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Social Isolation in Community-Dwelling Seniors

An Evidence-Based Analysis

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About the Medical Advisory Secretariat

The Medical Advisory Secretariat is part of the Ontario Ministry of Health and Long-Term Care. The mandate of the Medical Advisory Secretariat is to provide evidence-based policy advice on the coordinated uptake of health services and new health technologies in Ontario to the Ministry of Health and Long-Term Care and to the healthcare system. The aim is to ensure that residents of Ontario have access to the best available new health technologies that will improve patient outcomes.

The Medical Advisory Secretariat also provides a secretariat function and evidence-based health technology policy analysis for review by the Ontario Health Technology Advisory Committee.

The Medical Advisory Secretariat conducts systematic reviews of scientific evidence and consultations with experts in the health care services community to produce the *Ontario Health Technology Assessment Series.*

About the Ontario Health Technology Assessment Series

To conduct its comprehensive analyses, the Medical Advisory Secretariat systematically reviews available scientific literature, collaborates with partners across relevant government branches, and consults with clinical and other external experts and manufacturers, and solicits any necessary advice to gather information. The Medical Advisory Secretariat makes every effort to ensure that all relevant research, nationally and internationally, is included in the systematic literature reviews conducted.

The information gathered is the foundation of the evidence to determine if a technology is effective and safe for use in a particular clinical population or setting. Information is collected to understand how a new technology fits within current practice and treatment alternatives. Details of the technology's diffusion into current practice and input from practicing medical experts and industry add important information to the review of the provision and delivery of the health technology in Ontario. Information concerning the health benefits; economic and human resources; and ethical, regulatory, social and legal issues relating to the technology assist policy makers to make timely and relevant decisions to optimize patient outcomes.

If you are aware of any current additional evidence to inform an existing evidence-based analysis, please contact the Medical Advisory Secretariat: MASinfo.moh@ontario.ca. The public consultation process is also available to individuals wishing to comment on an analysis prior to publication. For more information, please visit http://www.health.gov.on.ca/english/providers/program/ohtac/public_engage_overview.html.

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Abbreviations

ADL	Activities of daily living
CADTH	Canadian Agency for Drugs and Technologies in Health
GAINS	Gains through group involvement instrument
HHIE	Hearing Handicap Inventory Elderly
HSSD	Health System Strategy Division
ICD-10	International Classification of Diseases-10
INAHTA	International Agency for Health Technology Assessment
LTC	Long-term care
NICE	National Institute for Clinical Excellence
OARS	Older Americans Resources and Services
RCT	Randomized controlled trial
SD	Standard deviation
SF-36	Rand Medical Outcomes Study short form

Executive Summary

In early August 2007, the Medical Advisory Secretariat began work on the Aging in the Community project, an evidence-based review of the literature surrounding healthy aging in the community. The Health System Strategy Division at the Ministry of Health and Long-Term Care subsequently asked the secretariat to provide an evidentiary platform for the ministry's newly released Aging at Home Strategy.

After a broad literature review and consultation with experts, the secretariat identified 4 key areas that strongly predict an elderly person's transition from independent community living to a long-term care home. Evidence-based analyses have been prepared for each of these 4 areas: falls and fall-related injuries, urinary incontinence, dementia, and social isolation. For the first area, falls and fall-related injuries, an economic model is described in a separate report.

Please visit the Medical Advisory Secretariat Web site, http://www.health.gov.on.ca/english/providers/program/mas/mas_about.html, to review these titles within the Aging in the Community series.

1. *Aging in the Community: Summary of Evidence-Based Analyses*
2. *Prevention of Falls and Fall-Related Injuries in Community-Dwelling Seniors: An Evidence-Based Analysis*
3. *Behavioural Interventions for Urinary Incontinence in Community-Dwelling Seniors: An Evidence-Based Analysis*
4. *Caregiver- and Patient-Directed Interventions for Dementia: An Evidence-Based Analysis*
5. *Social Isolation in Community-Dwelling Seniors: An Evidence-Based Analysis*
6. *The Falls/Fractures Economic Model in Ontario Residents Aged 65 Years and Over (FEMOR)*

Objective of the Evidence-Based Analysis

The objective was to systematically review interventions aimed at preventing or reducing social isolation and loneliness in community-dwelling seniors, that is, persons ≥ 65 years of age who are not living in long-term care institutions. The analyses focused on the following questions:

- Are interventions to reduce social isolation and/or loneliness effective?
- Do these interventions improve health, well-being, and/or quality of life?
- Do these interventions impact on independent community living by delaying or preventing functional decline or disability?
- Do the interventions impact on health care utilization, such as physician visits, emergency visits, hospitalization, or admission to long-term care?

Background: Target Population and Condition

Social and family relationships are a core element of quality of life for seniors, and these relationships have been ranked second, next to health, as the most important area of life. Several related concepts—

reduced social contact, being alone, isolation, and feelings of loneliness—have all been associated with a reduced quality of life in older people. Social isolation and loneliness have also been associated with a number of negative outcomes such as poor health, maladaptive behaviour, and depressed mood. Higher levels of loneliness have also been associated with increased likelihood of institutionalization.

Note: It is recognized that the terms "senior" and "elderly" carry a range of meanings for different audiences; this report generally uses the former, but the terms are treated here as essentially interchangeable.

Methods of the Evidence-Based Analysis

The scientific evidence base was evaluated through a systematic literature review. The literature searches were conducted with several computerized bibliographic databases for literature published between January 1980 and February 2008. The search was restricted to English-language reports on human studies and excluded letters, comments and editorials, and case reports. Journal articles eligible for inclusion in the review included those that reported on single, focused interventions directed towards or evaluating social isolation or loneliness; included, in whole or in part, community-dwelling seniors (≥ 65 years); included some quantitative outcome measure on social isolation or loneliness; and included a comparative group. Assessments of current practices were obtained through consultations with various individuals and agencies including the Ontario Community Care Access Centres and the Ontario Assistive Devices Program. An Ontario-based budget impact was also assessed for the identified effective interventions for social isolation.

Findings

A systematic review of the published literature focusing on interventions for social isolation and loneliness in community-dwelling seniors identified 11 quantitative studies. The studies involved European or American populations with diverse recruitment strategies, intervention objectives, and limited follow-up, with cohorts from 10 to 15 years ago involving mainly elderly women less than 75 years of age. The studies involved 2 classes of interventions: in-person group support activities and technology-assisted interventions. These were delivered to diverse targeted groups of seniors such as those with mental distress, physically inactive seniors, low-income groups, and informal caregivers. The interventions were primarily focused on behaviour-based change. Modifying factors (client attitude or preference) and process issues (targeting methods of at-risk subjects, delivery methods, and settings) influenced intervention participation and outcomes.

Both classes of interventions were found to reduce social isolation and loneliness in seniors. Social support groups were found to effectively decrease social isolation for seniors on wait lists for senior apartments and those living in senior citizen apartments. Community-based exercise programs featuring health and wellness for physically inactive community-dwelling seniors also effectively reduced loneliness. Rehabilitation for mild/moderate hearing loss was effective in improving communication disabilities and reducing loneliness in seniors. Interventions evaluated for informal caregivers of seniors with dementia, however, had limited effectiveness for social isolation or loneliness.

Research into interventions for social isolation in seniors has not been broadly based, relative to the diverse personal, social, health, economic, and environmentally interrelated factors potentially affecting isolation. Although rehabilitation for hearing-related disability was evaluated, the systematic review did not locate research on interventions for other common causes of aging-related disability and loneliness, such as vision loss or mobility declines. Despite recent technological advances in e-health or telehealth, controlled studies evaluating technology-assisted interventions for social isolation have examined only

basic technologies such as phone- or computer-mediated support groups.

Conclusions

Although effective interventions were identified for social isolation and loneliness in community-dwelling seniors, they were directed at specifically targeted groups and involved only a few of the many potential causes of social isolation. Little research has been directed at identifying effective interventions that influence the social isolation and other burdens imposed upon caregivers, in spite of the key role that caregivers assume in caring for seniors. The evidence on technology-assisted interventions and their effects on the social health and well-being of seniors and their caregivers is limited, but increasing demand for home health care and the need for efficiencies warrant further exploration. Interventions for social isolation in community-dwelling seniors need to be researched more broadly in order to develop effective, appropriate, and comprehensive strategies for at-risk populations.

Evidence-Based Analysis of Social Isolation in Community-Dwelling Seniors

In early August 2007, the Medical Advisory Secretariat began work on the Aging in the Community project, an evidence-based review of the literature surrounding healthy aging in the community. The Health System Strategy Division at the Ministry of Health and Long-Term Care subsequently asked the secretariat to provide an evidentiary platform for the ministry's newly released Aging at Home Strategy.

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Objective of the Evidence-Based Analysis

The objectives were to systematically review interventions aimed at preventing or reducing social isolation and loneliness in community-dwelling seniors, that is, persons ≥ 65 years of age who are not living in long-term care institutions. The analyses focused on the following questions:

- Are interventions to reduce social isolation and/or loneliness effective?
- Do these interventions improve health, well-being, and/or quality of life?
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- Do the interventions impact on health care utilization, such as physician visits, emergency visits, hospitalization, or admission to long-term care?

Background: Target Population and Condition

Social and family relationships are a core element of quality of life for seniors, and these relationships have been ranked second, next to health, as the most important area of life. (1;2) Several related concepts, reduced social contact, being alone, isolation, and feelings of loneliness have all been associated with a reduced quality of life in older people. (3)

Social isolation refers to the objective characteristics of a situation and has been defined as the lack of meaningful and sustained communication or as having minimal contact with family or the wider community. (4) Loneliness, on the other hand, concerns the way that people perceive, experience, and evaluate lack of communication with other people. (5) The experience of loneliness generally implies an unpleasant experience or negative feelings that occur when an individual's network of social relationships is perceived to be deficient in some important way.

Seniors are vulnerable to a decline in social networks and support due to a range of factors associated with life changes and loss events. These synergistic factors include events such as retirement, loss of loved ones and other relationships, declining health and increasing disability, sensory loss, and mobility restrictions. (6)

Social support provides not only companionship and emotional reassurance but also practical assistance in dealing with difficulties in daily life due to illness or frailty. Social supports and networks can also influence the type and amount of care (formal and informal) that seniors need or receive. Approximately half of community-dwelling seniors (45%) received help exclusively from family and friends (informal caregivers), and over half (55%) received formal assistance, with half of these also receiving care and support from informal caregivers. (7) Living arrangements are a key aspect of one's social network and are often associated with the type of care and support needed by women. Based on the 2002 Canadian General Social Survey, elderly women were much more likely to live alone than men (43% versus 16%), and for women the probability of receiving formal care increased from 9% for those living with children to 15% for those living alone. (8) Lack or loss of caregiver support was also found to be an important risk factor for institutional admission among community-dwelling seniors. (9;10)

Social isolation and loneliness have also been associated with a number of negative outcomes such as poor health and maladaptive behaviour with impacts on dietary deficits and increased utilization of services. (11) They have also been associated with negative psychological effects such as depressed mood, and decreased quality of life and life satisfaction. (12-14) Higher levels of loneliness have also been associated with an increased likelihood of hospitalization and nursing home admissions. (15;16)

Methods of the Evidence-Based Analyses

Search Strategy

The initial literature search for systematic reviews and health technology assessments evaluating interventions for social isolation in community-dwelling seniors was performed using information from several sources: the Cochrane Library, the ECRI Institute, and the International Agency for Health Technology Assessment (INAHTA) database. The Web sites of several other health technology agencies were also reviewed including the Canadian Agency for Drugs and Technologies in Health (CADTH) and the United Kingdom National Institute for Clinical Excellence (NICE).

Databases Searched

The search strategies with appropriate keywords and subject headings for social isolation in community-dwelling seniors are outlined in Appendix 1. The following databases were searched for literature published between January 1980 and February 2008: MEDLINE, MEDLINE In-Process and other Non-Indexed Citations, EMBASE, CINAHL, PsycINFO, The Cochrane Library, and the INAHTA/Centre for Reviews and Dissemination.

Inclusion Criteria

- English-language reports and human studies,
- single-focused interventions directed to or evaluating social isolation or loneliness,
- community-dwelling elderly (≥ 65 years) subjects in whole or in part,
- quantitative outcome measures on social isolation or loneliness, and
- study design that included a control or a comparative group.

Exclusion Criteria

- nonsystematic reviews, letters, comments, and editorials;
- case reports or case series involving fewer than 30 subjects; or
- reports involving comprehensive or integrated models of outreach or care.

The search results were merged into a database using Reference Manager software, and duplicates were subsequently removed. In total, 738 citations were identified. The search results were reviewed, and articles were selected based on information provided in the title and abstract. Copies of original articles of eligible articles were obtained and reference lists were hand searched.

Additional Information Sources

Additional information on estimates of seniors living in the community or in LTC and disease prevalence was obtained from several national Canadian surveys including the Canadian Community Health Survey in 2000, (17) the Statistics Canadian Cycle 16 of the General Social Survey conducted in 2002, (8) and the Participation and Activity Limitation Survey 2006. (18)

Quality of Evidence

An overall assessment of the quality of evidence was based on the grading of recommendations assessment, development, and evaluation (GRADE) system and referred to as the GRADE Working Group criteria. (19)

- Quality of the study refers to a range of criteria associated with the design, conduct, and evaluation of the study.
- Consistency refers to the similarity of estimates of effect across studies. If there is important unexplained inconsistency in the results, confidence in the estimate of effect for that outcome decreases. Differences in the direction of effect, the size of the differences in effect, and the significance of the differences guide the decision about whether important inconsistency exists.
- Directness refers to the extent to which the interventions and outcome measures are similar to those of interest.

As stated by the GRADE Working Group, the following definitions were used in grading the quality of the evidence.

High	Further research is very unlikely to change confidence in the estimate of effect.
Moderate	Further research is likely to have an important impact on confidence in the estimate of effect and may change the estimate.
Low	Further research is very likely to have an important impact on confidence in the estimate of effect and is likely to change the estimate.
Very low	Any estimate of effect is very uncertain.

Findings of Evidence-Based Analysis

Other Systematic Reviews

The literature search identified 2 systematic reviews on interventions for social isolation and loneliness in community-dwelling seniors. (20;21)

Findlay et al. (20) searched the literature published in English between 1982 and 2002. They included studies that intended to achieve a health gain and recorded any health outcome measures. The authors concluded that there were few high-quality evaluations of effectiveness of interventions for social isolation. Only 6 randomized trials were identified, (22-25;25-27) and 2 of these were ineligible for the Medical Advisory Secretariat analysis as one study involved multiple interventions (26) and the other study involved an intervention in a nursing home. (27)

Several qualitative conclusions were made based on the general evidence and on the characteristics of successful interventions. The degree of training of study facilitators or coordinators was cited as one factor of success. Involving older people in the planning and execution of the interventions was also an important factor in successful interventions. Interventions also had a greater likelihood of success if they involved existing community resources and aimed to build community capacity. An example cited for this was known as a gatekeeper program, in which nontraditional community referral sources were trained to identify "at risk" older people, who often do not come to the attention of support services. (28) The author recommended that networking among communities, governments, the private sector, and researchers be improved, in order to connect financial support with technical expertise, thus enabling more thorough investigations in this area.

Cattan et al. (21) reviewed studies involving health promotion intended to remedy social isolation and loneliness among older people. Their review considered outcome studies published between 1970 and 2002 in any language; pertained to older people, with no specific age cutoff; and included the following inclusion criteria: interventions that were intended to prevent or alleviate social isolation/loneliness and which reported some form of quantitative outcome measure. Thirty quantitative studies were identified, 16 involving randomized controlled trial (RCT) reports. Of the 30 quantitative studies, 10 were eligible for the Medical Advisory Secretariat's analysis. (22-25;29-34) The remainder of the reports discussed by Catton et al. were ineligible for the current review either because the interventions consisted of a broad range of services, or because the studies did not involve mainly seniors, did not involve community-dwelling seniors, were not in English, had no control groups, or were pilot studies with fewer than 30 subjects.

In general the Cattan review concluded that a few interventions for social isolation in community-dwelling seniors were effective. Group activities that included some form of educational or training input, and social activities that targeted specific groups of people were both effective. An observation was also made that intrapersonal resources such as coping, self-esteem, or psychosocial health were significant moderating factors for perceived isolation and loneliness. Interventions that resulted in improved self-esteem and locus of control, leading to perceived competence and personal control were suggested as

pathways to decreased loneliness. The authors concluded that there was limited generalizability of the studies because of the substantial variability in target groups, settings, circumstances, and in measurement tools and outcomes. The authors also suggested that it was as important to focus on reasons for failures as well as reasons for success in the interventions, although limited reporting on the protocols or processes made this difficult in these studies. The authors also acknowledged that the research in this area is further hampered by poorly understood complexities in the conceptual relationship between loneliness, social isolation, and living alone.

Systematic Evidence Review by the Medical Advisory Secretariat

The evidence review by the Medical Advisory Secretariat identified an additional quantitative report in the literature. (35) Therefore, in addition to the 10 quantitative studies identified in the previous systematic reviews, a total of 11 quantitative studies were identified involving single, focused interventions targeting social isolation and loneliness in community-dwelling seniors. Each of the studies involved a different intervention strategy and target group. Table 1 outlines the study designs for these reports. Of the 11 quantitative studies, 6 were RCTs, (23-25;30;32;35) and the balance involved other prospective controlled study designs. Two studies were a form of cluster or community-based intervention where the randomization unit was other than the individual; in one study, comparisons were between different floors of a senior citizen building (29) and in the other, across different municipal regions. (31)

The 3 nonrandomized studies involved the use of various prospective control groups. (22;33;34) One of the studies, involving a phone crisis line, had been referred to as a randomized study, but allocation to the groups was systematic and was therefore reclassified as a prospective controlled study. (22) The other 2 studies, 1 involving mental health services (33) and 1 involving hearing loss rehabilitation, (34) each involved comparisons with 2 different control groups.

Table 1: Evidence Summary for Interventions Targeting Social Isolation and Loneliness in Community-Dwelling Seniors*

Study Design	Level of Evidence†	Number of Eligible Studies
Large RCT, systematic review of RCT	1	3, 2
Large RCT, unpublished but reported to an international scientific meeting	1(g)	0
Small RCT	2	3
Small RCT, unpublished but reported to an international scientific meeting	2(g)	0
Non-RCT with contemporaneous controls	3a	5
Non-RCT with historical controls	3b	0
Non-RCT, presented at international conference	3(g)	0
Surveillance (database or register)	4a	0
Case series (multisite)	4b	0
Case series (single site)	4c	0
Retrospective review, modeling	4d	0
Case series presented at international conference	4(g)	0

*g indicates grey literature; RCT, randomized controlled trial.
†For each included study, levels of evidence were assigned according to a ranking system based on a hierarchy proposed by Goodman. An additional designation "g" was added for preliminary reports of studies that have been presented at international scientific meetings. (36)

Background Study Information

Table 2 presents general information on the 11 quantitative studies involving single, focused interventions

targeting social isolation and loneliness in community-dwelling seniors. The reports involved studies from either American (n = 7) or European (n = 4) settings. Only 1 study (31) also received funding from industry.

Most of the included studies were done on a pilot scale, and only 4 studies involved samples of more than 150 participants. (23;30-32) The mean age of the participants in the studies ranged from 64 to 77 years, and the majority of the trial participants were women. In 3 studies, (23;24;35) only women were included, and one of these involved female informal caregivers of persons with dementia. (35)

Table 2: Overview of Quantitative Studies Involving Interventions Targeting Social Isolation in Community-Dwelling Seniors*

	Author, Year	Region, Country	Target Group	Sample Characteristics	Funding Source
1.	Andersson 1985 (24)	Stockholm, Sweden	On wait lists for senior apartments	108 F Mean age 77 y	Delegation for Social Research & City of Stockholm
2.	Arnetz and Theorell 1983 (29)	Stockholm, Sweden	Residents of senior apartments	60 (40 F + 20 M) Mean age 77.6 y	Delegation for Social Research & City of Stockholm
3.	Hopman-Rock and Westoff 2002 (31)	Leiden, Netherlands	Physically inactive	390 (320 F + 70 M) Mean age 72.3 y	Merck Sharpe & Dohme, Ministry of Public Health, Welfare and Sports, Pfizer, Leerdammer Cheese, & health insurance companies (Zilveren Kruis Achmea & Groene Land Achmea)
4.	McAuley et al. 2000 (32)	Illinois, United States	Physically inactive	174 (125 F + 49 M) Mean age 65.5 y	National Institute on Aging
5.	Caserta and Lund 1993 (30)	Utah, United States	Bereaved	339 (239 F + 100 M) Mean age 67.2 y	National Institute on Aging
6.	Rosen and Rosen 1982 (33)	Georgia, United States	Mental distress	117 (95 F + 22 M) Median age 70 y	Administration on Aging, Office Human Development
7.	Morrow-Howell et al. 1998 (22)	St. Louis, Missouri, United States	Mental health crisis	61 (52 F + 9 M) Mean age 77 y	The Retirement Research Foundation
8.	Heller et al. 1991 (23)	Indiana, United States	Low income & low social support	291 F Mean age 74 y	National Institute Mental Health
9.	Tesch-Romer et al. 1997 (34)	Greifswald, Germany	Hearing impaired	148 (77 F + 71 M) Mean age 71 y	German Research Foundation
10.	Brennan et al. 1995 (25)	Cleveland, Ohio, United States	Informal caregivers	102 (68 F + 34 M) Median age 64 y	National Institute on Aging
11.	Winter and Gitlin 2007 (35)	Philadelphia, Pennsylvania, United States	Informal caregivers	103 F Mean age 66 y	Alzheimer's Association

*F indicates female; M, male; y; years.

Types of Interventions and Target Groups

The reports identified with community-dwelling seniors involved different intervention strategies and target groups. The current analysis group them into studies involving interventions conducted in-person (n = 6) and studies involving interventions assisted by technology (n = 5) such as via the phone or the Internet (Table 3). One of the technology-based studies involved a direct technological intervention, namely, hearing aids. (34) All except 2 studies involved group interventions rather than individual-based interventions. (22;34) The interventions involved diverse senior target groups, such as those who are physically inactive, bereaved, living alone, in need of mental health services, hearing impaired, or on waiting lists for senior apartments. Two of the studies involved interventions targeting social isolation in seniors as informal caregivers to persons with dementia (25) or Alzheimer's disease. (35)

Table 3: Study Participants and Class of Interventions Targeting Social Isolation in Community-Dwelling Seniors

	Study Participants, Country	In-Person Group Activity	Technology-Assisted Activity
1.	Wait list for senior apartments, Sweden	1 RCT (N = 108 F)	
2.	Residents of senior apartments, Sweden	1 CIT (N = 60 F & M)	
3.	Physically inactive, Netherlands	1 CIT (N = 448 F & M)	
4.	Physically inactive, United States	1 RCT (N = 174 F & M)	
5.	Bereaved, United States	1 RCT (N = 339 F & M)	
6.	Mental health services at senior centres, United States	1 Cohort – 2 Control Groups (N = 117 F & M)	
7.	Mental health crisis phone support, United States		1 Cohort (systematic sampling) (N = 61 F & M)
8.	Low income with low, perceived social support, United States		1 RCT (N = 291 F)
9.	Hearing impaired, Germany		1 Cohort – 2 Control Groups (N = 148 F & M)
10.	Informal caregivers of persons with Alzheimer's disease, United States		1 RCT (N = 102 F & M)
11.	Female informal caregivers of persons with dementia, United States		1 RCT (N = 103 F)

*CIT indicates community intervention trial; F, female; M, male; RCT, randomized controlled trial.

Study Objectives, Outcome Assessment, and Follow-Up

The objectives of the interventions, outcomes assessed, and duration of study follow-up are listed in Table 4a for in-person interventions and in Table 4b for technology-assisted interventions. The longest follow-up period for any study was 24 months, (30) with the majority being 1 year or less. The interventions studied had diverse objectives, but all involved some form of behaviour change.

In both the in-person group-based interventions and the technology-assisted interventions, the objectives tended to focus on improving self-efficacy (that is, the subject's belief that he or she can execute a behaviour required to produce a certain outcome successfully) or self-help through an increase in social activation or engagement. Efforts to increase self-efficacy and coping were directed at different target groups: those in bereavement, those in need of mental health services, or those not coping in the community. The methods to increase self-efficacy were varied, using focus groups to provide support and education and a social forum in which to discuss health topics. Two studies involving group-based exercise interventions evaluated the indirect or additional effects of group exercise activity on social isolation. (31;32)

The technology-assisted interventions used the Internet or telephone conferencing systems to support and engage seniors in the community. The lack of in-person contact for these interventions was viewed by the investigators as an advantage for 2 groups of seniors: informal caregivers of persons with dementia, because of their constrained schedules and limited availability, and seniors with a mental health crisis, because of their concern for anonymity.

Two intervention studies for informal caregivers included one led by a nurse (25) and the other by a social worker. (35) Although both studies examined how caregiver burden and social isolation affected caregivers, each involved slightly different objectives. The nurse-led intervention, involving a Web-based computer network support system, was intended to improve decision-making as well as decrease social isolation and burden for the caregiver. The social worker–led telephone-based support group was intended mainly to increase the social support network and decrease burden for caregivers.

Although the study objectives were generally focused on social isolation or loneliness and involved measures of social isolation or loneliness, they also evaluated a number of other outcome assessments (Tables 4a, 4b). The diverse range of psychosocial health and resource outcome measures evaluated in the studies included competency, coping, self-esteem, morale, and life satisfaction. Depression was assessed in 7 studies (22;23;29;30;34) either by the Geriatric Depression Scale (37) or the Center Epidemiologic Studies in Depression Scale. (38) A health-related quality of life outcome measure evaluated by the Rand Medical Outcomes Study short form (SF-36) (39) was reported in one study, (31) and the impact of the intervention on disability as measured by activities of daily living (ADL) (40) was measured in another study. (23) The interventions involving informal caregivers assessed additional outcome measures of caregiver burden and decision making. (25;35) None of the studies evaluated the impact of interventions on health care utilization, such as physician visits, emergency visits, hospitalization, or admission to LTC.

Table 4a: Study Objectives, Outcome Assessments, and Follow-Up for In-Person Group Interventions for Social Isolation

	Intervention	Study Objective	Outcome Assessment Domains*	Follow-Up (months)
1.	Focus groups led by social worker or home helper	Increase social network in seniors on wait list for senior citizen apartments	Social integration, social contacts, alienation, psychological resources, health changes	6
2.	Staff-led senior citizen support groups	Social activation in residents of senior citizen apartments	Mental, physical well-being, social interaction, behaviour	6
3.	Peer- and professional-led exercise and education program	Increase physical activity in inactive community-dwelling seniors	General health, physical performance, health-related knowledge	12
4.	Trained exercise specialist	Evaluate the impact of different modes of exercise on components of subjective well-being	Happiness, satisfaction with life, loneliness	12
5.	Peer and professional-led self-help support groups	Increase self-efficacy in bereaved persons	Self-esteem, life satisfaction, competency	24
6.	Social worker–led self-help support groups	Increase self-efficacy in seniors needing mental health services	Social isolation, activity, morale	12–15

*Details of the domain assessments are outlined in Table 1 of Appendix 3.

Table 4b: Study Objectives, Outcome Assessments, and Follow-Up for Technology-Assisted Interventions for Social Isolation

Intervention	Study Objective	Outcome Assessment Domains*	Follow-Up (months)
7. Social worker crisis phone line	Increase self-efficacy in seniors with mental health crisis	Depressive symptoms, socialization, unmet needs, independence.	4
8. Friendly interviewer phone visits followed by telephone friendship dyads	Increase friendships in community-dwelling low-income women with low perceived social support	Perceived social support, morale, depression, loneliness, physical health, activities daily living, network embeddedness	10
9. Aural rehabilitation	Correct functional deficit in patients referred by physician for hearing assessment	Hearing aid handicap, social activities, social relations, psychosomatic well-being, cognition	6
10. Nurse-moderated computer link	Increase self-efficacy in informal caregivers of persons with Alzheimer's disease	Decision making, social isolation, caregiver burden, depression	12
11. Social worker–led telephone-based support group	Increase social support network in female informal care givers of persons with dementia	Gains, depression, caregiver burden	6

*Details of the domain assessments are outlined in Table 2 of Appendix 3.

Table 5 presents the detailed outcome measurements employed for social isolation, loneliness, and depression. Social isolation was measured by various assessment indices of social contact or social embeddedness ranging from frequency counts of social interactions to formal measurement instruments. The formal instruments designed for social isolation included Perceived Social Support Scale for Friends and for Family (41), Instrumental and Expressive Social Support (42), Network Embeddedness Scale, (43) and the Social Provisions Scale. (44)

Loneliness was evaluated either as a 1-item response to frequency of loneliness or measured by specifically designed instruments such as the UCLA Loneliness Scale. (45) No distinctions were made between emotional loneliness and social loneliness in the studies, and none employed the De Jong Gierveld Loneliness Scale, (46) which was specifically designed for use in elderly populations. Measures of social isolation and loneliness were also extracted from various generic global health or multidimensional functional assessment tools such as the Older Americans Resources and Services (OARS) instrument (47) and the SF-36. (39) The Hearing Handicap Inventory for the Elderly, (48) another multidimensional assessment tool, was applied for a specific population, the hearing-impaired.

For the 2 studies involving informal caregivers of persons with Alzheimer's disease or dementia, social support or isolation were estimated with different measurement instruments, those for caregiver burden and those for gains through group involvement. Two different measures of caregiver burden were employed in the studies, the Zarit Burden Scale (49) and the Impact of Caregiving Scale (50), each of which have subdomains that include the impact of caregiver burden on emotions, social relations, family relations, and social support. Gains were measured using the gains through group involvement instrument (GAINS), a 6-item scale adapted from a full instrument evaluating gains. (51) The gains perceived by caregivers included those in making new friendships, knowing what to do or how to handle loneliness, stress, or resource issues in the past few months.

Table 5: Social Isolation, Loneliness, and Depression Outcome Measurements

		Mental Health & Well Being		
		Social Isolation	**Loneliness**	**Depression**
1.	Self-help programs for seniors on wait list for senior apartments	▪ Social contacts	UCLA Loneliness Scale	NM
2.	Residents of senior apartments	▪ Social activity levels	NM	▪ 1 item (often, sometimes, rarely, never lonely)
3	Exercise programs in physically inactive	▪ Rand Medical Outcomes Study Short Form SF-36	1 item (often, sometimes, rarely, never lonely)	NM
4.	Exercise programs in physically inactive	▪ Social Provisions Scale (SPS)	UCLA Loneliness Scale	NM
5.	Group support program for bereaved	NM	NM	▪ Texas Revised Inventory of Grief (TRIG) ▪ Geriatric Depression Scale (GDS)
6.	Mental health services at senior centres	▪ Older Americans Resources and Services (OARS) ▪ Social activity	1 item (always, frequently, seldom, never lonely)	NM
7.	Mental health crisis phone line	▪ Older Americans Resources and Services (OARS) ▪ Frequency social contacts and satisfaction	1 item (always, frequently, seldom, never lonely)	▪ Geriatric Depression Scale (GDS)
8.	Phone friendships for low income persons with low perceived social support	▪ Perceived social support friends (PSS-FR) and family (PSS-FA) ▪ Network embeddedness	7-item loneliness scale	▪ Center Epidemiologic Studies Depression Scale (CES-D)
9.	Hearing impaired	▪ Hearing handicap Inventory Elderly (HHIE) ▪ German Social Support Scale	UCLA Loneliness Scale	▪ Center Epidemiologic Studies Depression Scale (CES-D)
10.	Support for informal caregivers of persons with Alzheimer's disease	▪ Instrumental and Expressive Social Support (IESS) ▪ Impact of Caregiving Scale	NM	▪ Center Epidemiologic Studies Depression Scale (CES-D)
11.	Support for female informal caregivers of persons with dementia	▪ Caregiver Burden Scale ▪ Gains through Group Involvement Scale (GAINS)	NM	▪ Center Epidemiologic Studies Depression Scale (CES-D)

*NM indicates not measured; UCLA, the University of California, Los Angeles.

Recruitment Strategies and Intervention Protocols

The recruitment strategies and protocols for the in-person group interventions and for the technology-assisted interventions are outlined in Tables 6a and 6b, respectively. Appendix 2 details the intervention protocols.

Eligible subjects were variably defined by age groups in the studies (51–89, 52–91, 60–80, ≥65, and 75+ years). Three studies reported sampling frames involving agency lists: seniors on waiting lists for senior residences, (24) municipal lists, (31) and municipal household listings. (23) The other studies reported diverse recruitment strategies for senior volunteers in various settings and with different living arrangements. Four studies involved subjects referred by a physician, (22;29;33;34) and the others involved various communication and advertising strategies through the media and local community outlets.

Participants were recruited from various settings. Only 1 study reported targeting seniors living alone in the community, and that involved elderly women who were already on a waiting list for senior citizen apartments. (24) One study involved residents of congregate-living senior citizen apartments. (29) Three studies involved interventions with seniors living in the community but in various states of emotional distress: in bereavement, (30) needing mental health services, (33) and in mental health crisis. (22)

Two studies, 1 from the Netherlands (31) and 1 from the United States (32), evaluated exercise interventions with inactive community-dwelling seniors. One study (23) sought to recruit a representative group of the general elderly population at risk for social isolation and included seniors living in the community with low income and low perceived social support, who were randomly selected from residences of low-income housing tracts. That study, however, only involved women.

Table 6a: Recruitment Strategies and Intervention Protocols for In-Person Group Interventions Targeting Social Isolation*

Author, Year, Region	Study Group – Recruitment	Intervention
1. Andersson, 1985 (24) Stockholm, Sweden	▪ 108 F aged 60 to 80 years ▪ living alone ▪ on waiting list for senior citizen apartments	Home-help assistant-led focus group (3–5 participants) meeting in neighbourhood centres for 4 meetings over 2 months
2. Arnetz and Theorell 1983 (29) Stockholm, Sweden	▪ 60 M & F aged 52 to 91 years (30 per floor) ▪ in senior citizen apartment building ▪ randomly selected by staff	Staff-led self-help group (3–4 participants) and social activities in the complex and outings involving picnics, theater visits, activities focusing on social activation in a senior citizen apartment building for 6 months; no special interest activities or programs were created for the control floor
3. Hopman-Rock and Westoff, 2002 (31) Netherlands	▪ 448 (CIT) M & F aged 55 to 75 years ▪ physically inactive ▪ in 12 test and control municipal regions matched on urbanization and involving 21 program centres ▪ recruited by media, brochures, personal contacts	Peer and professional physical activity instructor-led exercise and peer health education for groups of 25 participants for 6 sessions over 6 months, each session consisting of 1 hour health education by peer educator and 1 hour of exercise led by professional exercise instructor.
4. McAuley et al., 2000 (32) Urbana, Illinois, United States	▪ 174 M & F aged 60 to 75 years sedentary lack of regular exercise in past 6 months ▪ recruited through local media and flyers through community outlets (churches, grocery stores, senior centres)	Trained exercise specialists; brisk aerobic program 3 times a week for 6 months starting for 15 minutes and increasing to a maximum 40 minutes per session compared with group undergoing stretching and toning exercises 3 times a week for 6 months
5. Caserta and Lund 1993 (30) Urban counties, Utah, United States	▪ 339 bereaved M& F aged 50 to 89 years ▪ recruited from obituaries, initial letter followed by phone contact	Peer-led (13 groups) and professional-led (13 groups) self-help groups; 14 groups in 8 weeks (weekly) + 12 groups in extra 10 months in community centres/libraries
6. Rosen and Rosen 1982 (33) Rural Georgia, United States	▪ 117 M & F ≥ 65 years ▪ with mental health problems ▪ in senior centres ▪ referred by centre staff ▪ compared with 2 matched control groups	Social worker–led self-help support group meetings; 40 to 49 sessions in senior citizen centres for 12 to 15 months

*CIT indicates community intervention trial; F, female; M, male; RCT, randomized controlled trial.

Table 6b: Recruitment Strategies and Intervention Protocols for Technology-Assisted Interventions Targeting Social Isolation*

Author, Year, Region	Study Group - Recruitment	Intervention
7. Morrow-Howell, 1998 (22) St Louis, Missouri, United States	▪ 61 M & F ≥ 65 years ▪ recruited from crisis line, self referred and referred by friends, family, and professionals	Social work crisis hot line phone provided initial crisis management and subsequent weekly phone follow-up for 4 months
8. Heller, 1991 (23) Indiana, United States	▪ 291 low-income ≥ 65 years ▪ community-dwelling women, with low perceived social support from random residences low-income housing tracts from 3 areas	Friendly interviewer staff contact for 10 weeks followed by peer telephone dyads for 30-week study period
9. Tesch-Romer, 1997 (34) Germany	▪ 148 M & F mean age 71 years ▪ referred by physicians and acousticians and through public media outlets ▪ 3 groups: aided, hearing loss but waiting, no hearing loss	Hearing assessment and aid fitting was performed by registered acousticians after an initial examination by ear, nose, and throat physician. Rehabilitation instructions were provided by the acousticians upon receiving the aid. Six months after the aiding there was a standardized follow-up.
10. Brennan, 1995 (25) Cleveland, Ohio, United States	▪ 102 spousal caregivers of persons with dementia ▪ recruited from a registry, area Association, self referred	Nurse-moderated Web-based computer link providing 24-hour access to information, decision support, and communication support for 1 year
11. Winter and Gitlin 2007 (35) Philadelphia, Pennsylvania, United States	▪ 103 F ≥ 65 years informal caregivers of persons with Alzheimer's disease ▪ Recruited by targeted mailings to adult day centers, clinical programs, media	Social worker–led telephone-based group support intervention weekly 1 hour sessions by social workers for 6 months

*F indicates female; M, male.

Results of In-Person Group-Based Interventions

The effectiveness of the single, focused interventions targeting social isolation and loneliness in community-dwelling seniors are summarized in Table 7. Table 8 outlines the overall assessments of the quality of evidence for these intervention studies.

Support Groups

In-person, group-based support or focused activities led by professional groups to decrease social isolation or loneliness were evaluated in 6 studies. Two studies conducted in Sweden in 1983 and 1985 reported that self-help focus groups decreased social isolation as measured by increased social activity for seniors on waiting lists for senior apartments (increased social contacts, $P < .05$), (24) and for those living in senior apartments (increased social activity level, $P = .02$). (29) Loneliness was not found to be significantly affected by the intervention for seniors on a waiting list and was not measured for those living in senior citizen residences.

Two other studies evaluated self-help/self-support group interventions for targeted groups of seniors including those in mental health distress, those needing mental health services and visiting senior citizen centres in low-income regions in Georgia (33) and bereaved seniors in urban counties in Utah. (30) The support group offered to seniors visiting senior centres with mental health services reported decreased

loneliness ($\chi^2 = 6.76$, $P < .001$), decreased social isolation through increased household activity ($\chi^2 = 5.33$, $P < .05$), and increased social activity ($\chi^2 = 6.55$, $P < .01$) compared with control groups not receiving support.

The study on bereaved seniors did not evaluate measures of social isolation or loneliness but did measure depression and grief. In multivariate analysis, neither grief nor depression was affected by the group-support program over several observation points in a 2-year follow-up. Expanded regression models were evaluated for the independent effects of individual intrapersonal resources, such as life satisfaction, competencies, and self-esteem, on the outcome measures of grief and depression. An unexpected observation was that at the 2-year follow-up, participants' recovery from grief was related more closely to their intrapersonal resources at baseline (life satisfaction [$P = .002$], competencies [$P = .03$], and self-esteem [$P = .03$]) than to the intervention support activities. This pattern, however, was less strong for depression and was significantly detected only for self-esteem ($P = .04$).

Community-Based Exercise Programs

Group exercise interventions were found to reduce social isolation and loneliness in 2 studies. In the Dutch study, Hopman-Rock and Westoff (31) conducted a community intervention incorporating an education and exercise program focusing on well-being and pleasure. They reported increased physical activity ($F = 16.9$, $P < .01$), where physical activity was assessed in household, sport, and leisure settings. The intervention also resulted in greater physical activity in those participants who were less active at baseline ($F = 16.9$, $P < .01$). Loneliness was also reported to be significantly reduced (Friedman statistic; $P < .01$) following the intervention. At follow-up, 82% reported that they had an active lifestyle, compared with 52% at baseline.

The American study (32) was designed as an exploratory RCT to evaluate the effects of aerobic and nonaerobic exercise regimens, and to determine the effects of exercise and the impact of the increased socialization on subjective well-being. Using advanced longitudinal modeling approaches, the study demonstrated that the exercise arms were found to be equally effective in reducing isolation, suggesting that subjective well-being could be improved with less aggressive forms of exercise such as stretching and toning. The relationship between exercise, social isolation, and subjective well-being was also evaluated through multivariate modeling strategies, which took into account the extensive correlations among the variables. Social interactions related to the group exercise activities were reported to have an effect on loneliness ($\beta = -0.10$, $P < .05$) independent of exercise. The authors also noted that in follow-up, adherence to the nonaerobic intervention was higher than adherence to the aerobic intervention (75% versus 51%), and that this posed a potential advantage for exercise programs in the elderly population (where maintaining compliance over long periods is difficult).

Results of Technology-Assisted Interventions

Five studies examined different technology-assisted interventions which targeted community-dwelling seniors and did not require in-person participation.

Telephone Support

Telephone Crisis Support Line

A small demonstration project involving a social worker phone crisis line for seniors at risk of suicide resulted in significantly decreased social isolation through increased person contacts ($t = 2.44$, $P = .01$) and decreased depression ($t = 1.78$, $P = .04$) but not decreased loneliness. (22)

Telephone Friendships

An intervention aimed at increasing social support in low-income women with low perceived social support, by developing phone friendships, was not successful in reducing social isolation, loneliness, or depression. (23) Additional observations, however, were made in subsequent subgroup analyses restricted to those continuing the phone friendship. Participants who continued reported more emotional support ($P < .001$) from the intervention than those not continuing with the phone friendship. Those continuing also differed in baseline characteristics from those that did not continue in that they had higher perceived friend support ($P < .04$), a greater number of friends ($P < 0.04$), and higher ADL scores ($P < .03$). The authors also noted that, overall, the initial participation rates for the study were low, as 52% of those approached for the study refused an initial home assessment.

Technology-Assisted Interventions for Informal Caregivers

The effectiveness of technology-assisted interventions was limited in the 2 studies directed towards relieving the effects of social isolation in informal caregivers of persons with dementia or Alzheimer's disease. (25;35)

Nurse-Led Web-Based Computer Network Support for Informal Caregivers

The nurse-led Web-based computer support system did not demonstrate improvements in depression or social support, and it did not affect caregiver burden according to well-defined measures. (25) The participation or access of the network support system by the study participants, however, was highly variable. Participants accessed the network support system 83 times on average (range 3–590 times, over the 12 months, on average 2 times per week. An analysis of the comments posted on the Web forum suggested that participants perceived the program to be a social support system.

There was a discrepancy between formal quantitative measures and qualitative measures in evaluating how the intervention influenced social isolation. The difference may be attributable to the heavy weighting of the quantitative measure on familiar supports rather than on newly developed supports. Furthermore, it may also be that increased contacts and supports with new friends for the caregivers in this short-term study could not help them to overcome their isolation and loneliness due to the loss of the companionship they had had with the care receiver prior to the onset of their dementia.

Social Worker–Led Telephone Support System for Informal Caregivers

The phone group-support intervention led by social workers, referred to as telesupport, did not demonstrate any main effects in multivariate analysis on self-efficacy gains, depression, or caregiver burden. (35) Subgroup analysis, however, demonstrated a significant interaction effect between depression and age. Younger (≤ 65 years) women compared with older (> 65 years) women were significantly more likely to report decreased depression, with a 4-point lower score ($P = .014$). The participation rate in this intervention was also highly variable: on average, 14.8 sessions (range 0–26, SD = 10.7) out of a possible 26 sessions in 6 months. Participation rates were also influenced by the caregiver's relationship to the care recipient ($P = .022$; 16.7 sessions by wives versus 11.8 sessions by other relatives).

Hearing-Loss Rehabilitation

One prospective cohort study evaluated the effects of hearing-loss rehabilitation in patients referred with mild or moderate hearing loss. (34) The research team considered that randomization of patients for hearing aids would not have been ethical, and outcomes in the intervention group were therefore

compared with 2 prospectively evaluated unaided control groups. Overall, hearing impairment was measured by a multidimensional scale, the Hearing Handicap Inventory for the Elderly (HHIE). The inventory included scales measuring social and emotional problems associated with hearing loss. The scale evaluated the impact of hearing loss on individuals' social activities and interactions, through associated activity limitations, difficulties, or embarrassment. Hearing loss impairment evaluated with this outcome instrument was significantly improved ($F = 24.56$, $P < .01$) in the hearing-aided group compared with the unaided group. Loneliness was also significantly reduced ($F = 6.34$, $P < .01$).

The effects of the intervention were thought to be an underestimate because of the extreme interindividual variability in daytime use of the aids at fitting (daily average range, 36–924 minutes) and at follow-up (daily average range, 26–960 minutes). To increase adherence to hearing aid use, audiologic counseling and psychosocial support in early usage were recommended. It was also noted that most participants were fitted with only a single hearing aid (74%), half of which were in-the-ear aids, and although this was the current practice in Germany, it did not represent ideal aural rehabilitation for symmetrical hearing loss.

Table 7: Effectiveness of Diverse Interventions for Social Isolation, Loneliness, and Depression in Heterogenous Populations of Community-Dwelling Seniors*

	Population	Country, Year	Intervention Type	N	Findings
1.	Wait list for senior apartments	Sweden, 1985	Social worker–led self-help groups	108	↓ Isolation†
2.	Residents of senior apartments	Sweden, 1983	Support groups	60	↓ Isolation†
3.	Physically inactive seniors	Netherlands, 2002	Group exercise programs	382	↓ Isolation‡ ↓ Loneliness‡
4.	Physically inactive seniors	United States, 2000	Group exercise programs	174	↓ Loneliness†
5.	Bereaved seniors	United States, 1993	Peer- and professional- led self-help support groups	339	NS
6.	Users of mental health services at senior centres	United States, 1982	Social worker–led self-help groups	68	↓ Isolation‡ ↓ Loneliness§
7.	Seniors experiencing mental health crisis	United States, 1998	Social worker crisis phone line	61	↓ Isolation‡ ↓ Depression†
8.	Seniors with low income and low perceived social support	United States, 1991	Telephone friendships	291	NS
9.	Hearing-impaired seniors	Germany, 1997	Hearing aids	148	↓ Loneliness†
10.	Informal caregivers of persons with Alzheimer's disease	United States, 1995	Nurse moderated computer link	102	NS
11.	Informal caregivers of persons with dementia	United States, 2007	Social worker–led telephone-based support	103	↓ Depression† (subgroup > 65 y)

↓ indicates decrease; NS, not significant , $P > .05$.
†$P < .05$; ‡$P < .01$; §$P < .001$.

Table 8: GRADE Evidence for Interventions Targeting Social Isolation in Community-Dwelling Seniors*

Intervention	Number of Interventions	Design	Quality	Consis-tency	Directness Generalizability	Overall Quality
In-person group intervention	5	RCT wait list	Low/Moderate	NA	Limited	Moderate
		CIT senior apartment	Moderate		Limited	Moderate
		CIT exercise	Moderate		Limited	Moderate
		RCT exercise	Moderate		Limited	Moderate
		RCT Bereaved	Moderate		Moderate	Moderate
	1	Cohort MH senior centre	Low	NA	Limited	Low
Technology-assisted (phone, Web)	4	RCT crisis phone	Low	NA	Moderate	Low/Moderate
		RCT CG Web link	Moderate		Moderate	Moderate
		RCT CG phone link	Moderate		Moderate	Moderate
		RCT phone pals	Low		Limited	Low/Moderate
Device	1	Cohort hearing aid	Moderate	NA	Moderate	Moderate

*CG indicates caregiver; CIT, community intervention trial; MH, mental health; NA, not applicable; RCT, randomized controlled trial.

Discussion

Evidence Limitations

The systematic evidence search identified only a few studies addressing social isolation, and each study involved a different intervention targeting a different group of elderly subjects. In addition, the available evidence had several major limitations, with generalizability being the most significant. None of the studies were conducted with Canadian populations, and most involved highly selected senior groups from 10 to 15 years ago. Participants in the studies also tended to be in their sixties and seventies on average, and mainly women. Those over 80 years of age and men of any age were not well represented in any of the studies, and it is difficult to determine to what extent the interventions that were mainly evaluated in young, female seniors would be appropriate for the needs and preferences of older and/or male seniors. The durability of any of the intervention outcomes is also largely unknown, as the studies involved short time frames with follow-up periods of generally 1 year or less. In developing programs or interventions for social isolation in the elderly, consideration should also be given to the idea that the seniors of today or tomorrow represent distinct cohorts with a unique life course and aging and likely with particular needs.

Generalizability is also an issue in that the interventions that were identified as targeting social isolation and loneliness mostly involved some element of change, particularly behaviour-based change. The stated behavioural changes depended upon seniors' gaining new skills in coping and resiliency, going out more regularly, seeking information and services, or becoming more physically active. Responses to these interventions are therefore likely to be more variable – influenced by personal factors, gender, race, or cultural differences – than responses to interventions involving devices or medical management.

Matching the interventions targeting social isolation and or loneliness to the needs, attitudes, and preferences of seniors is also an important consideration. The participation rates in several of the intervention studies, including those found to be effective, were low. Less than half of community-dwelling low-income elderly women agreed to participate in introductory interviews for 1 study. (23) Gaining participation in the study was also no guarantee that the potential intervention being offered would be appropriate for each participant, given the varying causes of social isolation or loneliness. An example of this was the intervention involved in establishing phone friendships to create new social support. (23) This intervention could not be expected to be effective if the participants were lonely mainly because of absent or declining family support, as was suggested in post-intervention interviews. Another example was the intervention intended to increase social support for isolated informal caregivers through newly created social networks. (35) However, if the caregiver's loneliness was attributable to the loss of companionship of the care recipient, improving other friendship support would have limited effect on caregiver loneliness. Flexibility of programs and choice would seem to be key aspects of connecting seniors in need with interventions that are effective and appropriate to their needs.

The many complex needs of seniors were found to limit the effectiveness of interventions, particularly the technology-assisted interventions. A straightforward intervention to rehabilitate mild/moderate hearing loss with a hearing aid was effective in reducing communication-related disability and loneliness. The extreme variability in compliance with the hearing aid at baseline and at follow-up, however, suggests that education or counseling regarding appropriate use of their device is needed to ensure that maximum effectiveness is achieved. The authors characterized the provision of a hearing aid as a necessary but not sufficient condition for the subject to achieve effective hearing-loss rehabilitation.

Methodological Issues

Although the studies generally had a single objective that focused on an intervention involving measures of social isolation or loneliness, social isolation in particular was variably defined and measured differently in every study. Social isolation was operationalized from simple frequency counts of friend and family visits to more complex measures of social network support or embeddedness. For informal caregivers, social isolation was evaluated as one component of a global measure of caregiver burden. The varying precision and lack of consensus on measurement across studies limits any comparisons between interventions and across studies.

Many other health states and conditions were also evaluated in the studies, but given the limited focus of the interventions and their short duration, it was unsurprising that the interventions were not found to impact on broader measures of health and quality of life, or on longer-term outcomes such as institutionalization or admission to LTC.

The interventions for social isolation by their very nature were mainly group-based, involving longitudinal follow-up with repeated measures. Analytical approaches in the studies varied from simple bivariate analysis to more advanced techniques taking into account longitudinal follow-up and repeated measurements. The interventions mainly depended on group dynamics, and outcomes could vary considerably as a result. In other cases, the intervention was conducted in settings involving community congregate living, and for practical reasons the assignment to treatment or control group was based on floor of residence or health centre attendance. The research study strategy for these interventions is more complicated and requires consideration of the effects of grouping or clustering either at the design stage or the analytical stage. Although a few studies evaluated in this report did attempt to take clustering into effect, the majority did not.

Relevant Areas Not Addressed or Incompletely Addressed

Social isolation and loneliness occurring in the elderly can be attributed to a variety of interconnected personal, social, economic, health-related, geographic and environmental factors. Research in this area has been narrowly based, focusing on only a few of the diverse potential causes of social isolation and loneliness.

Although the impact of hearing-loss rehabilitation on social isolation was investigated, no studies were found to evaluate the effects of interventions for other age-related functional disability such as vision loss or mobility restrictions. On the other hand, research is not necessarily needed to confirm that correcting mobility restrictions or vision loss would interfere with seniors' quality of life, socialization, and independence. Many programs and services that intuitively seem to be of benefit for seniors' socialization and independence are already offered and funded. In Ontario, mobility aids, hearing aids, and vision aids have variable support from ministry-funded programs. Adult day camps and friendly visitor programs are other popular approaches for socialization that have not been evaluated by formal research but are perceived to be of benefit to seniors. A variety of community organizations in the province provide these services to seniors.

Seniors are in various states of living, health, and aging, with diverse changing needs and preferences. In addition, given the complex, interconnected causal pathways of social isolation, it is unlikely that a single, focused intervention would provide a comprehensive solution for social needs. The identification or targeting of seniors who are at risk for social isolation or loneliness was not addressed in the studies. Given the high prevalence of health conditions and aging-related disabilities, the provision of multiple services and interventions needed by seniors also poses difficulties for assessment, program design, and delivery. The existing trials on social isolation employed a range of professionals to conduct the

interventions, and no comparative information is available to evaluate the abilities of specialists or peer groups to provide supportive interventions. None of the studies evaluated different methods of service delivery and how best to provide services to seniors whose needs and personal situations may vary greatly.

Only 2 studies examined interventions for social isolation in informal caregivers, and the effectiveness of the interventions involving technology-assisted support via phone or computer was limited at best. Given the tremendous role that informal caregivers have in assisting and providing support to seniors in the community, the paucity of evidence on interventions that would support or assist caregivers in this vital activity is particularly regrettable. (7) Seniors' need for support from informal caregivers is not likely to lessen in the future, and more information is required about the needs or burden (including social isolation) of caregivers and about interventions that would support them in that role.

Technology-assisted interventions would potentially seem to offer particular advantages to both isolated caregivers and homebound, isolated, frail seniors, by avoiding the need for out-of-house in-person attendance. However the range of technology-assisted options is limited at present, as is the evidence supporting their effectiveness. One promising area for dealing with social isolation in seniors has been the introduction of video telehome phone monitoring and support systems. Video home phones could also potentially offer efficiencies to health and social support professionals, and social support could be a great advantage for isolated, homebound seniors. Although prospective randomized trials have been implemented, they have evaluated the impact of the technology on home-based medical case management and not the impact on well-being and social factors such as isolation and loneliness. (52;53) The effectiveness of video telehome phone support systems on reducing social isolation in the elderly population has been evaluated in prospective cohort trials (54-56) but so far has not been evaluated in RCTs.

The interventions for social isolation identified in this review were directed only at the individual or group level. No studies evaluated interventions at the higher or environmental level, including factors such as neighbourhood, community, or housing. Housing, or where and how seniors choose to live, has been viewed as a central element of their health and quality of life. (57) Concern for housing or living space relates to broader issues including lifestyle, personality, self-esteem, identity, well-being, and social environment. Adequate housing plays a major role in community care and is often a key to independent living. (58) There are established links between good housing and good health, and the importance of housing has to be factored into health implementation strategies for community-dwelling seniors. (59;60)

Economic Analysis

Disclaimer: The Medical Advisory Secretariat uses a standardized costing methodology for all of its economic analyses of technologies. The main cost categories and the associated methods from the province's perspective are as follows:

Hospital: Ontario Case Costing Initiative cost data are used for all in-hospital stay costs for the designated International Classification of Diseases-10 (ICD-10) diagnosis codes and Canadian Classification of Health Interventions procedure codes. Adjustments may need to be made to ensure the relevant case mix group is reflective of the diagnosis and procedures under consideration. Due to the difficulties of estimating indirect costs in hospitals associated with a particular diagnosis or procedure, the secretariat normally defaults to considering direct treatment costs only.

Nonhospital: These include physician services costs obtained from the Ontario Schedule of Benefits for physician fees, laboratory fees from the Ontario Laboratory Schedule of Fees, device costs from the perspective of local health care institutions, and drug costs from the Ontario Drug Benefit formulary list price.

Discounting: For all cost-effectiveness analyses, a discount rate of 5% is used as per the Canadian Agency for Drugs and Technologies in Health.

Downstream costs: All costs reported are based on assumptions of utilization, care patterns, funding, and other factors. These may or may not be realized by the system or individual institutions and are often based on evidence from the medical literature. In cases where a deviation from this standard is used, an explanation has been given as to the reasons, the assumptions, and the revised approach. The economic analysis represents an estimate only, based on assumptions and costing methods that have been explicitly stated above. These estimates will change if different assumptions and costing methods are applied for the purpose of developing implementation plans for the technology.

Economic Analysis of Effective Interventions for Social Isolation

Community exercise programs were found to be effective in reducing social isolation outcomes in seniors living in the community. Therefore, an economic analysis to project total cost to implement the program in the first year based on eligible seniors in the community willing to participate in a community exercise program was calculated. Table 9 describes the cost to implement the program in the first year for these interventions.

Table 9: Cost to Implement Community-Based Exercise Programs (2008 $Cdn)*

Type of Professional Delivering Program	Unit Cost, $	First Year Cost, $	Population	Number	First Year Total Cost, $
Recreation Therapist	25.85	74.68	Seniors in the community willing to participate in an exercise program	476,992	35,620,736
Occupational Therapist	29.68	85.74	Seniors in the community willing to participate in an exercise program	476,992	40,898,392
Physiotherapist	18.41	53.18	Seniors in the community willing to participate in an exercise program	476,992	25,368,578

*Assumed hourly exercise group sessions of 9 seniors per group once biweekly with either an occupational therapist, a physiotherapist, or a recreation therapist. Assumed 4.5% of seniors are in long-term care. Assumed 57% of seniors 65+ would participate in a community exercise program and 79% would be compliant. Assumed 65.8% of seniors in the community are mobile.

This economic analysis was calculated for the first year after an introduction of the interventions, from the Ministry of Health and Long-Term Care perspective, using prevalence data only. Incidence and mortality rates were not factored in. Numbers may change based on population trends, rate of intervention uptake, trends in current programs in place in the province, and assumptions on costs. Number refers to patients likely to access these interventions in Ontario based on assumptions stated below from the literature. Resource consumption was confirmed by an expert panel.

Assumptions

Several assumptions were made to calculate the annual budget impact:

- Total population 65 and over in Ontario was calculated from Statistics Canada population data. (61)
- Assumed exercise group sessions (1 hour) of 9 seniors once biweekly (62) with either an occupational therapist (63) or physiotherapist (64) or recreation therapist. (65)
- Assumed 4.5% of seniors are in LTC. (66)
- Assumed 57% of seniors 65+ would participate in a community exercise program and 79% of seniors would be compliant. (67)
- Assumed 65.8% of seniors in the community are mobile. (10)

As a result of these assumptions, and due to the limited data available in the literature, uncertainty could become an issue. If and when new evidence is presented, these results may change and may better predict program resources over time, allowing for a more accurate analysis.

Current Expenditures in the Province of Ontario

Currently there are community programs in Ontario that offer exercise programs to seniors 65 years and older. The funding infrastructure for such programs in the province was not investigated in this review.

Conclusion

A systematic review of the published literature focusing on interventions for social isolation and loneliness in community-dwelling seniors identified 11 quantitative studies. The studies involved European or American populations with diverse recruitment strategies, intervention objectives, and limited follow-up, with cohorts from 10 to 15 years ago involving mainly female seniors in their sixties and seventies. The studies involved 2 classes of interventions: in-person, group-support activities and technology-assisted interventions. These were delivered to diverse targeted groups of seniors such as those in mental or emotional distress, informal caregivers, the physically inactive, and low-income groups. Both classes of interventions were found to reduce social isolation, although the technology-assisted interventions tended to involve only seniors in mental distress and informal caregivers. Effective interventions included social support groups for seniors on wait lists for senior apartments and those living in senior citizen apartments, and community-based exercise programs that featured health and wellness for physically inactive community-dwelling seniors. Rehabilitation for hearing loss was also effective in remedying communication impairment and reducing loneliness in seniors.

Social isolation and loneliness in seniors are attributable to a variety of personal, social, economic, health-related, geographic, and environmental factors. Research into interventions for social isolation in seniors has been very limited, given the diverse potential causes of isolation. Although the impact of hearing loss rehabilitation was investigated, impacts of interventions towards other major age-related disabilities, such as vision loss or mobility declines, were not investigated. The process issues (methods of targeting at-risk subjects, delivery, and settings) and modifying factors (client personality, attitude, or preference) of behaviour-based change interventions for social isolation are particularly important and have not been addressed.

Research into several key areas for sustainability of independent community living for seniors is needed. First, the impact of environmentally directed interventions such as housing or living arrangements has not been investigated in any controlled fashion. Evaluations at this level, however, would be problematic and would require a more complex research design and analytical strategy than has been typically employed in this area. Second, considering the key role that informal caregivers have in supporting seniors in the community, little is known on how to positively influence their social isolation and other burdens imposed on them. Third, the increasing demand for home health care and the need for efficiencies have coincided with the development of many initiatives in the e-health or telehealth field. However, the potential impact of these interventions upon the social health and well-being of seniors has been evaluated only at the pilot or preliminary stage. In conclusion, more evidence is needed to guide the development of effective, appropriate, and comprehensive interventions or strategies for the social needs and health of present-day and future community-dwelling Canadian seniors.

Appendices

Appendix 1. Search Strategy for Social Isolation in Community-Dwelling Seniors

Final Search – Social Isolation

Search date: March 5, 2008
Databases Searched: OVID MEDLINE, MEDLINE In-Process and Other Non-Indexed Citations, EMBASE, Cochrane Library, CINAHL, PsycINFO, INAHTA/CRD

Database: Ovid MEDLINE(R) <1996 to February Week 3 2008>
Search Strategy:

1	exp Social Isolation/ (3709)
2	exp Loneliness/ (701)
3	1 or 2 (3709)
4	limit 3 to "all aged (65 and over)" (790)
5	exp Aged/ (788008)
6	(elder$ or senior$).mp. [mp=title, original title, abstract, name of substance word, subject heading word] (75147)
7	3 and (5 or 6) (810)
8	4 or 7 (810)
9	exp Telemedicine/ or exp telephone/ or exp videoconferencing/ (12631)
10	exp Community Health Nursing/ or exp Home Care Services/ (18813)
11	exp exercise/ or exp exercise therapy/ (37456)
12	exp Self-Help Groups/ or exp Self Care/ (18674)
13	exp Social Support/ or exp Peer Group/ (25044)
14	exp Social Environment/ (32034)
15	exp Intervention Studies/ (2987)
16	exp Health Promotion/ (21288)
17	exp Health Education/ (48176)
18	exp House Calls/ (801)
19	exp Primary Prevention/ (34879)
20	exp social adjustment/ or exp social facilitation/ (5433)
21	exp health services for the aged/ or exp preventive health services/ (157679)
22	exp counseling/ (10892)
23	exp Pychotherapy/ or exp Social Work/ (3879)
24	((lonely or loneliness or isolation) adj4 (decrease or reduce$ or reduction$ or intervention$ or prevent$)).mp. [mp=title, original title, abstract, name of substance word, subject heading word] (609)
25	or/9-24 (277119)
26	8 and 25 (353)
27	limit 26 to (english language and humans and yr="2003 - 2008") (184)

Database: EMBASE <1980 to 2008 Week 09>
Search Strategy:

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1 social isolation/ (4986)
2 exp LONELINESS/ (1350)
3 1 or 2 (6201)
4 limit 3 to aged <65+ years> (1144)
5 (elder$ or senior$).mp. [mp=title, abstract, subject headings, heading word, drug trade name, original title, device manufacturer, drug manufacturer name] (118915)
6 3 and 5 (513)
7 4 or 6 (1260)
8 exp telephone/ (8884)
9 exp TELEMEDICINE/ (1525)
10 exp VIDEOCONFERENCING/ (162)
11 exp Community Care/ (22319)
12 exp Elderly Care/ or exp Home Care/ (38128)
13 exp Kinesiotherapy/ (16609)
14 exp EXERCISE/ (81057)
15 exp Self Help/ (2994)
16 exp Self Care/ (13259)
17 exp Social Support/ (15074)
18 exp Peer Group/ (1100)
19 exp Social Environment/ (71146)
20 exp Intervention Study/ (2710)
21 exp Health Promotion/ (23540)
22 exp Health Education/ (70734)
23 exp Social Adaptation/ (31527)
24 exp Preventive Health Service/ (4231)
25 exp Counseling/ (43484)
26 exp Mental Health Service/ (12728)
27 exp Social Network/ (443)
28 exp social care/ or exp Social Work/ (33091)
29 exp psychotherapy/ (73423)
30 ((lonely or loneliness or isolation) adj4 (decrease or reduce$ or reduction$ or intervention$ or prevent$)).mp. [mp=title, abstract, subject headings, heading word, drug trade name, original title, device manufacturer, drug manufacturer name] (869)
31 or/8-30 (435544)
32 7 and 31 (1056)
33 limit 32 to (human and english language and yr="2003 - 2008") (417)

Database: CINAHL - Cumulative Index to Nursing & Allied Health Literature <1982 to February Week 4 2008>
Search Strategy:

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1 exp Social Isolation/ (2197)
2 exp LONELINESS/ (641)
3 1 or 2 (2197)
4 limit 3 to (aged <65 to 79 years> or "aged <80 and over>") (710)
5 (elder$ or senior$).mp. [mp=title, subject heading word, abstract, instrumentation] (33441)
6 3 and 5 (249)
7 4 or 6 (725)

8 exp Telephone/ or exp Telemedicine/ or exp Teleconferencing/ (9176)
9 exp Community Health Nursing/ or exp Home Health Care/ or exp Community Health Services/ or exp Community Mental Health Services/ (134368)
10 exp Health Services for the Aged/ or exp Gerontologic Nursing/ or exp Gerontologic Care/ (17447)
11 exp Exercise/ (25112)
12 exp Therapeutic Exercise/ (15205)
13 exp Support Groups/ (4075)
14 exp Self care/ (11961)
15 exp Support, Psychosocial/ (19251)
16 exp Peer Group/ (1704)
17 exp Social Environment/ (11315)
18 exp Health Promotion/ (14613)
19 exp Health Education/ (46582)
20 exp Social Adjustment/ or exp Adaptation, Psychological/ (8095)
21 exp Preventive Health Care/ (77142)
22 exp Home Visits/ (1946)
23 exp Counseling/ (8177)
24 exp PSYCHOTHERAPY/ (44148)
25 exp Social Work/ (4781)
26 ((lonely or loneliness or isolation) adj4 (decrease or reduce$ or reduction$ or intervention$ or prevent$)).mp. [mp=title, subject heading word, abstract, instrumentation] (379)
27 exp Social Networks/ (1982)
28 exp Social Work Service/ (1680)
29 or/8-28 (263356)
30 7 and 29 (421)
31 limit 30 to (english and yr="2003 - 2008") (181)

Appendix 2. Protocols for Intervention Studies for Social Isolation in Community-Dwelling Seniors

Interventions were mainly (8 of 11) led by various professional groups (social workers, nurses, psychologists, exercise specialists, and audiologists). Social workers were reported as conducting the intervention in 3 studies, (22;33;35) and nurses conducted an intervention in 1 study. (25) Peer as well as professional support leaders were identified in 2 studies, 1 involving exercise and education (31) and 1 involving bereavement support groups. (30) The interventions were usually conducted with small groups(< 30 participants) and in community or senior centres. The duration of the interventions was typically 6 months or less, with the longest being 12 months.

The 2 trials involving exercise interventions involved different protocols. In the community intervention study conducted in the Netherlands by Hopman-Rock and Westoff, (31), a program known as the Aging Well and Healthy Program was designed to promote a healthy lifestyle among older adults living independently. The program targeted seniors from 55 to 75 years of age, was conducted in community settings, and consisted of 6 sessions, including a combination of a 45-minute peer-led education component and a 30-minute exercise component led by a professional physical activity instructor. The education topics included successful aging, exercise and mobility, wholesome food, safety in and around the house, resistance (physical and psychological), and infirmities of old age. The exercise program consisted of activities that could be performed sitting or standing, and included warm-up exercises, upper and lower body exercises, whole body movements, and cooling-down exercises. Participants were encouraged to continue the exercises at home for a minimum of 3 times a week.

In the United States, the exercise intervention study was a randomized trial intended to differentiate the effects of different levels of exercise – an aerobic program versus an anaerobic program. (32) Both exercise programs were conducted in community gymnasiums and led by trained exercise specialists. The exercise programs targeted community-dwelling physically inactive seniors aged 60 to 75 years of age. The aerobic program employed brisk walking as the aerobic component and was conducted 3 times per week for 6 months. The exercise intensity was increased over the program from short (10–15 minutes) to longer (45 minutes) intervals and from light to moderate activity levels as measured by physiological testing and heart rate monitoring. The anaerobic program, or less strenuous activity, consisted of a stretching and toning comparative exercise group with the same frequency and duration of the aerobic program and lasted for 40 minutes with 10-minute warm-up and cool-down periods. The program consisted of strengthening exercises of 8 to 12 repetitions per major muscle group and flexibility exercises for all large muscle groups. Both groups were followed up at 6 and 12 months.

Interventions assisted by technology, such as by phone (n = 3) or a Web-based computer support system (n = 1), involved varying protocols over short time periods (4–12 months) for diverse client groups. All of them involved some degree of client-initiated control of the schedules. The intervention to develop a friend support system for community-dwelling, low-income individuals with low perceived social support involved a 2-stage study design. (23) The intervention was initiated by a friendly staff interviewer with phone contacts over 10 weeks and was followed by random assignment of clients to phone "friends" in pairs or dyads, who were encouraged to provide each other with social contact and support by phone and were followed for an additional 30 weeks.

Of the 5 studies employing technology-assisted interventions, 2 involved informal caregivers for persons with Alzheimer's disease and dementia. One of studies included a nurse-led 24-hour access to a Web-based computer link that provided 3 services to caregivers: information, decision support, and communication. (25) Computer terminals were set up in participants' homes, and participants received

90 minutes of instruction and monthly phone calls on service use. A nurse moderator of the Web site served as a group facilitator and clinical expert. The other study involved social worker–led weekly phone conferencing support groups consisting of 5 caregivers. (35)

Appendix 3: Summary of Study Analysis, Outcome Assessments, and Results

Table 1: In-Person Group-Focus Interventions*

Study Group Intervention	Analysis	Outcomes – Scales	Results
Andersson 1985 (24) Study conducted in Stockholm Women on wait lists for seniors apartments Self-help focus groups: 4 meetings led by a social worker or home helper RCT (n = 108) Objective: strengthen social network	T-test ANCOVA	At 6 months: ▪ Social integration (Loneliness – UCLA) ▪ Social contacts ▪ Alienation [Meaninglessness 4-item scale by Gardell and Powerlessness 3-item scale] ▪ Psychological resources (Self-esteem 4-item scale, inability to trust) ▪ Health changes by 5 indicators (psychosomatic complaints, subjective health, drug use, blood pressure, and activities [participation in organized activities, no leisure activities])	T-Test Treatment Group, [No sign change in controls] ▪ ↑ Social contact, *P* = .028 ▪ ↓ Meaninglessness, *P* = .019 ▪ ↑ Self esteem, *P* = .003 ▪ ↓ Diastolic BP, *P* = .007 ▪ ↓ Systolic BP, *P* = .013 (10 mmHg drop in 49% of treatment group, 39% of control group) ANCOVA ▪ ↓ Systolic BP, *P* < .05 ▪ ↑ Social contact, *P* < .05
Arnetz and Theorell 1983 (29) Study conducted in Stockholm Self-help group for seniors in senior apartment building Community Intervention Trial (N = 60) – Control Group other floor (F1 vs. F2) Objective: effects of social activation on mental, physical well-being, social interaction and behaviour	ANOVA	At 3- and 6-month follow-up: ▪ Baseline questionnaire 150 questions (upbringing, education, occupation, marital status, family activities, interests, personality, emotional state, future expectations, social interactions, medical disorders) ▪ Behavioural scale staff-rated 8-item ▪ Social activity level staff-rated ▪ Psychosomatic 4-item index (NS) ▪ Psychological 6-item index ▪ Sleep	ANOVA ▪ ↑ Social activity level – number of activities per week (F = 8.34, *P* = .02) ▪ (NS) Depression (F = 0.01, *P* = .99) ▪ (NS) Suicide ideation (F = 0.95, *P* = .39)
Hopman-Rock and Westoff 2002 (31) Study conducted in the Netherlands Education and exercise program geared to well-being and pleasure rather than health Initial RCT (N = 50) followed by CIT (N = 382) Control municipal areas Objective: program impact on general health, physical performance, health related knowledge	MANOVA, repeated measures Nonparametric (Wilcoxon, Friedman, Kruskall-Wallis) Stratified by men and women and by activity level (< 3 h/wk)	At 3- and 6-month follow-up: ▪ SF-36 (General health, physical functioning, social functioning, role limitation, mental health, energy/fatigue, bodily pain) (NS) ▪ Loneliness (1 item) ▪ Physical performance – (NS) Vooripp physical activity score (PPT) range 0–28 (household, sport and leisure activity – frequent intensity) ▪ Knowledge score (0–20)	↓ Loneliness (3.9 [SD 1.5] to 4.2 [SD 1.3], Friedman *P* < .01) ↑ Physical activity (F = 16.9, *P* < .01) ↑ Physical activity (< median [F = 39.3, *P* < .01]) At follow-up, 82% reported having an active lifestyle (baseline 48% inactive).

Study Group Intervention	Analysis	Outcomes – Scales	Results
McAuley et al. 2000 (32) Study conducted in the United States Exercise program geared to welfare and pleasure rather than health RCT (N = 174) Objective: Impact of aerobic and nonaerobic exercise program on components and the impact of exercise on social support	First stage was exploratory to determine the best fit the repeated measures over time fitting a regression model analysis latent growth curve modelling	At 6- and 12-month follow-up: ▪ Happiness – Memorial University of Newfoundland Scale of Happiness (MUNSH) ▪ Satisfaction with life – the Diner Satisfaction With Life Scale (SWLS) ▪ Social support – the Social Provisions Scale (SPS) ▪ Loneliness – the UCLA Loneliness Scale	Model testing differences between 2 exercise groups was not significant by 3 different tests (aerobic vs. nonaerobic exercise group) χ^2 goodness-of-fit (χ^2 = 74.06, *P* > .05), comparative fit index (CFI = 0.97), root mean square error of approximation (RMSEA) = 0.037 Final Path model (χ^2 = 53.61, *P* < .05) showed significant path coefficients between changes in social support and exercise frequency and changes in well-being Those who exercised more realized ↑happiness (β = .30, *P* < .05) Higher levels of initial social support (β = −.21, *P* < .05) and changes in social support (β = −.10, *P* < .05) were associated with reductions in loneliness
Caserta and Lund 1993 (30) Study conducted in Utah Support groups, recently bereaved Recruited from obituaries. Randomized to control group (N = 98) and to either (N = 241) short (8 weeks) or long-term (> 10 months) treatment in 13 groups Led by peer facilitators and by practitioners (social work, psychology, or nursing) for meetings in community settings Objective: To facilitate self-help	Analysis of variance (ANOVA) Main and interactive effects over time of resources, self esteem, life satisfaction and competencies on depression and grief Stepwise linear regression with 4 models on depression and on grief	Follow-up at 4 time periods up to 24 months <u>Measures:</u> ▪ Depression - Geriatric Depression Scale (GDS) ▪ Grief – Texas Revised Inventory of Grief (TRIG) <u>Intrapersonal Resources:</u> ▪ Self-esteem (Rosenberg self-esteem scale) ▪ Life satisfaction (Life Satisfaction Index (LSI – Neugarten) ▪ Competency scale of 9 scale items – self perceived adaptation & resiliency – life transitions	Intrapersonal resources were more influential than self-help group in reducing negative effects of spousal bereavement. Baseline depression was explained mostly (73.3% variance) by life satisfaction (β = 1.49), competencies (β = −.27), and self esteem (β = −.270) [*P* < .001]

Study Group Intervention	Analysis	Outcomes – Scales	Results
Rosen and Rosen 1982 (33) Conducted in Georgia Group meeting for seniors (N = 68) at senior citizen centres Seniors in need of mental health services versus 2 control groups: Group 1 – those at centre not needing MH services (N = 31) Group 2 – those from centres without MH services (N = 22) Objective: To improve life situation in those displaying a decline in overall functioning – measured by 3 constructs	χ^2, McNemar trend test	At 15-month follow-up: Multidimensional Functional Assessment – Older Americans Resources & Services (OARS) 146 items in16 functional areas, measures of social isolation, activity, and morale	No significant changes over time in either control group Test Group: ↑ Activities ▪ Household 2+ hours/day (18%–37% vs. 6% –7% [χ^2= 5.33, *P* < .05]) ▪ Wants to do more (χ^2= 5.45, *P* < .01) ▪ Attends socials [20%–56% vs. 47%–39% (χ^2 = 6.55, *P* < .01)] ↑ Morale ▪ ↑ Mood (χ^2= 5.10, P < .05) ▪ ↑ Feelings (χ^2= 30.25, P < .001) ▪ ↓ Seldom/never lonely (24%–44% vs. 44%–22% [χ^2= 6.76; *P* < .01]) At baseline, mobility differences between groups, variation in car ownership: NMH (32%), UMH (28%), TMH (6%)

*↓ indicates decrease ↑, increase; χ^2.= chi-squared test; ANCOVA, analysis of covariance; ANOVA, analysis of variance; BP, blood pressure; CIT, community intervention trial; MANOVA, multivariate analysis of variance; MH, mental health; NMH, not needing mental health services; NS, not significant; RCT, randomized controlled trial; SD, standard deviation; SE, standard error; SF-36, Rand Medical Outcomes Study short form; TMH, treated with mental health services; UCLA, University of California, Los Angeles; UMH, unmet mental health services.

Table 2: Technology-Assisted Interventions

Study Group Intervention	Analysis	Outcomes – Scale	Results
Morrow-Howell et al. 1998 (22) Study conducted in St. Louis Link-Plus: a social worker run crisis phone line serving elderly persons at risk of suicide. Consecutive referred cases, after crisis intervention, systematic assignment to treatment and wait list control group. (N = 61) Demonstration project ▪ Objective: To assist clients to access community mental health services. Focus on ↓ depressive symptoms ▪ ↓ unmet ADL needs ▪ ↑ socialization	T-Test ANCOVA ANOVA on each outcome, dependent variable: depressive symptoms, unmet ADLs, social isolation, regressed on pretest covariate, and independent variable (group assignment)	At 4 months: ▪ Geriatric Depression 15-item Scale (GDS) ▪ Multidimensional Functional assessment (OARS) ▪ 4 measures of social isolation – satisfaction with socialization, telephone contact, in-person contact, frequency of loneliness	T-Test ANCOVA ↓ Depression (5.20 vs. 6.59 [t = 1.78, *P* = .04]) Group assign 4% variance ↑ In-person contact (2.09 vs. 1.57 [t = 2.44, *P* = .01]) Group assign 9% variance (NS) Unmet needs (*P* = .17) (NS) Satisfaction with socialization (*P* = .08) (NS) loneliness (*P* = .36)
Heller et al. 1991 (23) Study conducted in Indiana Friendly interviewer staff contact for 10 weeks followed by peer telephone dyads for 30-week study period Objective: to increase social network and social supports through phone friendships	ANOVA Primary outcomes: perceived social support and mental health	At 6 months: ▪ Perceived Social Support Scale friends (PSS-FR) and Family (PSS-FA) ▪ Morale Philadelphia Geriatric Morale Center (17-item) Scale ▪ Depression – (CES-D 20-item scale) ▪ Loneliness – 7-item scale (Paloutzian scale) ▪ Physical health – 20-item scale revised scale (Belloc scale) ▪ ADL – 15 item Fillenbaum scale ▪ Network embeddedness – number of ties and frequency of interactions, weekly, globally, friends & family	No significant differences in social support or mental health changes over groups for either intervention Of the 1314 approached, 685 (52%) refused initial in-home assessment (social life and health) After the study, 71% of dyads were still in contact Those still in dyad contact (compared with those not) received more emotional support (*P* < .001) and had more positive dyad reports (*P* < .001) Those that continued in dyads differed at baseline – perceived friend support (*P* <. 04), greater number of friends (*P* < .04), and higher ADL score (*P* < .03)

Study Group Intervention	Analysis	Outcomes – Scale	Results
Tesch-Romer et al. 1997 (34) Study conducted in Germany Hearing aid Cohort mild–moderate (> 30 dB in at least 1 frequency 0.5, 1, 2, or 3 KHz in better ear) hearing loss aided (n = 70), versus 2 control groups – hearing loss unaided (n = 42) and normal hearing (n = 28) with diary & 6-month follow-up Objective: impact of hearing aid on 5 dependent variables: communication, social integration, well-being, cognitive capacity, functional impairment	MANOVA with replicated matched subsamples group comparisons Hierarchical regression analyses – predict dependent variables at follow-up by baseline scores 2-month hearing diary	At 6-month follow-up: ▪ Hearing Aid Handicap Inventory (HHIE) – scales measuring social and emotional problems with hearing handicap ▪ Social activities – list 14 activities/importance ▪ Social relations – UCLA loneliness scale; satisfaction with social support – German Social Support Scale ▪ Psychosomatic well-being – emotional well-being (PANAS) ▪ CES Depression Scale ▪ Cognition – speed, fluency, and vocabulary	ANOVA ↑ Communication (HHIE) (F = 24.56, *P* < .01, n = 140) ↓ Loneliness and social support (UCLA 30.8 [7.9] to 28.8 [7.4], F = 6.34, *P* < .01, n = 50) (NS) Psychosomatic well-being (affect, depressive & psychosomatic symptoms) (NS) Cognition
Brennan et al. 1995 (25) Study conducted in Cleveland Intervention provides information, communication and decision support Objective: Loss of companionship and support of partner facing social isolation and having to make new and complex decisions Relationship of modifying variables	ANOVA repeated measures	At 1 year: ▪ Decision-making confidence 14-item scale (Saunders et al.) and skill (investigator) ▪ Social isolation (IESS - Instrumental and Expressive Social Support 27-item scale) ▪ Caregiver burden (Impact of Care Giving Scale – 4 domains emotions, social relationships, family relationships, and physical health) ▪ Depression (20 item CES-D scale) Service use exploration	ANOVA Decision confidence (51.9–56.8 vs. 54.7–54.7 [F= 9.73, *P* < .01]) (NS) Decision making (F = 1.69, *P* = .20) (NS) Social Isolation (62.7–62.6 vs. 63.4–65.0 [F = 0.43, *P* = .51])
Winter and Gitlin 2007 (35) Study conducted in Philadelphia Professionally-led telephone support (telesupport) groups 103 family CGs randomized to support groups of 5 for 1 hour/week Objective: To provide a supportive social network that would increase social support and reduce depression and burden among female CGs of persons with dementia	ANCOVA Group effect managed by cluster variable Dependent variables (CG burden, depression, gains) Covariates were baseline values of dependent variables. Treatment group and age were independent	At 6 months: ▪ CG burden 22-item Zarit burden scale (range 0–88) ▪ Depression CES 20-item Scale (range 0–16) ▪ GAINS (Gains Through Group Involvement 6-item scale, range (0–18) [Knowing what to do when lonely, how to handle the blues, how to handle stress, how to find health care or other resources, ability to deal with family relationships]	No significant main effects CES-D [F = 4.58, *P* = .121] CG burden [F = 0.46, *P* = .490] Gains [F = 0.073, *P* = .932] Significant age × depression interaction: greater depression in older (≥ 65 y) women versus younger (< 65 y) women) [F = 6.26, *P* = .014] 4-point depression (16.1 vs. 20.0, *P* = .014)

*↓ indicates decrease; ↑, increase; ADL, activities of daily living; ANCOVA, analysis of covariance; ANOVA, analysis of variance; CES, Center Epidemiologic Studies; CES-D, Center Epidemiologic Studies Depression Scale; CG, caregiver; MANOVA, multivariate analysis of variance; NS, not significant. UCLA, University of California, Los Angeles.

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