



ORIGINAL ARTICLE

Improving mental health and wellbeing in elderly people isolated at home due to architectural barriers: A community health intervention



Ferran Daban^{a,d,e,*}, Irene Garcia-Subirats^{a,d}, Victoria Porthé^{a,c}, M^aJosé López^{a,c,d}, Begoña de-Eyto^b, M Isabel Pasarín^{a,c,d,e}, Carme Borrell^{a,c,d,e}, Lucía Artazcoz^{a,c,d,e}, Anna Pérez^{a,d}, Elia Díez^{a,c,d,e}

^a Agència de Salut Pública de Barcelona, Barcelona, Spain

^b Creu Roja Barcelona, Barcelona, Spain

^c Centro de Investigación Biomédica en Red Epidemiología y Salud Pública (CIBERESP), Madrid, Spain

^d Institut d'Investigació Biomèdica de Sant Pau, Barcelona, Spain

^e Department of Experimental and Health Sciences, Universitat Pompeu Fabra, Barcelona, Spain

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KEYWORDS

Elderly;
Loneliness;
Social isolation;
Health outcomes;
Health inequalities;
Community health
intervention

Abstract

Objectives: To explore the health effects of a community health intervention on older people who are isolated at home due to mobility problems or architectural barriers, to identify associated characteristics and to assess participants' satisfaction.

Design: Quasi-experimental before–after study.

Setting: Five low-income neighbourhoods of Barcelona during 2010–15.

Participants: 147 participants, aged ≥ 59 , living in isolation due to mobility problems or architectural barriers were interviewed before the intervention and after 6 months.

Intervention: Primary Health Care teams, public health and social workers, and other community agents carried out a community health intervention, consisting of weekly outings, facilitated by volunteers.

Measurements: We assessed self-rated health, mental health using the General Health Questionnaire (GHQ-12), and quality of life through the EuroQol scale. Satisfaction with the programme was evaluated using a set of questions. We analysed pre and post data with McNemar tests and fitted lineal and Poisson regression models.

* Corresponding author.

E-mail address: fdaban@aspb.cat (F. Daban).

Results: At 6 months, participants showed improvements in self-rated health and mental health and a reduction of anxiety. Improvements were greater among women, those who had not left home for ≥ 4 months, those with lower educational level, and those who had made ≥ 9 outings. Self-rated health [aRR: 1.29(1.04–1.62)] and mental health improvements [β : 2.92(1.64–4.2)] remained significant in the multivariate models. Mean satisfaction was 9.3 out of 10.

Conclusion: This community health intervention appears to improve several health outcomes in isolated elderly people, especially among the most vulnerable groups. Replications of this type of intervention could work in similar contexts.

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PALABRAS CLAVE

Personas mayores;
Soledad;
Aislamiento social;
Resultados en salud;
Desigualdades en salud;
Intervención en salud comunitaria

Mejorando la salud mental y el bienestar de las personas mayores aisladas en casa debido a las barreras arquitectónicas: una intervención de salud comunitaria

Resumen

Objetivos: Explorar los efectos sobre la salud de una intervención de salud comunitaria en personas mayores aisladas en casa debido a problemas de movilidad o a barreras arquitectónicas, identificar las características asociadas y evaluar la satisfacción de las personas participantes.

Diseño: Estudio cuasi-experimental antes-después.

Emplazamiento: Cinco barrios de baja renta de Barcelona durante 2010-15.

Participantes: Se entrevistó a 147 participantes, ≥ 59 años, antes y 6 meses después de la intervención.

Intervención: Equipos de atención primaria, trabajadores sociales, de salud pública y otros agentes comunitarios desarrollaron una intervención que consistía en salidas semanales, facilitadas por voluntarios.

Mediciones: Se evaluó la salud autopercibida, la salud mental utilizando la escala GHQ-12 y la calidad de vida mediante la escala EuroQol. La satisfacción se evaluó mediante un conjunto de preguntas. Analizamos los datos previos y posteriores con pruebas de McNemar y modelos de regresión lineal y de Poisson ajustados.

Resultados: A los 6 meses, los participantes mostraron mejoras en la salud percibida, en la salud mental y en la reducción de la ansiedad. Las mejoras fueron mayores entre las mujeres, las personas que no habían salido de casa durante ≥ 4 meses, las de bajo nivel educativo y las que habían realizado ≥ 9 salidas. La salud percibida (aRR: 1,29 [1,04-1,62]) y las mejoras en salud mental [β : 2,92 [1,64-4,2]] permanecieron significativas en los modelos multivariados. La satisfacción media fue de 9,3 sobre 10.

Conclusión: Esta intervención de salud comunitaria parece mejorar varios resultados de salud en las personas mayores aisladas, especialmente en los grupos más vulnerables. Replicar este tipo de intervención podría funcionar en contextos similares.

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Introduction

Social isolation among the elderly is associated with increased mortality, poorer self-rated health, lower quality of life and greater risk of dementia.^{1,2} Social isolation refers to the lack of structural and functional social support that includes (a) the objective assessment of its size and frequency, and (b) the subjective assessment of the perceived value of emotional, instrumental and informational support provided by others.³ Loneliness is closely related to social isolation and has been defined as the subjective experience of the absence or loss of companionship which is always involuntary.³⁻⁵ Loneliness and social isolation are more prevalent among older people due to factors such as the death of relatives and friends, loss of social

roles (children growing up and/or retirement) and increased prevalence of chronic or disabling illnesses.⁶

In elderly, difficulty in engaging in community activities has been associated with self-perceived depression and loss of interest in pleasurable activities.⁷ Conversely, elderly people who have more social relationships and social participation have better mental, social and physical health.³ Some studies have shown that interventions to promote social participation for older people can prevent loneliness and social isolation associated among the least wealthy groups.^{5,8-10} Besides that, architectural barriers that hinder or prevent people from going out on their own, have been described as factors associated with the perception of loneliness.⁴

In Barcelona in 2016, 31.6% of buildings did not have an elevator, and this percentage was higher in the most

Table 1 Description of the activities carried out by the working group to develop a community health intervention from 2010 to 2015.

Phases/activities	Working group						
	Community Development Plan	Primary Health Care	Social Services	Public Health ^a	Red Cross ^b	Neighbourhood organisations	City Council ^c
Design							
Health needs assessment	×	×	×	×	×	×	×
Intervention design	×	×	×	×	×	×	×
Participants detection	×	×	×			×	
Inclusion/exclusion of participants	×	×	×		×		
Implementation							
Outings coordination	×			×	×		
Recruitment and maintenance of volunteers	×				×		
Outings equipment needed	×	×		×	×		
Evaluation							
Monitoring and evaluation	×			×	×		
Results dissemination				×	×		×

^a Barcelona Public Health Agency.

^b Red Cross in Barcelona.

^c Health Department of Barcelona City Council.

deprived neighbourhoods.¹¹ In addition, in 2018, 21.6% of the citizens of Barcelona were over 65 years old, and 25.6% of them were living alone.¹² Since 2007, the municipal strategy *Barcelona Health in the Neighbourhoods* has been working to reduce health inequalities through community health interventions.^{13,14} As part of this community health strategy, a working group composed by Community Development Plan, Primary Health Care, Social Services, Barcelona Public Health Agency, Health Department of Barcelona City Council, Red Cross in Barcelona and neighbourhoods' organisations (Table 1), designed and conducted an intervention consisted of weekly outings in five deprived neighbourhoods in Barcelona, to alleviate loneliness among older people who were living in isolation in their homes for long periods, mainly due to mobility limitations and/or the lack of an elevator in their buildings. The objective of this paper is to: (1) explore the effects of the intervention on health outcomes, (2) identify what characteristics of the participants and the intervention are associated with health effects and (3) assess participants' satisfaction.

Methods

Design

We used a quasi-experimental before–after design. The study analyses the intervention carried out from May 2010 to December 2015 in five disadvantaged neighbourhoods in Barcelona. Neighbourhoods were prioritised according to the Family Disposable Income Index in 2010¹⁵ and prevalence of older people living alone.¹¹

Participants

The inclusion criteria were people aged ≥ 59 years old and who had been living in isolation in their homes for two or more months due to mobility limitations and/or lack of an elevator in their buildings. Bedridden persons, persons with severe dementia and those without medical authorisation to leave their home were excluded. Primary health

care teams contributed to establish and assessed health-related exclusion criteria. Services usually in contact with the target population in the neighbourhoods, such as Primary Health Care, Social Services, Community Development Plan and neighbourhoods' organisations, were responsible for detecting people with inclusion criteria (Table 1).

Intervention

The intervention was developed by a working group who made the health need assessment and intervention design (Table 1). This consisted of weekly outings, facilitated by volunteers using a portable climbing wheelchair. The coordination and recruitment of volunteers was mainly in charge of the Community Development Plan and Red Cross. Equipment needed to carry out the outings such as wheelchairs and a portable climbing wheelchair was mainly provided by primary health care, Red Cross and the Barcelona Public Health Agency (Table 1). The intervention promoted social support and participation through activities proposed by the participants, such as visiting friends, short walks, going to the market or attending church.¹⁶ In addition to the individual weekly outings, group outings were conducted once a month to foster new social relationships among participants, such as city sightseeing, cultural activities and group dynamics. The evaluation process was mainly in charge of the Barcelona Public Health Agency, Community Development Plan and Red Cross (Table 1). Economic and human resources to maintain the sustainability of the intervention came from Barcelona Public Health Agency and Health Department of Barcelona City Council.

Sample and data collection

Trained interviewers administered a face-to-face questionnaire to participants before entering the programme and after six months, during which time at least four outings were performed. From a total of 147 initial participants, an 8% were lost to follow up; thus 135 participants answered both questionnaires. Reasons for lost to follow-up were change of address, hospitalisation or death.

Since it was a community programme which the main aim was improving health in disadvantaged populations, all people who met the criteria and who wished to participate were included, and no sample size was calculated in the design of the intervention. However, to ensure the validity of the results, we estimated the sample size necessary to detect a change in health perception of 20% (based on the intervention pilot study)¹⁷: accepting an alpha risk of 0.05 and a beta risk of less than 0.2 in a two-sided contrast, we obtained that the minimum sample size required would be 100 people.¹⁸

Study variables

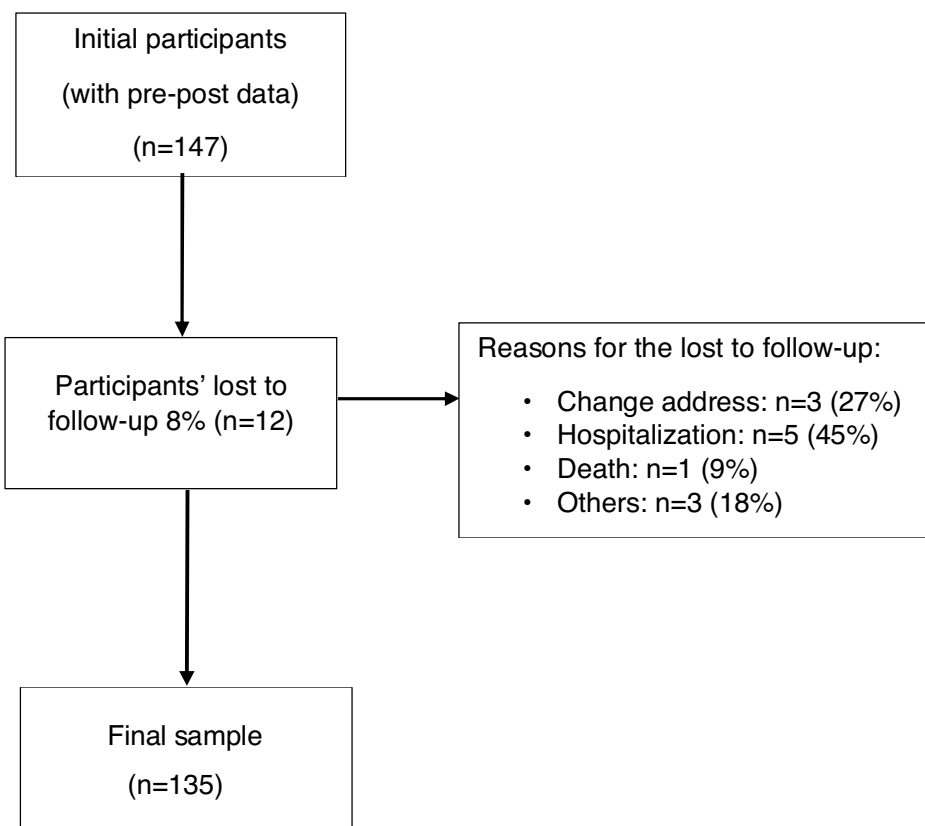
The explanatory variables were divided into (a) individual characteristics: sex, age, time (in months) without

leaving home, and educational level and (b) intervention dose estimated through the number of outings. The dependent variables were self-rated health, mental health, and quality of life. Self-rated health was assessed through the question 'How do you assess your health in general?' with a five categories Likert scale, which was dichotomised into good (fair, good and very good) or poor (poor or very poor).¹⁹ Mental health was assessed using the General Health Questionnaire (GHQ-12), which is made up of 12 items that are answered using a 4-point Likert (0–4) scale. We analysed the GHQ-12 as a dichotomous variable where people with three or more positive answers were considered to be at risk of poor mental health,²⁰ and also as a continuous variable, that is the sum of all the items (ranging from 0 to 36), where high values denote high mental disorder.²¹ The Likert scoring of the GHQ yielded a normal distribution and we have used this variable as a continuous variable in our analysis. Quality of life related to health was evaluated using the EuroQol scale (EQ-5D-3L),²² which assesses five dimensions including mobility, personal care, daily activities, pain or discomfort, and anxiety/depression. EQ-5D-3L has three levels of severity in each item, and it was dichotomised into: (a) 'no problems' or 'some problems' and (b) 'severe problems'.²³ User's satisfaction with the programme was evaluated through a set of questions used in Barcelona Health in the Neighbourhoods interventions to assess general satisfaction, dimensions of frequency, duration, time, place and punctuality and whether the participants would recommend it to other people.^{24,25}

Data analysis

We performed a univariate analysis to describe individual characteristics and intervention dose and a bivariate analysis to assess changes in self-rated health, mental health and the five quality of life dimensions, within the explanatory variables, before and after the intervention through McNemar tests for paired data. Then, we fitted generalised estimating equation regression models for the outcome variables adjusting for explanatory variables. Poisson regression models were fitted for self-rated health and quality of life, and mental health was analysed through its continuous variable with a linear model. We analysed each quality of life dimension separately, as we did not expect that the programme would affect all of them.

In our study there were two types of missing data: losses to follow up and items missing within the survey. To deal with the first type we compared the socio-demographic characteristics of lost cases with the total number of participants (*t*-test for continuous variables and chi2 square test for categorical variables). For the missing data in the specific items in the GHQ-12 scale, we applied the simple imputation method based on the person-mean score when less than two items were missing per case. This method is considered to be adequate due to the high proportion of complete cases.²⁶ All analyses were conducted using the statistical package STATA.



Results

The study sample was consisted mainly of women (58.5%), people aged ≥ 85 (44.8%) and had not left their homes for ≥ 4 months (55.9%) (Table 2). No differences were observed between follow-up losses and study participants by sex, age and time without leaving home; however, the level of study in the former group was lower than the overall sample. Participants made a median of 8 and a mean of 18 outings during the six months period of study. After the intervention, participants' self-rated health improved significantly in all categories of the explanatory variables, except for men or for people aged ≥ 85 years (Table 3). Among participants who made 9–24 outings, good self-rated health increased from 51.6% before the intervention to 77.4% after; among participants who made ≥ 25 outings, it increased from 35.7% to 67.9%. Self-perceived mental health improved among all participants, especially among men (45.3% to 66.0%), those younger than 85 years old (50.8% to 71.6%), those who had not left their homes for ≥ 4 months (44.8% to 65.7%), those who had made 9–24 outings (46.7% to 73.3%), and those with a lower level of education (55.6% to 74.1%). The intervention had a positive effect on anxiety, with significant increases of people reporting no anxiety among women (69.7% to 86.8%), people aged ≥ 85 (73.2% to 89.3%), those who had not left their homes for ≥ 4 months (69.1% to 89.7%), those who had made 9–24 outings (70.0% to 90.0%), and those with a lower level of education (71.4% to 85.7%). We did not observe significant changes in other aspects of quality of life (mobility, personal care, daily activities and pain or discomfort).

After adjusting for explanatory variables, the multivariate analysis showed that the improvement, before and after

Table 2 Socio-demographic characteristics of the participants from 2010 to 2015.

Variables	% (n)
Sex	
Women	58.5 (86)
Men	41.5 (61)
Age	
59–74	14.0 (20)
75–84	41.2 (59)
≥ 85	44.8 (64)
Time without leaving home	
<4 months	44.1 (60)
≥ 4 months	55.9 (76)
Level of studies achieved	
Less than primary	21.6 (27)
Primary	55.2 (69)
Secondary	19.2 (24)
University	4.0 (5)
Number of outings during the intervention*	
4–8	53.4 (71)
9–24	24.1 (32)
≥ 25	22.0 (29)
Mean of outings (sd)	18.0 (21.3)
Median (interquartile range)	8 (7–18)

* There were a total of 135 participants in the intervention.

Table 3 Self-rated health, mental health and anxiety prevalence among isolated elder participants before and after the programme ($n = 135$).

	Before % (n)	After % (n)	Difference %	Bivariate analysis <i>p</i> value	Multivariate analysis Coefficient (95% CI)
Good self-rated health					1.29 (1.04–1.62) ^a
Sex					
Women	48.7 (38)	69.2 (54)	20.5	***	
Men	60.0 (33)	71.0 (39)	11		
Age					
<85	45.1 (32)	66.2 (47)	21.1	***	
≥85	63.8 (37)	74.1 (43)	10.3		
Time without leaving home					
<4 months	53.7 (29)	75.9 (41)	22.2	***	
≥4 months	55.1 (38)	68.1 (47)	13	*	
Educational level					
Without studies or primary	60.0 (51)	70.6 (60)	10.6	*	
Secondary or university	42.9 (12)	71.4 (20)	28.5	*	
Number of outings					
4–8	59.2 (42)	66.2 (47)	7		
9–24	51.6 (16)	77.4 (24)	25.8	*	
≥25	35.7 (10)	67.9 (19)	31.1	**	
Total	53.4 (71)	70.0 (93)	16.6	***	
Good mental health					2.92 (1.64–4.20) ^b
Sex					
Women	58.6 (41)	74.4 (50)			
Men	45.3 (24)	66.0 (35)		*	
Age					
<85	50.8 (34)	71.6 (48)		**	
≥85	56.6 (30)	67.9 (36)			
Time without leaving home					
<4 months	66.0 (33)	78.0 (39)		**	
≥4 months	44.8 (30)	65.7 (44)			
Educational level					
Without studies or primary	55.6 (45)	74.1 (60)		***	
Secondary or university	56.5 (13)	73.9 (17)			
Number of outings					
4–8	63.4 (45)	70.4 (50)			
9–24	46.7 (14)	73.3 (22)		*	
≥25	23.8 (5)	57.1 (12)			
Total	52.85 (65)	69.11 (85)		*	
No anxiety					1.17 (0.91–1.50) ^a
Sex					
Women	69.7 (53)	86.8 (66)	17.1	***	
Men	81.5 (44)	85.2 (46)	3.7		
Age					
<85	77.5 (55)	83.1 (59)	5.6		
≥85	73.2 (41)	89.3 (50)	16.1	*	
Time without leaving home					
<4 months	82.7 (43)	84.6 (44)	1.9		

Table 3 (Continued)

	Before % (n)	After % (n)	Difference %	Bivariate analysis <i>p</i> value	Multivariate analysis Coefficient (95% CI)
≥4 months	69.1 (47)	89.7 (61)	20.6	***	
<i>Educational level</i>					
Without studies or primary	71.4 (60)	85.7 (72)	14.3	***	
Secondary or university	74.1 (20)	81.5 (22)	7.4		
<i>Number of outings</i>					
4–8	80.0 (56)	85.7 (60)	5.7		
9–24	70.0 (21)	90.0 (27)	20	*	
≥25	63.0 (17)	81.5 (22)	17.8		
<i>Total</i>	74.6 (97)	86.2 (112)	11.6	***	

^a Adjusted risk ratio of the GEE regression model adjusting for all explanatory variables.

^b Adjusted coefficient of the GEE normal regression model adjusting for all explanatory variables.

* $p < 0.05$.

** $p < 0.01$.

*** $p < 0.001$.

the intervention, in self-rated health (aRR 1.29; (CI) 95%: 1.04–1.62) and mental health (β : 2.92; (CI) 95%: 1.64–4.20) remained significant, while no differences were found in anxiety (aRR 1.17; (CI) 95%: 0.91–1.50).

Participants reported being very satisfied with the programme, with an average score of 9.3 out of 10 and 99% declared they would recommend the programme to other people. Dimensions of satisfaction, such as frequency, duration, time, place, and punctuality, were rated as adequate by almost 100% of the participants, although the frequency of the group outings was considered insufficient (data not shown).

Discussion

This study shows that this community health intervention improves participants' self-rated health and mental health and reduces anxiety. We observed significant improvements in self-rated health in all sociodemographic groups, except for men. The number of outings was also associated with good self-rated health. There was a general improvement in mental health and lower rates of anxiety, mainly among men, people who had not left their home for a long time, those with a lower level of education, and those who had made more than 9 outings during the intervention. The improvements in self-rated health and mental health remained significant with the adjusted analysis.

Evidence shows that people from vulnerable groups are the least able to positively respond to population-approach interventions.²⁷ In this sense, this community health intervention, which forms part of a strategy to reduce social health inequalities in disadvantaged neighbourhoods, seems to have contributed to alleviating inequalities by benefiting people with more cumulative risk factors (those with a lower level of education and ≥4 months without leaving home).

This intervention is one of the few, at the individual level, that seems to be effective in reducing social isolation and loneliness. Previous studies have shown that the most effective individual interventions to reduce elder people

loneliness are those that use new technologies to increase socialisation with loved ones or new friendships.^{28–31} Other types of individual intervention, such as home visits, have shown to be ineffective in reducing loneliness among older people,^{3,31} probably due to the relatively small increase in their social interaction, and that they do not encourage participants to leave their homes. A number of group-based interventions, such as educational or volunteering activities over several months, have proven to be effective in reducing loneliness among elderly people, by generating purpose in their lives, promoting social participation and support, and reducing stigma.^{3,8,9,31–34} There is also evidence describing that community health interventions can contribute to improved health, wellbeing and social support in disadvantaged populations.^{35–38} One systematic review found that 21 out of 24 studies analysed reported improvements in health-related behaviours, a range of health outcomes, health literacy and the use of health services, as well as community changes such as empowerment or public health planning. In addition, 60% of the studies included reported reduced health inequalities.³⁵

Furthermore, evidence indicates that effective interventions are not restricted to group interventions or solitary interventions.^{29,39,40} Our intervention combined individual and group outings, to promote social support and participation, and this could be another key component of the intervention's success.

Our intervention was implemented at the time when the Catalan Department of Health launched COMSALUT programme, with the objective of redirect the Primary Health Care towards health promotion and community health, as well as tackling social health inequalities. This context may have enabled synergies and exchanges between Primary Health Care, Public Health and other community agents to boost local community health.⁴¹

One of the main strengths of this intervention is the community response to a global health problem among older people, especially among those with fewer resources.^{4,9} This community health intervention is based on the information that Primary Health Care, Social Services, and other

community agents collect on a daily basis, to access a group of the population that can hardly benefit from usual community interventions. This intersectoral and communitarian approach strengthens community health and the co-production of interventions to reduce social inequalities. Another strength of this study is that it is one of the first community health interventions that evaluates health outcomes measured with validated scales.

The main limitation of this study is the absence of a comparison group. An experimental design was not feasible due to ethical constraints (leaving one of the study arms at home for 6 months) and the limited number of eligible participants. Another limitation could be reverse causation between the number of outings and self-reported health, i.e. participants who had good health may have been more likely to have more outings, while those with poorer health may have been unable to leave their homes for this reason. Even though, some elements may reinforce and give support to our results: (a) a pilot test of the intervention yielded similar results in self-rated health, mental health and anxiety reduction¹⁷; (b) a strong positive relationship between the number of outings and health outcomes; (c) the improvements in variables expected to suffer a maturation bias, as older people's self-rated and mental health tend to worsen over time, and (d) the great satisfaction reported by the participants.

We conclude that community health strategies based on periodic outings to promote social relationships and social participation could contribute to improve self-rated health and alleviate mental health risks among vulnerable elderly people isolated at home due to mobility limitations and architectural barriers. Replications of this community health intervention could work in similar contexts.

Key points

What is already known on this topic?

- Social isolation among the elderly is associated with increased mortality, poorer self-rated health, lower quality of life and greater risk of dementia.
- Evidence has shown that interventions to promote social participation for older people can prevent loneliness and social isolation associated among the least wealthy groups.
- Architectural barriers can hinder or prevent people from going out on their own and have been associated with the perception of loneliness. In Barcelona, 31.6% of buildings did not have an elevator, and this percentage was higher in the most deprived neighbourhoods.

What this study adds?

- This community health intervention is a response to a global health problem among older people, especially among the most vulnerable groups.

- This intervention based in periodic outings to promote social relationships and social participation could contribute to improve self-rated health and alleviate mental health risks among the most vulnerable elderly people isolated at home.
- This community health intervention has enabled synergies and exchanges between primary health care, public health, and other community agents to boost local community health.

Compliance with ethical standards

Ethics approval

Obtained (2019/8569/I) (undisclosed details to protect anonymity).

Informed consent

A written informed consent for participation was signed by each participant before intervention.

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Undisclosed details to protect anonymity.

Conflict of interests

None declared.

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References

1. Hand C, Retrum J, Ware G, Iwasaki P, Moaalii G, Main DS. Understanding social isolation among urban aging adults: informing occupation-based approaches. *OTJR Occup Particip Heal*. 2017;37:188–98.
2. Singh A, Misra N. Loneliness, depression and sociability in old age. *Ind Psychiatry J*. 2009;18:51–5.
3. Dickens AP, Richards SH, Greaves CJ, Campbell JL. Interventions targeting social isolation in older people: a systematic review. *BMC Public Health*. 2011;11:647.
4. Gené-Badia J, Comice P, Belchín A, Erdozain MÁ, Cáliz L, Torres S, et al. Profiles of loneliness and social isolation in urban population. *Aten Primaria*. 2019;54:224–32.
5. Grenade L, Boldy D. Social isolation and loneliness among older people: issues and future challenges in community and residential settings. *Aust Heal Rev*. 2008;32:468–78.

6. Dahlberg L, Mckee KJ. Correlates of social and emotional loneliness in older people: evidence from an English community study. *Aging Ment Heal*. 2014;18:504–14.
7. Hao G, Bishwajit G, Tang S, Nie C, Ji L, Huang R. Social participation and perceived depression among elderly population in South Africa. *Clin Interv Aging*. 2017;12:971–6.
8. Pool MS, Agyemang CO, Smalbrugge M. Interventions to improve social determinants of health among elderly ethnic minority groups: a review. *Eur J Public Health*. 2017;27:1048–54.
9. Niedzwiedz CL, Richardson EA, Tunstall H, Shortt NK, Mitchell RJ, Pearce JR. The relationship between wealth and loneliness among older people across Europe: is social participation protective? *Prev Med (Baltim)*. 2016;91:24–31.
10. Cattán M, White M, Bond J, Learmouth A. Preventing social isolation and loneliness among older people: a systematic review of health promotion interventions. *Ageing Soc*. 2005;25:41–67.
11. Agència Salut Pública de Barcelona. Infobarris Barcelona [Internet]. Available from: <http://www.aspb.cat/infobarris> [cited 12.04.20].
12. Ajuntament de Barcelona. Departament d'Estadística i difusió de dades [Internet]. Available from: <https://www.bcn.cat/estadistica/catala/index.htm> [cited 15.01.20].
13. Fuertes C, Pasarín MI, Borrell C, Artazcoz L, Díez È, Calzada N, et al. Feasibility of a community action model oriented to reduce inequalities in health. *Health Policy (New York)*. 2012;107:289–95.
14. Díez E, Pasarín MI, Daban FCN, Fuertes C, Artazcoz LBC. «Salut als barris» en Barcelona, una intervenció comunitària para reducir las desigualdades sociales en salud. *Comunidad*. 2012;14:121–6.
15. Ajuntament de Barcelona. Distribució territorial de la renda familiar a Barcelona 2000-2017. Departament d'Estadística i difusió de dades [Internet]. Available from: <http://www.bcn.cat/estadistica/catala/dades/economia/renda/rdfamilar/evo/rfbarris.htm> [cited 10.04.20].
16. Agència Salut Pública de Barcelona. Barcelona Salut als Barris [Internet]. Available from: <http://www.aspb.cat/documents/informes//promocio-entorns/barris/> [cited 16.12.19].
17. Díez E, Daban F, Pasarín M, Artazcoz L, Fuertes C, Jose Lopez M, et al. Evaluation of a community program to reduce isolation in older people due to architectural barriers. *Gac Sanit*. 2014;28:386–8.
18. Marrugat J, Vila J. Calculadora de tamaño muestral. GRANMO [Internet]. 2012. Available from: <https://www.imim.es/ofertadeserveis/software-public/granmo/>
19. Idler EL, Benyamini Y. Self-rated health and mortality: a review of twenty-seven community studies. *J Health Soc Behav*. 1997;38:21–37.
20. Goldberg D. Manual of the general health questionnaire. Windsor: National Foundation for Educational Research; 1978.
21. Rodrigo MF, Molina JG, Losilla J-M, Vives J, Tomás JM. Method effects associated with negatively and positively worded items on the 12-item General Health Questionnaire (GHQ-12): results from a cross-sectional survey with a representative sample of Catalanian workers. *BMJ Open*. 2019;9:e031859.
22. Williams A, The EuroQol Group. EuroQol – a new facility for the measurement of health related quality of life. *Health Policy (New York)*. 1990;16:199–208.
23. van Reenen M, Janssen B, Stolk E, Secnik Boye K, Herdman M, Kennedy-Martin M, et al. EQ-5D-5L User Guide. EuroQol Research Foundation; 2019.
24. Sánchez-Martínez F, Juárez O, Serral G, Valmayor S, Puigpinós R, Pasarín MI, et al. A childhood obesity prevention programme in Barcelona (POIBA project): study protocol of the intervention. *J Public Health Res*. 2018;7:1129.
25. Lapena C, Continente X, Sánchez Mascañano A, Pons Vigués M, Pujol Ribera E, López MJ. Qualitative evaluation of a community-based intervention to reduce social isolation among older people in disadvantaged urban areas of Barcelona. *Heal Soc Care Community*. 2020;28:1488–503.
26. Bono C, Ried LD, Kimberlin C, Vogel B. Missing data on the Center for Epidemiologic Studies Depression Scale: a comparison of 4 imputation techniques. *Res Soc Adm Pharm*. 2007;3:1–27.
27. Frohlich KL, Potvin L. Transcending the known in public health practice: the inequality paradox: the population approach and vulnerable populations. *Am J Public Health*. 2008;98:216–21.
28. Sharit J, Czaja SJ. The role of technology in supporting older workers. *Gerontechnology*. 2018;17:32.
29. Poscia A, Stojanovic J, La Milia DI, Duplaga M, Grysztar M, Moscato U, et al. Interventions targeting loneliness and social isolation among the older people: an update systematic review. *Exp Gerontol*. 2018;102:133–44.
30. Tsai HH, Tsai YF. Changes in depressive symptoms, social support, and loneliness over 1 year after a minimum 3-month videoconference program for older nursing home residents. *J Med Internet Res*. 2011;13:e93.
31. Hagan R, Manktelow R, Taylor BJ, Mallett J. Reducing loneliness amongst older people: a systematic search and narrative review. *Aging Ment Heal*. 2014;18:683–93.
32. Robins LM, Hill KD, Finch CF, Clemson L, Haines T. The association between physical activity and social isolation in community-dwelling older adults. *Aging Ment Heal*. 2018;22:175–82.
33. Findlay RA. Interventions to reduce social isolation amongst older people: where is the evidence? *Ageing Soc*. 2003;23:647–58.
34. Coll-planas L, Valle G, Bonilla P, Masat T, Puig T, Montseserin R. Promoting social capital to alleviate loneliness and improve health among older people in Spain. *Heal Soc Care Commun*. 2017;25:145–57.
35. Cyril S, Smith BJ, Possamai-Inesedy A, Renzaho AMN. Exploring the role of community engagement in improving the health of disadvantaged populations: a systematic review. *Glob Health Action*. 2015;8:1–13.
36. O'Mara-Eves A, Brunton G, Oliver S, Kavanagh J, Jamal F, Thomas J. The effectiveness of community engagement in public health interventions for disadvantaged groups: a meta-analysis. *BMC Public Health*. 2015;15:1–23.
37. NICE. Community engagement: improving health and wellbeing and reducing health inequalities. NICE guideline NG44. Your responsibility our responsibility [Internet]; 2016. Available from: <https://www.nice.org.uk/guidance/ng44>
38. Daban F, Pasarín MI, Borrell C, Artazcoz L, Pérez A, Fernández A, et al. Barcelona Salut als Barris: twelve years' experience of tackling social health inequalities through community-based interventions. *Gac Sanit*. 2020. S0213-9111(20)30070-4.
39. Gardiner C, Geldenhuys G, Gott M. Interventions to reduce social isolation and loneliness among older people: an integrative review. *Heal Soc Care Community*. 2018;26:147–57.
40. Cotterell N, Buffel T, Phillipson C. Preventing social isolation in older people. *Maturitas*. 2018;113:80–4.
41. Fornells JM, González A, Lacasa C, Martín-Zurro A, Martínez E, Mena I, et al. Projecte COMSALUT. Comunitat i Salut: Atenció Primària i Comunitària [Internet]; 2015. Available from: <https://comsalut.files.wordpress.com/2015/12/comsalut-document-base.pdf>