Effectiveness of home based support for older people: systematic review and meta-analysis

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Abstract

Objective To evaluate the effectiveness of home visiting programmes that offer health promotion and preventive care to older people.
Design Systematic review and meta-analysis of 15 studies of home visiting.
Participants Older people living at home, including frail older people at risk of adverse outcomes.
Outcome measures Mortality, admission to hospital, admission to institutional care, functional status, health status.
Results Home visiting was associated with a significant reduction in mortality. The pooled odds ratio for eight studies that assessed mortality in members of the general elderly population was 0.76 (95% confidence interval 0.64 to 0.89). Five studies of home visiting to frail older people who were at risk of adverse outcomes also showed a significant reduction in mortality (0.72; 0.54 to 0.97). Home visiting was associated with a significant reduction in admissions to long term care in members of the general elderly population (0.65; 0.46 to 0.91). For three studies of home visiting to frail, "at risk" older people, the pooled odds ratio was 0.55 (0.35 to 0.88). Meta-analysis of six studies of home visiting to members of the general elderly population showed no significant reduction in admissions to hospital (odds ratio 0.95; 0.80 to 1.09). Three studies showed no significant effect on health (standardised effect size 0.06; –0.07 to 0.18). Four studies showed no effect on activities of daily living (0.05; –0.07 to 0.17).
Conclusion Home visits to older people can reduce mortality and admission to long term institutional care.

Introduction

The objective of enabling older people to remain in their own homes has been a cornerstone of government policy for several decades. A recent royal commission on long term care has endorsed this objective, recommending that more emphasis be given to health promotion and other preventive measures as a means of delaying the onset of illness and dependency that eventually lead older people to need long term care.[1]

One way of promoting health and delivering preventive care to older people is through regular home visiting. Several studies of home visits by teams based in general practices have shown promising results, with home visitors identifying a large number of previously unmet medical and social needs.[2–7] Health visitors are well placed to promote the health of older people and to provide surveillance and support. Although British health visitors have historically provided services to mothers and young children rather than older people, the potential of the health visitor in meeting the needs of older people in the community has been widely recognised.[8 9] Despite this, today's generic health visitor devotes little time to older people.[10–12]

Two previous systematic reviews examined the effectiveness of home visits to older people. In 1993, Stuck et al performed a meta-analysis of 28 controlled trials that evaluated the outcomes of comprehensive geriatric assessment.[13] The 28 studies were each allocated to one of five types of assessment, two of which involved home visits to older people. They reviewed nine trials of such visits.[7 14–21] They found significant positive effects of home visiting on mortality, hospital admission and readmission, and nursing home placements.[13] A second systematic review of 15 trials of preventive home visits to older people was undertaken more recently by van Haastregt et al.[22] This review, unlike that of Stuck et al, did not involve meta-analysis of the 15 trials.[7 14–18 23–30] Van Haastregt et al found no consistent evidence that preventive home visits had a significant effect on any outcome.[22]

Both these previous reviews have limitations. Stuck et al[13] did not include five controlled trials of home visiting to older people, all of which were published at the time they undertook their meta-analysis but which we assume did not meet their inclusion criterion of involving comprehensive geriatric assessment.[24 26 31–33] In the review by van Haastregt et al, the failure to pool the results of the trials was a considerable limitation. The fact that meta-analysis was not performed means that it is possible that significant effects were not detected, and this may in part explain their less positive results.

In view of the shortcomings of previous reviews, and the lack of consistency between their findings, we thought it important to undertake a meta-analysis of all relevant studies available to date to clarify the

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benefits of preventive home visiting. We report the results of this systematic review and meta-analysis.

Method

As part of a larger systematic review to assess the effects of home visiting to all client groups, including parents and children, we reviewed studies on the effects of home visits to older people (aged 65 years and above). We have presented only those results relating to older people.

Search strategy

We searched Medline for 1966-97, CINAHL for 1982-97, and Embase for 1980-97. We also searched the Cochrane Library and the internet. We hand searched the journal *Health Visitor* for 1982-97 and scanned reference lists of review articles for relevant literature. We contacted key individuals and organisations to trace unpublished work and placed advertisements in relevant journals to identify unpublished work.

Inclusion criteria

Papers were included in the review if they reported an empirical study, with a comparison group, evaluating a home visiting programme. Randomised and non-randomised controlled trials were included. The home visitor had to undertake tasks within the scope of British health visitors—namely, surveillance, support, health promotion, and the prevention of ill health. The intervention had to involve the pursuit of a wide range of preventive outcomes rather than a single goal such as the prevention of falls or increased uptake of immunisation. We excluded studies in which the home visitor was a specialist in a branch of nursing other than health visiting (for example, community psychiatric nursing or district nursing) and those in which the intervention was delivered solely by volunteers. We also excluded studies that involved only screening and referral, with no other input from the home visitor. We obtained the full text of all studies identified by the search. Disagreements about whether a study met the inclusion criteria were settled through joint discussion of the research team.

We found 1215 references through the searches. Of these, 102 studies fulfilled our inclusion criteria, of which 15 studies reported outcomes relating to older people.[15–17 19 23–35] Nine studies did not meet our inclusion criteria (table 1).[7 14 18 20 29 30 36–38]

Table 1 Excluded studies

Study	Reason for exclusion
Stuck et al 2000[38]	Published after end of period of review
Tinetti et al 1994[29]	Single objective of reducing falls
Wagner 1994[30]	Narrow objective of reducing falls and disability
Vetter et al 1992[18]	Single objective of reducing falls
Melin et al 1992[20]	Home visitors performed full nursing care rather than fulfilling health visitor role
Carpenter and Demopoulos 1990[14]	Home visits were undertaken solely by volunteers with no professional qualifications
Townsend et al 1988[36]	Home visitors performed full nursing care rather than fulfilling health visitor role
Sorensen and Sivertsen 1988[7]	Home visits undertaken by social workers performing only screening and referral role
Zimmer et al 1985[37]	Home visitors performed full nursing care rather than fulfilling health visitor role

Quality rating

We assessed the quality of the studies included in the review by using the Reisch scale,[39] which covers the purpose of the study (including prespecification of outcomes and expected effect sizes), experimental design, determination of sample size, description and suitability of treatment/management, masking, subject attrition, and evaluation of participants and treatment/management. The quality of the studies ranged from 0 to 1, with higher scores representing better quality studies. As there is no consensus about the cut off between good and bad studies, the score should be interpreted as indicating relative quality. Three members of the research team scored the papers for quality (DK, MH, MB); they were blind to the name of the publication, authors, results, and conclusions. All three reviewers applied the Reisch scale to 19 of the 102 articles to assess inter-rater reliability. The overall intraclass correlation coefficient was 0.74 (95% confidence interval 0.52 to 0.88).

Combining results

When outcomes were measured on a continuous scale we combined effect sizes using Hedges' method and computed an overall value of g (the standardised effect size).[40] For categorical variables we combined odds ratios with the fixed effects Peto method.[41]

Outcomes included in meta-analyses

The 15 studies measured a wide range of outcomes. We performed a meta-analysis only when three or more studies reporting on the same outcome provided sufficient information for this to be undertaken. This meant that we could not use meta-analysis for psychological health, morale, quality of life, wellbeing, and referral to general practitioners and outside agencies. Several studies that examined the same outcomes that we assessed by meta-analysis did not provide enough information to be included (see table 4). Our review also included two studies that were not randomised.[32 35] Findings from these studies were not entered into a meta-analysis (see table 4).

Meta-regression

In addition to meta-analysis we used meta-regression to see whether the effect sizes that we had extracted could be predicted by study characteristics. We regressed log odds ratios on the predictors, weighted by the inverse of sampling variance.[42] We used three characteristics: population (the general population of older people v those at risk of adverse outcomes); duration of the intervention (up to two years v over two years); and age group (<75 v ≥ 75 years).

Heterogeneity

Although the number of studies that reported any given outcome was small, we calculated formal tests of homogeneity[41] (see figure legends). We did not see the use of random effects models as helpful here because the studies we examined were on different groups of participants and used interventions that were far from standardised, and so we believed the solution was to try to explain differences rather than to average what cannot be effectively averaged. We therefore carried out meta-regressions when there were sufficient studies.

Publication bias

We took no formal steps to look for publication bias, such as by plotting effect sizes or by calculating test sta-

Table 2 Aims, outcome measures, and content of interventions of studies included in review of home based support for older people

Study	Aims	Outcome measures	Content of intervention
Hendriksen 1984[15] (Denmark)	To assess effects of preventive home visits	Admission to hospital; admission to nursing homes; contacts with GP; home nursing care; receipt of social services	Social support, coordinating community services, distributing aids and modifications
Pathy 1992[16] (England)	To monitor effects of surveillance and case finding	Mortality; admission to hospital; admission to nursing homes; health status; functional status; quality of life	Practical advice, health education, referal to appropriate services
Vetter 1984[17] (Wales)	To test effectiveness of health visitors' visiting and monitor caseload	Mortality; health; wellbeing; functional status; access to other health and social services	Usual health visiting practice: health education, prevention, referal to other services
Hansen 1992[19] (Denmark)	To evaluate effects of home visiting	Mortality; readmission to hospital; admission to institutional care	Assessment, problem identification, referrals to GP if required. Follow up for medical and social problems, referral if required
Fabacher 1994[23] (USA)	To evaluate effectiveness of in-home geriatric assessments as means of providing preventive health care and improving health and functional status	Physical and mental health status; functional status; admission to hospital; admission to institutional care; immunisation	Screening for medical, functional, and psychosocial problems. Follow up letter (after initial visit from physician's assistant or nurse) with recommendations
Hall 1992[24] (Canada)	To assist older people to live longer at home	Mortality; admission to institutional care; psychological status	Developing personal health skills, goal setting, coordination of and referral to community services
Luker 1982[25] (UK)	To assess effects of focused health visitor intervention	Changes in problems (problems discussed under 10 headings: weight, mobility, dentition, sensory function, elimination, loneliness, performance of tasks, rest, medication, and miscellaneous)	Discussion of actual and potential health problems. Psychological support
McEwan 1990[26] (Britain)	To promote health, identify functional problems, prevent exacerbation of problems, and improve morale and wellbeing	Health status, self rated health; functional status; mortality; morale	Identification of problems, health promotion, advice, information, education, and referral
Van Rossum 1993[27] (Netherlands)	To assess effect of preventive home visits on health and use of services	Mortality; self rated health status; functional state; psychological state; wellbeing	Information, advice, social support
Stuck 1995[28] (USA)	To prevent disability	Functional status; hospital admission; admission to institutional care; use of community services; visits to physicians	Comprehensive assessment, health education, making recommendations, and monitoring compliance
Balaban 1988[31] (USA)	To improve function and wellbeing of patient and family	Health; morale and wellbeing; hospital admissions; function status; client satisfaction	Assessment of medical and social needs, diagnostic and therapeutic care, follow up after admission to hospital, referrals, education, and counselling
Oktay 1990[32] (USA)	To evaluate a post-hospital support programme for frail elderly people and their caregivers	Caregiver stress; mortality; functional status; health service utilisation	Assessment, case management, service coordination, counselling, referrals, respite, education, medical back up
Williams 1992[33] (England)	To evaluate effects of home visiting after discharge from hospital	Health status; mortality; use of hospital services	Practical help, providing aids, dealing with problems, companionship
Dunn 1994[34] (England)	To reduce unplanned hospital re-admissions in patients recently discharged from geriatric wards	Mortality; admission to institutional care; unplanned hospital readmission	Stabilise patients, deal with any problems
Archbold 1995[35] (USA)	To increase competence of family members providing care at home to frail older people	Caregiver role strain; caregiver rewards; use and cost of hospital services by older people	Increasing preparedness of caregiver, with emphasis on relationship between caregiver and care receiver

tistics. In most cases there are few studies on any given effect, and any formal method would have had little power.

Results

Fifteen studies that met our inclusion criteria reported outcomes relating to older people; 13 were randomised controlled trials.[15–17 19 23–34] The two others used a quasi-experimental design.[32 35] The 15 studies were divided into two groups: one group of nine studies assessed members of the general elderly population,[15–17 23 25–31] a second group of six studies assessed vulnerable older people who were at risk of adverse outcomes.[19 24 32–35] The second group consisted of four studies of older people recently discharged from hospital who were at risk of further admissions[19 32–34] and two studies of frail older people who had been referred to home care agencies.[24 35]

The aims and content of the studies are shown in table 2. The characteristics of all 15 studies and their quality scores are shown in table 3. Details of the results of the studies are shown in table 4.

Findings

Of eight trials that measured mortality in elderly people in general,[15–17 23 26–28 31] three reported significant reductions.[15–17] Meta-analysis of these trials gave a pooled odds ratio of 0.76 (95% confidence interval 0.64 to 0.89), indicating that home visiting was associated with reduced mortality. Five studies assessed mortality among frail older people who were at risk of adverse

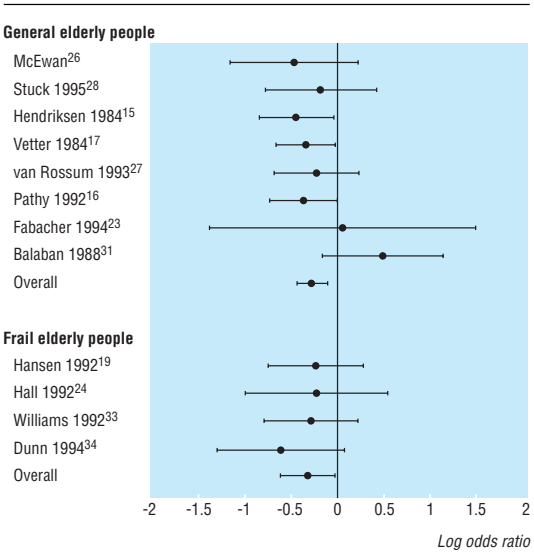

Fig 1 Log odds ratios and 95% confidence intervals for mortality in general elderly population (test for homogeneity: Q=6.91, df=7, P=0.44) and frail elderly population (Q=0.87, df=3, P=0.83)

Table 3 Quality scores and characteristics of studies

Study	Quality score	Design	Intervenors	Participants	Sample size, duration, and intensity of visits
Hendriksen 1984[15] (Denmark)	0.43	RCT	Nurses	People aged ⩾75 years, living at home	Intervention: home visits (n=285), visits every 3 months for 3 years; control: no home visits (n=287)
Pathy 1992[16] (England)	0.5	RCT	Health visitors	Patients of general practice, aged ⩾65 years, living at home	Intervention: home visits to 60% of 369, for 3 years, frequency dependent on health visitors' judgment; control: no home visit (n=356)
Vetter 1984[17] (Wales)	0.39	RCT	Health visitors	Patients of two general practices, aged ⩾70 years	Intervention: A (rural practice) n=281; B (urban practice) n=296; home visits for A (528) and B (864) for 2 years, at least one visit per year, follow up visits on basis of need; control A (rural) n=273, B (urban) n=298, no home visits
Hansen 1992[19] (Denmark)	0.36	RCT	Nurse, GP	People aged ⩾75 years, discharged from hospital to own home	Intrevention: home visit (n=163) for 1 year, one visit by nurse, one by general practitioner; control: no home visit (n=181)
Fabacher 1994[23] (USA)	0.57	RCT	Nurse and trained volunteers	Veterans living in community, ⩾70 years	Intervention: home visits (n=131) for 1 year, visits four monthly, first visit undertaken by physician's assistant or nurse; control: no home visits (n=123)
Hall 1992[24] (Canada)	0.61	RCT	Nurse	Frail elderly people, aged ⩾65 years, living at home, newly admitted to community care programme	Intervention: home visits plus home health services (n=81) for 3 years, frequency dependent on need; control: home health services (n=86)
Luker 1982[25] (UK)	0.46	RCT (crossover)	Health visitor	Women aged ⩾70 years, living alone at home	Intervention 1: home visits (n=50) for 4 months, visits once monthy, mean length 34 mins; control 1: no home visits (n=50), (crossover: intervention 1=control 2, control 1=intervention 2)
McEwan 1990[26] (England)	0.55	RCT	Nurse	Patients of general practice, aged ⩾75 years	Intervention: home visits (n=151) for 20 months, one visit; control: no home visits (n=145)
Van Rossum 1993[27] (Netherlands)	0.5	RCT	Nurses	Patients of GP, aged 74-85 years, living at home	Intervention: home visits (n=292), for 3 years, four visits per year plus extra visits when necessary; 95 participants received 174 extra visits; control: no home visits (n=288)
Stuck 1995[28] (USA)	0.65	RCT	Gerontological nurse practitioners	People aged ⩾75, living in community	Intervention: home visits (n=215) for 3 years, visits three monthly; control: no home visits (n=199)
Balaban 1988[31] (USA)	0.21	RCT	Nurse, physician	Elderly or sick or disabled people living in community; 72% aged ⩾65 years; intervention: mean age 69 years, control 68 years	Intervention: home visits (n=103) for 2 years, mean No of visits 3.8 (year 1), 2.5 (year 2); control: routine care including occasional home visits (n=95), mean No of visits 0.2 (year 1), 0.9 (year 2)
Oktay 1990[32] (USA)	0.5	Quasi-experimental	Nurse and social worker	Patients aged ⩾65 years, discharged from hospital with post-hospital needs	Intervention: home visits (n=98); control: no home visits (n=93), for 1 year with minimum one nurse and one social worker visit per month, further visits dependent on need, mean of four nurse visits per month
Williams 1992[33] (England)	0.46	RCT	Health visitor's assistant	Patients >75, recently discharged from hospital	Intervention: home visits (n=231) for 1 year, eight visits; control: no home visits (n=239)
Dunn 1994[34] (England)	0.54	RCT	Health visitor	Patients discharged from hospital; mean age 83 years	Intervention: home visits (n=102), one visit, mean 72 hours after discharge; control: no home visits (n=102)
Archbold 1995[35] (USA)	0.5	Quasi-experimental	Nurses	Frail elderly preople, aged ⩾65 years, at home with carer, needing daily assistance	Intervention: home visits (n=11) for 3 to 6 months, average 11.5 visits per family; control: routine home health services (n=11)

RCT=randomised controlled trial.

outcomes. The pooled odds ratio of four randomised trials[19 24 33 34] was 0.72 (0.54 to 0.97), again indicating that home visiting had a significant effect (fig 1).

Of six studies that measured admissions to hospital in the general elderly population,[15 16 23 27 28 31] only one reported a significant reduction.[15] The pooled odds ratio for all six studies was 0.95 (0.80 to 1.09), suggesting that home visiting did not have a significant effect (fig 2). Three studies examined admission to hospital of frail elderly people who were considered "at risk."[19 32 35] Meta-analysis was not possible because insufficient information was provided. None found any significant effect. Five studies measured health status among the general elderly population,[16 25–27 31] of which two reported improvements.[16 25] Meta-analysis of the results of three studies[16 27 31] showed no significant effects (standardised effect size 0.06, –0.07 to 0.18). Among the studies that assessed the at risk population, the only study that measured health status[33] reported no significant effect (fig 3).

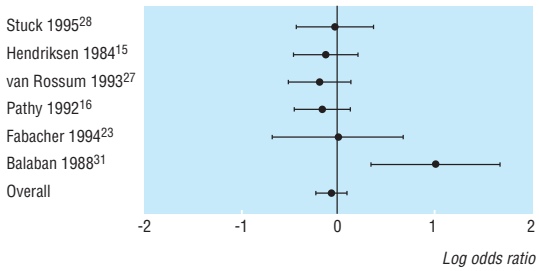

Fig 2 Log odds ratios and 95% confidence intervals for hospital admissions in general elderly population (test for homogeneity: Q=1.42, df=3, P=0.04)

Seven studies measured functional ability in the general elderly population.[16 17 23 26–28 31] None reported a significant improvement in activities of daily living or other similar measures of functional ability. However, the only two studies that measured instrumental activities of daily living[23 28] both reported significant improvements. Meta-analysis of four studies that measured activities of daily living[23 27 28 31] showed no significant effect (standardised effect size 0.05, –0.07 to 0.17). Of two studies that assessed functional ability among older people considered to be "at risk,"[32 33] neither reported significant improvements (fig 4).

Only one of five studies that reported admission to residential nursing homes of members of the general elderly population[15 16 23 27 28] found a significant reduction.[28] However, meta-analysis of the results of four of these studies[15 16 27 28] gave a pooled odds ratio of 0.65 (0.46 to 0.91), indicating that home visiting did have a significant effect in reducing admissions.

Table 4 Outcomes of home visits to elderly people: mortality, admission to hospital, health, functional ability, and long term institutional care

Study	Mortality	Hospital admission and hospital stay	Health status	Functional status	Admission to long term institutional care
Luker 1982[25] (UK)	NR	NR	Improvement in problems: 42% intervention 1, 48% intervention 2 Problem improvement score (intervention 1 *v* control 1) z=4.4, P<0.001	NR	NR
Hendriksen 1984[15] (Denmark)	Intervention: 56/285; control: 75/287; P<0.05	No of admissions: intervention 219, control 271, P<0.05 No of bed days: intervention 4884; control 6442, P=0.01	NR	NR	Intervention 20/285, control 29/287, NS
Pathy 1992[16] (England)	Intervention: 67/369; control: 86/356; P<0.05	No of admissions: intervention 262; control 284, NS Mean No days in hospital: intervention 12.5, control 14.6, NS	Health status: NS (no data given) Self rated health (mean score): intervention 6.9, control 6.4, P<0.05	Functional ability: NS (no data given)	Intervention 20/369, control 28/356, NS
Vetter 1984[17] (Wales)	Intervention A: 45/281; control A: 45/273; NS Intervention B: 35/296; control B: 60/298; P<0.01	NR	NR	Disability (test for trend): intervention and control A, NS, intervention and control B, NS	NR
Hansen 1992[19] (Denmark)	Intervention: 32/163; control: 43/181; NS	No with one or more readmissions: intervention 56/163, control 56/181, NS	NR		Intervention 16/163, control 29/181, P<0.05
Fabacher 1994[23] (USA)	Intervention: 4/118; control: 4/123; NS	No admitted: intervention 22/100, control 21/95, NS	NR	Mean score ADL: intervention 5.8, control 5.8, NS Mean score (1) IADL: intervention 7.1, control 6.7, P<0.05	Intervention 0/100, control 0/195
Hall 1992[24] (Canada)	Intervention: 14/81; control: 18/86; NS. No of "survivors" (neither died nor admitted to institutional care): intervention: 60/81; control: 51/86; P=0.054	NR	NR	NR	Intervention 6/81, control 17/86, P<0.05
McEwan 1990[26] (Britain)	Intervention: 16/151; control: 23/145; NS	NR	Physical health, percentage with problems: NS	ADL, percentage with problems NS	NR
Van Rossum 1993[27] (Netherlands)	Intervention: 42/292; control: 50/288; NS	No admitted to hospital: intervention 121/292, control 133/288, NS Mean No days per admission: intervention 20, control 20, NS	Mean change in self rated health score: intervention –0.4, control –0.6, NS	ADL mean change in score: intervention 0.4, control 0.3, NS	Intervention 7/292, control 5/288, NS
Stuck 1995[28] (USA)	Intervention: 24/215; control 26/199; P=0.80	No admitted to hospital: intervention 99/215, control 93/199, NS	NR	Mean score ADL: intervention 96.8, control 95.4, P=0.10 Mean score IADL: intervention 72.3, control 69.3, P=0.02	Intervention 9/215, control 20/199, P=0.02
Balaban 1988[31] (USA)	Intervention: 31/103; control: 20/95; P=0.20	Mean (SD) No of admissions: intervention 1.2 (1.2), control 0.6 (0.8), P<0.003 Mean (SD) No of days in hospital: intervention 6.2 (11.1), control 7.7 (21.7), NS	Health status (mean): intervention 5.7, control 6.0, P>0.50	ADL (mean score): intervention 87, control 90, P>0.20	NR
Oktay 1990[32] (USA)	Intervention: 27/98; control: 30/93; NS	Mean No of admissions: intervention 0.78, control 0.66, NS Mean No days in hospital: intervention 29.1, control 38.5, P<0.05	NR	ADL: intervention –0.20, control –0.12, NS (1) ADL: intervention 0.10, control –0.05, NS	Intervention 10/98, control 11/93, NS
Williams 1992[33] (England)	Intervention: 30/231; control: 40/239; P>0.30	NR	Mean physical status score at baseline (change over 12 months): intervention 5.7 (0.09), control 6.1 (0.09), NS	Mean disability score at baseline (change over 12 months): intervention 8.0 (2.1), control 7.8 (2.6), NS	NR
Dunn 1994[34] (England)	Intervention: 15/102; control: 25/102; P>0.10	Mean length unplanned readmissions (days): intervention 12.1, control 14.0, P>0.05	NR	NR	Intervention 8/102, control 7/102, NS
Archbold 1995[35] (USA)	NR	No admitted: intervention 6/11, control 5/11 Mean No days' stay: intervention 4.6, control 13.3 (no test results reported)	NR	NR	NR

NR=not reported.
(I)ADL=(instrumental) activities of daily living.
NS=no significant difference between groups; actual P value not reported in original paper.

Of four studies reporting admission to institutional care of older people considered to be at risk,[19 24 32 34] two reported significant reductions.[19 24] The pooled odds ratio for the three randomised trials entered into a meta-analysis[19 24 34] was 0.55 (0.35 to 0.88), suggesting that home visiting was successful in reducing admissions for at risk older people (fig 5).

Meta-regressions

Our meta-regressions showed that none of our three predictors (population type, duration of intervention, and age group) had any effect on mortality or admissions to institutional care. The analysis of hospital admissions was complicated by the small number of studies, the lack of any studies on elderly people who were considered to be at risk, and the fact that one study[31] was of poor methodological quality.

Discussion

Our review of the results of home visiting programmes shows that home visiting is effective in reducing mortality and admission to long term institutional care

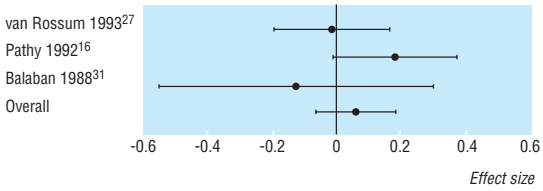

Fig 3 Effect sizes and 95% confidence intervals for health status (test for homogeneity: Q=2.89, df=2, P=0.24)

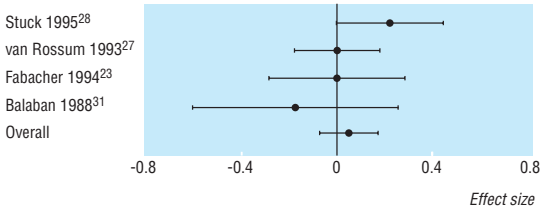

Fig 4 Effect sizes and 95% confidence intervals for functional ability (test for homogeneity: Q=3.67, df=3, P=0.30)

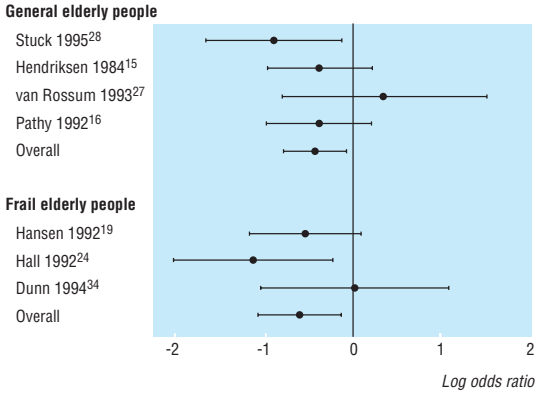

Fig 5 Log odds ratios and 95% confidence intervals for institutional care in general elderly population (test for homogeneity: Q=3.19, df=3, P=0.36) and frail elderly population (Q=2.64, df=2, P=0.27)

among members of the general elderly population and frail older people who are at risk of adverse outcomes. We did not find any significant reduction in admissions to hospital. The observed heterogeneity in relation to this outcome (see fig 2) seems to be accounted for largely by the study of Balaban et al,[31] which was of poor methodological quality. Balaban et al conceded themselves that they had failed to control successfully for differences in health status between intervention and control participants at entry into the trial, resulting in a control group with better health than the intervention group. The lack of any significant effect in reducing admission to hospital may also have been the result of two opposing effects: on the one hand home visiting may have resulted in increased admissions of older people whose need for hospital care might otherwise have been neglected; on the other hand, some admissions might have been averted through home visits.

Impact on health and functional status

The absence of evidence of improved health and functional status requires explanation. Undoubtedly one reason for the failure to find any significant differences between intervention and control groups was that those in poorest health had died, so that this outcome could be measured only on a subset of the original sample—namely, those who had survived. Another possible explanation is that where self rated measures have been used, the presence of the home visitor may have encouraged older people to express their problems more easily, thereby obscuring differences between intervention and control group. The tools used may not have been sensitive enough to detect modest improvements in health or functional ability.[27] Also, chronic and relatively intractable health and functional problems may require a greater, or different type of, input than that provided by the home visitors in the studies we reviewed.[17]

Characteristics of home visiting programmes

Why some of the programmes were more successful than others in reducing mortality is puzzling, given that this was not the primary goal of any study. The three studies of members of the general elderly population that reported significant reductions in mortality[15–17] did not share any characteristics that differentiate them from the other studies in this group (see table 3). One feature is the breadth of response of the health visitor. In the inner city group in the study by Vetter et al[17] and in the study by Hendriksen et al[15] the health visitor referred to a wide range of outside agencies, whereas in the rural group in the study by Vetter et al and in other studies that showed no reduction in mortality there was a narrower focus on referral to a general practitioner.

It is difficult to know which components of the home visitors' interventions made a difference to any of the outcomes assessed. As all the programmes were multifaceted, the independent effect of a particular component of care was difficult to assess. Moreover, in the papers we reviewed, descriptions of what the home visitor did were brief, giving little feel for the processes involved. Future studies would benefit from a greater focus on the process of delivering care and on attempting to identify which components of the intervention work.

Our finding from the meta-regression that the effect of home visiting did not depend on whether the intervention was targeted at elderly people who are at risk or whether it was delivered more widely is interesting. It suggests that the exclusion of people who are not at increased risk from such interventions is not, on the present evidence, justified. Similarly, the finding that the effect of home visiting did not depend on the age of participants suggests that the exclusion of "younger" elderly people from such interventions is also unjustified. However, more work is required to test our findings here, as the evidence from individual studies we reviewed suggests that those in poorer health benefit more from the intervention[27] and that interventions targeted more intensively on those identified as having problems are more effective.[16] A recent study by Stuck et al, published after the end of our literature search, found that disability was reduced in older people at low risk at baseline but not in those at high risk.[38] More work is clearly required to assess which populations benefit most from home visiting. Further work could also assess the optimal intensity of

What is already known on this topic

The benefits of regular, preventive home visits to older people are the subject of controversy

A recent systematic review found no clear evidence that preventive home visits were effective

What this study adds

This meta-analysis of 15 trials shows that home visiting can reduce mortality and admission to institutional care among older people

home visiting. As several studies did not report the intensity of visits, the importance of this factor was difficult to gauge.

Comparisons with other studies

Our findings are in marked contrast to those of van Haastregt et al,[22] who, in the absence of a meta-analysis of the results of the trials they reviewed, failed to find evidence that home visiting resulted in any consistent positive outcomes. Though only four out of the 15 studies we reviewed found a significant effect on mortality, we have shown significant positive effects by combining data. Similarly, only three of the 14 studies showed a significant reduction in admissions to institutional care.[19 24 28] Yet by pooling data from all the studies that assessed this outcome, we showed significant positive effects. It seems that the decision of van Haastregt et al not to perform a meta-analysis might have led them to underestimate the effectiveness of preventive home visits to older people.

Clearly, all meta-analyses contain heterogeneity. However, unlike van Haagstregt et al, we did not consider that differences between the interventions meant their results could not be combined. By grouping our trials into two more homogeneous types of intervention (those aimed at the general elderly population and those aimed at frail older people who were at risk of adverse outcomes), we considered that meta-analysis was justified. While the number of trials in each meta-analysis was small, the results are encouraging, confirming the earlier promising findings of Stuck et al.[13] On the basis of our own results, we cannot endorse the conclusion of van Haastregt et al that the evidence of effectiveness is so modest and inconsistent that home visits to older people should be discontinued. On the contrary, we believe that further trials to assess the effectiveness of home based support to older people may confirm our positive findings, and we look forward to the results of ongoing trials.[43]

The views expressed in this paper do not necessarily reflect those of the NHS Executive.

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Commentary: When, where, and why do preventive home visits work?

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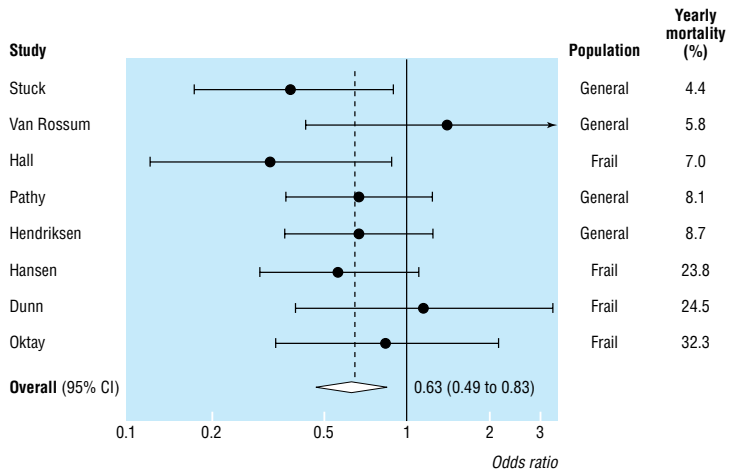
This is the second of two reviews of trials of preventive home visits to elderly people published in the *BMJ* in the past 18 months. Elkan et al conclude that home visits reduce mortality and admissions to nursing homes, whereas last year's review found no evidence supporting their effectiveness and argued that existing programmes should be reconsidered.[1] Why did the two reviews reach such contrasting conclusions?

The main reason is the different methodological approaches adopted by the two groups. Van Haastregt et al reported the results from individual trials as "no significant effects" or "significant favourable effects."[1] For example, they found a "significant" reduction ($P<0.05$) in admissions to institutions in only two out of seven trials and that overall effects were "modest and inconsistent." This "vote counting" approach is clearly unsound as it ignores the direction and size of effects from individual studies and their confidence intervals.[2 3] If the *BMJ* and other journals adopt the recent recommendation that "the description of differences as statistically significant is not acceptable,"[4] then the confusion created by such analyses could be avoided.



Meta-analysis of eight trials of effect of preventive home visits on admission to long term institutional care. Data taken from table 4. Elkan et al's classification of study population (general elderly population or frail elderly) and mortality in control groups are also shown

In contrast to the paper by Van Haastregt et al the present review used meta-analysis to summarise results. The potential of this approach is illustrated in the figure, which shows the effects on admission to long term care: six out of eight trials show a beneficial effect of preventive home visits. The evidence against the null hypothesis was fairly strong in two trials (Stuck $P=0.021$ and Hall $P=0.025$) but weak in the others ($P>0.10$). The pooled analysis, however, indicates that there is convincing evidence for a clinically important reduction in the risk of admission to long term institutional care ($P=0.001$). The reduction in the odds of admission is likely to be at least 17% and could be as large as 51%.

Van Haagstregt et al argued that the data should not be combined statistically, given the heterogeneous nature of the interventions and the populations enrolled in the different trials.[1] Interestingly, there was little evidence of heterogeneity between trials in the analysis shown in the figure ($P=0.46$) and those performed by Elkan et al. The power of tests of heterogeneity is notoriously low and combining studies is always questionable if there is important clinical heterogeneity. However, only by graphically and statistically analysing effect estimates from individual trials can we identify factors introducing heterogeneity. Elkan et al attempted this but their analysis was limited to a few crude factors. For example, they explored the importance of the underlying risk by stratifying trials according to whether older people from the general population or frail elderly people had been enrolled. They found no difference between these groups, which may be due to misclassification of the Hall study. This trial was supposedly performed in frail elderly people, but mortality in the control group was low (see figure). When the effects are ordered according to mortality, as shown, they get smaller with increasing mortality in the control group (figure). This important finding was recently confirmed by Stuck et al in a trial designed to examine effects in older people at low and high risk for admission to a nursing home.[5]

The analysis carried out by Elkan et al found no improvement in functional status, which is inconsistent with the rationale for home visits. How could mortality and admissions to a nursing home be reduced without an effect on functional status? Unfortunately, only four

studies contributed to this analysis, confidence intervals were wide, and Elkan et al did not contact investigators to obtain additional data. Future reviewers should collaborate with original investigators to define the exact characteristics of interventions, obtain data on implementation and adherence, and standardise outcome measures and quality assessment. Several additional trials which have been published recently will increase the power of their analyses. The results are likely to generate useful hypotheses, which should be addressed in trials that are powered to examine effects across prespecified interventions and subgroups of elderly people. Trials and meta-analyses show that preventive home visits can work. The challenge now is to tease out which components of the intervention are effective and which populations are most likely to benefit.

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