PEER REVIEW HISTORY

ARTICLE DETAILS

TITLE (PROVISIONAL)	Effect of social prescribing link workers on health outcomes and costs for adults in primary care and community settings: a systematic review
AUTHORS	Kiely, Bridget; Croke, Aisling; O'Shea, Muireann; Boland, Fiona; O'Shea, Eamon; Connolly, Deirdre; Smith, Susan

VERSION 1 – REVIEW

REVIEWER	Stephanie Tierney University of Oxford, Nuffield Department of Primary Care Health Sciences
REVIEW RETURNED	02-May-2022

GENERAL COMMENTS	Thank you for the opportunity to comment on this systematic review of link workers providing social prescribing. There are some comments that I have to make to the authors in relation to the paper: Methods • The decision to compare services across countries – given the variation in how social prescribing is applied in different countries (there is a new paper on this about to come out in BMJ Global Health), I wonder if this had been an area of consideration by the team? As only two countries were reflected in included papers, this was perhaps not an issue, although it is something to consider when synthesising papers on interventions that are context dependent. • It was good to see the range of terms used to try and identify papers. Perhaps there could be a reference to the following paper that highlighted the range of terms used in England (https://bjgp.org/content/69/687/e675.abstract). • The authors had face-to-face interaction as an inclusion criteria. Perhaps there needs to be some reflection on this in light of how link workers have and continue to work because of the pandemic – remote working has been adopted and continues to be used or is mixed with face-to-face interactions. • Data management – how were data that were extracted managed? Excel? Excel and Word? • Page 11 – at the start of the section on the review process, what was meant by 'clearly ineligible titles'? Can some examples of what constituted clearly ineligible be given? Results • I presume that papers also did not give information about how long interactions were between a patient and a link worker (e.g. number of minutes per patient)? Whether the interactions were short or medium or long?

	• Any information on the professional background/prior background of link workers in the studies? • Any information about how many things patients were connected to in the community? Any information in papers about the sorts of things papers were referred on to? • Were Kangovi et al. 2017 and 2018 different studies or just reporting on different elements of the same study? • It was interesting to note a lack of increase in social support in included studies (page 22) – given that social capital development has been proposed as a key component of bringing anticipated benefits in social prescribing (https://bmcmedicine.biomedcentral.com/articles/10.1186/s12916-020-1510-7). This would seem to fit with the finding of a lack of improvement in loneliness. Perhaps if this is not addressed sufficiently then benefits in terms of quality of life and cost savings will not arise? Discussion • There could be some reflection here about the difficulties of a trial type design for this type of intervention. What is likely to be happening is that it works for some people, in certain situations for specific reasons – taking a binary approach (works/doesn't work) is probably too blunt for a complex intervention like this – which is shaped by contextual factors and relationships. • Mention of the PAM on page 29 – I am not sure if this is still recommended for use. Implications for practice • Perhaps reflect on changes that may come about due to COVID (e.g. more remote working, shorter appointments) – this may mean there is not enough time to legitimise the link worker role as a credible alternative to medical care from the perspective of patients (as suggested in a previous realist review - https://bmcmedicine.biomedcentral.com/articles/10.1186/s12916-020-1510-7). Conclusion • Page 30 – the line about cost savings ('The opportunity costs of investing in social prescribing may be considerable') – perhaps make very clear that there is a lack of evidence to make this claim at present.

REVIEWER	Martin Gulliford King's College London, UK
REVIEW RETURNED	12-May-2022

GENERAL COMMENTS	This is a well written paper on a topical subject. There are only minor issues that could be addressed before publication: 1. In the Asbtract, please comment on the quality of the evidence reviewed. 2. In the Abstract Results and Discussion, please adjust the wording to make clear the distinction between absence of evidence and evidence of abssence: https://www.bmj.com/content/311/7003/485 3. The included studies might possibly have been naive to think that a link worker would have short term imp[acts on QoL. In the

	Discussion, it might be worth suggesting a possible logic model for how the link worker might have effect. This could lead to suggestions for more appropriate process and outcome measures.

REVIEWER	Adrienne Sabety University of Notre Dame, Department of Economics
REVIEW RETURNED	18-May-2022

GENERAL COMMENTS	This is a systematic review of link workers across UK and US contexts. I believe the work does as it sets out to do, although I have several suggestions to help the clarity of the manuscript. - The search is a year old – it should be refreshed - The authors should define link workers up front, ideally in both the abstract and introduction. o There are a number of different terms used for these workers (at least given my understanding), e.g. community health workers, patient navigators, case managers, etc. Would suggest making this clear - I was confused about the relationship btw link workers and social prescribing. The discussion frames around social prescribing, whereas the intro talks about link workers. Neither term was clearly defined, much less the intersection btw the two. o I suggest streamlining the terminology around link workers or social prescribing, instead of using the two interchangeably. - The authors search criteria do not seem all inclusive. E.g. I would think that case manager and social worker should be included. - I would suggest the authors make it clear in the introduction why this is an important topic - There are a number of places where the use of citations would be helpful. E.g. line 39 in the introduction. - The UK and US environments are extremely different, especially for something like link workers. For instance, baseline access issues are quite important in the US context. As a result, the country is extremely important to contextualizing the results in Table 2 and I would suggest adding this information. - Is there a way to report results in Table 1 as well? This would help the reader see and think through the mechanics a bit more. Perhaps you can combine Table 1 with Table 3? - Table 3 only reports adjusted mean differences. In order to interpret across studies, and to have a sense of relative magnitudes, authors should also report means. - I believe Table 3 notes only defines SF12v2, not SF12 PCS. Please make clear what these both are. - I wanted more in the discussion about what we can learn from these studies, as well as what we cannot. - Please make text font consistent throughout

VERSION 1 – AUTHOR RESPONSE

Reviewer 1	
The decision to compare services across countries –given the variation in how social prescribing is applied in different countries (there is anew paper on this about to come out in BMJ Global Health), I wonder if this had been anarea of consideration by the team? As only two countries were reflected in included papers,this was perhaps not an issue, although it is something to consider when synthesising papers on interventions that arecontext dependent.	Thank you for that relevant reference. We have included it in the Introduction. “Social prescribing is however gaining momentum internationally and while interventions are adapted to the local context,there are similarities and potential to learn from experiences in other countries. (13)” (P7) We agree that context and variation in application of social prescribing, not just in different countries but indifferent boroughs makes it challenging to make direct comparisons, and because of the heterogeneityof the papers identified we did not attempt meta- analysis. We have tried to be as specific as possible around the context of any results and have added country to all tables to help put results in context as per suggestion from Reviewer 3. We also refer to the heterogeneity of interventions in our Discussion “It could be argued that only four of the studies tested interventions that reflect the format of currentsocial prescribing link worker activities in the UK, which are relatively short and tailored to the individual and locality, with a high degree of flexibility(25, 29-31). Even among these, there is variation in terms of the intensity of support and link worker location, with both community and primary care settings”
It was good to see the range of terms used to try andidentify papers. Perhaps there could be a reference to the following paper that highlightedthe range of terms used in England (https://bjgp.org/content/69/687/e675.abstract).	Thank you. Again another useful reference that wehave included in the Methods section. “Inclusion was based on the function of the role, i.e.supporting people to improve their health and wellbeing through connecting them with communityresources and health and social care coordination, recognising that there is a wide range of terms used to describe such roles. (17)” (P8)

The authors had face-to-face interaction as aninclusion criteria. Perhaps there needs to be some reflection on this in light of how link workershave and continue to work because of the pandemic – remote working has been adopted and continues to be used or is mixed with face-to- face interactions.	Yes- the inclusion criteria were developed prior to thepandemic with the intention of distinguishing telephone interventions from link worker interventions, which usually where possible involve atleast one face to face interaction. We have clarified inthe Methods section that only one meeting needed tobe face to face and others could be remote "Participants meeting with a link worker face to face at least once, although additional contacts could be via telephone or other remote methods" (P9). We have also added a line to the Discussion on implications for research acknowledging the changein practice "(45) Since the pandemic link workers
	have adapted to restrictions and use more remote supports which has impacted participants experience. (46) The impact of this on outcomes is yet to beevaluated. (P32)
Data management – how were data that wereextracted managed? Excel? Excel and Word?	Excel was used to manage extracted data. And this has been added to the Methods on P12 under Data Management "Excel was used to manage extracted data"
Page 11 – at the start of the section on the reviewprocess, what was meant by 'clearly ineligible titles'? Can some examples of whatconstituted clearly ineligible be given?	As outlined in response to editors comments, we have added an example and further clarification ofthis process to the Methods "The lead author (BK) then did an initial screen to remove clearly ineligible titles. This step was necessary due to the large number of potentially eligible reports returned by our search strategy. Where it was clear from the title that our eligibility criteria on population, intervention or methods werenot met the title was excluded. For example, a title clearly reporting a qualitative study of a healthcare intervention delivered by lay people to children, suchas a qualitative study of a community health worker intervention for childhood diarrhoea, would have been excluded. Any report where it was not clear from the title if eligibility criteria were met was reviewed by abstract by BK and AC (P12/13)

I presume that papers also did not give informationabout how long interactions were between a patient and a link worker (e.g. number ofminutes per patient)? Whether the interactions were short or medium or long?	You are correct and we had reported this lack of information. The IMPaCT intervention included duration of time spent with participants- 38.4 hours in total, but there was not any detail on duration of individual contacts in this or other studies. We have added additional comment on this in the Results: Interventions and comparators, for the IMPACT studyas follows "Each link worker worked with 55 clients per year foran average of 38.4 hours suggesting an average of one hour per meeting"
Any information on the professional background/prior background of link workers in thestudies?	Any information available has been included in Table1 under "Intervention"
Any information about how many things patients were connected to in the community? Any information in papers about the sorts of things paperswere referred on to?	There was no information on how many resources orservices people were connected to but some additional information on types and uptake of resources has been added to the Results: Interventions and comparators on page 15 "Resources referred to were tailored to the individualin all interventions with counselling services, social and craft groups, exercises classes, addiction

	supports, welfare and employment advice all mentioned as examples of resources. Only one studyreported specifically on uptake of community resources with uptake of resources positively associated with number of link worker contacts and ranging from 36% of participants who had met once to 71% of participants who had met 4 times. (29) "
Were Kangovi et al. 2017 and 2018 different studies or just reporting on different elementsof the same study?	They were different studies. The 2017 paper reported on participants recruited via internal medicine clinics, and the 2018 paper on participants from primary care centres. The intervention was the same. See Table 1.

It was interesting to note a lack of increase in socialsupport in included studies (page 22) – given that social capital development has beenproposed as a key component of bringing anticipated benefits in social prescribing (https://bmcmedicine.biomedcentral.com/articles/10.1186/s12916-020-1510-7). This would seem to fit with the finding of a lack of improvementin loneliness. Perhaps if this is not addressed sufficiently then benefits in terms of quality of life and cost savings will not arise?	A comment on this has been added in the Discussion"Improving social connections is one of the key mechanisms by which social prescribing is thought toimprove outcomes, (38, 39), but only three studies reported on this. Including this as an outcome in future may help demonstrate interim impact." (P29) "As mentioned previously social connectedness is another important interim measure to consider."(P33)
There could be some reflection here about thedifficulties of a trial type design for this type of intervention. What is likely to be happening is thatit works for some people, in certain situations for specific reasons – taking a binaryapproach (works/doesn't work) is probably too blunt for a complex intervention like this – whichis shaped by contextual factors and relationships.	We have attempted to address some of the challenges on P32 and added a line to the Discussion:Implications for future research emphasising that theRCT is only part of the picture for complex interventions "RCTs are feasible as shown by the trials in the review. They are of course challenging given the tailored nature of social prescribing link worker interventions, and parallel process evaluations are recommended to evaluate contextual factors and mechanisms of action, (55), which in turn can inform further refining of existing programmes." (P33)
Mention of the PAM on page 29 – I am not sure if thisis still recommended for use.	It is, but among a range of other measures, so the focus is not so much on PAM so we have removed this reference in the the Discussion: Implications for future research and replaced it with "There are no agreed outcomes or measures for social prescribing. The NHS does not recommend any specific measuresin its draft outcomes framework that recommends self management, physical activity and social connectedness as individual outcomes. (3)" (P33)
Perhaps reflect on changes that may come about dueto COVID (e.g. more remote working, shorter appointments) – this may mean there is notenough time to legitimise the link worker role as a credible alternative to medical carefrom the perspective of patients (as suggested in a previous realist review -	A comment on this has been added to the Discussion:Implications for research "Since the pandemic link workers have adapted to restrictions and use more remote supports, which has impacted participants experiences. (46) The impact of this on outcomes is yet to be evaluated." (P32)

https://bmcmedicine.biomedcentral.com/articles/10.1186/s12916-020-1510-7).	

Page 30 – the line about cost savings ('The opportunity costs of investing in social prescribing may be considerable') – perhaps make very clear thatthere is a lack of evidence to make this claim at present.	We have replaced this line in the Conclusion with "The opportunity costs of investing in social prescribing link workers are unknown. It is essential that high quality trials determining cost effectivenessare conducted so that the evidence can catch up withthe policy and we avoid wasting valuable time and resources. "
Reviewer 2	
In the Abstract, please comment on the quality of theevidence reviewed.	The revised abstract now includes this. "Eight studies(n=6,500 participants), with five randomized controlled trials at low risk of bias and three controlled before after studies at high risk of bias, were included."
In the Abstract Results and Discussion, please adjustthe wording to make clear the distinction between absence of evidence and evidence of absence	Wording has been adjusted to make this clear in the revised Abstract "There is an absence of evidence forsocial prescribing link workers. " And in the Conclusion "The opportunity costs of investing in social prescribing link workers are unknown and it is essential that high quality trials determining cost effectiveness are conducted so that the evidence cancatch up with the policy and we avoid wasting valuable time and resources. "
3. The included studies might possibly have been naïve to think that a link worker would have short term imp[acts on QoL. In the Discussion, it might beworth suggesting a possible logic model for how thelink worker might have effect. This could lead to suggestions for more appropriate process and outcome measures.	We have included a comment on the importance ofimproving social connections as a potential mechanism for improving outcomes in social prescribing in Discussion ""The outcomes chosen, in particular HRQoL may alsohave been difficult to improve in the short time frameof most studies. Improving social connections is one of the key mechanisms by which social prescribing is thought to improve outcomes, (38, 39), but only three studies reported on this. Including this as an outcome in future may help demonstrate interim impact" (P30) The limitations of HRQoL had been mentioned previously in the Discussion and we have now referred to the potential of social connections as aninterim measure. "The EuroQoL HRQoL measure, EQ-5D-5L (50), is one such measure, but it can be difficult to show changes in a relatively short timeframe (51) and is quite healthfocused whereas social prescribing has potentially wider social benefits. The ICECAP-A (The ICEpop CAPability measure for Adults) is an alternative. (52) It measures capability well-being, can be used in

	economic evaluations and is recommended by NICE

	for use in evaluations of interventions with potential health and social benefits. (53) Future studies should consider its inclusion as an outcome. As mentioned previously social connectedness is another important interim measure to consider" (P33)
Reviewer 3 The search is a year old – it should berefreshed	It is not within our resources to update the full search, particularly given the volume of citations thissearch identifies. To address this comment we have updated the forward citation search, resulting in the identification of one more US based RCT, which has now been included.

The authors should define link workers up front, ideally in both the abstract and introduction. o There are a number of differentterms used for these workers (at least given myunderstanding), e.g. community health workers, patient navigators, case managers, etc. Would suggest making this clear	This is now defined in the Abstract “social prescribing link workers (non-health or social care professionals who connect people to community resources)” and in more detail in the introduction “Social prescribing is a way of linking people with complex needs to non-medical supports in the community. There are different models of social prescribing, ranging from online signposting services to individual support from a link worker to access community resource. The link worker model of social prescribing is most frequently used in the UK.(1) Link workers are non health or social care professionals, usually based in primary care or community organisations, who determine the health and well-being needs of people referred to them (usually by health care professionals), co-produce a health and well-being plan and provide support to connect with community resources to meet these needs.” (P6) The different terminology is referred to in the Methods: Intervention section as follows: “Social prescribing link workers may be known by other terms such as community health workers, patient navigators or health facilitators. While all of these work in the area of health, they are generally considered “lay workers” as they have not completed formal professional health or social care qualifications. Similarly, the process of social prescribing may be known by other terms such as “community referral” or “navigation”. Inclusion was based on the function of the role, i.e. supporting people to improve their health and wellbeing throughconnecting them with community resources and health and social care coordination, recognising that there is a wide range of terms used to describe such roles. (17)” (P8)
I was confused about the relationship btw link workers and social prescribing. The discussionframes around social prescribing, whereas the	Terminology has now been streamlined to refer to “social prescribing link workers” throughout, to avoid

intro talks about link workers. Neither term wasclearly defined, much less the intersection btw the two. o I suggest streamlining the terminology around link workers or social prescribing, instead of using the two interchangeably.	confusion with the other lighter touch forms of socialprescribing mentioned in the introduction.

The authors search criteria do not seem all inclusive. E.g. I would think that case managerand social worker should be included.	Case managers and social workers would be regardedas health and social care professionals. Link workers are specifically non-health or social care professionalsand so these terms were not included in the search criteria.
I would suggest the authors make it clear in theintroduction why this is an important topic	We have revised the Introduction to reflect this "A recent systematic review however, concluded thatthere was a lack of evidence for how, for whom and when social prescribing was effective or how much it cost.(10) Previous reviews have only looked at U.K. based interventions and included a broad range of studies including those with uncontrolled designs.(11,12). Social prescribing is however gaining momentum internationally and while interventions are adapted tothe local context, there are similarities and potential to learn from experiences in other countries. (13) Weaimed to systematically review the evidence of effectiveness and costs of link worker social prescribing link worker interventions internationally and to establish the evidence, if any, for their effectiveness in people with multimorbidity and socialdeprivation." (P7)
There are a number of places where the use ofcitations would be helpful. E.g. line 39 in the introduction.	We have rephrased this line to make it clearer "People experiencing multimorbidity (defined as twoor more chronic health conditions) experience fragmented care, poorer health outcomes and more psychological stress and as multimorbidity becomes the norm among an aging population, it poses a significant challenge to health systems.(4)"
The UK and US environments are extremely different, especially for something like link workers. For instance, baseline access issuesare quite important in the US context. As a result, the country is extremely important to contextualizing the results in Table 2 and I would suggest adding this information.	The country location has now been included in alltables.
Is there a way to report results in Table 1 as well? This would help the reader see and think through the mechanics a bit more. Perhaps youcan combine Table 1 with Table 3?	Unfortunately there is a journal limit on length of tables and we also think this volume of informationwould make the Table very difficult to read.
Table 3 only reports adjusted mean differences. In order to interpret across studies,	Means (SD) are now included in Table 3
and to have a sense of relative magnitudes,authors should also report means.	

I believe Table 3 notes only defines SF12v2, not SF12 PCS. Please make clear what theseboth are.	SF12 PCS would have been the original score and V2an updated version, but we double checked Dickenset al and they used V2, so this has been updated in the table.
I wanted more in the discussion about what we*can* learn from these studies, as well as what we cannot.	We have now included this in the Discussion "Thesefindings demonstrate that it is possible to conduct RCTs of social prescribing link worker interventions,but for those with complex needs more intense interventions delivered alongside chronic disease management programmes may be required to improve outcomes. " (P29)
Please make text font consistent throughout	Font size in Table 1 was smaller to meet journal requirements for Tables fitting onto 2 pages. It is nowCalibri 10 in all Tables for consistency and Times New Roman 12 in main text.

VERSION 2 – REVIEW

REVIEWER	Stephanie Tierney University of Oxford, Nuffield Department of Primary Care Health Sciences
REVIEW RETURNED	15-Aug-2022

GENERAL COMMENTS	I am happy with the revisions and responses provided by the authors.

REVIEWER	Adrienne Sabety University of Notre Dame, Department of Economics
REVIEW RETURNED	18-Aug-2022

GENERAL COMMENTS	The reviewer completed the checklist but made no further comments.