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Maria João Gomes da Mota

The role of loneliness and social isolation among older adults in the use of
health care services - A systematic review

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DESIGNAÇÃO DA ÁREA DO PROJECTO

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TÍTULO DISSERTAÇÃO/MONOGRAFIA (riscar o que não interessa)

The role of loneliness and social isolation among older adults in the use of health care services - A systematic review

ORIENTADOR

Professor Doutor Paulo Santos

COORIENTADOR (se aplicável)

ASSINALE APENAS UMA DAS OPÇÕES:

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DE ACORDO COM A LEGISLAÇÃO EM VIGOR, (INDICAR, CASO TAL SEJA NECESSÁRIO, Nº MÁXIMO DE PÁGINAS, ILUSTRAÇÕES, GRÁFICOS, ETC.) NÃO É PERMITIDA A REPRODUÇÃO DE QUALQUER PARTE DESTES TRABALHOS.	☒

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Maria João Gomes da Mota

Aos meus pais, por todo o suporte e por me terem proporcionado toda a minha formação.

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The role of loneliness and social isolation among older adults in the use of health care services - A systematic review

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Abstract

Background: Loneliness and social isolation have been linked to poor health outcomes and higher morbidity and mortality due to all causes, with an effect comparable with risk factors such as obesity and substance abuse. Older adults are more vulnerable to loneliness and social isolation due to the current lifestyle and morbidities associated with age. This systematic review aims to evaluate the influence of loneliness and social isolation of older adults in the health care utilization.

Methods: Two databases, MEDLINE (PubMed) and Scopus, were searched for this investigation, alongside an individual search through relevant journals to the matter. A total of 672 studies on loneliness or social isolation and health care or primary care use published after 2002 were found in the initial search, from which 34 studies were eligible for full-text assessment and 18 studies were included in the final review.

Results: Almost all of the studies included had found an association between loneliness, social isolation or weak social relationships and poor health outcomes or increased frequency in health care use (16/18). The most common health care use outcome found was higher frequency of utilization associated with higher loneliness and poorer social relationships. An association between loneliness or social isolation and hospital admissions and longer hospital stays was also found. Higher mortality rates and multimorbidity were also associated with higher social isolation and loneliness, as well as a negative association between social isolation and health promoting behaviors.

Conclusions: This systematic review shows that loneliness, social isolation and poor social networks are associated with increased GP, emergency department and specialist visits, as well as with prolonged hospital stays.

Key words: Aged, Loneliness, Social Isolation, Primary Care Use, Health Care Use

1. Background

Loneliness and social isolation have increasingly recognized health consequences, with significant physical and mental health effects [1]. Among those consequences are higher morbidity and higher mortality, as loneliness and social isolation have been shown to be risk factors comparable with smoking, alcohol abuse and obesity [2]. Those suffering from social isolation have less infection resistance, are at a bigger risk for depression and cognitive decline and have increased emergency care admissions [3]. The concern about social relationships of older adults, not only regarding the quantity of social relationships an individual might have but also the quality of those relationships, has been growing [4] as older people are more likely to feel alone and be socially isolated, given the current lifestyle and social demands that hinder cohabitation with their children or other family members, alongside with the loss of loved ones, the decreasing in health, mobility and independence, and therefore the increasing need for institutionalization in nursing homes. Projects and campaigns have been rising across all Europe, such as the European based “Long Live the Elderly!” (to counteract social isolation) and “MOAI LABS” (to combat isolation and loneliness), both focused on the elderly, and the country based “Campaign to End Loneliness” (aiming to combat loneliness of all the population of United Kingdom) and “Porta 55+” (Portugal based and aiming to combat loneliness among older adults). North america has also been seeing a raise in its campaigns for the same purposes, such as the “HelpAge” from Canada that aims to counteract the barriers imposed by social isolation among older adults, and “Coalition to End Social Isolation and Loneliness” from USA that combats social isolation and loneliness and their adverse consequences. We tend to think of the terms loneliness and social isolation as synonymous, and they are indeed often interrelated, but they are different terms and should be seen as such. The perception of loneliness can easily be answered by the general population, as we all know the distressing feeling of loneliness, yet it is more accurately defined as a subjective experience

of the discrepancy between the aimed social and affectionate relationships and the ones actually perceived by the individual. It also isn't directly linked with being alone: we can both feel lonely when surrounded by people and be physically alone without feeling lonely [5]. Furthermore, the term social isolation should not be confused with loneliness, as the first is an objective and quantifiable measure of a social network's reduced size and the lack of social contact [6]. This topic becomes even more relevant after the measures of social distancing and lockdowns imposed worldwide to refrain viral transmission during Covid19 pandemic in the last three years. Reported loneliness has been shown to have had an overall increase with the pandemic measures, from a third of adults worldwide reporting loneliness pre-pandemic to around half of them reporting loneliness in 2020, still almost in the beginning of it all [7]. During our search for studies in this theme, we found a systematic review with meta-analysis from 2021 that studied the relation between loneliness and the frequency of utilization of health care services, with the majority of their studies focusing on an older population [8]: but despite the similarities with our current study, we include more recent studies (their review included studies until 2019), we focus on both loneliness and social isolation and we did not restrict our health care use outcomes to the frequency of utilization. This systematic review aims to evaluate the influence of loneliness and social isolation among older adults in their health care utilization.

2. Methods

2.1. Protocol

This systematic review was conducted following the guidelines from PRISMA for systematic reviews [9], thus making a systematic approach to structure the evidence on primary health care consumption by older adults affected by loneliness and social isolation. Its main objectives

were to approach the associations between loneliness and social isolation and the health care utilization among older adults.

2.2. Eligibility criteria

The studies included were all the found studies from the last ten years (between 2002 and 2022) that connected the keywords “loneliness” or “social isolation” with the keyword “aged” and with the keywords “health care use” or “primary care use”. For the studies to be included they should also have fulfilled the following:

- a. be written in Portuguese or English
- b. have guaranteed quality by peer-review and literature-index
- c. be focused on a population above 55 years old

Studies without an abstract were excluded, as well as studies without an available full-text version. Any findings classified as guidelines, correspondence, communication, case report, erratum or protocol were excluded.

2.3. Search strategy and information sources

Two databases - MEDLINE (PubMed) and Scopus - were used for this investigation, alongside an individual search through relevant journals to the matter. The search in those databases used the queries “loneliness AND aged AND health care use”, “social isolation AND aged AND health care use”, “loneliness AND aged AND primary care use ” and “social isolation AND aged AND primary care use”.

2.4. Study selection and risk of bias assessment

Two researchers (M.M. and P.S.) independently performed the first screening, based on titles and abstracts, searching the above-mentioned databases for studies that met the inclusion and exclusion criteria, and any dead-lock was discussed until agreement. Duplicate articles were

identified and excluded using Endnote20. After cross checking the references individually found, a second screening took place, now with the articles with an available full text, reapplying the eligibility criteria. To assess the risk of bias of the studies eligible for inclusion, we used the National Heart, Lung and Blood Institute's (NHLBI) Study Quality Assessment Tools, as described in the Appendix (Tables 1 and 2), and all of the 18 included studies were screened for all of the quality assessment tools' criteria, which were answered, as recommended, as Y (yes), N (no), CD (cannot determine), NA (not applicable) or NR (not reported), after what the studies were rated as good, fair or poor (Tables 3 and 4).

2.5. Data extraction

The data was extracted into a spreadsheet, created for better organization. The following data was extracted:

- a. article title
- b. first author's name
- c. publication year
- d. country of origin
- e. study design
- f. sample type
- g. number of participants
- h. demographic data (age, sex)
- i. outcome of interest (association between loneliness or social isolation and health care outcomes)
- j. social isolation or loneliness measure
- k. health care use or primary care use measure
- l. key findings

135 3. Results

136 Given the heterogeneity of study design, loneliness or social isolation measures, health care
137 use or primary care use measures and outcome assessment, a meta-analytic approach was not
138 attempted. Instead, a narrative synthesis was conducted.

139 3.1. Study selection

140 From the 672 studies found in the initial search, 34 studies met the inclusion criteria, from
141 which 16 additional studies were excluded, 12 for not being related to the aim of this review,
142 2 for the study design and 2 for impossibility of finding available full text (see Figure 1: Flow
143 diagram of study selection process). Altogether, 18 studies [4, 8, 10-25] were included and all
144 of them were rated as good in relation to the risk of bias assessment, as can be seen in the
145 Appendix Tables 3 and 4.

146 3.2. Study design

147 From the eighteen studies included, eleven were cross sectional designed, three were
148 longitudinal observational, one was retrospective observational, one was a systematic review
149 and one was a systematic review with a meta-analysis (see Table 5: Study characteristics).

150 3.3. Study characteristics

151 Regarding the countries of origin, five were from Germany [10, 11, 12, 13], four from the
152 United States of America [14, 15, 16, 17], three from the United Kingdom [4, 8, 18], two from
153 Sweden [19, 20], one from Belgium [21], one from Greece [22], one from China [23], and two
154 encompassed various countries: one was from seventeen european countries [24], and one from
155 twenty countries in five continents [25].

156 Of the sixteen non-systematic review and non-meta analytic studies included, the majority of
157 the sample type was representative population-based (11/16), from which four had a large

sample (more than 10 000 participants). Regarding the age of participants, most studies had a mean age above 60 years old, from which three studies had a mean age above 80 years old. Regarding to sex, almost all the studies had a majority of female participants (17/18), with five studies having consistently (between all study-defined subgroups) more than 60% female participants.

3.4. Measuring tools

Loneliness was assessed by itself in six studies, from which two [10, 13] used the short version (6-item) of the 11-item De Jong Gierveld Loneliness Scale [26], two [16, 24] used the 3-item short version of the loneliness scale developed by Hughes et al. in 2004 [27], one [20] used four single-item questions designed specifically for the study, and one [12] did not clarify the method used.

Social isolation measurements without loneliness measurements were assessed by eight studies, from which two [11, 23] used the Lubben Social Network Scale-6 (LSNS-6) [28], one [14] used the Social isolation short form (PSI) of PROMIS (Patient-Reported Outcomes Measurement Information System) [29], one [25] constructed a social isolation scale with five items from the PURE baseline questionnaire [30], one [17] used the responses to the MTHA question “How often do you feel lonely or isolated from those around you?” and made three groups with the answers, and one [22] measured social isolation in accordance to the premise that “social isolation is an inadequate quality and quantity of social relations” [31] and used, for that, questions about marital status, children number, living arrangements and relations between the family. The other two approached the social component in means of social network: one [18] used a four-item Group Identification Scale to measure respondents level of identification with their family, their local community and their chosen group and one [15] asked respondents to give a list of five people they considered important to them and then asked about the frequency of interactions and health matters discussion with those people, and

accessed social support with the respondents perceived possibility to rely on family and friends for help and emotional support with the frequency respondents opened up to family and friends. Two studies measured both social isolation and loneliness: one measured loneliness with a single questions with responses divided in four categories and assessed the social component via social contacts (with four items about visits with friends and family) and social activity (with a list of eleven activities) [19] and one [21] applied the Frailty Assessment Instrument (CFAI) [33], using its social domain to assess social isolation and its psychological domain to assess loneliness.

Referring to the health outcomes regarding health care use or primary care use, seven studies used only the frequency of service utilization, but with different measures. Two of those studies categorized individuals into frequent attenders or non-frequent attenders: one measured only self-reported GP consultations and considered frequent attendance if individuals had six or more consultations with GP in the previous three months [11] , and the other measured both self-reported GP and specialist visits and considered frequent attendance if individuals had more than six visits within a year [12]. Two of those studies divided frequency in categories: one divided frequency in six categories, using the self-reported frequency of consultations via online platforms [13], and the other one divided health care use in outpatient (with self-reported number of GP and specialist visits divided in six categories) and inpatient treatment (with self-reported number of hospital stays divided in two categories) [10]. Furthermore, three of those studies used frequency of attendance with the total number of visits: one of them used the patient records to find the total number of patient visits to the primary care clinic in the previous six months [18] , one assessed self-reported number of hospitalizations and number of consultations with a medical doctor [16] and one used medical records to assess the number of hospital admissions and emergency department visits during 12 months [17].

207 One study used both frequency of utilization and length of stay: this study used two databases
208 to access registers from the previous 12 months, and divided the data in inpatient care (with
209 number of visits and length of stay for both acute and planned care) and outpatient care (number
210 of visits to a doctor or to an emergency department, and if it lead or not to an hospital
211 admission) [20].

212 Eight studies did not approach health care use or primary care use by frequency of attendance,
213 three of which still considering service use as GP, specialist or hospital visits: one studied
214 whether participants have had a planed or an unplanned hospital admission using the nacional
215 medical register [19], another one used self-reported responses to a twelve-item questionnaire
216 (referring to GPs recommendations, if there was a dentist visit in the last year, immunizations
217 and screenings) and created a 0-100 scale with those responses [22], and one measured
218 whether the individuals had a fallow-up visit with a general practitioner within 7 days and 30
219 days after an emergency department visit [14]. The other five had different kinds of health
220 consumption measures: one measured mortality (divided in all-cause, cardiovascular and non-
221 cardiovascular) and the incidence of the study selected diseases [25], one studied the
222 multimorbidity (two or more) of the individuals by the self-reported diseases of a previously
223 defined list of 13 diseases [24], one used self-reported need of assistance in seven categories
224 of care used (four of them for informal care, like from family and friends, and the other three
225 for formal care, including GP, home nursing and formal home assistance) [21], one [23]
226 measured self-reported health promoting behaviors endorsed by the individuals, using the
227 Health-Promoting Lifestyle Profile II (HPLP-II) scale, developed by Susan Noble Walker [33]
228 (regarding to behaviors like physical activity, nutrition or stress management) and one [15]
229 approached the health variable with self-reported measures, as well as biological measures, to
230 assess diagnosis of hypertension and its control.

The systematic review [4] and the meta-analysis [8] have not yet been mentioned in these results because of the big differences in study design compared to the aforementioned. The systematic review [4] included 126 studies, with one of the exclusion criteria excluding studies with a mean age younger than 60 years, but did not mention female to male rates in the studies included. The meta-analysis [8] included 25 studies, from which the majority had a mean age above 60 years old (15/25) and had a percentage of female participants over 50% (21/25).

3.5. Study outcomes

Referring to the findings of the studies included in the current systematic review, almost all of them (16/18) found an association between loneliness, social isolation or weak social relationships and poor health outcomes or increased frequency in health care use.

One study found a significant positive association between social isolation and higher frequency in health care services attendance [11], four studies found a significant positive association between loneliness and higher frequency in health care attendance [8, 13, 16, 20] and one study found a significant positive association between larger social networks and social connectedness and reduced frequency of health care attendance [18]. Two studies found an association between social isolation or lower levels of social interaction and the number of hospital admissions [17, 19] and one found an association between smaller social networks and longer hospital stays [4].

One study found a significant association between social isolation and higher mortality rates [25] and one found a significant association between higher loneliness and multimorbidity [24].

One study found a significant negative association between social isolation and health promoting behaviors within older adults with multimorbidity (no association was found for the healthy older adults) [23] and two studies found that the more social isolated individuals had less health care service utilization [14, 22], one of which found that highly social isolated

patients had significantly less follow-up within the 7-day after emergency department discharge (but no difference was found in a 30-day follow-up) [14] and the other found that patients with high social isolation pursued less preventive health care services [22]. One study found that the groups of individuals with higher assistance needs were more lonely and socially isolated [21] and one study found that the larger the social networks and frequency of interactions, the lower the risks of undiagnosed and uncontrolled hypertension [15]. Two studies did not find an association between loneliness and the utilization of health care services [10, 12].

3.6. Other Findings

Regarding findings of the included studies beyond the linking between loneliness and social isolation and the utilization of health care services, one study identified that individuals with more chronic diseases and worries about the financial situation were at an increased risk of being a frequent attender of health services, while individuals with depression were less frequent attenders [11]. Although, one study found that individuals with depressive symptoms were more likely to have a follow-up within 7 days after ED discharge [14]. Another one found an association between low self-esteem and greater GP visits, as well as between greater optimism and less health care use [10]. An association between unemployment and increased frequency GP visits was also found [12]. Living with a partner in the same household was also linked with more health care consumption [13]. One study found that being male was associated with unplanned hospital admissions, and that both higher age and having a higher number of diseases was associated with both planned and unplanned hospital admissions. [19].

4. Discussion

Through the review, we became more aware of the disparities of approaches to social isolation and loneliness, and the difficulty in finding a unique measure that could serve as a good

approach of health care and primary care utilization without being too restrictive. A more uniform approach to these subjects might be good for further investigation, as it might bring a better understanding on the matter.

Despite all the differences found between studies in the definition and quantification of loneliness and social isolation, in the methods used for its assessment, in the health outcomes used to assess health care utilization and the way of getting the information needed, there is still strong evidence that loneliness, social isolation and poor social network have an important role in the frequency of health care utilization, in poor health outcomes, like multimorbidity and mortality, and in lower health promoting behaviors, which goes in accordance to the existing literature [4, 8, 11, 13, 14, 16, 17, 18, 19, 20, 22, 23, 24, 25].

We looked at the rate of female participants, as it was above 50% in almost every study included - with the exception of one [13], that was still very close to 50% - and came up to above 60% in 5 of them. This made us think that either the participants' recruiting methods - most of them relying on the answers of questionnaires - ended up recruiting more female participants, as they might be more prone to complete the questionnaires, or women might be more affected by social isolation and loneliness. In fact, one study admitted that, along with other studies with the similar recruiting methods, their sample might have underrepresented people who have lower primary care attendance and over-represent middle-aged women [18], as another one admitted that women were more likely to answer the questionnaires [10] and one found a highest prevalence of multimorbidity among women [24]. That being said, it was found that women were more prone to social isolation [25] and that the association between loneliness and the use of primary care services was stronger within female participants [8]. In the studies where the percentage of female participants was assessed between different groups, the groups with highest loneliness had a higher percentage of female participants than the less lonely groups [16] and the same happened to social isolation, as the groups with higher social

isolation had a bigger percentage of females than the groups with lower social isolation [25]. But from the studies with more than 60% female participants, one did not find an association between gender and the frequency of health care use [11] and one even found that being male was associated with unplanned hospital admissions [19]. As it can be seen, whether women have highest rates of loneliness and social isolation and the possible reasons and implications should be a subject of interest for future research on loneliness and social isolation.

We are aware that the increase in the health care utilization might be due to other health factors that simultaneously cause the individuals to be more lonely and socially isolated, like for example patients suffering from hearing loss. One of the studies addressed this link between morbidity and loneliness, and the morbidity itself as the possible explanation for increased GP visits, but after controlling for illnesses and a subjective health measure, loneliness was still significantly associated with doctor visits, suggesting that the link between loneliness and health care use isn't explained by the subjacent health conditions [16]. Cayenne et al. offered a plausible explanation for the increased visits to a health care provider from people suffering from social isolation and loneliness, as the appointment can be an opportunity for the individual to have some social connection [14].

We also looked at depression and its implications to the subject, as loneliness and social isolation may be associated with depressive symptoms and vice versa. One study found that individuals with depressive symptoms were less likely to be frequent health services attendants [11], but another one found that individuals with depressive symptoms were more likely to have a follow-up within 7 days after ED discharge [14]. An association between low self-esteem and greater GP visits was also found [10], as well as unemployment and increased frequency of GP visits. These findings contradict themselves and show that depressive symptoms may have different health service utilization outcomes, and the reasons behind one or another should be subject of further investigation. As Cayenne et al. said, "both depression

331 and comorbidities have potential to contribute to and/or be the result of social isolation” [14].
332 This shows that loneliness should not be looked at by itself, but rather in a comprehensive way
333 with a range of psychological and mental health factors, which might be good to take in
334 consideration in future research on the matter.

335 It was surprising to find a correlation between life satisfaction and higher health care
336 consumption [13], as it seems to be in contradiction to the idea that loneliness and social
337 isolation are related to increased health care use. However, that same study said, this may be
338 explained by the bigger value an individual sees in their life, the life they are satisfied with,
339 which leads to a greater pursuit for preventive health care services [13]. This goes accordingly
340 with the finding from one study that social isolation was negatively associated with health-
341 promoting habits [23]. This last study also addressed the connection between a larger network
342 and more social interactions with a better health status, giving the “sense of obligation” to
343 maintain a good health as a possible explanation [23], which is in accordance with the finding
344 that older adults with a higher frequency of social interactions and emotional support have a
345 lower probability of having undiagnosed hypertension [15].

346 We also looked at self-reported data, especially concerning health care use, as it might not be
347 a good way to access this information because of the possible under or overestimation the
348 individuals can incur in. Despite that, it still seems to be the most feasible way to do it, as the
349 studies that relied on health registers might have missed other health services used by the
350 participants outside the clinics or health services checked.

351 About Covid19, various of the included studies were conducted after the pandemic outburst,
352 but only one mentioned it as a factor for their outcomes and found no association between
353 Covid19 related factors and the frequency of online consultations [13].

We are not aware of other recent studies that focus on an older population (above 55 years old) to find the connections between both social isolation and loneliness with various measures of health care utilization such as the present one.

With regard to limitations, we could find several to this systematic review: only two databases were searched, and few articles found that met the inclusion criteria, there was heterogeneity in study design, study population, and even more in the measurements of loneliness and social isolation, as well as the health service use outcomes were very distinct from each other. If there were any biases in the included studies, the compilation of their information could enhance those biases. Finally, there can't be excluded the possibility of confounding because of common causes that may have not been measured, as well as the possibility of reverse association, as aforementioned.

5. Conclusions

This systematic review goes in line with existing literature in showing that loneliness, social isolation and poor social networks are associated with increased GP, ED and specialist visits, and with prolonged hospital stays, as well as with poor health outcomes. There is the need for further investigation to find a trustworthy universal tool of measurement of social isolation and loneliness, to look at them with a more integrative and comprehensive view with psychological and mental health issues and to assess in to what extent do the health outcomes of this review influence themselves the highest rates of loneliness and social isolation.

6. Declarations

6.1. Ethics approval and consent to participate

Not applicable

6.2. Consent for publication

377 Not applicable

378 6.3. Availability of data and materials

379 All data related to this study are contained in this manuscript.

380 6.4. Competing interests

381 The authors declare that they have no competing interests.

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383 This study did not receive any funding

384 6.6. Authors' contributions

385 All the authors contributed to the design of the study. M.M. and P.S. performed the study
386 selection and data extraction. M.M. drafted the manuscript, with contributions from P.S. All
387 authors read and approved the final manuscript.

388 6.7. Acknowledgements

389 Not applicable

390 List of abbreviations

391391

392392

393 GP - General Practitioner

394 ED - Emergency Department

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488 **Figure 1**

489

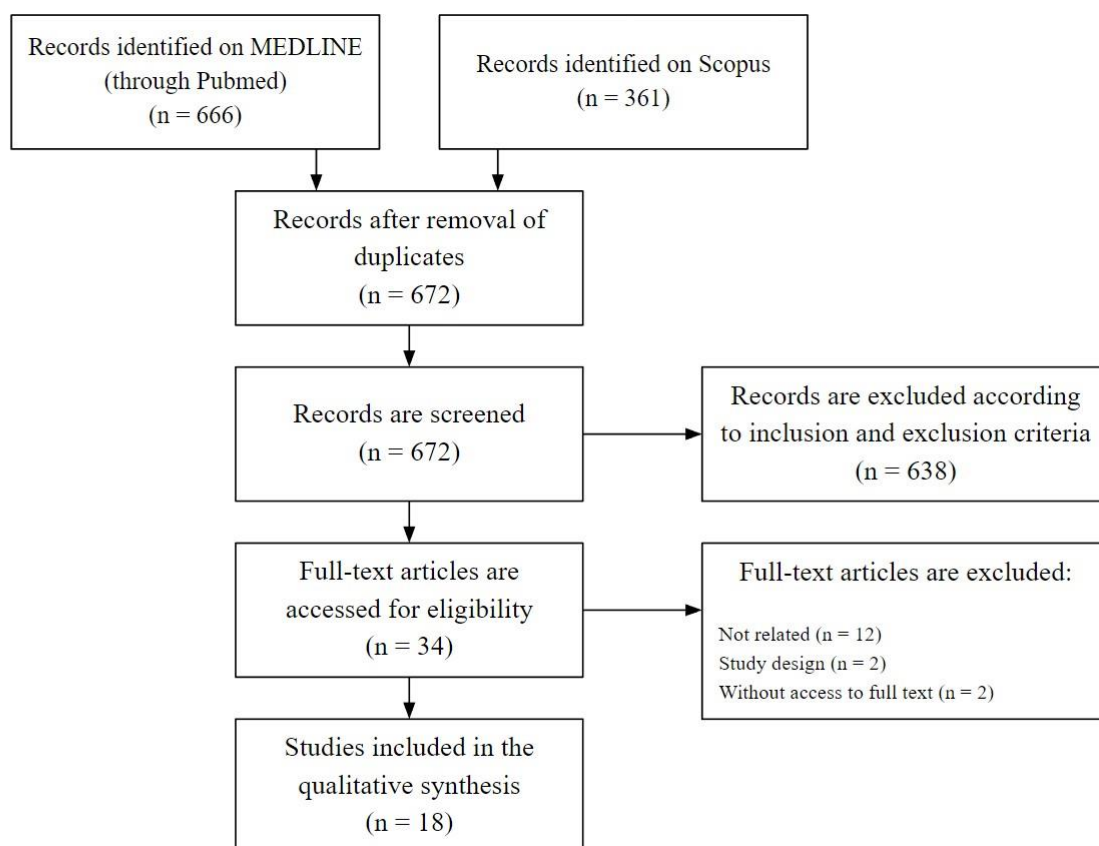


Table 1. Quality Assessment of Observational Cohort and Cross-Sectional Studies

1. Was the research question or objective in this paper clearly stated?
2. Was the study population clearly specified and defined?
3. Was the participation rate of eligible persons at least 50%?
4. Were all the subjects selected or recruited from the same or similar populations (including the same time period)? Were inclusion and exclusion criteria for being in the study prespecified and applied uniformly to all participants?
5. Was a sample size justification, power description, or variance and effect estimates provided?
6. For the analyses in this paper, were the exposure(s) of interest measured prior to the outcome(s) being measured?
7. Was the timeframe sufficient so that one could reasonably expect to see an association between exposure and outcome if it existed?
8. For exposures that can vary in amount or level, did the study examine different levels of the exposure as related to the outcome (e.g., categories of exposure, or exposure measured as continuous variable)?
9. Were the exposure measures (independent variables) clearly defined, valid, reliable, and implemented consistently across all study participants?
10. Was the exposure(s) assessed more than once over time?
11. Were the outcome measures (dependent variables) clearly defined, valid, reliable, and implemented consistently across all study participants?
12. Were the outcome assessors blinded to the exposure status of participants?
13. Was loss to follow-up after baseline 20% or less?
14. Were key potential confounding variables measured and adjusted statistically for their impact on the relationship between exposure(s) and outcome(s)?

491 **Table 2.** Quality Assessment of Systematic Reviews and Meta-Analyses
492

1. Is the review based on a focused question that is adequately formulated and described?
2. Were eligibility criteria for included and excluded studies predefined and specified?
3. Did the literature search strategy use a comprehensive, systematic approach?
4. Were titles, abstracts, and full-text articles dually and independently reviewed for inclusion and exclusion to minimize bias?
5. Was the quality of each included study rated independently by two or more reviewers using a standard method to appraise its internal validity?
6. Were the included studies listed along with important characteristics and results of each study?
7. Was publication bias assessed?
8. Was heterogeneity assessed? (This question applies only to meta-analyses.)

493 **Table 3.** Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies

494

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Quality Rating
[10]	Y	Y	Y	Y	NR	Y	Y	Y	Y	Y	Y	N	N	Y	Good
[11]	Y	Y	Y	Y	NR	N	N	Y	Y	NA	Y	N	Y	Y	Good
[12]	Y	Y	Y	Y	NR	Y	Y	Y	Y	Y	Y	N	Y	Y	Good
[13]	Y	Y	Y	Y	NR	N	N	Y	Y	NA	Y	N	Y	Y	Good
[14]	Y	Y	NR	Y	NR	Y	Y	Y	Y	NA	Y	N	Y	Y	Good
[15]	Y	Y	Y	Y	NR	N	N	Y	Y	NA	Y	N	Y	Y	Good
[16]	Y	Y	Y	Y	NR	N	N	NA	Y	NA	Y	N	Y	Y	Good
[17]	Y	Y	Y	Y	NR	Y	Y	Y	Y	Y	Y	Y	Y	Y	Good
[18]	Y	Y	Y	Y	NR	N	N	Y	Y	NA	Y	N	Y	Y	Good
[19]	Y	Y	Y	Y	NR	Y	Y	Y	Y	Y	Y	N	Y	Y	Good
[20]	Y	Y	Y	Y	NR	N	N	Y	Y	NA	Y	N	Y	Y	Good
[21]	Y	Y	Y	Y	NR	N	N	Y	Y	NA	Y	N	Y	Y	Good
[22]	Y	Y	Y	Y	NR	N	N	Y	Y	NA	Y	N	Y	Y	Good
[23]	Y	Y	Y	Y	NR	N	N	Y	Y	NA	Y	N	Y	Y	Good
[24]	Y	Y	Y	Y	NR	N	N	Y	Y	NA	Y	N	Y	Y	Good
[25]	Y	Y	Y	Y	NR	Y	Y	Y	Y	Y	Y	N	Y	Y	Good

495 **Table 4. Quality Assessment Tool for Systematic Reviews and Meta-Analyses**

496

	1	2	3	4	5	6	7	8	Quality Rating
[4]	Y	Y	Y	Y	Y	N	Y	NA	Good
[8]	Y	Y	Y	Y	Y	Y	Y	Y	Good

497 **Table 5. Study Characteristics**

Study Authors; Year	Article Title	Country	Study design	Sample type	Number of participants	Age	Sex (female percentage)	Outcome of interest	Social Isolation Measure or Loneliness Measure	Health care use measure or Primary care use measure	Key findings
Bock et al.; 2018	The Longitudinal Association between Psychological Factors and Health Care Use	Germany	Longitudinal observational	Representative population-based sample of adults, ≥40 years	n = 2302	Mean age GP visits group: 63.1; Specialist visits group: 63.5 ; hospitalization group: 65.2	GP visits group: 51.2% ; Specialist visits group: 49.9%; hospitalization group: 54.1%	Association between psychological factors and health care use.	Loneliness, measured via short version of the 11-item De Jong Gierveld Loneliness Scale	Self reported frequency of health care use, divided in outpatient treatment (frequency of GP and specialist visits, divided in 6 categories) and inpatient treatment (hospital stays, divided in 12 categories)	A correlation between loneliness and GP visits, specialist visits or hospitalization was not found.
Buczak-Stec et al.; 2020	Frequent attendance in primary care in the oldest old: evidence from the AgeCoDe-AgeQualiDe study	Germany	Cross-sectional	Sample of oldest old primary care patients, ≥ 85 years	n = 861	Mean age 89.0 years	67.59%	Characteristics of frequent attendance among individuals aged 85 years or older.	Social isolation, quantified with the 6-item version of the Lubben Social Network Scale (LSNS-6)	Self reported frequency of attendance to GP's offices. Frequent attendance was defined as 6 and more GP's consultations in the last three months.	Frequent attendance was significantly positively associated with social isolation. Within the frequent attender group, 55.05% reported social isolation, while within the non-frequent attender only 44.47% reported social isolation.
Cayenne et al.; 2021	Association Between Social Isolation and Outpatient Follow-Up in Older Adults Following Emergency Department Discharge	USA	Cohort	Sample of adults after emergency department discharge, ≥60 years	n = 642	Mean age 71.75	53.3%	Social isolation as a predictor of outpatient follow-up after discharge from the emergency department.	Social isolation, using the Social Isolation (PSI) short form questionnaire from the Patient-Reported Outcomes Measurement Information	Follow-up visits with outpatient clinicians within 7 and 30 days of an emergency department visit were obtained from electronic health records.	Socially-isolated older adults had significantly less in-person follow-up within the 7 days following ED discharge. Social isolation did not predict outpatient follow-up at 30 days post ED discharge.

									System (PROMIS).		
Cornwell and Waite; 2012	Social Network Resources and Management of Hypertension	USA	Cross-sectional	Representative population-based of adults, ≥ 55 years	n = 2269	Mean age 69.30 years	51.6%	The contribute of multiple social factors to hypertension diagnosis and control among older adults.	Social isolation, via social support by asking participants for a list of people with whom they most often discussed things and asking about frequency and quality of the relation with those people.	A combination of self-reported and biological measures to assess hypertension diagnosis and control.	Regardless of network size, older adults who interact more frequently with their network members are less likely to have undiagnosed hypertension.
Cruwys et al.; 2018	Social Isolation Predicts Frequent Attendance in Primary Care	United Kingdom	Cross-sectional	Community sample of adults	n = 1752	Mean age 57.47 years	57.3%	Degree to which social isolation might affect frequent GP attendance.	Social isolation, by self reported identification with the family, with the local community, and a third group of the participant's choice.	Frequency of primary care attendance via health records.	A significant relationship between social group connectedness and reduced frequency of primary care attendance was found. It was established that lack of social group connectedness may need further investigation as it could be as a risk factor for more frequent attendance in primary care.
Dahlberg et al; 2018	Planned and Unplanned Hospital Admissions and Their Relationship with Social Factors: Findings from a National, Prospective Study of People Aged 76 Years or Older	Sweden	Prospective Cohort	Representative population-based sample of adults, ≥ 76 years	n = 931	Mean age 83.1 years	61.6%	The relation between planned and unplanned hospital admissions and social factors among older people.	Loneliness, self-reported by answers to single questions devided in 4 categories. Social isolation, by self-reported social contacts and social activity (with questionnaire answers).	If there were planned or unplanned hospital admissions between the date of the interview and the end of the year.	An association between unplanned hospital admissions and lower levels of social contacts and social activity was found.

Gerst-Emerson and Jayawardhana; 2015	Loneliness as a Public Health Issue: The Impact of Loneliness on Health Care Utilization Among Older Adults	USA	Cross-sectional	Representative population-based sample of adults, ≥ 60 years	n = 3530	Mean age 2008 Lonely group: 71.19 ; Not lonely group: 71.24 ; 2012 Lonely group: 75.50 ; Not lonely group: 74.85	2008 Lonely group: 61.52% ; Not lonely group: 56.60% ; 2012 Lonely group: 63.38% ; Not lonely group: 53.75%	Association between loneliness and higher health care utilization among older adults.	Loneliness, measured with the 3-item loneliness scale developed by Hughes et al. 2004	Frequency of health care use by self-reported number of hospitalizations and number of approaches to a medical doctor	There was found an association between lonely respondents and a greater frequency of doctors' and hospital visits; Lonely respondents had more depressive symptoms, were less likely to count their health as good, very good, or excellent, and reported slightly more chronic conditions;
Hajek and König; 2018	Which factors lead to frequent attendance in the outpatient sector among individuals in the second half of life? Evidence from a population-based longitudinal study in Germany	Germany	Longitudinal observational	Representative population-based sample of adults, ≥ 40 years	n = 1049	Mean age GP visits non-frequent attenders: 66.9 ; GP visits frequent attenders: 66.3 ; Specialist visits non-frequent attenders: 64.0 ; Specialist visits frequent attenders: 64.0	51.6%	The factors leading to frequent attendance in the outpatient sector.	Loneliness. Measure tool not specified.	Frequency of GP or specialist visits in the previous 12 months, assessed by health records. Frequent attendance was considered as more than 6 visits within a year.	"Neither cognitive function nor loneliness were associated with the outcome measures."
Hajek and König; 2022	Frequency and Correlates of Online Consultations With Doctors or Therapists in Middle-Aged and Older Adults: Nationally Representative Cross-sectional Study	Germany	Cross-sectional	Representative population-based sample of adults ≥ 46 years	n = 3067	Mean age 67.6 years	49.31%	Frequency and correlates of online consultations with doctors or therapists.	Loneliness, measured via short version of the 11-item De Jong Gierveld Loneliness Scale	Frequency of online consultations with doctors and therapists, self-reported.	There was found an association between an increased loneliness and the likelihood of having online consultations.

Lambotte et al.; 2018	Frailty differences in older adults' use of informal and formal care	Belgium	Cross-sectional	Representative population-based sample of adults, ≥ 60 years	n = 12,481	Age groups: 60-69: 27.1% ; 70-79: 36,3% ; 80+: 36,7%	64.3%	The association between different combinations of informal and formal care and the need for care and enabling factors for care use among older adults.	Frailty Assessment Instrument (CFAI). Social domain for social isolation and psychological domain for loneliness.	Respondents indicated the source of formal help they used, between general practitioner, home nursing and formal home assistance.	Older adults in need of assistance were more psychologically and socially frail than expected.
Mosen et al.; 2021	Social Isolation Associated with Future Health Care Utilization	USA	Retrospective observational	Representative sample of Medicare members, ≥ 65 years	n = 18,557	Mean age 73.4 years	56.5%	Associations between social isolation and hospital and emergency department utilization.	Social isolation in response to the MTHA question, "How often do you feel lonely or isolated from those around you?" and transforming the answers into 3 categories.	Frequency of inpatient hospital admissions and emergency department's visits, by medical records, in the 12 months following the index MTHA	There was a significant association between social isolation and hospital admissions; the participants who reported higher social isolation had increased odds of having an hospital admission.
Naito et al; 2021	Impact of social isolation on mortality and morbidity in 20 high-income, middle-income and low-income countries in five continents	Worldwide	Longitudinal observational	Representative population-based sample of adults	n = 118764	Social isolation group mean age: 52.2 years; No social isolation group mean age: 50.1 years	Social isolation group: 72.4%; No social isolation group: 56.3%	Association between social isolation and mortality and incident diseases in adults in urban and rural communities from high-income, middle-income and low-income countries.	Social isolation, self-reported by using a scale of five items from PURE baseline questionnaire.	All cause mortality, cardiovascular mortality, non-cardiovascular mortality and incidence of pre-selected diseases, via medical records.	There was found an association between old age, being female, having a low level of education and being unemployed and the increase odds of being socially isolated; Smoking, having a poor diet and disabilities were associated with social isolation; An association between social isolation and increased risk of all-cause mortality was found.
Sirois and Owens; 2021	A meta-analysis of loneliness and use of	United Kingdom	Meta-analysis	Studies that met the inclusion criteria	25 studies included	Majority of studies included had a mean age	Majority of the studies had more than	Assess the association between loneliness and	Non applicable	Non applicable	An association between loneliness and an increased number of visits to primary care providers was found.

	primary health care					above 60 years old (15/25)	50% females (21/25)	use of primary care.			
Souza et al; 2021	Multimorbidity and its associated factors among adults aged 50 and over: A cross-sectional study in 17 European countries	17 european countries	Cross-sectional	Representative population based sample of adults, ≥ 50 years	n = 63,844	Age groups 50-59 years: 25.17%; 60-69 years: 35,89%; 70-79: 25,94%; 80+: 13%	55.71%	Estimate the prevalence of multimorbidity among European adults and analyse its association with gender, age, education, self-rated health, loneliness, quality of life, size of social network, Body Mass Index (BMI) and disability.	Loneliness, measured with the 3-item loneliness scale developed by Hughes et al. 2004	Multimorbidity, self-reported by the participants by answering if they have or not a disease from a list of 13 non-communicable diseases.	Multimorbidity was positively associated with high loneliness.
Taube et al.; 2015	Loneliness and health care consumption among older people	Sweden	Cross-sectional	Community sample of adults, ≥ 65 years	n = 153	Mean age 81.5 years	66.7%	Relation between loneliness, HRQoL and health complaints and health care consumption of in- and outpatient care.	Loneliness, self-reported by answering to four single-item questions.	Frequency of utilization and length of stay, by using two databases to access registers from the previous 12 months. Data was divided in inpatient care (number of visits and length of stay for both acute and planned care) and outpatient care (number of visits to a doctor or to an emergency department, and if it lead or not to an hospital admission).	There was found a significant association between patients reporting loneliness and the greater use of outpatient services. Participants reporting loneliness had more contacts with a physician more visits to an emergency department.

Valtorta et al.; 2018	Older Adults' Social Relationships and Health Care Utilization: A Systematic Review	United Kingdom	Systematic review	Sample of studies that met the inclusion criteria	126 studies included	Studies with less than 50% of the sample older than 60 years or mean age younger than 60 years were excluded.	Not mentioned.	Association between social relationships and the use of health services.	Social isolation by social relationships and network: structure of a person's social network, the availability of social support and subjective perceptions of social support.	Contact with all physicians. Hospital admission. Hospital readmission. Length of time spent in hospital. Emergency department use. Home- and community-based service use. Senior centre and day centre use. General health service use. Mental health service use. Medication, preventive services, cancer support, ambulance, and hospital social work services.	Strong evidence of an association between social relationships and the likelihood of early hospital readmission was found. Smaller social networks were associated with longer hospital stays. There was no evidence that older people with weaker social relationships have greater demands on ambulatory care than warranted by their needs.
Vozikaki et al.; 2017	Preventive health services utilization in relation to social isolation in older adults	Greece	Cross-sectional	Representative population-based sample of adults, ≥ 65 years	n = 5129	Age groups 65-74 years: 60,3%; 75-84 years: 33,2%; 85+ years: 6,5%	53.9%	Relation between utilization of preventive health services and social isolation.	Social isolation, self-reported in a structural and functional questionnaire, with questions about living arrangements, marital status, number of children and family-associated relations.	Utilization of preventive health services, self-reported from a 12-item questionnaire.	An association between highly isolated adults and fewer preventive health services was found.
Wu and Sheng; 2021	Social isolation and health-promoting	China	Cross-sectional	Community sample of adults, ≥ 60 years	n = 485	Mean age Healthy group: 67,17;	Healthy group: 73.6%; With one	Relation between social isolation and	Social isolation, quantified with the 6-item version	Health-promoting behaviours, measured with the	A significant negative association between social isolation and health-promoting

	behaviours among older adults living with different health statuses: A cross-sectional study					With one disease group: 69,29; Multimorbidity group: 72,11	disease group: 67.8%; Multimorbidity group: 60%	health promoting behaviours.	of the Lubben Social Network Scale (LSNS-6)	Health-Promoting Lifestyle Profile II (HPLP-II).	behaviours was found for the whole sample and for participants living with multimorbidity, but not between social isolation and health-promoting behaviours of healthy participants.
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PRISMA 2009 Checklist

Section/topic	#	Checklist item	Reported on page and paragraph/ table #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	TITLE: The role of loneliness and social isolation among older adults in the use of health care services - A systematic review
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	Page 2 “Background (...) hospital stays.”
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	Page 3 and 4 “Loneliness (...) of utilization.”
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	Page 4 “This (...) care utilization.”
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	Not applicable
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	Page 5 “The studies (...) excluded.”



PRISMA 2009 Checklist

Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	Page 5 “Two databases (...) the matter.”
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	Page 5 “The search (...) care use”
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	Page 5 and 6 “Two researchers (...) eligibility criteria”
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	Page 6 “The data (...) organization.”
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	Page 6 “The following (...) key findings.”
Risk of bias in individual studies / Risk of bias across studies	12/ 15	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	Page 6 “To assess (...) 3 and 4).”
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	Not applicable
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	Not applicable
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	Not applicable
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	Page 7 “From the (...) process).” and Figure 1
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	Page 7 to 12 “From the (...) hospital admissions.”
Risk of bias within and across studies	19/ 22	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	Page 7 “and all of them (...) and 4.” And Tables 3 and 4



PRISMA 2009 Checklist

Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	Not applicable
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	Not applicable
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	Not applicable
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	Page 12 to 16 “Through the (...) present one.”
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	Page 16 “With regard to (...)aforementioned”
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	Page 16 “This systematic (...)social isolation.”
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	Not applicable

From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097

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Criteria

Research articles should report on original primary research or new experimental or computational methods, tests or procedures. Manuscripts reporting results of a clinical trial must conform to CONSORT 2010 guidelines. Authors of randomized controlled trials should submit a complete CONSORT checklist alongside their manuscript, available at www.consort-statement.org. Research articles may also report on systematic reviews of published research provided they adhere to the appropriate reporting guidelines which are detailed in our [editorial policies](#). Please note that non-commissioned pooled analyses of selected published research and bibliometric analyses will not be considered. Studies reporting descriptive results from a single institution or region will only be considered if analogous data have not been previously published in a peer reviewed journal and the conclusions provide distinct insights that are of relevance to a regional or international audience.

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Preparing your manuscript

The information below details the section headings that you should include in your manuscript and what information should be within each section.

Please note that your manuscript must include a 'Declarations' section including all of the subheadings (please see below for more information).

Title page

The title page should:

- present a title that includes, if appropriate, the study design e.g.:

- "A versus B in the treatment of C: a randomized controlled trial", "X is a risk factor for Y: a case control study", "What is the impact of factor X on subject Y: A systematic review"
- or for non-clinical or non-research studies a description of what the article reports
- list the full names and institutional addresses for all authors
 - if a collaboration group should be listed as an author, please list the Group name as an author. If you would like the names of the individual members of the Group to be searchable through their individual PubMed records, please include this information in the "Acknowledgements" section in accordance with the instructions below
- indicate the corresponding author

Abstract

The Abstract should not exceed 350 words. Please minimize the use of abbreviations and do not cite references in the abstract. Reports of randomized controlled trials should follow the [CONSORT](#) extension for abstracts. The abstract must include the following separate sections:

- Background: the context and purpose of the study
- Methods: how the study was performed and statistical tests used
- Results: the main findings
- Conclusions: brief summary and potential implications
- Trial registration: If your article reports the results of a health care intervention on human participants, it must be registered in an appropriate registry and the registration number and date of registration should be stated in this section. If it was not registered prospectively (before enrollment of the first participant), you should include the words 'retrospectively registered'. See our [editorial policies](#) for more information on trial registration

Keywords

Three to ten keywords representing the main content of the article.

Background

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- Availability of data and materials
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Healthwise Knowledgebase. US Pharmacopeia, Rockville. 1998. <http://www.healthwise.org>. Accessed 21 Sept 1998.

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