychiatry.2021.0113>
- Kwok, J. Y. Y., Jiang, D., Yeung, D. Y.-L., Choi, N. G., Ho, R. T. H., Warner, L. M., & Chou, K.-L. (2024). Layperson-delivered telephone-based behavioral activation among low-income older adults during the COVID-19 pandemic: The HEAL-HOA randomized clinical trial. *JAMA Network Open*, 7(6), e2416767. <https://doi.org/10.1001/jamanetworkopen.2024.16767>
- Liang, Y. Y., Chen, Y., Feng, H., Liu, X., Ai, Q. Y. H., Xue, H., Shu, X., Weng, F., He, Z., Ma, J., Ma, H., Ai, S., Geng, Q., & Zhang, J. (2023). Association of social isolation and loneliness with incident heart failure in a population-based cohort study. *JACC: Heart Failure*, 11(3), 334–344. <https://doi.org/10.1016/j.jchf.2022.11.028>
- Long, R. M., Terracciano, A., Sutin, A. R., Creaven, A.-M., Gerstorf, D., D'Arcy-Bewick, S., & O'Súilleabháin, P. S. (2023). Loneliness, social isolation, and living alone associations with mortality risk in individuals living with cardiovascular disease: A systematic review, meta-analysis, and meta-regression. *Psychosomatic Medicine*, 85(1), 8–17. <https://doi.org/10.1097/PSY.00000000000001151>
- Nakagomi, A., Saito, M., Ojima, T., Ueno, T., Hanazato, M., & Kondo, K. (2024). Sociodemographic heterogeneity in the associations of social isolation with mortality. *JAMA Network Open*, 7(5), e2413132.

- <https://doi.org/10.1001/jamanetworkopen.2024.13132>
- Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., ... Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ*, 372, n71. <https://doi.org/10.1136/bmj.n71>
- Parker, M., Self-Brown, S. R., Rahimi, A., & Fang, X. (2024). Longitudinal analysis of the relationship between social isolation and hypertension in early middle adulthood. *Journal of the American Heart Association*, 13(9), e030403. <https://doi.org/10.1161/JAHA.123.030403>
- Rethlefsen, M. L., Kirtley, S., Waffenschmidt, S., Ayala, A. P., Moher, D., Page, M. J., Koffel, J. B., & PRISMA-S Group. (2021). PRISMA-S: An extension to the PRISMA statement for reporting literature searches in systematic reviews. *Systematic Reviews*, 10, 39. <https://doi.org/10.1186/s13643-020-01542-z>
- Shekelle, P. G., Mlake-Lye, I. M., Begashaw, M. M., Booth, M. S., Myers, B., Lowery, N., & Shrank, W. H. (2024). Interventions to reduce loneliness in community-living older adults: A systematic review and meta-analysis. *Journal of General Internal Medicine*, 39(6), 1015–1028. <https://doi.org/10.1007/s11606-023-08517-5>
- Shen, C., Zhang, R., Yu, J., Sahakian, B. J., Cheng, W., & Feng, J. (2025). Plasma proteomic signatures of social isolation and loneliness associated with morbidity and mortality. *Nature Human Behaviour*, 9(3), 569–583. <https://doi.org/10.1038/s41562-024-02078-1>
- Tan, S., Liu, D., Zhang, Y., Li, S., Zhang, K., Tang, Z., & Zuo, H. (2024). Loneliness, living alone, and risk of cardiovascular disease among older adults in China. *The Journals of Gerontology: Series A*, 79(5), glae079. <https://doi.org/10.1093/gerona/glae079>
- Tang, V. F. Y., Jiang, D., Kwok, J. Y. Y., Yeung, D. Y.-L., Choi, N. G., Warner, L. M., Ho, R. T. H., & Chou, K.-L. (2026). Behavioral activation and mindfulness interventions in reducing loneliness and improving well-being in older adults: The HEAL-HOA randomized clinical trial. *JAMA Network Open*, 9(2), e2557170. <https://doi.org/10.1001/jamanetworkopen.2025.57170>
- Teshale, A. B., Htun, H. L., Owen, A. J., Gasevic, D., Phyo, A. Z. Z., Fancourt, D., Ryan, J., Steptoe, A., & Freak-Poli, R. (2023). The role of social determinants of health in cardiovascular diseases: An umbrella review. *Journal of the American Heart Association*, 12(13), e029765. <https://doi.org/10.1161/JAHA.123.029765>
- Wang, F., Gao, Y., Han, Z., Yu, Y., Long, Z., Jiang, X., Wu, Y., Pei, B., Cao, Y., Ye, J., Wang, M., & Zhao, Y. (2023). A systematic review and meta-analysis of 90 cohort studies of social isolation, loneliness and mortality. *Nature Human Behaviour*, 7(8), 1307–1319. <https://doi.org/10.1038/s41562-023-01617-6>
- Welch, V., Ghogomu, E. T., Barbeau, V. I., Dowling, S., Doyle, R., Beveridge, E., Boulton, E., Desai, P., Huang, J., Elmetekawy, N., Hussain, T., Wadhwani, A., Boutin, S., Haitas, N., Kneale, D., Salzwedel, D. M., Simard, R., Hébert, P., & Mikton, C. (2023). Digital interventions to reduce social isolation and loneliness in older adults: An evidence and gap map. *Campbell Systematic Reviews*, 19(4), e1369. <https://doi.org/10.1002/cl2.1369>
- William, S., McDonagh, J., Allida, S. M., Kasa, A. S., Patterson, C., Deek, H., Moxham, L., Wand, T., & Ferguson, C. (2025). A systematic review to identify assessment instruments for social isolation or loneliness in adults with heart failure. *npj Cardiovascular*

-
- Health*, 2, 10. <https://doi.org/10.1016/j.socscimed.2025.117701>
- <https://doi.org/10.1038/s44325-025-00044-y>
- Yang, Z., Liu, C., He, L., Zhao, H., Jian, J., Chen, H., Wei, H., Niu, J., & Luo, B. (2025). Social isolation and loneliness increase the risk of coronary heart disease: Insights from a prospective cohort study. *Social Science & Medicine*, 366, 117701.
- Zhou, Y., Chen, R., Xu, M., Gong, Y., Liu, C., Wang, M., & Yin, X. (2025). Association of loneliness and social isolation with excess risk of cardiovascular events in people with obesity: A prospective cohort study. *Journal of Global Health*, 15, 04241. <https://doi.org/10.7189/jogh.15.04241>