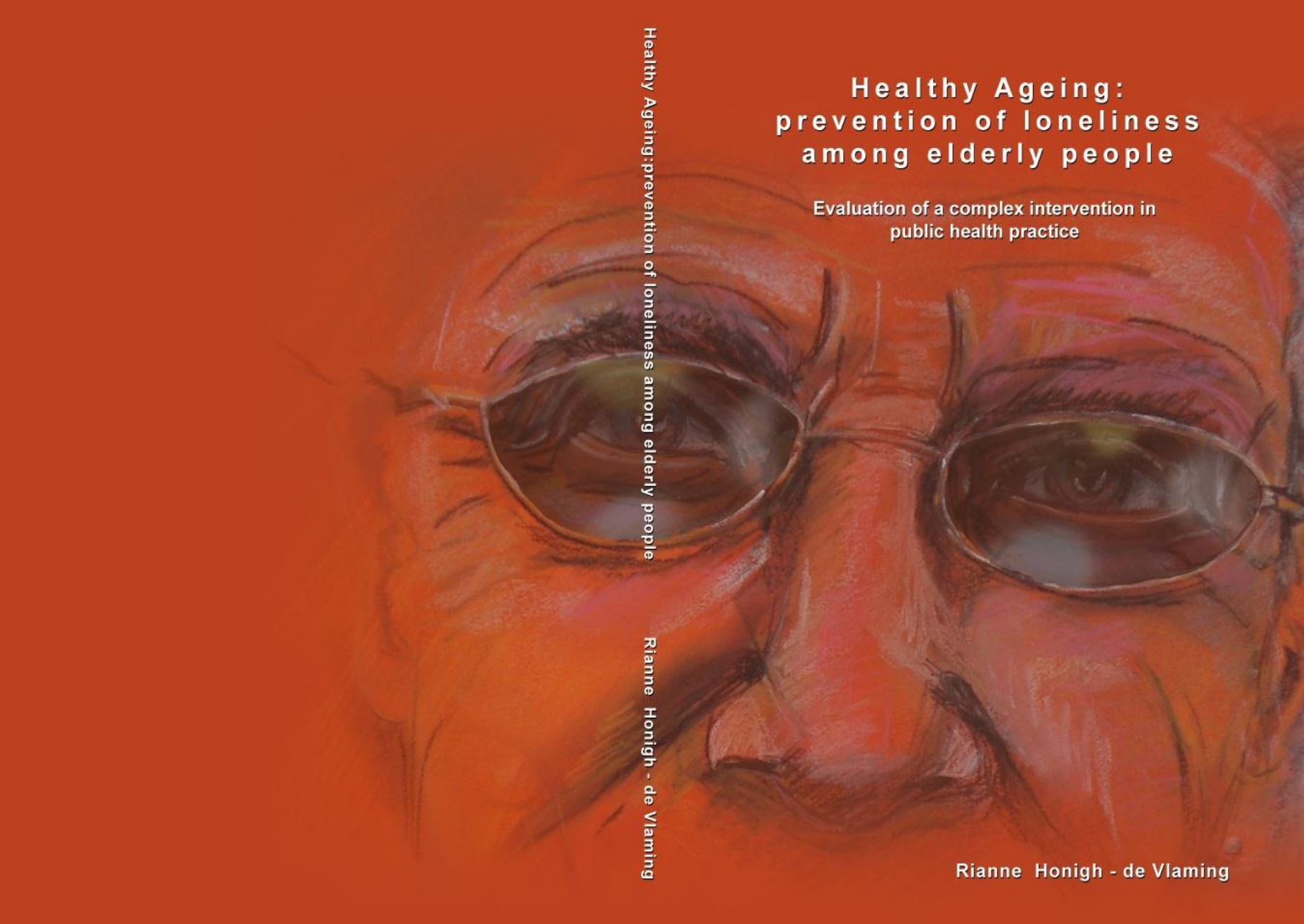
Healthy Ageing: prevention of loneliness among elderly people
Evaluation of a complex intervention in public health practice
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Thesis

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Ogen heb je om te zoeken
Naar wat mensen nog ontbreekt
En een hart om uit te zeggen
Wat een ander moed in spreekt

Voeten heb je om te lopen
Naar een mens die eenzaam is
En een hart om waar te maken
Dat geen mens een eiland is

Abstract

Introduction

Concerns about the ageing population and formal responsibilities of local governments to promote social cohesion and to enhance participation of vulnerable groups in society placed loneliness prevention high on the local policy agenda of Dutch municipalities in the past decade. The study described in this thesis was part of the Healthy Ageing programme of the Academic Collaborative Centre AGORA and aimed to contribute to more effective, evidence-based and problem-oriented approaches to healthy ageing at the local level.

Aim

The general aim of this thesis was to evaluate the effectiveness of a local intervention project – called *Healthy Ageing* – targeting loneliness among non-institutionalised elderly people. *Healthy Ageing* consisted of five intervention components, namely, a mass media campaign, information meetings, psychosocial group courses, social activities organised by neighbours, *Neighbours Connected*, and training of intermediaries.

Methods

First, the influence of socio-demographic and health characteristics on changes in loneliness over time and municipal differences in the prevalence of loneliness were investigated. Data were gathered from 9,641 persons who participated in the *Elderly Health Survey* of the community health service, GGD Noord- en Oost-Gelderland (former GGD Gelre-IJssel), in 2005 or 2010. Second, the overall-effect of *Healthy Ageing* on the initial outcome loneliness literacy, intermediate outcome social support, and ultimate outcome loneliness was evaluated using a quasi-experimental pre-test post-test design, including an intervention and control community. Baseline and follow-up measurements, in 2008 and 2010 respectively, were available for 858 non-institutionalized elderly people. The Loneliness Literacy Scale was developed within the context of this thesis and was pre-tested in a separate study among 303 elderly persons who also participated in the quasi-experimental study. Finally, delivery, reach, and acceptance of the individual intervention components was studied in several satellite studies. Data were collected by different means, e.g. project records and surveys among participants. Furthermore, the acceptability of the mass media communication materials, information meetings, and psychosocial courses of *Healthy Ageing* was studied by in-depth interviews with 14 clients of the meal delivery service in the intervention community.

Results

Overall and across municipalities, average loneliness scores did not significantly differ between 2005 and 2010. However, among the subgroup with mobility disabilities, loneliness was significantly higher in 2010. Furthermore, mobility disabilities and marital status were the most important factors explaining differences between municipalities. With regard to the evaluation of *Healthy Ageing*, the satellite studies showed that the reach and intensity of the intervention components were modest. Furthermore, from the interviews it appeared that the mass media communication materials were not successful in attracting attention because interviewees did not expect health information from these communication channels, the perceived personal relevance of the message was low, and the presentation was not attractive. Moreover, the content of the intervention components was not well received because the objectives and intervention components did not connect well with the priority group's daily life. In addition, it appeared from the quasi-experimental study that 39% of the study participants from the intervention community was familiar with *Healthy Ageing* at follow-up. Overall, the intervention group scored more favourably on the loneliness literacy subscales, motivation (4.4%), perceived social support (8.2%), and subjective norm (11.5%) than the control group. However, no overall effects were observed for the intermediate and ultimate outcomes, total social support and loneliness after two years.

Conclusion

Given the modest overall intervention exposure, the effect of *Healthy Ageing* on the loneliness literacy subscale, motivation, is plausible, whereas on the subscales, perceived social support and subjective norm, probable, and on the subscale, self-efficacy, unlikely. Furthermore, whether the initial effects will carry forward to the intermediate and ultimate outcomes needs to be confirmed. The modest effects of *Healthy Ageing* can partly be explained by the challenges on organisational level which delayed and suppressed project implementation. Furthermore, the project might have benefited from a more systematic approach in order to ensure better alignment between the intervention components and formulated objectives. Finally, target group differentiation is highly recommended. This evaluation of *Healthy Ageing* illustrates how researchers can cope with the evaluation challenges of complex interventions which cannot be fully controlled. In turn, this provides valuable lessons for the development of intervention programmes and evaluation designs in public health practice.

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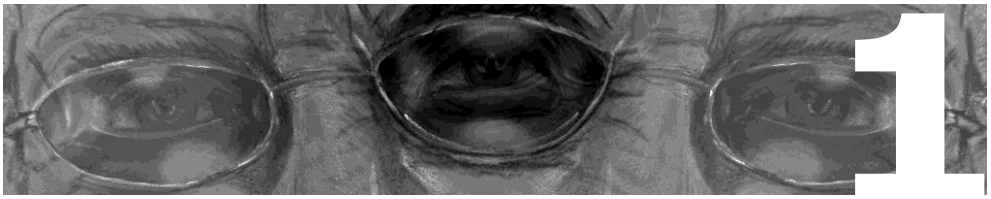

1

General Introduction

Societal context

Ageing society

The world population is ageing because of rising life expectancy and decreasing fertility rates. In 2010, 524 million people, 8% of the world's population, were aged 65 years and over. This is expected to triple to about 1.5 billion persons (16%) by 2050 [1]. EU prognoses indicate even higher estimates: an increase from 17% in 2010 to 30% in 2060 for those aged 65 years and over [2]. Ageing is often accompanied by physical and mental health problems. This results in higher healthcare utilisation and related societal costs. Therefore, 'active ageing' or 'healthy ageing' has internationally been designated as a priority area in policy [3-10]. The World Health Organisation (WHO) defined active ageing as the process of optimising opportunities for health, participation, and security in order to enhance quality of life as people age [8]. Complementarily, the European Healthy Ageing project defined healthy ageing as the process of optimising opportunities for physical, social, and mental health to enable older people to take an active part in society without discrimination and to enjoy an independent and good quality of life [3, 4]. In line with these definitions, key points of healthy ageing policies are: encouraging physical and social participation of elderly people in order to utilise older people's social capital, maintain their intrinsic value to society, and improve their sense of belonging, well-being, meaningfulness, autonomy, and personal control [3-10].

Healthy ageing policies are also of current interest in the Netherlands, an average EU country with 15% of people aged 65 years and over and an expected increase up to 27% in 2060 [2]. Between 2010 and 2040, the number of older people aged 65 years and over is expected to increase from 2.6 million to 4.6 million [11]. Recently, two policy acts came into force which placed healthy ageing not only on the national policy agenda, but also on the local policy agenda. Since January 2007, the Social Support Act (WMO – Wet Maatschappelijke Ondersteuning) makes local governments responsible for the promotion of social cohesion and enhancement of participation of vulnerable groups, such as elderly people, in mainstream society [12] (see also text box 1.1). Subsequently, in December 2008, the Public Health Act (WPG – Wet Publieke Gezondheid) declared that municipalities had become responsible for elderly healthcare in addition to existing care for young people and adults. This means that municipalities are now accountable for monitoring, signalling, and preventing health problems among elderly persons [13, 14]. In the Netherlands, municipalities have commissioned regional community health services (GGD) to support in these tasks [15]. Together, these acts facilitate processes to enable elderly people to actively participate in society and maintain independence, thus contributing to a good quality of life

despite inevitable health deterioration in old age. In this sense, social and societal participation function as a means and a consequence of healthy ageing (text box 1.1). In this thesis, healthy ageing is confined to the absence of loneliness. Social as well as societal participation can prevent loneliness in two ways. On the one hand, both can be a means to improve the quality of individuals' social network. On the other hand, if social cohesion in neighbourhoods is established, citizens will be able to care of, and look out for, lonely persons in their surroundings.

Text box 1.1 Connection between participation and loneliness

The word participation has different meanings that can lead to confusion if it is unclear who participates in what. In the scope of this thesis, a distinction has to be made between societal and social participation. Societal participation is organised by formal organisations in the private domain, for example sport clubs, unions, associations, volunteer organisations, etc. Social participation concerns informal, unorganised social bonding of citizens, such as contact with neighbours and visiting friends and family. The Social Support Act aims in the first place to ensure that persons with limitations can participate in social networks (social participation). In the second place, the act aims to ensure that all citizens can contribute to civil organisations and social networks. The second aim builds on principles of self-organisation, personal responsibility, and civil society, and aspires to strengthen the social cohesion in neighbourhoods (combination of social and societal participation). In the third place, the act is used as a policy instrument and encourages citizens to contribute to policy via advising bodies [16].

Participation can prevent loneliness in two ways. On the one hand, social as well as societal participation can be a means to improve the quality of individuals' social network. On the other hand, if social cohesion is established in neighbourhoods, citizens will be able to care of, and look out for one another. In turn, the participation of elderly people in society can reduce the burden on formal support services.

Health priorities: Loneliness

In 2005, several community health services in the eastern part of the Netherlands conducted an elderly health monitor among non-institutionalised persons aged 65 years and over. One of the notable outcomes was the high prevalence of loneliness among elderly people, ranging from 30% to 63% between municipalities [17, 18]. The National Institute for Public Health and the Environment (RIVM) reported comparable figures in 2011 and indicated that 28% of elderly people are

mildly lonely and 3% severely lonely, on the basis of data from the Longitudinal Ageing Study Amsterdam [19]. At the same time, the ageing society is accompanied by demographic and societal changes such as more single-family households, more mobility problems, and changing network ties, all risk factors for loneliness [20, 21]. These changes enhance public concern about the increasing prevalence of loneliness; however, scientific data on trends in loneliness are limited [20-24]. Nevertheless, political awareness of the growing burden of the ageing population and the formal responsibility of local governments to promote social cohesion and enhance participation of vulnerable groups placed loneliness prevention high on the local policy agenda.

Central theme: Loneliness

Origin of loneliness

The statements 'lonely, but not alone' and 'alone, but not lonely' illustrate that being alone and feeling lonely are two distinctive features [25]. Loneliness has often been defined as the unpleasant or inadmissible lack of the (quality of) certain relationships [25, 26]. A 'deficit' and a 'cognitive' perspective on loneliness have been proposed. According to the deficit perspective, also called the social needs approach, different types of relationships serve different functions which are not directly interchangeable [27-29]. This explains, for example, why widowed persons might feel lonely despite receiving support from friends. The deficit perspective is related to Bowlby's (1969) attachment theory [30], which underlines the importance of developing attachment bonds early in life to provide the sense of warmth, intimacy, and security, necessary for healthy social bonding later in life [28, 31]. In addition, Weiss (1973) has suggested six types of social relationships each serving a different function, namely, attachment, social integration, opportunity for nurturance, reassurance of worth, reliable alliance, and guidance [28, 32]. The absence of any of these types of relationships might give rise to feelings of distress and loneliness, which Weiss broadly described as social or emotional loneliness. He indicated that social loneliness is related to feelings of diminished sociability and lacking meaningful relationships, whereas emotional loneliness is related to emotional abandonment and missing companionship [32].

Contrary to the deficit perspective, the cognitive or discrepancy perspective on loneliness focuses on the imbalance between individuals' self-standards and social support needs on the one hand and the realised social network structure and function on the other hand, rather than on the absence of specific relations per se. This perspective underlines the importance of understanding individual social needs and social expectations to gain insight into differences in feelings of

loneliness [27-29]. The cognitive perspective is based on the attribution theory, which suggests that lonely people have irrational thoughts about the causes of their feelings, blaming themselves and pointing to social situations beyond their personal control [28]. Consequently, psychosocial coping resources, such as personal control, social skills, self-esteem, self-efficacy, and positivism are seen as important protective factors for psychological health and loneliness [25, 28, 33-36]. The protective mechanism of coping resources is explained by the buffering model and direct-effect model. The buffering model suggests that good coping strategies diminish stress reactions consequent to diseases or life-events. Conversely, the direct-effect model suggests that favourable personality characteristics have a beneficial effect on psychological health regardless of stress factors [35]. In this thesis, insights from both the deficit and the cognitive perspective on loneliness are combined.

Loneliness among elderly people

Age-related live-events, such as retirement, moving to sheltered housing, death of a partner or other relatives, and age-related health problems, affect, on the one hand, the social network ties and, on the other hand, the social support needs of elderly people – two important factors related to loneliness [20, 22, 26, 29, 37-40]. However, several theories suggest coping mechanisms for older people to make them feel less lonely than might be expected from their deteriorating network. The disengagement theory states that the shrinking of the social network and withdrawal from social involvement is a natural part of ageing. The theory assumes that older people become more conscious of approaching death and more self-focused and therefore attach less importance to social interaction [29, 38, 41]. In addition, social comparison processes suggest that older adults compare themselves with peers who have less favourable social circumstances and therefore evaluate their own situation as less deplorable [38]. Finally, the socio-emotional selectivity theory suggests that older people select relationships which are most meaningful to them and continue contact only with persons who engender positive emotions and strengthen their individual self-esteem [29, 33, 40].

To summarise, age-related live-events and health problems may result in loss of social relationships with specific functions of intimacy or sociability. Furthermore, support needs may either increase because of age related-health problems or decrease because of an increasing self-focus, resignation to one's personal situation, and selectivity in social contacts. Therefore, the balance between support needs and support received from the social network has to be re-established gradually in old age.

Stability of loneliness

Depending on the severity and duration of loneliness feelings, a distinction can be made between transient, situational, and chronic loneliness. Transient loneliness refers to temporary day-to-day fluctuations in mood, whereas situational loneliness occurs often after life-events that change existing relationships or social support needs. Further, situational loneliness is more severe and persists for longer periods, but is still temporary in character – in contrast to chronic loneliness which is defined as an enduring trait of loneliness [28, 42].

Determinants of loneliness

Cross-sectional studies have indicated higher prevalences of loneliness among sub-groups of elderly people, according to socio-demographic characteristics, health characteristics, and social resources (see table 1.1). The oldest-old are often found to be the most lonely. However, in most studies, age is not independently associated with loneliness [24, 29, 36, 39, 40, 43-50]. In contrast, marital status is a distinctive risk factor for loneliness. The prevalence of loneliness is higher among non-married persons compared to married [37, 39, 43, 45, 49, 51], and marital status is also independently associated with loneliness [37, 43, 44, 49]. Differences in loneliness prevalence between men and women and socio-economic classes are ambiguous. In most cross-sectional studies, women appear to be lonelier than men. However, after adjustment for other socio-demographic and health variables, this gender effect mostly disappears [24, 29, 39, 43, 45]. In some studies, loneliness is more common among less educated persons and persons with a low income [37, 40, 46, 49], but not in others [29, 36, 47]. Furthermore, psychological and physical health problems can be a barrier to the establishment and maintenance of social contacts and therefore a risk factor for loneliness. Loneliness is strongly associated with poor self-perceived health [24, 29, 33, 45, 46, 48-50]. Restricted functional abilities, mobility, or capacity also increase the risk of loneliness [37, 39, 43, 46, 50]. However, this association weakens in some multivariate analyses [37, 44]. Finally, social resources such as network size, contact frequency, and especially network quality are indicated as determinants of loneliness [40]. In multivariate analysis, however, the association between network size or contact frequency and loneliness is not very strong [24, 33, 36, 37, 44, 45, 49, 52, 53]. On the other hand, persons lacking a local network structure tend to be more lonely than persons who are locally integrated [43, 47, 50, 54]. Furthermore, frequent social engagement has been associated with lower prevalences of loneliness [24, 37, 39, 55].

Table 1.1 Crude and independent associations of socio-demographic, health, and social determinants with loneliness in older populations

	Crude association with loneliness		Independent association with loneliness	
Socio-demographic				
Age (older)	**+/ 0**	[29, 36, 39, 40, 43, 45-50]	**+/0/-**	[24, 29, 36, 43-46, 62]
Gender (female)	**+ /0**	[29, 39, 43, 46, 50, 56]	**+/0/-**	[24, 29, 39, 43-46, 48]
Marital status (not married)	**+**	[37, 39, 43, 45, 49, 51]	**+**	[37, 43, 44, 49]
Income (low)	**+/0**	[36, 37, 40, 46]	**+/0**	[24, 33, 36, 44]
Education (low)	**+/0**	[29, 36, 37, 40, 46, 47, 62]	**+/0**	[24, 29, 36, 44, 48, 49]
Health resources				
Self-perceived health (poor)	**+**	[29, 45, 49, 50]	**+**	[24, 29, 33, 46, 48-50]
Chronic disease (present)/ physical health (poor)	**+/0**	[29, 45, 63]	**+/0**	[29, 44]
Functional inability	**+**	[37, 39, 43, 46, 50]	**+/0**	[37, 39, 43, 44, 46]
Social resources				
Network size (small)	**+**	[45, 49, 50]	**+/0**	[33, 37, 44, 45, 49, 52, 53]
Frequency contacts (limited)	**+/0**	[36, 37, 40, 46]	**0**	[24, 36, 44]
Type of network (non-integrated)	**+**	[40, 47]	**+**	[43, 50, 54]
Network quality (poor)	**+**	[40, 47]		
Social support (limited)	**+**	[64]	**+/0/-**	[37, 53, 65]
Participation (reduced)	**+**	[39, 55]	**+/0**	[24, 37, 39]

+ positive association; - negative association; 0 no association between determinant and loneliness

Caution is required in drawing conclusions about causality in the association of health and social determinants and loneliness, because these factors influence one another. On the individual level, longitudinal studies have confirmed that changes in marital status and deterioration in individuals' health status and network structure result in more loneliness [22, 38, 51, 56]. On the other hand, it has been proposed that lonely people have a diminished self-capacity and receive limited social support to regulate their lifestyle [28, 34, 57-61], and that this might affect their health unfavourably. Further, loneliness might affect health via physiological processes of the cardiovascular and neuroendocrine system [57-59]. On the societal level, loneliness might be induced by the degree of social cohesion and individualism. Conversely, a high prevalence of loneliness might also generate societal problems, such as further withdrawal from society and increasing dependency. Accordingly, the valuable social capital of elderly persons cannot be utilised and societal costs rise.

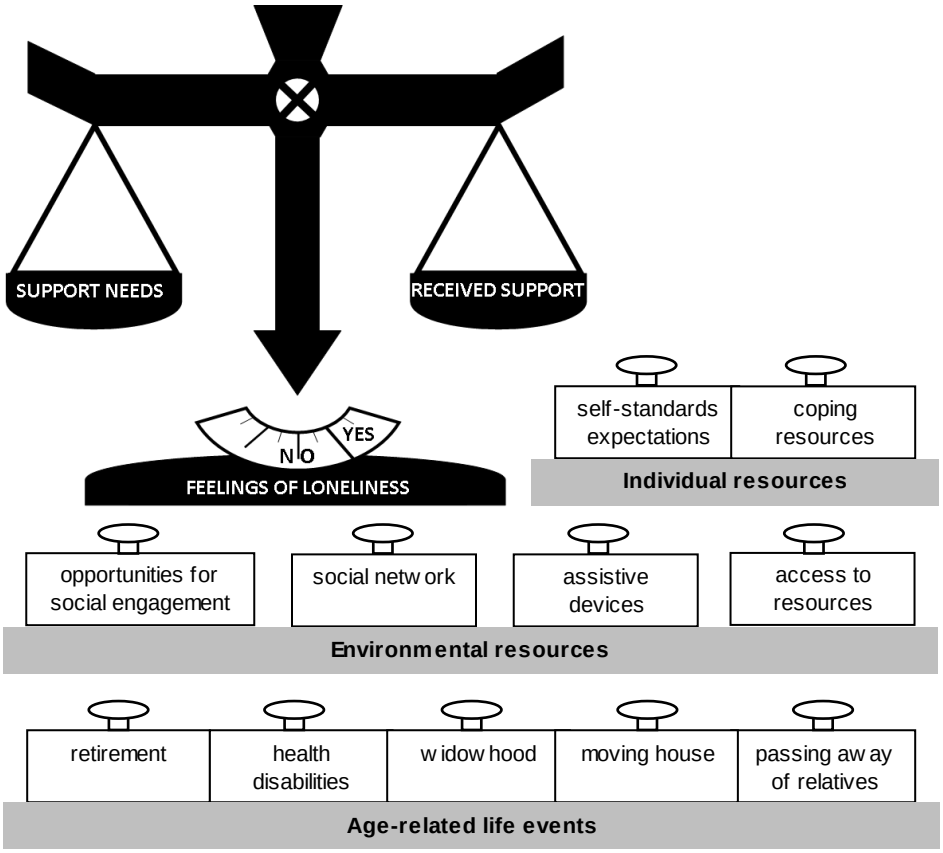

Figure 1.1 Balance with determinants of loneliness

Summarising the development of loneliness

Figure 1.1 schematically represents the delicate balance between support needs of an individual and support received from the social environment. Age-related life-events, internal resources, and external resources might swing the balance in either direction. With regard to age-related life-events for example, the passing away of a partner might increase social support needs, whereas moving to sheltered housing might increase the support received and restore equilibrium. Individual resources such as personality, coping resources, and self-standards can enable individuals to cope with these changes in life. In addition, environmental resources can enable elderly people to stay engaged in society despite, for example, physical or financial limitations. Whether or not somebody feels lonely depends in the end on his/her subjective evaluation of the situation.

Interventions to prevent or alleviate loneliness

Characteristics of loneliness interventions

Differences in the origin and determinants of loneliness and the individual person's evaluation of the situation underline the importance of adapting intervention activities to the needs of the target population. Loneliness interventions can be categorised according to four dimensions: coping strategy, target group, initiator, and duration [66, 67]. With regard to the first dimension, three coping styles can be distinguished, namely, network development, lowering standards regarding relationships, and reduction of the importance of the loneliness experience. These styles are derived from a cognitive perspective on loneliness and are intended to remove the discrepancy between the desired and the realised relationships (see figure 1.2) [68]. Network development (coping style 1) can in the first place be established by stimulating social participation, for example by improving municipal services and infrastructure and providing opportunities to come into contact with other people. In the second place, interventions might target personal barriers to social interaction, such as social skill training, strengthening personal self-esteem, and aids for hearing or mobility problems. Finally, one might intervene on societal circumstances which stand in the way of social interactions, such as changing social norms about intergenerational solidarity or imaging of elderly people. By lowering standards (coping style 2), we mean the adjustment of the desires and expectations of social relationships to the actual level of network quality. For example, get the idea out of your head that your children have to call you every day. Coping strategies focusing on adjusting the importance of the loneliness problem (coping style 3) include, for example, seeing things in perspective by comparing one's own situation with others, distracting oneself from negative

thoughts, and avoiding situations where feelings of loneliness are reinforced [66, 69].

With regard to the second dimension, three target groups can be distinguished, namely, elderly persons who are lonely or at risk of becoming lonely (micro-level), persons in the social environment of these elderly people such as friends, family, and health professionals (meso-level), and the entire society (macro-level). Thus, not only elderly people themselves but also people in their direct environment and in general society play a role in the alleviation and/or prevention of loneliness. Fokkema and Van Tilburg (2006) distinguished five types of loneliness interventions of which three on the micro-level, namely, social activation through social cultural activities, personal activation interventions, and courses, conversations, and therapy focusing on individual functioning; one on the meso-level, namely, training for intermediaries; and one on the macro-level, namely, campaigns aimed at the general public [67].
Finally, the third (the initiator) and fourth (duration) dimensions are characteristics of the delivery of the intervention. Interventions can be delivered by professionals or volunteers, and the duration of an intervention might vary from once-off to a few weeks, a couple of months, or an indefinite time [70].

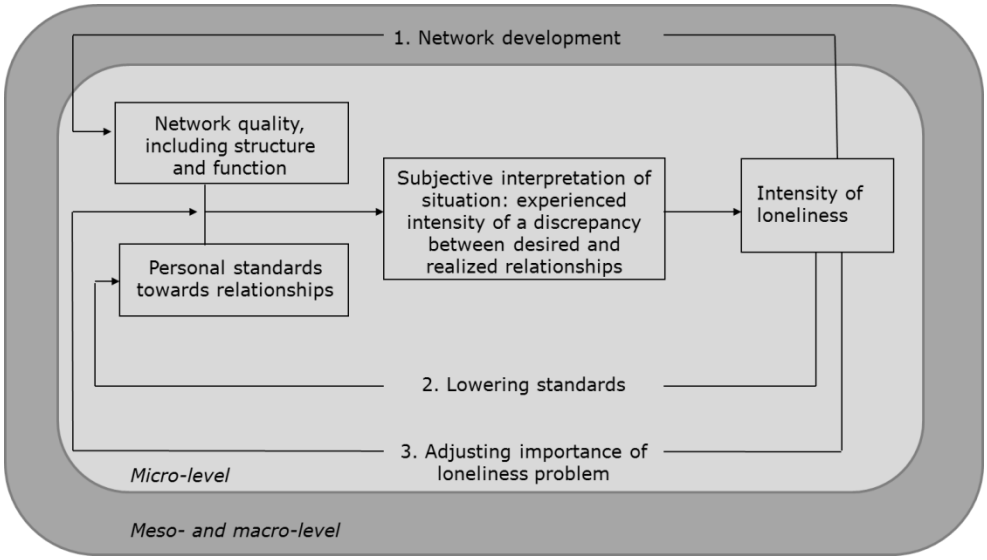

Figure 1.2 Three possible strategies to reduce feelings of loneliness (adapted from Van Tilburg, 1988)

Effectiveness of loneliness intervention studies

To date, evidence about the effectiveness of loneliness interventions has been limited because intervention studies use weak research designs, do not use a valid indicator for loneliness, focus only on short-term outcomes, or lack process indicators to gain better understanding about the achievement of the desired outcomes [41, 71, 72]. In the Netherlands, lack of evidence about the effectiveness of loneliness interventions resulted in 2001 in the programme *Loneliness Among the Elderly* [67, 70]. In this programme, 18 Dutch loneliness interventions were, almost uniformly, evaluated with an experimental study design. It appeared that loneliness was significantly reduced in two of these interventions: an individual at-home intervention for elderly persons with a chronic disease and a group intervention in a residential care home including discussion groups and coffee breaks. Limited insight into the causes of loneliness in the target population, a one-sided focus on network development, difficulties in reaching the target group, and approaching a too wide target group were identified as reasons for ineffectiveness [66, 67].

International reviews on loneliness interventions have shown that, of the interventions accompanied by (high-quality) effect evaluations, only a limited number have proved to reduce feelings of loneliness. Most promising are group interventions involving an educational component and social activities targeting specific groups of people. Further, involvement of the target population in the planning, development, and delivery of activities, and the utilisation of existing community resources, have been shown to facilitate the development of effective interventions [41, 71].

Research setting of this thesis

Local context: *Healthy Ageing in Epe*

As mentioned in the first section of this chapter, the theme loneliness ranks high on the policy agenda of many Dutch municipalities, as it does in the municipality of Epe, a rural village in the eastern side of the Netherlands. In the project *Healthy Ageing in Epe*, the municipal council aimed to tackle loneliness among non-institutionalised elderly residents aged 65 years and older. A multidisciplinary project group was established to develop a loneliness intervention, including representatives of the municipality of Epe, the regional community health service, the regional mental health service, and the local welfare organisation for the elderly. *Healthy Ageing* aimed to combine several interacting intervention components and can therefore be described as a complex intervention [73]. Furthermore, *Healthy Ageing* directed its activities at older residents in general,

elderly people at increased risk of loneliness, intermediary professionals and volunteers from health and welfare organisations, and the general population of Epe. Inclusion of the individual intervention components was based mainly on the assumption that they would stimulate social engagement and improve elderly people's social network. One of the intervention components focused especially on personal coping skills to reduce standards or the importance of the problem [74, 75]. Some of the intervention components encompassed regular services of one of the cooperating partners, e.g. psychosocial courses, social-recreation activities, and delivery of health information via mass media. In addition to these existing activities, new activities were developed, such as a healthy ageing workshop, wherein ten tips about healthy ageing were discussed, and the sub-project *Neighbours Connected,* which specifically focused on activating people who are generally hard to reach [76]. Table 1.2 presents the characteristics of the intervention components according to the dimensions coping style, target group, initiator, and duration. More details about *Healthy Ageing* are provided in chapter 2 of this thesis. In sum, *Healthy Ageing* distinguishes itself from most other loneliness interventions by its population-level approach, combination of several intervention components, and connection with existing services and resources.

Broader context of this thesis

In the Netherlands, the Ministry of Health, Welfare, and Sport supported in 2005 the establishment of Academic Collaborative Centres. The goals for these collaborations were [77]:

- To strengthen and establish a knowledge infrastructure with an equal balance between science and practice.
- To support researchers (PhD or otherwise) working in regional or municipal public health departments.
- To foster high-quality scientific research relevant to day-to-day practice in public health services.
- To disseminate and implement research results.
- To improve the application of evidence-based interventions and methods in regional or municipal public health services.

The current PhD research took place within the context of the Academic Collaborative Centre AGORA. AGORA aimed to generate new insights by joining knowledge from policy, practice, and research and from epidemiology and health promotion in order to improve healthy ageing. With this coherent approach and collaborative efforts, AGORA aimed to contribute to more effective, evidence-based, and problem-oriented approaches to healthy ageing [78].

Table 1.2 Characteristics of the intervention components of *Healthy Ageing*

		Intervention components				
		Mass media campaign	**Information meetings**	**Psychosocial courses**	**Neighbours Connected**	**Training of intermediaries**
Coping styles	**Network development**					
	Social participation	x	x		x	
	Remove personal barriers				x	
	Influence social norms in society	x			x	
	Lowering standards		x	x		
	Adjusting importance of problem			x		
Target group	**Micro-level**					
	Elderly people in general	x	x		x	
	High-risk groups			x	x	
	Meso-level: intermediaries					x
	Macro-level: general population	x				
Initiator	**Professionals**	x	x	x		x
	Volunteers				x	
Duration	**Once-off**	x	x		x	x
	Less than 6 months			x	x	
	More than 6 months	x				

AGORA's *Healthy Ageing* programme consisted of three core projects. Core project 1 studied social determinants of health using existing epidemiological data [79]. Core project 3 focused on the development of a knowledge management system designed to support and facilitate intersectoral collaboration for healthy ageing in the Gelre-IJssel region [80]. Core projects 1 and 3 delivered information for the development of an evidence-based intervention for healthy ageing (core projects 2a and 2b). Core project 2b studied mainly how the development and implementation of a healthy ageing programme can be organised at the local level using a participatory approach [81]. The current thesis covers core project 2a,

focusing mainly on the evaluation of the local project *Healthy Ageing in Epe*, targeting loneliness among elderly people (Figure 1.3).

Bridging policy, practice, and research – The dynamic multidisciplinary field of public health requires growing cooperation between the fields of policy, practice, and research. Traditionally, these fields operate as more or less independent niches. Their working procedures are directed by different ideologies, unique values and norms, niche languages, and formal tasks [82, 83]. Within the AGORA programme, two community health service researchers and two university researchers were appointed, all having access to the facilities of both organisations. The researchers collaborated closely with the policymakers in four participating municipalities. Furthermore, they were in dialogue with among others elderly people, associations for elderly people, volunteer organisations, residential and homecare organisations, the elderly welfare organisation, the mental health service, and sport organisations. Accordingly, research findings were discussed with the stakeholders in interactive meetings.

Bridging the disciplines of epidemiology and health promotion – AGORA also aimed to strengthen the collaboration between health promoters and epidemiologists within the community health service. Collaboration between these two disciplines offers the opportunity to combine different sources of knowledge about 1) organisation, 2) interventions, 3) intervention outcomes, 4) determinants, and 5) health [78]. Traditionally, within community health services, health promotion officers and epidemiologists have their own tasks with limited interaction. Epidemiologists are mainly responsible for the monitoring of the health situation of different population groups, whereas health promotion officers are primarily responsible for the development and coordination of health promoting interventions. Further, in the current programme, qualitative and quantitative research methods and bio-medical and participatory approaches have been combined to create a more complete picture.

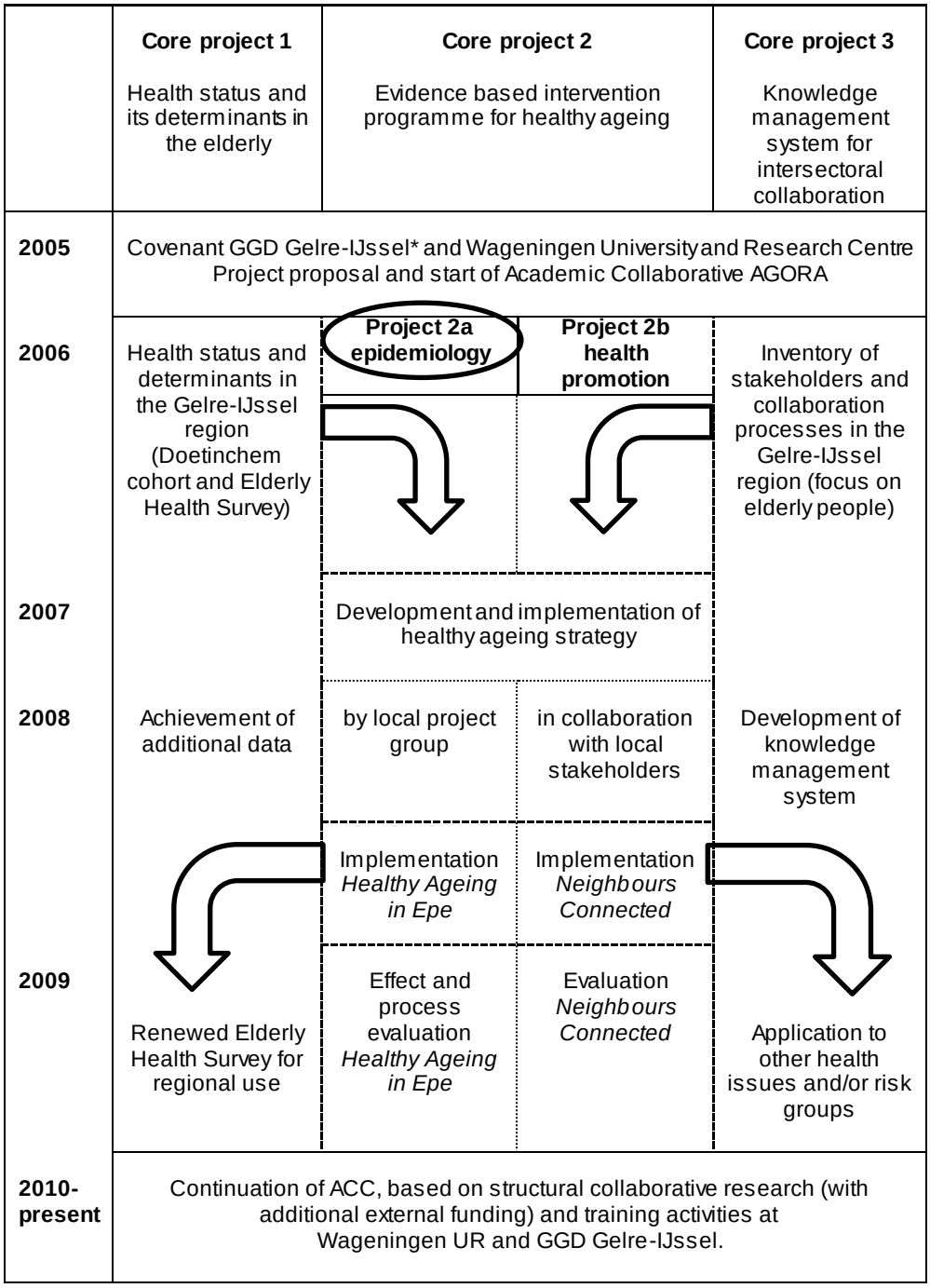

Figure 1.3 Schematic representation of AGORA's work programme in the three coherent core projects [78]
** Since 1 January 2013 GGD Gelre-IJssel is named GGD Noord- en Oost-Gelderland*

Aim and outline of the PhD thesis

The general aim of this thesis is to evaluate the effectiveness of the intervention *Healthy Ageing in Epe.* This has been done by studying determinants of trends and regional variation in loneliness, by developing an evaluation study design including a process and effect evaluation, by developing an indicator to assess short-term outcomes of *Healthy Ageing,* and by performing a process- and effect evaluation. These research activities and results are successively discussed in this thesis.

Chapter 2 starts to disentangle the public concern about the rising prevalence of loneliness among elderly people. Determinants of trends and regional variation in loneliness were studied using data from the community health services' *Elderly Health Survey* for 2005 and 2010. **Chapter 3** continues with the development of the design of our evaluation study. We combined the evaluation of the overall intervention using a quasi-experimental pre-test post-test design with the evaluation of single intervention components. A logic model was developed to discover outcomes over the entire causal chain from intervention inputs to the final outcome, loneliness. Indicators to assess this range of outcomes were carefully selected. An indicator to assess short-term outcomes at the level of behavioural determinants relating to loneliness was not yet available. Therefore, in **chapter 4** the development and evaluation of the Loneliness Literacy Scale is described. We designed this scale to measure the early effects of *Healthy Ageing.* Accordingly, the evaluation results are reported in chapters 5 and 6. **Chapter 5** concerns an in-depth study among elderly people at increased risk of loneliness about the acceptability of the mass media communication materials, information meetings, and psychosocial courses. In **chapter 6**, the results of the evaluation study on the initial, intermediate, and long-term outcomes are presented. This thesis concludes in **chapter 7** with a discussion of the main findings of this PhD research, the methodological considerations and the implications for public health practice.

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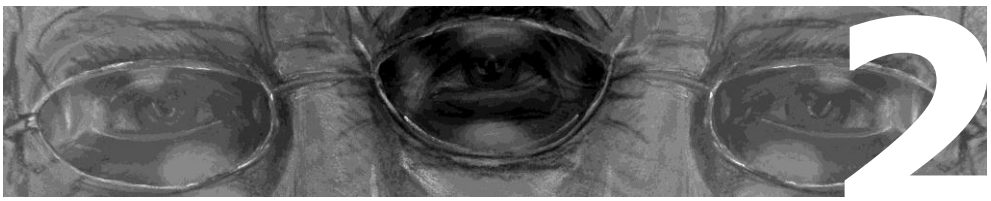

2

Determinants of trends and regional variation in loneliness among Dutch older people over the period 2005–2010

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Submitted for publication

Abstract

The ageing of society is associated with demographic and societal changes such as more single-family households, more mobility problems, and changing network ties, all risk factors for loneliness. So far, it is unclear what the consequences of these changes are for trends and regional variation in loneliness, as scientific data are limited. Therefore, we investigated the influence of socio-demographic and health characteristics on time trends and regional differences in the prevalence of loneliness. Data were gathered from 9,641 persons who participated in two independent cross-sectional monitoring studies (2005 and 2010, respectively) among non-institutionalised elderly people aged 65 years and over. Loneliness was assessed using the Dutch De Jong Gierveld loneliness scale. Crude and adjusted multilevel models were analysed to study the independent association of study year, and socio-demographic and health characteristics with loneliness. Male gender, older age, not being married, difficulties managing on income, mobility disabilities, and suffering from a chronic disease were independently associated with higher loneliness scores. Overall and across municipalities, trends in loneliness remained stable between 2005 and 2010. However, among the sub-group with mobility disabilities loneliness increased over time. Mobility disabilities and marital status were the most important factors explaining regional differences. For the prevention of loneliness we recommend public health professionals and policy makers to pay special attention to elderly people with mobility disabilities.

Introduction

The increasing prevalence of loneliness among elderly people is a public concern because of societal changes, such as smaller family size, fewer people living in multigenerational households, more people never marrying, increasing divorce rates, and greater distance between residences of family members [1, 2], especially in countries such as the Netherlands where the absolute number of elderly people is expected to increase from 2.4 million (16%) in 2010 to 4.6 million in 2040 (26%) [3, 4].

Although there are limited scientific data available on trends in loneliness [1, 2, 5-7], surveys of the community health services in the Netherlands have reported large regional variation between municipalities in the prevalence of loneliness among non-institutionalised elderly people aged 65 years and over, ranging from 30% to 63% in 2005 [8, 9]. In addition, heterogeneity in trends across municipalities is suggested in the period 2005–2010.

Trends and regional differences might be explained by populations' socio-demographic and health characteristics. It is consistently found that loneliness is not a matter of age by itself. Associations between age and loneliness can mainly be explained by age-related health problems, widowhood, and changes in social network ties [5, 10-14]. Furthermore, marital status is clearly associated with loneliness; persons who are not married or live alone are at increased risk of loneliness compared to persons who are married or live together [5, 10-13, 15, 16]. The association between gender and socio-economic status and loneliness is less consistent [5, 10, 12-16]. With regard to health-related factors that affect the ability of elderly people to sustain a good network quality, issues such as functional mobility, chronic diseases, and hearing and vision problems are independently associated with higher loneliness scores in some [10-12, 15-19] but not all [5, 11-13, 16] cross-sectional and longitudinal studies. Therefore, the aim of this study is to investigate the influence of socio-demographic and health characteristics on trends and regional variation in loneliness among community-dwelling elderly people.

Methods

Study design and study population

In 2005 and 2010, two independent cross-sectional surveys were performed to measure determinants and outcomes of health and healthcare use among non-institutionalised elderly people aged 65 years or older living in the Gelre-IJssel

region of the Netherlands. Data were collected by means of self-administered questionnaires. For 15 municipalities, data were available for the two consecutive time points. Population size ranged between 21,179 and 155,962 inhabitants, and the proportion aged 65 years or older ranged between 15% and 23% on 31 December 2010[20]. In both studies, age-stratified random samples were taken from the municipal population registries. Study samples of 500 individuals in 2005 and 600 individuals in 2010 were randomly selected per municipality. People aged 75 years or older were oversampled to constitute half of the study population. As a result, in the respective years, 250 and 300 persons aged 65-74 years and 250 and 300 persons aged 75 years or older were selected. For one larger city, the sample was raised to 2,500 and 3,500 persons in 2005 and 2010, respectively, again stratified by age (Figure 2.1).

In the 2005 survey, a questionnaire with reply envelope was sent to the selected participants. After a period of three weeks and six weeks, the non-responders received a reminder by mail. With the second reminder, the questionnaire was included again. In the 2010 survey, the first mailing was an invitation to conduct the survey online. After 2.5 weeks, a hard copy of the questionnaire was sent to the non-responders. After an additional 3.5 weeks, a reminder was sent, this time without a copy of the questionnaire. The response rate was 77% in 2005 and 60% in 2010. Data were available for 9,641 participants in total: 4,868 in 2005 and 4,773 in 2010.

Measurements

Loneliness was measured using the De Jong Gierveld loneliness scale, which is based on a cognitive approach to loneliness [21, 22]. Loneliness is defined as an unpleasant or inadmissible lack of certain relationships or quality of these relationships. The scale is composed of 11 questions of which five are positively and six negatively formulated. Three answer categories were provided (yes, more or less, no). For the positive items, ‘no’ and ‘more or less’ answers were an indication of loneliness, whereas, for the negative items, ‘yes’ and ‘more or less’ were an indication of loneliness. A score of 0–2 corresponds to no loneliness, 3–8 to moderate loneliness, 9–10 to severe loneliness, and 11 to very severe loneliness. The scale permits one missing value per participant to which a score of 0 is given [21-23]. The reliability of the scale can be indicated as good and comparable to other studies [22, 24], with a Cronbach’s α of 0.84 and 0.86 in 2005 and 2010, respectively.

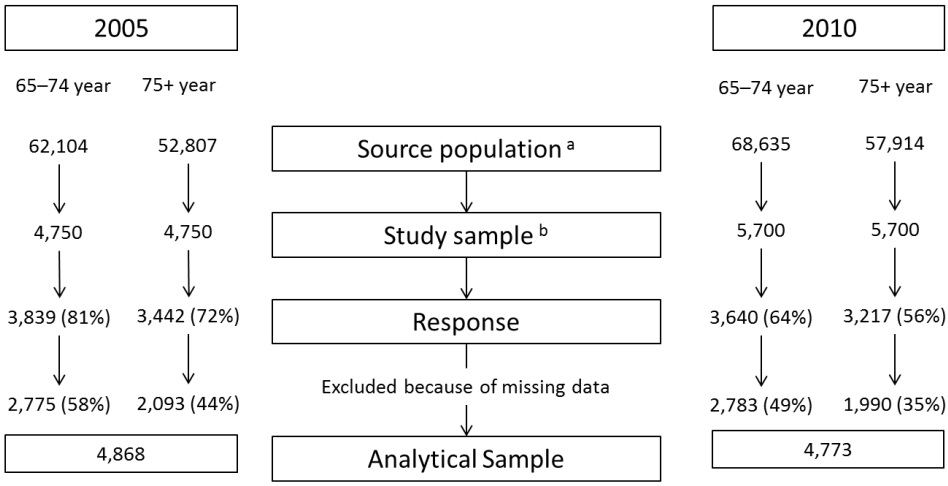

Figure 2.1 Flow chart study participants in 2005 and 2010
[a] Statistics Netherlands (CBS), 2011
[b] The study sample in 2005 included 14 municipalities with 250 persons aged 65–74 years and 250 persons aged 75+ years in each municipality and 1 municipality with 1,250 persons aged 65–74 years and 1,250 persons aged 75+ years; The study sample in 2010 included 14 municipalities with 350 persons aged 65–74 years and 350 persons aged 75+, and 1 municipality with 1,500 persons 65–74 years and 1,500 persons 75+ years.

The socio-demographic characteristics age, sex, country of birth, marital status, household composition, education level, and income level were included in the study. Country of birth was categorised as 'the Netherlands' or 'elsewhere'; marital status as married or living together, divorced or living separately, widowed, and single (never married or never lived with anyone); education as illiterate or primary school, lower vocational education, intermediate vocational education, and higher vocational education or university; household composition represents the participants' living arrangements and is classified as living alone and living together with one or more persons; having difficulties with managing on income is classified as 'having major or moderate difficulties' or 'having no difficulties.'

Presence of chronic diseases, presence of mobility disabilities, and self-perceived health were assessed as explanatory health characteristics. Mobility was measured using the following three items based on the OECD disability indicator [25]: carrying 5 kg for 10 metres, bending and picking something up from the floor, and walking 400 metres continuously. Mobility disability was defined as having major difficulty with, or not able to do, one or more of these activities. Participants could indicate on a list of 13 chronic diseases whether they suffered from the disease during the past 12 months, diagnosed by a physician or not. Suffering from chronic diseases was categorised as 'suffering from one or more diseases' or 'no diseases

reported.' Self-perceived health was assessed using the question 'How would you classify your health in general?' on a 5-point scale ranging from excellent to poor. Good self-perceived health was defined as having good, very good, or excellent health [26].

Statistical analysis

Participants with missing data for loneliness, gender, age, marital status, level of education, managing on income, household composition, chronic disease, or mobility disabilities were excluded from the analyses (figure 2.1). The socio-demographic and health characteristics of the two study populations were compared using the chi-square test and independent samples T-test for categorical and continuous variables, respectively. One-way ANOVA was used to compare mean loneliness scores within sub-groups of socio-demographic and health characteristics and between the two study years separately. Because the distribution of loneliness was heavily skewed, the multivariate analyses were repeated with a natural logarithm of the scores, a square root of the scores, and robust standard errors (Complex Survey GLM), resulting in highly similar patterns of association. Therefore, for simplicity of interpretation, the results are shown for the non-transformed score.

To study the contribution of the socio-demographic and health characteristics to the variance in loneliness scores between individuals and between municipalities, multilevel analyses were conducted using the statistical software MLwiN 2.24 [27]. The models included one level for individual participants and a second level for municipality. To evaluate consistency, this was done for 2005 and 2010 separately. A forward modelling approach was used, starting with an empty model including a constant with a random intercept for municipality. The socio-demographic variables age, gender, marital status, educational level, and managing on income, and the health variables mobility disabilities and chronic disease were added as fixed effects in consecutive steps.

To analyse trends in loneliness, a forward modelling approach was followed using pooled data from 2005 and 2010. Model 1 represents an empty model, including a constant with a random intercept for municipality. In model 2, a dummy variable for study year (reference year 2005) has been included. In order to explore whether the slope of the regression lines differed between municipalities, a random effect for study year was added, but this did not improve the model fit (likelihood ratio test). Therefore, study year is included as a fixed factor in models 3–5. Model 3 additionally adjusts for age and gender and model 4 for all previously mentioned socio-demographic and health variables. To study trends in loneliness within sub-groups of socio-demographic and health characteristics, for each of the determinants the interaction with study year was explored. Model 5 represents the final model, additionally including statistically significant interactions. The

proportion of explained variance between municipalities and between participants within municipalities was calculated from the consecutive models. P-values ≤ 0.05 were considered to be significant.

Table 2.1 General characteristics of study population in 2005 and 2010 (n=9,641)[a]

		2005 n=4,868	2010 n=4,773	p-value[b]
Socio-demographic characteristics				
Gender (%)	Men	46	50	0.001
Age (%)	65-74	57	58	0.120
	75-84	36	34	
	85+	7	7	
	Mean (sd) age (years)	73.8 (6.5)	73.8 (6.5)	0.535
Marital status (%)	Married or living together	68	71	<0.001
	Divorced, living separately	3	4	
	Widowed	26	22	
	Single	3	3	
Household composition (%)	Living alone	30	28	0.017
Education %	Illiterate or primary school	26	15	<0.001
	Low	48	53	
	Intermediate	14	15	
	High	13	18	
Manage on income %	Moderate or major problems	55	53	0.032
Country of birth %	Netherlands	96	96	0.322
Health characteristics				
Disability in mobility %	1 or more disabilities	23	19	<0.001
Chronic disease %	1 or more diseases	64	67	0.004
Self-rated health %	Fair or poor	25	24	0.122
Loneliness %	Not lonely	60	62	0.058
	Mildly lonely	34	32	
	Severely lonely	4	4	
	Very severely lonely	2	2	
	Mean (sd) score loneliness	2.57 (2.80)	2.51 (2.86)	0.35

[a] Sum total scores exceed 100% because of rounding off
[b] P-value for baseline difference <0.05

Results

Mean age was 73.8 years in both studies. The proportion of women, persons with no or only primary education, and widowed persons was lower in 2010 than in 2005 (table 2.1). With regard to health characteristics, no significant differences were seen in self-rated health. In contrast, the percentage of participants with mobility disabilities was significantly lower in 2010 than in 2005, whereas the percentage of participants with one or more chronic diseases was significantly higher in 2010.

Accordingly, no significant differences were seen in loneliness scores (mean change ± SE) over time in the total population (-0.05 ± 0.06) and within municipalities, ranging from 0.29 ± 0.28 increase to 0.33 ± 0.26 decrease. Between municipalities, loneliness scores (mean ± SD) ranged from 2.22 ± 1.60 to 2.88 ± 1.72 in 2005 and from 2.09 ± 1.64 to 2.78 ± 1.72 in 2010. The between-municipality variance (variance ± SE) in loneliness scores was 0.01 ± 0.01 in 2005 and 2010. In addition, the within-municipality variance was 7.84 ± 0.16 and 8.17 ± 0.17 in 2005 and 2010, respectively (figure 2.2).

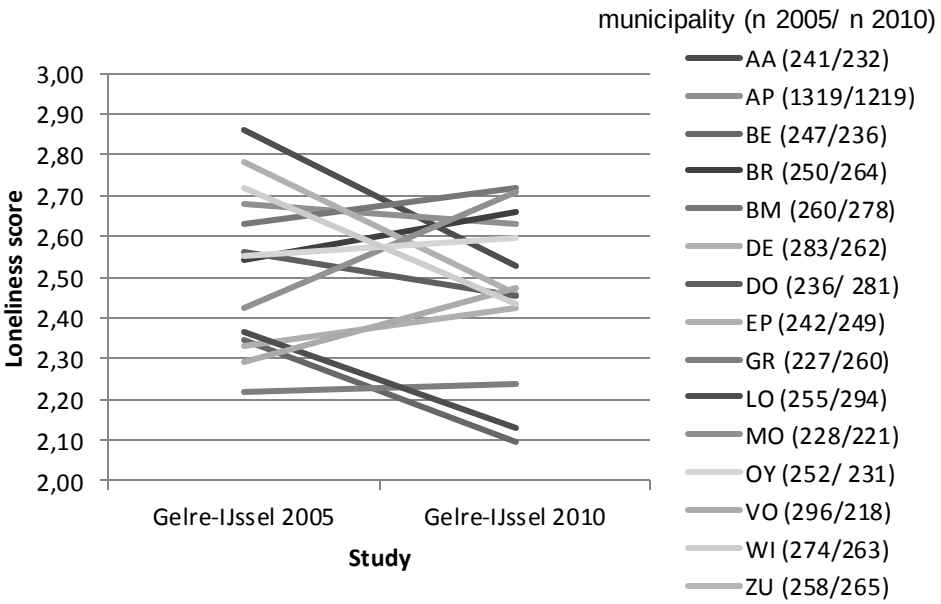

Figure 2.2 Mean loneliness scores for 15 municipalities in 2005 and 2010
The variance ± SE in mean loneliness scores was 0.01± 0.01 between municipalities in 2005 and 2010; and 7.84 ± 0.16 and 8.17 ± 0.17 within municipalities (or between individuals) in 2005 and 2010, respectively.

In both study years, differences in loneliness between the sub-groups of socio-demographic and health characteristics were all highly significant (p≤0.001) (table 2.2). Loneliness was higher among the oldest-old, women, persons living alone, persons with problems managing on their income, with one or more chronic diseases, with mobility disabilities, and with lower self-perceived health. Looking at trends in loneliness within the sub-groups of socio-demographic and health characteristics, participants with no or only primary education and with mobility problems were lonelier in 2010 than in 2005. Participants with intermediate vocational education, without problems managing on their income, with mobility problems, and with good self-rated health were less lonely in 2010.

Table 2.2 Mean (sd) loneliness scores for sub-groups of socio-demographic and health characteristics in 2005 and 2010 (n=9,641)

		2005[a]	2010[a]	p-value[b]
Total		2.57 (2.80)	2.51 (2.86)	0.35
Socio-demographic characteristics				
Gender	Men	2.40 (2.65)	2.38 (2.70)	0.75
	Women	2.71 (2.92)	2.65 (3.01)	0.46
Age	65-74	2.25 (2.62)	2.19 (2.70)	0.43
	75-84	2.91 (2.94)	2.82 (2.98)	0.37
	85+	3.46 (3.12)	3.67 (3.05)	0.39
Marital status	Married or living together	2.08 (2.47)	2.06 (2.52)	0.74
	Divorced, living separately	3.88 (3.70)	3.57 (3.58)	0.45
	Widowed	3.57 (3.10)	3.67 (3.27)	0.41
	Single (never married)	3.71 (3.19)	3.30 (3.21)	0.30
Household composition	Living alone	3.65 (3.19)	3.68 (3.33)	0.84
	Living together	2.11 (2.48)	2.07 (2.52)	0.53
Education	Illiterate or primary school	2.74 (2.94)	3.10 (3.18)	0.01
	Low	2.46 (2.75)	2.46 (2.83)	0.99
	Intermediate	2.82 (2.88)	2.46 (2.85)	0.02
	High	2.37 (2.60)	2.23 (2.61)	0.33
Manage on income	Moderate or major problems	2.75 (2.88)	2.80 (3.03)	0.52
	No problems	2.35 (2.69)	2.19 (2.62)	0.05
Health characteristics				
Disability in mobility	1 or more disabilities	3.49 (3.15)	3.89 (3.34)	0.01
	No disabilities	2.30 (2.63)	2.19 (2.63)	0.07
Chronic disease	1 or more diseases	2.77 (2.92)	2.71 (2.95)	0.40
	No chronic disease	2.21 (2.54)	2.13 (2.63)	0.34
Self-rated health	Fair or poor	3.54 (3.23)	3.73 (3.35)	0.16
	Good	2.24 (2.55)	2.13 (2.56)	0.09

[a] Differences of loneliness scores within sub-groups were all highly significant: p<0.001
[b] P-value for difference of loneliness score between 2005 and 2010; p <0.05 is considered as statistically significant

Table 2.3 presents the results from multilevel models on the association between socio-demographic and health characteristics and loneliness, adjusted for one another and for municipality of residence (random effect). The models for 2005 and 2010 are largely comparable. Mobility disability was strongly associated with loneliness in 2005 and even more in 2010. In contrast to the descriptive analyses, men were lonelier than women after adjustment for the other co-variables. Older age, being married or living together, having moderate or major problems managing on income, and having one or more chronic diseases were independently associated with loneliness in both years. Persons with intermediate education were lonelier than the more highly educated in 2005 but not in 2010. Furthermore, variation between municipalities was very small and not statistically significant in either model. The variables in the models explained approximately 10% of the variance between participants within municipalities in both years.

Table 2.3 Multilevel linear regression models for the association between socio-demographic and health characteristics and loneliness in 2005 and 2010

		2005 n=4,868 β (SE)	**2010 n=4,773 β (SE)**
Constant		-0.15 (0.49)	0.35 (0.50)
Gender (ref women)	Men	0.22* (0.08)	0.26* (0.08)
Age/decade		0.22* (0.07)	0.14* (0.07)
Marital status	Divorced, living separately	1.68* (0.23)	1.33* (0.20)
(ref married)	Widowed	1.29* (0.10)	1.34* (0.11)
	Single (never married)	1.60* (0.24)	1.24* (0.24)
Education	Illiterate or primary school/low	-0.09 (0.12)	-0.03 (0.11)
(ref higher educ.)	Intermediate	0.41* (0.15)	0.11 (0.14)
Income (ref no problems)	Moderate/major problems	0.31* (0.08)	0.49* (0.08)
Disability in mobility (ref no problems)	1 or more disabilities	0.75* (0.10)	1.27* (0.11)
Chronic disease (ref no diseases)	1 or more diseases	0.32* (0.08)	0.20* (0.09)
Between-municipality variance (SE)		0.004 (0.009)	0.015 (0.015)
% explained variance between municipalities [a]		NS	NS
Within-municipality variance (SE)		7.110 (0.144)	7.285 (0.149)
% explained variance within municipalities [a]		9%	11%

[a] % explained variance is the additionally explained variance of the adjusted model compared to the empty model ; *p<0.05

In table 2.4, the two study years are combined to continue the trend analysis. Study year appeared not to be significantly associated with loneliness in the crude model (model 2), after adjustment for age and gender (model 3), and all socio-demographic and health characteristics (model 4). As expected, age, gender, marital status, education, income, mobility disabilities, and chronic disease were predictors of loneliness. βs were in-between those in table 2.3. The percentage explained variance within municipalities increased from 2.5% in model 3 to 9.8% in model 4. The between-municipality variance remained small and was not significant in any of the models. Finally, the similarity of trends within sub-groups was studied by interaction terms and was statistically significant for mobility disability. Model 5 shows the results accounting for this interaction; loneliness significantly increased among participants with one or more disabilities (β=0.39 [95% CI: 0.15 to 0.63]), and decreased among participants without disabilities, albeit with borderline statistical significance (β=-0.10 [95% CI: -0.22 to 0.02]). Addition of the interaction term did not further increase the variance between and within municipalities.

Discussion

Male sex, older age, not being married, difficulties managing on income, mobility disabilities, and having a chronic disease were independently associated with higher loneliness scores and explained regional variance. Overall, and across municipalities, loneliness remained stable between 2005 and 2010. However, among the sub-group with mobility disabilities loneliness increased over time.

Comparability of consecutive studies is important in studying trends. In both studies, similar standardised sampling procedures were followed, resulting in age distributions that were fairly comparable in both years. Unfortunately, the response rate was lower in 2010 than in 2005 (77% and 60%, respectively); this may have resulted in a healthier sample in 2010. Van Goor (2009) reported that elderly participants in surveys generally have a higher socio-economic status, are more socially integrated, and have better health than non-participants [28]. However, this was not clearly observed in our study population: the prevalence of mobility disabilities was lower and the prevalence of chronic diseases was higher in 2010 than in 2005, whereas the prevalence of poor self-rated health did not differ between the two populations. Therefore, we assume that the lower response rate in 2010 has not influenced our trend results for loneliness. Moreover, mobility disability and having chronic diseases were included in the multivariate trend analyses to adjust for potential differences between the two studies.

Table 2.4 Multilevel linear regression models for the difference in loneliness between 2005 and 2010 (n=9,641)

		Model 1 β (SE)	Model 2 β (SE)	Model 3 β (SE)	Model 4 β (SE)	Model 5 β (SE)
Constant		2.52* (0.04)	2.54* (0.05)	-2.22* (0.33)	0.07 (0.35)	0.09 (0.35)
Study year (ref 2005)	2010		-0.05 (0.06)	-0.04 (0.06)	0.00 (0.06)	-
Gender (ref women)	Men			-0.21* (0.06)	0.24* (0.06)	0.23* (0.06)
Age/decade				0.66* (0.04)	0.18* (0.05)	0.18* (0.05)
Marital status (ref married)	Divorced, living separately				1.48* (0.15)	1.48* (0.15)
	Widowed				1.31* (0.07)	1.31* (0.07)
	Single				1.42* (0.17)	1.41* (0.17)
Education (ref high education)	Illiterate or primary school/low				-0.06 (0.08)	-0.07 (0.08)
	Intermediate				0.26* (0.10)	0.26* (0.10)
Income (ref no problems)	Problems				0.40* (0.06)	0.40* (0.06)
Disability in mobility (ref no problems)	1 or more disabilities				0.99* (0.08)	0.76* (0.10)
Chronic disease (ref no diseases)	1 or more diseases				0.26* (0.06)	0.26* (0.06)
Study year x disability in mobility (ref 2005)	2010 x 1 or more disabilities					0.39* (0.12)
	2010 x no disabilities					-0.10 (0.06)
Between-municipality variance (SE)		0.015 (0.011)	0.015 (0.011)	0.014 (0.010)	0.010 (0.008)	0.010 (0.008)
% explained variance between municipalities [a]				NS	NS	NS
Within-municipality variance (SE)		8.000 (0.115)	7.999 (0.115)	7.796 (0.112)	7.214 (0.104)	7.204 (0.104)
% explained variance within municipalities [a]				2.5%	9.8%	9.9%
-2 * log likelihood		47418.70	47417.90	47170.15	46420.15	46407.18

[a] % explained variance is the additionally explained variance of the adjusted model compared to model 2 ; *p<0.05

Furthermore, we found that in both study populations the percentage of non-married persons was 10% less than in the source population [20]. Moreover, both study populations are assumed to be healthier and less lonely than the source population. Therefore, the observed associations between the socio-demographic and health-related determinants and loneliness are presumably an underestimation of the real associations.

The multivariate models including the selected determinants of loneliness explained approximately 10% of the within-municipality variance in the data from 2005 and 2010 separately, and in the pooled dataset. Savikko [2005] included a comparable set of determinants that explained 5.5% of the variance in their data [16]. Some other studies reported on regression models that explained from 20% up to 50% of the variance of loneliness. These models included psychosocial factors [17], or social factors such as social participation, and network size [11, 12, 15, 29, 30], in addition to socio-demographic and health variables. The absence of network characteristics in our models might explain the lower proportion of explained variance. Furthermore, it might explain the observed association between gender and loneliness, as interaction between network characteristics and gender have been reported elsewhere [31, 32]. Men for example are more often involved in activities outside the home, whereas women are more family oriented [31]. Besides, men rely more strongly on their partner to assist with problems, whereas women have more varied networks for support [32]. As in other studies, the association between level of education and loneliness was not consistent in our study [12, 14-16, 33]. Societal shifts in education level might disturb this association[34], indicating that education level is probably not a strong predictor of loneliness among the current generation of elderly people.

In our study, we did not find a general trend in loneliness over the five years studied, or a trend within municipalities. Dykstra [2009] reported a decreasing rather than an increasing trend in loneliness, at least in age-specific sub-samples of married persons, by comparing 30 cross-sectional studies among 18–90-year-old adults in the period 1980–2005 [1]. No time trends of loneliness were found in older men over the 10-year period 1985–1995 in the Zutphen Elderly Study [5] and in older men and women over the 7-year period 1992–1999 in the LASA study [11]. In the latter study, over a more extended study period (1992–2006), the percentages of persons categorising themselves as lonely sometimes, often, mostly, or always during the previous week increased from 16% to 21%, whereas the percentage of people classifying themselves in the last three categories (often, mostly, or always) did not change, 5% to 4% [1]. Thus, neither our study nor previous studies can confirm the public concern about a rising prevalence of loneliness among elderly people.

Although a 5-year period seems short to assess overall trends, it may suffice to identify specific sub-groups at increased risk of developing loneliness. We found that loneliness had increased among persons with mobility disabilities. A possible explanation is that persons with disabilities had more difficulties engaging in society in 2010 than five years before. Societal changes may have affected these vulnerable older persons unequally. For example, the disappearance of physical resources from the neighbourhood, such as small shops and service points, hinders the independence of elderly people with mobility problems [35]. Furthermore, changing family structures, such as offspring living further away, especially affect elderly persons with higher support needs. This suggests that current policies that call for individual responsibility and the independence of elderly persons [36] may place physically disabled persons at even more risk of developing loneliness.

Mobility disabilities, along with marital status, appeared to be the important determinants explaining differences in loneliness between municipalities. From the pooled data, the prevalence of loneliness differed by 19% between the municipality with the highest (2.75) and the municipality with the lowest (2.22) score. To understand the influence of municipalities' socio-demographic and health characteristics on loneliness, we calculated the extent to which loneliness would be reduced if the determinants were modified. On average, loneliness would decrease by 6%, from 2.54 to 2.39, if the population consisted solely of married elderly persons with no mobility disabilities.

To conclude, no loneliness time trend was found in the period 2005–2010 among non-institutionalised elderly people in the Gelre-IJssel region. However, loneliness increased among participants with one or more mobility problems. Concurrently, the population distribution of mobility disabilities and marital status largely explained differences in loneliness prevalence between municipalities, pointing towards high risk groups that need attention from public health professionals and policymakers.

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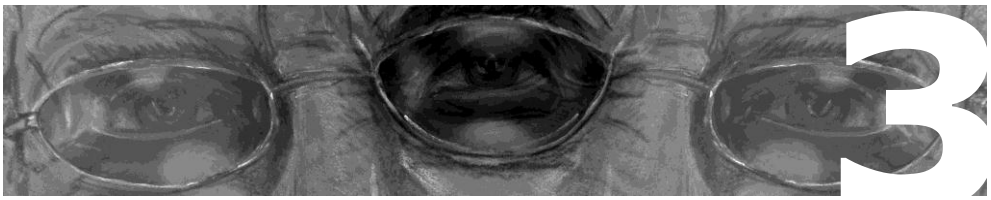

3

Evaluation design for a complex intervention program targeting loneliness in non-institutionalized elderly Dutch people

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Abstract

Background: The aim of this paper is to provide the rationale for an evaluation design for a complex intervention program targeting loneliness among non-institutionalized elderly people in a Dutch community. Complex public health interventions characteristically use the combined approach of intervening on the individual and on the environmental level. It is assumed that the components of a complex intervention interact with and reinforce each other. Furthermore, implementation is highly context-specific and its impact is influenced by external factors. Although the entire community is exposed to the intervention components, each individual is exposed to different components with a different intensity.

Methods/ Design: A logic model of change is used to develop the evaluation design. The model describes what outcomes may logically be expected at different points in time at the individual level. In order to address the complexity of a real-life setting, the evaluation design of the loneliness intervention comprises two types of evaluation studies. The first uses a quasi-experimental pre-test post-test design to evaluate the effectiveness of the overall intervention. A control community comparable to the intervention community was selected, with baseline measurements in 2008 and follow-up measurements scheduled for 2010. This study focuses on changes in the prevalence of loneliness and in the determinants of loneliness within individuals in the general elderly population. Complementarily, the second study is designed to evaluate the individual intervention components and focuses on delivery, reach, acceptance, and short-term outcomes. Different means of project records and surveys among participants are used to collect these data.

Discussion: Combining these two evaluation strategies has the potential to assess the effectiveness of the overall complex intervention and the contribution of the individual intervention components thereto.

Background

General background

In the last two decades, there has been growing interest in evidence-based policymaking in the field of public health [1-4]. For this, policymakers need information about the effectiveness and cost-effectiveness of interventions to prevent disease and promote health. Public health problems do not stand alone but are embedded in macro-level socio-economic environments. Therefore, public health problems require a combination of strategies that take the local context into account [5]. As a result, there is a need for the development of appropriate evaluation designs that address these characteristics of public health interventions [5, 6]. Internationally, several initiatives have been taken since the beginning of the new millennium, by bodies such as the UK Medical Research Council [5, 7, 8], USA Centers for Disease Control and Prevention [9] and WHO European Working Group on Health Promotion Evaluation [10], to develop guidelines for the evaluation of complex public health interventions.

In the Netherlands also, policymakers aim for more evidence-based public health interventions. For this reason, Academic Collaborative Centers for Public Health have been established since 2006 [11, 12]. Another step forward was the development of a national certification system for public health interventions by the National Institute of Public Health and the Environment (RIVM) in 2008. To date, only a few interventions have been approved as effective or cost-effective in the Netherlands as most evaluation studies are limited to process evaluations and therefore provide weak evidence on effectiveness [13].

The current study seeks to contribute to more evidence-based working procedures in public health practice. The aim of this paper is to provide the rationale for an evaluation design for a complex intervention targeting loneliness among non-institutionalized elderly people in a Dutch community. The intervention is practice driven, meaning that the intervention is newly developed by equitable partnering of researchers, practitioners, and policymakers directly affected by, and knowledgeable about, the local circumstances that impact health. The intervention called *Healthy Ageing* is being conducted in the community of Epe, a rural village in the eastern part of the Netherlands, with 32,970 inhabitants, 19% of whom were aged 65 years and over at the start of the initiative in January 2008 [14]. The intervention commenced in September 2008 with a start package of intervention activities addressing the non-institutionalized elderly people as the primary target group and people in the social environment of the elderly as the secondary target group. The planned intervention period is two years.

Three research questions were formulated to assess the effectiveness of the complex *Healthy Ageing* project. Firstly, can we observe changes over time in the prevalence of loneliness and in the determinants of loneliness in the general non-institutionalized elderly population of the intervention community, Epe, and specifically in high risk groups? Secondly, can these changes be attributed to the complex intervention? Thirdly, how can the observed changes be explained and what are the active components of the intervention? For the purpose of this paper, the term complex intervention is defined as an intervention consisting of several interacting components [8]. The components may include actions and activities at the individual level and at the social and physical environmental level. The level of complexity may be influenced by the number of components, the interactions between components, the number and difficulty of behaviors required by those delivering or receiving the interventions, the number of groups or organization levels targeted by the intervention, the number and variability of outcomes, and the permitted degree of flexibility or tailoring of the intervention [8]. This complexity makes a classical randomized controlled trial (RCT) design – generally accepted as the gold standard design for evaluating the efficacy of bio-medical trials in a clinical or controlled setting – inappropriate for evaluating the effectiveness of public health interventions in a real-life setting [15, 16]. Restricting the success indicator to one single health or behavioral outcome leads to many unsolved questions about the success factors for, and barriers to, the effectiveness of the intervention [6, 17]. Therefore, an evaluation approach is proposed that includes a combination of quantitative and qualitative evaluation methods to answer the three research questions of this study. To answer the first and second question, a quasi-experimental pre-test post-test study design including short-term, mid-term and long-term outcome indicators is used. To be able to answer the third question, intervention inputs, activities, and outputs are recorded to assess the implementation process. In-depth qualitative research is used to investigate the acceptability of the project within the target population in more detail.

Background to *Healthy Ageing*

Local policymakers in Epe defined loneliness as one of their priority areas, as local data showed that 40% of the elderly were mildly to severely lonely [18]. To develop an intervention program, a project group was commissioned, including representatives of the municipality of Epe, the regional community health service, the regional mental health service, and the local welfare organization for the elderly. The activities of the project group are described according to first two phases of Bracht et al.'s [19] community organization model: the community analysis phase and the intervention planning and initiation phase. The remaining three phases, the implementation phase, the maintenance and consolidation

phase, and the dissemination and reassessment phase are beyond the scope of this paper. In figure 3.1 the different phases of the project are indicated on a timeline. However, it should be borne in mind that the succession from one phase to another is not clear cut.

The first phase comprises the community analysis, also called context analysis or needs assessment, in combination with a literature study to identify the causes of loneliness and potential solutions to prevent or diminish loneliness. The community analysis includes in-depth analysis of local monitoring data and interviews with the elderly, organizations, and policymakers to discover the most important risk factors for loneliness in the local population and to generate ideas for an intervention strategy.

In the literature, loneliness is described as a discrepancy between the desired and realized social contacts of an individual [20]. This negative experience may be related to the absence of a partner or close relative, called emotional loneliness, or due to minimal social integration and the absence of friends with common interests, described as social loneliness. As the causes of loneliness are very diverse, different approaches are needed for different subgroups. Three potential pathways to reduce feelings of loneliness can be distinguished, namely network development, lowering of standards, and adjusting the relevance of the experienced loneliness [21]. Network development concerns an interaction between an individual and his or her social environment. The other two solution pathways require more intrinsic changes. The local monitoring data show that elderly people have a higher risk of becoming lonely if they have physical limitations, have difficulty managing on their income, are recently widowed, or have mental disabilities. On the other hand, frequent involvement in social engagement activities appears to be related to better self-perceived health, better mental health, and better physical functioning. Furthermore, higher contact frequency and better appreciation of contacts with friends, family, and neighbors are related to better health. Remarkably, satisfaction about contacts with neighbors is most strongly related to health [22]. The important role of neighbors is confirmed by the interviews with the target population. In addition, these interviews show that elderly citizens experience their health and wellbeing in the context of their daily life and not as isolated issues. They may benefit most from a positive approach, the provision of services in the immediate neighborhood, improved information provision about these services, and cooperation between service providers in the community [23].

The second phase in intervention planning is the design and initiation phase. In this phase, the project group formulates the overall project aim. The project aim is to

reduce loneliness among non-institutionalized elderly people aged 65 years or over by 10% in two years, i.e. from a mean score of 2.6 to 2.4 on the loneliness scale of De Jong-Gierveld. For the purpose of the evaluation design as described in this paper, the most important sub-objectives are: (1) to reduce loneliness in the high risk groups (physical limitations, low income, recent widowhood, mild mental disabilities); and (2) to create more awareness about the existence of loneliness in the general population.

An overview of the intervention activities addressing different target groups is given in appendix 1. Intervention activities for the high risk groups are directed at the development of a stronger personal network and skill training (objective 1). These activities include psychosocial courses based on the principles of life history memory [24-26], and social activities organized by the local welfare organization. The general elderly population is being approached by means of a mass medial campaign including a monthly article in the local newspaper, distribution of posters, and information meetings. This campaign aims to increase the awareness of the prevalence of loneliness among elderly people (objective 2), to give general lifestyle advice to improve healthy ageing, and to provide information about how to support each other with emotional or practical problems. As loneliness is not an isolated problem, the local newspaper articles are also directed at the social environment of the elderly, e.g. their family and other relatives, from now on called 'general Epe population', professionals and volunteers working with elderly people, and policymakers. Furthermore, professionals and volunteers are being trained to recognize early symptoms of loneliness and to make their diagnosis a subject of discussion. Moreover, these intermediaries are informed about the intervention activities and each other's services by a newsletter distributed three times a year.

The intervention activities introduced in the first project year have continued in the second year. Furthermore, initiatives of citizens to organize social activities are being stimulated within the intervention component *Neighbors Connected*. Simultaneously, the local government is being supported in the development of their new policy document in order to ensure that newly developed initiatives are embedded in the regular activities of public health practitioners.

Methods/ design

Logic model for loneliness prevention

A logic model has been developed to guide the evaluation planning (figure 2). The model focuses on the causal chain between intervention activities and outcomes at the level of the primary target group. In this model, reduction of the prevalence of

loneliness is placed as the overall goal. Improvement of the network quality is defined as an early marker for loneliness reduction and the long-term outcome of the intervention. Network quality is defined as a combination of the structure and function of the network. Therefore, improvement of network structure and improvement in experienced social support (network function) have been chosen as indicators for network quality. Improvement of the behavioral outcomes, being socially engaged and searching for professional or informal aid to support social engagement if needed, are included as mid-term outcomes. Thereafter, improvement of knowledge, attitude, and abilities are formulated as short-term outcomes, according to theoretical behavioral models [27]. These constructs are defined as loneliness health literacy in the model and will be achieved if sufficient outputs are delivered in terms of reach, dose received, and acceptability. Based on this model, appropriate indicators and research methods have been selected to measure these outcomes. These indicators are described in the section Questionnaire Development and in appendix 2. The model serves to guide the evaluation both of the overall complex intervention and of the individual intervention components.

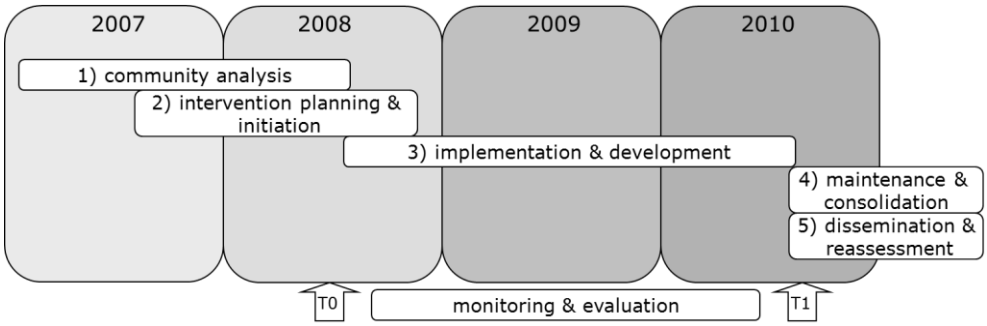

Figure 3.1 Timeline intervention and evaluation planning

Evaluation design for *Healthy Ageing*

In this section, the research approach to evaluate the overall effect of the complex intervention is described, building on a quasi-experimental pre-test post-test design involving a control group. By so doing, research questions 1) Can we observe changes over time in the prevalence of loneliness and in the determinants of loneliness? and 2) Can these changes be attributed to the complex intervention? are addressed.

As already stated, figure 3.1 visualizes the evaluation activities on a time line. A control community comparable to the intervention community was selected on the basis of demographic characteristics such as number of inhabitants, proportion of elderly persons in the community, religious orientation, and urbanization grade.

Adjacent communities were excluded from consideration as controls in view of the potential contamination of the project activities. Table 3.1 indicates that the populations of the intervention and control community are comparable in terms of demographic characteristics, determinants of loneliness, and prevalence of loneliness at baseline. In the control community as well as in the intervention community, regular health care, social activities, and other services are provided by, e.g., the community health service, local welfare organizations, home care organizations, housing agencies, and volunteer organizations. Local policymakers in the control community have been asked to restrict the starting of new initiatives for the elderly during the study period.

Study sample

The sample size calculation is based on an estimated reduction in loneliness of 10% at the population level. This means that a 10% difference in the mean score for loneliness on the loneliness scale of De Jong Gierveld between the intervention and control community has to be detectable (α=0.05;1-β=0.80). Standard deviation of difference in loneliness was estimated as SD=2.0 based on experiences in the Longitudinal Ageing Study Amsterdam (personal communication Prof. Van Tilburg). This leads to an effect size of d=0.13. The calculated sample size (n=930) was raised to 1,350 because of an expected response rate of 70%, based on previous experiences of the community health service in local surveillance studies among elderly people. A random study sample of non-institutionalized people aged 65 years and over was selected from the municipal registration system in both the intervention and the control community. People aged 75 years or over were oversampled to constitute half of the study population.

Data collection

Baseline measurements were taken over an 11-week period from mid-August 2008 to the end of October 2008. The follow-up measurement is scheduled to take place in the same period in 2010. Baseline data were collected by means of a 20-page, 60-item, self-administered questionnaire. Potential participants received an information letter together with the questionnaire at their home address. In this letter, it was explained that agreement to participate in the study was confirmed by the elderly person returning the questionnaire. A central telephone number was provided for questions concerning the study or to ask for assistance with filling out the questionnaire. In addition, the participants were allowed to ask a relative for assistance. Two reminders were sent out four and seven weeks after the first letter. The second reminder included another copy of the questionnaire. The response rate was 50% after four weeks, 58% after six weeks, 72% after nine weeks, and

74% when the baseline study closed after 11 weeks. Blank questionnaires were removed. This resulted in a study sample of 905 participants in the intervention community and 897 participants in the control community, respectively; this corresponds with a response rate of 67%.

The study is not invasive to the study participant's integrity. Therefore it does not require formal ethics review according to the criteria of the Medical Research Involving Human Subjects Act. The use of personal data in this study is in compliance with the Dutch Personal Data Protection Act and the Municipal Database Act, and has been registered with the Dutch Data Protection Authority (number 1440826).

Questionnaire development

Inclusion of the indicators for determinants of loneliness in the questionnaire is based on the logic model for loneliness prevention (figure 3.2). An overview of these indicators is given in appendix 2. In addition to the determinants of loneliness, demographic, lifestyle, and health indicators are included in order to characterize groups at risk. The indicators have been mainly selected from the standards of the national surveillance system for adults and the elderly in the Netherlands [28]. These national standards are based on best available scientific insights, experiences of local community health services, and expert opinions. For the indicators not included in the national surveillance system, the international scientific literature was reviewed. The questionnaire was pre-tested in a group of five voluntary elderly advisors to assess social acceptability of the questions by the local population and applicability for self-administration. Thereafter, the questionnaire was slightly adapted.

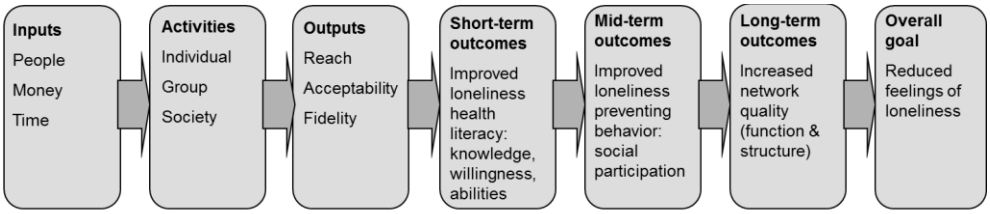

Figure 3.2 Logic model for loneliness prevention at the individual level

Table 3.1 Baseline characteristics of intervention and control community

		Intervention (n=905) [a]	Control (n=897) [a]
Gender (%)	Men	44	43
Age (%)	65-75	52	50
	75>	49	50
Marital status (%)	Married	67	65
	Unmarried	3	4
	Divorced	3	4
	Widowed	27	28
Education level (%)	Non/primary	24	22
	Lower	47	44
	Intermediate	13	17
	High	16	18
Managing on income (%)	Difficulties	12	9
Country of birth (%)	Netherlands	97	97
Household composition (%)	Living alone	30	34
Living situation (%)	Fully independent	93	92
	With services	7	9
Loneliness (%)	Not lonely	50	52
	Mildly lonely	41	41
	Severely lonely	7	5
	Very severely lonely	3	2
Self-perceived health (%)	Good to excellent	73	76
	Moderate to bad	28	25
Functional status (%)[b]	Not disabled	62	63
	Disabled in IADL	18	16
	Disabled in	14	15
	MADL/IADL	7	7
	Disabled in all domains		
Mental health (%)	Good	83	88
	Mild problems	13	9
	Moderate problems	4	2
	Severe problems	1	1

[a] Due to rounding off percentages may exceed 100%

[b] Domains of functional status: basic activities of daily life (BADL), mobility activities of daily life (MADL), instrumental activities of daily life (IADL)

Exposure assessment

In theory, all elderly people in the intervention community are more or less extensively exposed to the intervention components and people in the control community are not. However, in order to be able to explain the observed success or failure of the intervention in terms of changes in the prevalence of loneliness and

in the determinants of loneliness and to contribute to research question 3, it is important to gather information about the true exposure (also called dose received) of individual elderly persons from the intervention community within the study sample. Therefore, during the follow-up measurement study towards the end of 2010, participants will be asked whether they have read something about the intervention in the local newspapers, heard about the intervention in another way, have participated in one of the courses or have attended an information meeting.

Evaluation of individual components of *Healthy Ageing*

Complementary to the effect evaluation of the overall complex intervention, the individual intervention components have to be evaluated. This part of the evaluation delivers information to answer research question 3) How can the observed changes be explained and what are the active components of the intervention? Appendix 3 gives an overview of the intended evaluation activities. Evaluation of the inputs, activities, and outputs of the intervention are part of the process evaluation and include indicators for dose delivered, integrity, reach, dose received, and acceptability. Furthermore, the effect evaluation of the individual intervention components focuses on what has been achieved in the short term in terms of changes in behavioral determinants, behavioral intentions, and perceived further benefits. As the intervention is ongoing and dynamic, the evaluation activities take place throughout the life of the program. In addition, in-depth qualitative research will be conducted to understand the acceptability of the intervention activities to the target population.

Inputs

Project group members record all their personal inputs in the project, such as time investment, allocated resources, costs, organizational issues, and contact administration. In this way, it becomes clear which factors are needed to develop a well-functioning project group capable of coordinating, preparing, and organizing intervention activities. Furthermore, minutes of meetings are used to study the decision-making processes. The Checklist of Coordinated Action [29] was used at the end of year one to evaluate the experiences of the project group members and their managers about the collaboration and will again be used at the end of the intervention period to make the final evaluation.

Activities – dose delivered

To assess the dose delivered, the project group members record the actual delivery of intervention activities, such as the number of articles published and the number of courses and meetings organized. All this information is collected in a database. In the database, some characteristics of every intervention activity are

also recorded, such as the general objective of the activity, the intended target group, a general description of the content of the activity, the type of activity (e.g. information and education, community development, or policy development), the level of participation of the target group, the setting, the duration of an activity (e.g. once-off or repeated meetings), the length of meetings, and the interval between meetings. Data collected about inputs and activities contain information about the integrity of the program, i.e. whether the program is being implemented as planned.

Outputs – reach, dose received, acceptability

The reach of the intervention is assessed by counting the number of participants per activity. Participants' general characteristics, i.e. gender, age, and occasionally indicators to recognize high risk groups, namely marital status, functional status, mental status, and loneliness are estimated by the course leaders or if possible reported by the participants on an evaluation form.

The actual dose received by elderly people in the intervention community is assessed by different means. During the courses, frequency of attendance is recorded for each participant. This is a measure of dose per activity. However, participants on these courses are not per definition included in the sample of the pre- and post-test. Therefore, complementary to registration of dose per activity, dose per individual is assessed among study participants of the pre- and post-test. They will be asked in the follow-up measurement about their involvement in the intervention activities as described in the section, Exposure Assessment.

At the end of each intervention activity, apart from the communication materials (posters and flyers), the participants are asked to rate how they valued the activity. The questions are linked to the content of the activity, and the information collection methods vary from informal feedback to one-page evaluation questionnaires in the form of a visitors' book and the longer traditional evaluation forms. Two other qualitative in-depth studies have been designed to gain more insight into the motivations for participation in the intervention activities and the value derived from them. In the first study, *Neighbors Connected* is evaluated using in-depth interviews with elderly people who organize or participate in an activity [30]. The second qualitative study will be conducted among a sample of less active elderly people in the community to assess their opinion concerning communications about different intervention activities, the barriers they experience to participating in an activity, the factors that make an intervention attractive, and their perceived benefit of participating in one of the activities.

Short-term outcomes

Short-term outcomes at the individual level comprise the behavioral determinants. Using a short evaluation form or via informal feedback after the information meetings and courses, the participants are asked what they have learned. Participants in the psychosocial courses are asked whether their discomforts diminished after the course and whether they perceived an increase in knowledge and skills. Contact details of participants are collected after the intervention activities to have the opportunity to assess the effects of the activities after some months. In this follow-up, questions about changes in attitude and behavior are asked.

Discussion

The evaluation design as presented in this paper sets a framework for the evaluation of the complex intervention *Healthy Ageing* and aims to contribute to more evidence-based working procedures in public health practice. Combining two research strategies, namely the evaluation of the overall complex intervention and the evaluation of the individual intervention components provides, in our opinion, a promising way to evaluate complex public health interventions. First, a range of outcome indicators is included to assess short- and long-term outcomes. Second, different measures are used to assess the exposure of the target population to the intervention components. Third, in-depth qualitative research is conducted at the end of the research period to access the acceptability of the intervention by the target population.

Evaluation of a complex intervention conducted in a real-life setting has implications for the design. The *Healthy Ageing* project is a practice-driven intervention; this means that the intervention activities have been developed in cooperation with local public health practitioners and policymakers. As a consequence, the intervention is not fixed from the start. Intervention activities may be adapted and room is provided for local initiatives and activities. This working procedure requires a flexible attitude on the part of researchers, and the evaluation design has to be sensitive to consider the on-going development of the project.

Moreover, the *Healthy Ageing* project is a complex intervention including a combination of intervention components that reinforce each other and interact with the local context. As a consequence, the exposure is not under the full control of the project group. Therefore, the intervention dose received by the target group is expected to differ between individuals. Related to this, the expected progression from short-term to mid-term and long-term outcomes depends on the dose of the

intervention. Therefore a whole range of outcome measures has to be included in the data collection.

Given these characteristics of complex interventions, a combined evaluation strategy, including qualitative and quantitative research methods to assess outcome indictors over the entire logic model, has been chosen to assess the effectiveness of the complex intervention and to understand the underlying processes. To answer research questions 1) Can we observe changes over time in the prevalence of loneliness and in the determinants of loneliness? and 2) Can these changes be attributed to the complex intervention? it will be important to consider the robustness of the design and the choice of exposure and outcome measures [5].

With regard to robustness, a quasi-experimental pre-test post-test study design has been chosen as an alternative to an RCT to measure changes in loneliness and determinants of loneliness. Randomization of either individuals or communities to the intervention or control group was not desirable as the *Healthy Ageing* project was initiated in a local community that was motivated to promote the health and wellbeing of its elder citizens. It proved possible to select a control community comparable to the intervention community in terms of demographic characteristics, health status, and the main determinant of interest, namely loneliness and determinants of loneliness. Adjacent communities were excluded from consideration as possible controls to prevent diffusion from the intervention to the control group. Participants in the intervention and control community were randomly selected from the municipal registries and can be considered as representative of the non-institutionalized elderly population. The presence of a control group makes it possible to measure the effect of the intervention by making adjustments for confounding factors that may influence loneliness.

Sample size is another important component influencing the robustness of the design. The study population should be large enough to account for variability in individual-level outcomes. Therefore a power calculation was made to calculate the necessary study size, sensitive enough to detect a 10% reduction in loneliness. Although the response rate was reasonably high (67%) in both the intervention and control community, during the baseline measurement it was below the intended 70%. A high response in the follow-up measurement will be necessary to ensure sufficient power and to enable subgroup analyses for the high risk groups.

Finally, the condition of standardization of the exposure within an RCT is contravened in a complex intervention in a real-life setting. In the case of the *Health Ageing* project, no protocols have yet been developed to enable the

implementation of the intervention in a standardized way. However, even if there were protocols available, these would have to be tailored to the local context. Nevertheless, this limitation will be overcome by the assessment of a range of exposure measures, including inputs in terms of time, manpower and resources, the dose delivered, reach, and dose received by the target population.

The choice of outcome measures is based on the logic model. The literature and in-depth analysis of local monitoring data prompted the selection of indicators for network structure and network function, social engagement, and health literacy. Changes in these indicators can be seen as intermediate outcomes for the reduction of loneliness or as mediator between intervention and final outcome.

The third research question concerns the explanation of the observed effects and analysis of the active components of the intervention. This information will be essential to make the project transferable to other communities.

The evaluation of individual intervention components in this study aims to discover facilitating and inhibiting factors along the causal chain of the logic model. These factors can be attributed to the delivery of the intervention by the project group, or the acceptance of the intervention by the target population.

Accordingly, to move from inputs to activities, the contribution of the project group members in terms of time, resources, and expertise has to be assessed. These are preconditions for the implementation of the planned intervention activities. Thereafter, to move from activities to outputs, project group members record the actual activities undertaken and the number of participants reached. During regular meetings, difficulties faced and successes achieved are discussed in more detail. The next step is to move from outputs to short-term outcomes. This step is evaluated in two different ways. First, participants in courses and information meetings are asked about their appreciation of the activity and about the acquired skills or knowledge. Second, in-depth qualitative studies provide insight into the motivations of the target population to attend – or not to attend – certain intervention activities. Furthermore, insight into perceived usefulness and outcome expectation are of interest because these factors may stimulate elderly people to participate, or discourage them from participating.

To conclude, combining two research strategies, namely the evaluation of the overall complex intervention and the evaluation of the individual intervention components, has in our opinion the potential to answer our three central research questions. The pre-test post-test study design delivers information about changes over time in the prevalence of loneliness and in the determinants of loneliness in

the general elderly population. The presence of a control community makes it possible to exclude the influence of confounding factors from these observations. Complementarily, the evaluation of the individual intervention components provides information about the implementation process. These data explain how the objectives are achieved or not, and contribute to improvement of active components. Altogether, the collection of essential information to transfer the project to other communities is assured.

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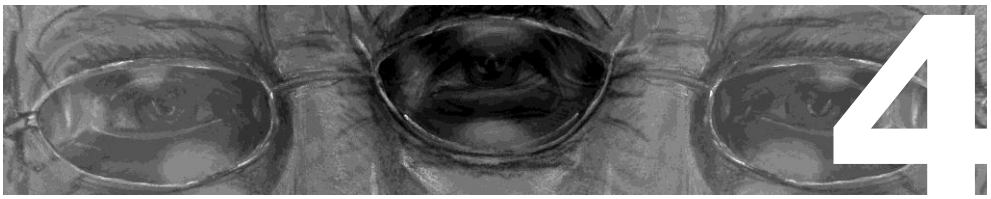

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Loneliness Literacy Scale: development and evaluation of an early indicator for loneliness prevention

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Abstract

To develop and evaluate the Loneliness Literacy Scale for the assessment of short-term outcomes of a loneliness prevention programme among Dutch elderly persons. Scale development was based on evidence from literature and experiences from local stakeholders and representatives of the target group. The scale was pre-tested among 303 elderly persons aged 65 years and over. Principal component analysis and internal consistency analysis were used to affirm the scale structure, reduce the number of items and assess the reliability of the constructs. Linear regression analysis was conducted to evaluate the association between the literacy constructs and loneliness. The four constructs, motivation, self-efficacy, perceived social support and subjective norm, derived from PCA captured 56% of the original variance. Cronbach's coefficient α was above 0.7 for each construct. The constructs, self-efficacy and perceived social support, were positively and, subjective norm was negatively associated with loneliness. To our knowledge this is the first study developing a short-term indicator for loneliness prevention. The indicator contributes to the need of evaluating public health interventions more close to the intervention activities.

Introduction

Elderly people are at increased risk of loneliness due to age-related life changes such as retirement, loss of a partner, friends or relatives, and physical and mental disabilities. These life changes affect on the one hand the social network ties and on the other hand the social support needs of elderly people, two important factors related to loneliness [1, 2]. Therefore, network development is the most commonly used strategy to reduce the prevalence of loneliness in the community [3-7]. However, to alleviate or prevent feelings of loneliness two other strategies have shown to be important, namely lowering standards regarding relationships and reduction of the importance of the loneliness experience [5, 8, 9].

In the eastern part of the Netherlands, the prevalence of loneliness among elderly people aged 65 years and over is around 40 %, as measured with the Dutch De Jong Gierveld Loneliness Scale [10-12]. This high prevalence, rapid population ageing and the severity of the problems related to loneliness made local policymakers decide to designate loneliness prevention as one of their priority areas. As a result, the loneliness prevention programme *Healthy Ageing* was developed aiming to reduce the prevalence of loneliness among non-institutionalized elderly people in the community, mainly by stimulating network development.

To evaluate the *Healthy Ageing* programme long-term as well as short-term outcomes need to be investigated. Long-term outcomes can indicate overall effectiveness, whereas short-term outcomes can indicate at an early stage whether intervention activities are well received and potentially effective. Besides, measuring short-term outcomes provides insight in how an intervention works and enables health professionals to adapt and improve the intervention activities in an early stage [13-15]. So far no validated short-term outcome indicators are available for measuring early results of loneliness interventions, while appropriate long-term outcome indicators for loneliness, social support and network size are frequently used [4, 16]. Therefore, we aimed to develop an outcome indicator, called Loneliness Literacy Scale (LLS), in order to be able to evaluate the short-term effects of the loneliness prevention programme *Healthy Ageing* on the level of behavioural determinants. This indicator is based on the literacy aspects motivation and ability to gain access to, understand, and use information to promote and maintain good health, as defined in the outcome model for health promotion of [14]. Nutbeam stated that health literacy measures include for example health-related knowledge, attitudes, motivation, behavioural intentions, personal skills and self-efficacy [14, 17]. More recently, he appealed for the development of literacy indices

tailored to specific health topics and contexts [18]. In this article we describe the development and evaluation of a literacy scale related to loneliness.

Methods

Scale development

For the development of the LLS the Intervention Mapping approach was used [19]. Determinants of loneliness were systematically identified during the first two steps of this approach: conduct a needs assessment (step 1) and formulate objectives (step 2). Hereby evidence from literature and experiences from local policy makers, health and welfare workers and representatives of the target group were taken into account. The needs assessment started with the identification of high risk groups for loneliness. Elderly people with a low discretionary income, with physical restrictions, with mild depressive symptoms and widowed elderly appeared to be lonelier according to literature and data from the local health monitor [20].

Thereafter, for each risk group causes for loneliness were identified and transformed to 21 behaviour change objectives. For example, it appeared that elderly with a low discretionary income have little money left for membership-fees, which diminishes their opportunities for social engagement. This resulted in the objective: Elderly with a low discretionary income apply for financial support for social activities by the local government. The risk group widowers mainly suffer from emotional loneliness and have to learn how to cope with these feelings. An example of a related objective was: Aged widowers join social support groups for bereavement.

Then, the 21 behavioural objectives were summarized and reduced to two main objectives, namely elderly people become or stay socially engaged and search for social support. With social support we refer to different kinds of support such as help in learning how to cope with feelings of loneliness, emotional support to enhance self-esteem, transport services for elderly to support mobility and financial support to facilitate engagement. This support can be derived from both informal support systems e.g. friends and family and from formal support systems e.g. general practitioner, elderly advisor and governmental services [21, 22].

Afterwards, behavioural determinants for the behaviours, becoming or staying social engaged and searching for support, were identified by studying health behaviour theories such as the Social Cognitive Theory, Theory of Planned Behaviour, Theory of Reasoned Action, and Health Belief Model [23-29]. Eight determinants were perceived to be most relevant, namely: awareness, knowledge,

self-efficacy beliefs, skills, attitudinal beliefs, normative beliefs, motivation to comply and intention. For simplification, these determinants were summarized into three general constructs of loneliness literacy. To be consistent with health promoters' practices, awareness was combined with knowledge; skills was combined with self-efficacy; and attitudinal beliefs, normative beliefs, motivation to comply and intention were combined in the overall concept motivation. The construct, knowledge, addressed factual knowledge and awareness about the availability of municipal services for elderly people with physical or mental health problems. The construct, self-efficacy, covered self-perceived social skills and skills to collect information about municipal services. The construct, motivation, comprised attitudinal beliefs (personal attitude and outcome expectations) and normative beliefs (social norms and motivation to comply). As a result, the construct, motivation, included intrinsic motivation as well as motivation driven by external support.

Next, so called change objectives were formulated for each combination of the two behaviours and the three behavioural determinants for the four priority groups. This resulted in a matrix with more than 200 potential change objectives contributing to the prevention of loneliness. These change objectives were summarized to come to a practical and manageable set. For example, knowledge about where to find information about dealing with bereavement, where to find information about organizations involved with depression prevention and where to find information about living on a low income were merged into knowledge about finding information about physical and mental health problems related to ageing. At the end, 43 change objectives remained.

Finally, each change objective was rephrased into a statement and was included as individual item in the draft version of the LLS. The scale was pre-tested for understandability among a group of seven volunteers from the target population, after which a few improvements were made. In the end, the scale contained 14 items for the construct, knowledge, 11 items for self-efficacy and 18 items for motivation. Ten items of the construct, knowledge, were assessed using a dichotomous scale (1 = 'no'; 2 = 'yes'). All other items of the three constructs were assessed using a 5-point Likert scale (1 = 'fully agree' or 'definitely'; 5 = 'fully disagree' or 'definitely not'). See the appendix 4 for a description of all items.

Data collection

To psychometrically evaluate the scale, a study was carried out among non-institutionalized elderly people aged 65 years and over living in the municipality of Epe, a rural community in the Eastern part of the Netherlands, in 2009. To exploit

heterogeneity, participants were selected on the basis of their score for loneliness in the baseline study of the *Healthy Ageing* programme in 2008 (n=903) as measured with the De Jong Gierveld Loneliness Scale [10, 11, 30]. Persons with the lowest and highest loneliness scores at baseline were selected, resulting in a sample of 203 persons indicated as not lonely (score 0–2) and 193 persons indicated as moderately to very severely lonely (score 6–11). Participants received a paper-and-pencil questionnaire at their home address and were asked to return the questionnaire by post.

Other measurements

Besides the 43 loneliness literacy items, the background variables gender, age and marital status were assessed. Data on education level were imported from the baseline dataset. Furthermore, self-perceived health was assessed with the question 'How do you perceive your health in general?', using a 5-point Likert scale ranging from excellent to poor. Loneliness was assessed with the De Jong Gierveld Loneliness Scale consisting of 11 questions of which 5 are positively and 6 negatively formulated. Three answer categories were provided ('yes', 'more or less', 'no'). For the positive items 'no' and 'more or less' answers were an indication for loneliness (1 point), whereas for the negative items 'yes' and 'more or less' were an indication for loneliness (1 point). A score of 0–2 corresponds to no loneliness, 3–8 moderate loneliness, 9–10 severe loneliness, and 11 very severe loneliness. The loneliness scale of De Jong Gierveld permits one missing value per subject to which a score of 0 is given [10, 11, 31]. The internal consistency of the loneliness scale in this dataset was in line with outcomes in other studies (Cronbach's coefficient α 0.92) [11].

Statistical Analysis

To affirm the underlying scale structure and to reduce the number of scale items, principal component analysis (PCA) with oblique (oblimin) rotation was used [32, 33]. To test the appropriateness of the data for PCA, the underlying assumptions were tested. The Kaiser-Meyer-Olkin index (KMO) of sampling adequacy was >0.7, indicating that patterns of correlations are relatively compact and suitable for PCA. According to Barlett's sphericity test (χ^2 = 2116.43, df = 231, $p<0.001$), multicolinearity and singularity were not violated [34, 35]. Internal consistency reliability of the constructs, based on the identified components from PCA, was assessed by Cronbach's coefficient α, taking a value of ≥0.7 as adequate [36]. Four-, five-, and six- component solutions were compared, of which the four-component solution appeared to be most meaningful. To shorten the LLS, item reduction was achieved by excluding two items with component loadings <0.4, ten

items with a high number of missing values and comments of participants suggesting misinterpretation of the questions, and another nine items that hardly contributed to the reliability of the constructs.

Concurrent validity of the LLS was tested in three steps. In advance, a mean score had been calculated for each of the constructs by adding the scores on the filled out items divided by the total number of items per construct, allowing a maximum of one missing value for each construct. For the evaluation, first, literacy scores of not lonely, mildly lonely, severely lonely and very severely lonely participants, based on the data of 2009, were compared using ANOVA. Second, the association between the mean scores of each of the loneliness literacy constructs as independent and loneliness as dependent variable was analysed in separate univariate models (N = 264). Third, the constructs were analysed together in a crude (N = 264) and adjusted (N = 245) multivariate model, including the confounders gender, age, marital status and education. This procedure enabled us to adjust for potential residual correlation between the discovered constructs, which is characteristic of an oblique rotation procedure [32]. All statistical calculations were performed using SPSS for Windows version 17.0.2.

Results

Sample characteristics

Of 396 invited persons, 303 persons (76%) completed the questionnaire, 165 persons (81 %) from the not lonely sub-sample and 133 persons (69%) from the lonely sub-sample. The sample included slightly more women (55%) than men and 17 % of the participants followed only primary education. Mean age of the study sample was logically one year older at the time of the current study in comparison to baseline, namely 75.5 years. The mean ± SD loneliness score was significantly lower in 2009 compared to 2008 (3.0 ± 3.5 versus 3.6 ± 4.2). At the time of the current study, 58% of the people were indicated as not lonely, 29% as moderately lonely, 9% as severely lonely and 4% as very severely lonely (table 4.1).

Scale structure and reliability

The pattern matrix of the four-component solution appeared to be most meaningful and interpretable, and accounted for 56% of the total variance (table 4.2). Items relating to the target behaviours, becoming or staying social engaged and searching for support, initially grouped in the constructs, knowledge, self-efficacy and motivation, were redistributed by PCA. The theoretical construct, knowledge, is omitted because of the high number of missing values. Items of the theoretical

construct, self-efficacy, clustered in one component and accordingly concerned the self-perceived ability to participate in social activities or conversations, to manage gathering information or to ask for support. Items relating to the broad construct, motivation, in our theoretical model were divided over three constructs, namely: motivation, perceived social support and subjective norm. The new construct, motivation, included mainly items about the motivation to search for support. The component, perceived social support, included items about previously experienced social support and the motivation to comply with the opinion of others. The last construct, subjective norm, included items about respondents' personal opinion and the perceived opinion of family, friends and neighbours with regard to participation. The Cronbach's coefficient α was above 0.7 for each of the four components, thus confirming an adequate internal consistency between the items within a construct: 0.87 for motivation, 0.83 for self-efficacy, 0.74 for perceived social support and 0.81 for subjective norm (table 4. 2).

Table 4.1 Background characteristics of elderly Dutch study participants (N = 303) at baseline (2008) and after one year (2009)

		Baseline study 2008	**Current study 2009**
Gender (%)	Men	45.0	as in 2008
	Women	55.0	
Education (%)	No/primary education	17	as in 2008
	Low education	48	
	Intermediate education	14	
	High education	21	
Mean (sd) age (years)		74.5 (6.7)	75.5 (6.7)
Marital status (%)	Married or living together	69	68
	Widow, widower	24	25
	Other living alone	7	7
Loneliness (%)			
	Not lonely (0-2)	55	58
	Moderately (3-8)	27	29
	Severely (9-10)	14	9
	Very severely (11)	4	4
Mean (sd) score loneliness		3.6 (4.2)	3.0 (3.5) [a]

[a] Mean difference in loneliness is significant (P < 0.01), paired sample t-test (N = 286)

Table 4.2 Pattern matrix and Cronbach's coefficient α for Loneliness Literacy constructs

	Item	Factor loading	Cronbach's α
Motivation	In my municipality there are professionals who can help people who feel gloomy or lonely	0.826	0.866
	Meetings for bereavement are offered in my municipality	0.817	
	If I felt lonely, I would search for professional help to reduce these feelings	0.805	
	A support group would help me to give ageing problems a place	0.790	
	If I have problems, a conversation with the elderly advisor helps me to solve my problems	0.684	
	If I lost my partner, I would follow a bereavement course	0.646	
Self-efficacy	I can manage in daily living as regards finding information	0.789	0.826
	I feel self-efficacious enough to go to an activity on my own	0.766	
	If I need help from others, I am able to arrange it myself	0.738	
	I am able do almost anything if I really want to	0.709	
	I can manage in daily living as regards arranging transportation to activities	0.658	
	In a group of friends/acquaintances, I speak up regularly	0.646	
Perceived social support	My family is there for me if I ask for help	0.787	0.735
	I perceive my family's opinion as important	0.742	
	My neighbours are there for me if I ask for help	0.608	
	My friends are there for me if I ask for help	0.585	
	I perceive my neighbours' opinion as important	0.482	
	I perceive my friends' opinion as important	0.443	
Subjective norm	My friends think it is important for me to participate in activities	-0.816	0.807
	My family thinks it is important for me to participate in activities	-0.783	
	By participating in activities I remain among men	-0.692	
	My neighbours think it is important for me to participate in activities	-0.532	

Concurrent Validity

Concurrent validity was evaluated by calculating the mean scores for the literacy constructs per loneliness category i.e. not lonely, mildly lonely, severely lonely or very severely lonely (table 4.3). The mean scores for the constructs, self-efficacy and perceived social support, were higher for people who were lonely than for people who were not lonely. The mean scores for the constructs, motivation and subjective norm, did not differ between the loneliness categories. Crude univariate regression analysis confirmed this, demonstrating that the construct, self-efficacy (β = 2.08, 95% CI 1.60, 2.58) and the construct perceived social support (β = 1.54, 95% CI 0.93, 2.14), were significantly associated with loneliness and explained 21% and 9% of the variance in loneliness respectively (table 4.4, models 0).

Table 4.3 Means (SD)[a] for loneliness literacy constructs motivation, self-efficacy, perceived social support and subjective norm for four categories of loneliness among elderly Dutch participants (2009) (N = 256)

	Motivation	Self-efficacy	Perceived social support	Subjective norm
Loneliness (2009)				
Not lonely (0-2)	2.8 (0.9)	1.6 (0.6)	1.8 (0.6)	2.4 (1.1)
Moderately lonely (3-8)	2.8 (0.9)	2.0 (0.8)	2.0 (0.6)	2.3 (0.9)
Severely lonely (9-10)	3.0 (0.9)	2.4 (0.9)	2.5 (0.6)	2.4 (0.7)
Very severely lonely (11)	2.8 (0.8)	2.9 (1.0)	2.2 (0.8)	2.5 (0.8)
All	2.8 (0.9)	1.8 (0.8)	2.0 (0.7)	2.4 (1.0)

[a] Loneliness literacy scores range from 1 (good/ favourable) to 5 (bad/ unfavourable)

Thereafter, multivariate analysis was conducted taking the four constructs together in the model (model 1). The constructs, self-efficacy and perceived social support, were significantly positively associated with loneliness, meaning that poor literacy scores were related to more severe loneliness. The construct, subjective norm, was significantly negatively associated with loneliness and the construct, motivation, was not associated with loneliness. After adjustment for confounders (model 2) the associations between loneliness and the constructs, self-efficacy (β = 1.62, 95% CI 1.11, 2.14), perceived social support (β = 1.27, 95% CI 0.69, 1.85) and subjective norm (β = -0.59, 95% CI -0.99, -0.19), remained significant at $p<0.05$. Motivation was excluded in the final model (model 3) as this construct did not contribute to the explanation of loneliness. In total, 41% of the variance in the final model was explained; 29 %by the three remaining loneliness literacy constructs and 12% by the confounders. As a result, figure 4.1 represents the intervention logic model of the *Healthy Ageing* programme as derived by the PCA,

reliability and regression analysis. The model visualises the relationship between the intervention activities, loneliness literacy, the behaviours, becoming or staying social engaged and searching for support, and loneliness.

Table 4.4 Crude univariate and crude and adjusted multivariate regression analysis for the association between loneliness and the loneliness literacy constructs among elderly Dutch participants (2009)

Model	**Motivation** β (95% CI)	**Self-efficacy** β (95% CI)	**Perceived social support** β (95% CI)	**Subjective norm** β (95% CI)	R^2 [a]
0	0.11 (-0.37, 0.58)	2.08* (1.60;2.58)	1.54* (0.93, 2.14)	-0.05 (-0.48, 0.39)	
1	-0.15 (-0.60, 0.31)	1.90* (1.40, 2.39)	1.51* (0.89, 2.12)	-0.59* (-1.03, -0.15)	0.28
2	-0.19 (-0.62, 0.23)	1.62* (1.11, 2.14)	1.27* (0.69, 1.85)	-0.59* (-0.99, -0.19)	0.42
3		1.61* (1.10, 2.13)	1.25* (0.68, 1.83)	-0.66* (-1.03, -0.29)	0.42

[a] R^2= variance explained by the model

*Significant at P < 0.05

Model 0: univariate model with mean scores for motivation, self-efficacy, perceived social support, or subjective norm as independent variables (N = 256)

Model 1: crude multivariate model including mean score for motivation, self-efficacy, perceived social support and subjective norm as independent variables (N = 256)

Model 2: adjusted multivariate model including mean scores for motivation, self-efficacy, perceived social support, subjective norm, gender, age, marital status and education as independent variables (N = 239)

Model 3: adjusted multivariate model including mean scores for self-efficacy, perceived social support, subjective norm, gender, age, marital status and education as explanatory variables (N = 239)

Discussion

We aimed to develop a scale to measure short-term outcomes of the loneliness intervention programme *Healthy Ageing.* PCA resulted in the identification of four meaningful constructs, namely motivation, self-efficacy, perceived social support, and subjective norm. Each of the four constructs had a good internal consistency reliability, indicated by a Cronbach's coefficient α>0.7. The concurrent validity was satisfactory for three of the four constructs, indicated by the positive association between the constructs, self-efficacy and perceived social support, and loneliness, and the negative association between the construct, subjective norm, and loneliness.

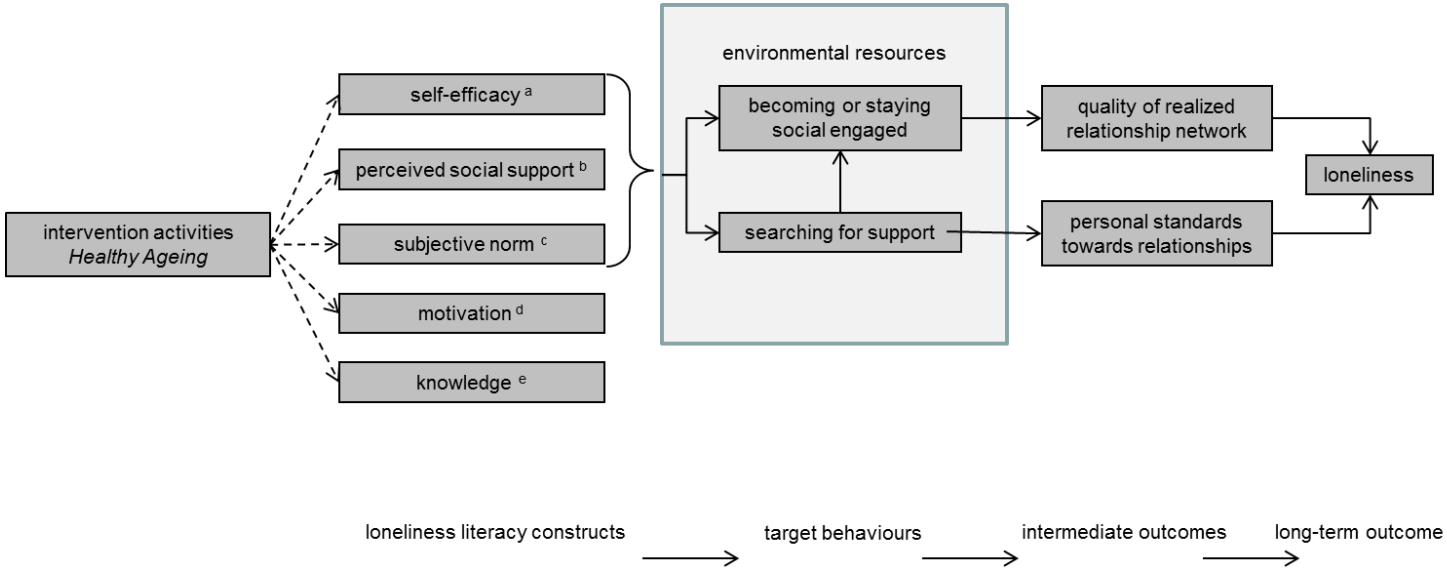

Figure 4.1 Intervention logic model of the *Healthy Ageing* programme focussing on loneliness literacy

[a] Self-efficacy: self-perceived ability to participate in social activities or conversations, to collect information or to ask for support.
[b] Perceived social support: previously experienced social support and the motivation to comply with the opinion of others.
[c] Subjective norm: respondents' personal opinion and the perceived opinion of family, friends and neighbours with regard to participation.
[d] Motivation: motivation to search for support – not included in final Loneliness Literacy Scale.
[e] Knowledge: factual knowledge and awareness about the availability of municipal services for elderly people with physical or mental health problems – not included in final Loneliness Literacy Scale.

For the development of the LLS the outcome model for health promotion of Nutbeam [1998] was used as conceptual framework [14]. In this model health literacy refers to the personal, cognitive and social skills that enable individuals to gain access to, understand, and use information. This information is assumed to change behavioural determinants such as knowledge, attitudes, motivations and self-efficacy related to a defined health promoting behaviour. According to Nubeam [2000], these behavioural determinants can be regarded as measurable outcomes of health education [17]. Further, Nutbeam [2009] ascertained a growing awareness of content and context specific literacy [18]. The developed LLS integrated these two visions by including the constructs, self-efficacy, subjective norm, and perceived social support, tailored to the topic loneliness in the local context of the *Healthy Ageing* programme.

A strength of the development procedure of the LLS is the structured approach of identifying causes of loneliness and related behavioural determinants. We combined theoretical evidence about causes of loneliness and general behavioural (change) theories with practical experiences of local policy makers, health and welfare workers and representatives of the target group. Furthermore, PCA and internal consistency analysis were used to affirm the scale structure, reduce the number of items, and assess the internal consistency reliability of the constructs. PCA with oblique rotation delivered best interpretable component solution and was therefore presented in this paper. The four component solution appeared to be quite robust as the components, respectively factors, were also found when the analysis is repeated with Common Factor Analysis (CFA) [32, 33] and with orthogonal (varimax) instead of oblique (oblimin) rotation procedures. Only two items did not have one dominant component respectively factor. Finally, we evaluated the concurrent validity of the LLS by studying cross-sectionally the associations between the loneliness literacy constructs and loneliness. The regression analysis showed that this association was significant for three of the four constructs, namely self-efficacy, perceived social support, and subjective norm. As the LLS is a newly developed short-term indicator, it would be important for further research to investigate the predictive validity of the LLS on top of concurrent validity by use of a prospective study. Furthermore, it is recommended to confirm the hypothesized association between the loneliness literacy constructs and the target behaviours in a next study.

PCA allocated the scale items in the theoretically defined constructs, knowledge and self-efficacy, however the theoretical construct, motivation was split into perceived social support, subjective norm, and motivation. The importance of including the construct, self-efficacy in the model was affirmed by PCA and regression analyses. Self-efficacy was, compared with the other constructs, most

strongly associated with loneliness in the univariate as well as the multivariate regression model. This association remained stable after adjustment for the other constructs and confounders. Higher, meaning less favourable, self-efficacy scores were related to more severe loneliness, thus confirming our expectations.

The construct, perceived social support, encompassed the social support experienced by older individuals from their social environment in the past. Perceived social support might either encourage or discourage a person to participate in social activities or to search for professional help in the future. In line with our expectations, higher (less favourable) scores on the construct, perceived social support, were significantly associated with more loneliness, still after adjustment for the other constructs and confounders.

The construct, subjective norm, included items about the opinion of important others, which might encourage or discourage a person to stay or become socially active. In the regression analysis we found a negative association with loneliness, meaning that less favourable literacy scores were associated with less severe loneliness. This association might probably be explained by reverse causality. Persons in the social environment of a more severely lonely person probably express more often their concerns and try to convince this person to go out and meet other people.

The new construct, motivation, included items about the awareness of offered services, expected outcomes of using these services and intention to use the service in case one would feel lonely. All six items were related to the target behaviour, searching for support. The construct, motivation, was not significantly associated with loneliness in the univariate as well as the multivariate analyses. The reason that motivation did not appear as individual predictor of loneliness in this study might origin in the formulation of the items which was probably too hypothetical. For example, for healthy, socially active and not lonely people it might be very hard to imagine how one would act if their situation would deteriorate after certain life-events. Therefore, it might be difficult to answer a question such as: '*If* I felt lonely, *I would* search for professional help to reduce these feelings.'

Finally, the construct, knowledge, was not included in the resulting model. As knowledge is seen as prerequisite to change other behavioural determinants it is a shortcoming that we cannot include the construct knowledge in our scale [37]. Communication of factual knowledge aiming to improve knowledge of health risks and health services is indicated by Nutbeam [2008] as functional health literacy [17]. With regard to the *Healthy Ageing* programme the focus was on the latter of these two, namely knowledge or awareness about the existence of health services

and opportunities for social engagement. Unfortunately, it appeared that the knowledge items of the LLS were difficult to answer, as indicated by the high number of missing values on these items and respondents' notes. This implies that persons who are not lonely and are socially active do not (yet) experience a need for the services and activities listed in the questions and thus are not aware of their existence, which resulted in skipping questions. However, within *Healthy Ageing* several intervention activities aimed to increase awareness about the importance of maintaining a good social network. Instead of measuring factual knowledge about health services, we suggest to include scale items that focus on awareness about personal health benefits.

Finally, the suitability of the LLS to evaluate the *Healthy Ageing* programme, and thus to observe changes, depends on three aspects, namely: the scale sensitivity, the correctness of the hypothesised intervention logic model, and the content and magnitude of the implemented the intervention activities. With regard to the intervention activities, first the attention of the target group should be drawn and the delivered messages should be meaningful and acceptable to them before loneliness literacy can change. Besides, availability and accessibility of services and support resources are a prerequisite to ensure that improved loneliness literacy scores will result in more social engagement and searching for support. This is visualised by the box, environmental resources, in figure 4.1.

To summarize, to our knowledge this study is the first developing a short-term indicator for loneliness prevention. The concurrent validity of the LLS was satisfactory for three of the four constructs, indicated by the positive association between the constructs, self-efficacy and perceived social support, and loneliness, and the negative association between the construct, subjective norm, and loneliness. With the LLS we meet Nutbeams' [2009] call-up for the development of health literacy indices that are tailored to specific health contents and contexts [18].

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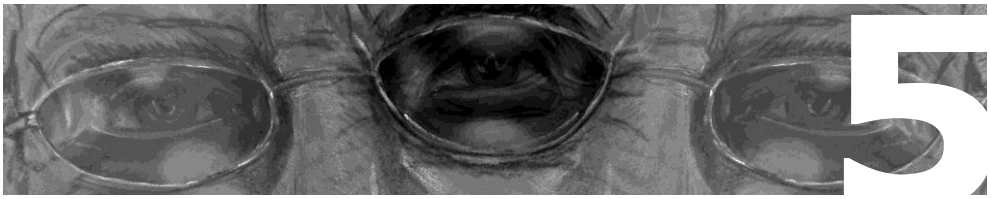

5

Acceptability of the components of a loneliness intervention among elderly Dutch people: a qualitative study

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Abstract

Background: *Healthy Ageing* is a complex intervention aimed at reducing the prevalence of loneliness among elderly Dutch people. **Purpose:** This study aimed to assess how mass media communication materials, information meetings, and psychosocial courses were received by elderly people at high risk of loneliness. **Methods:** Face-to-face interviews with 17 independently living elderly persons at increased risk of loneliness were conducted. They provided information about factors influencing attention to and acceptability of the content of the intervention components. Interviews were audio-taped, transcribed, and analyzed with Atlas.ti. **Results:** The mass media communication materials were not successful in attracting attention because interviewees' expectations about the communication channels differed from what was provided, the perceived personal relevance of the message was low, and the presentation was not attractive. The content of the intervention components was not well received because the objectives and components did not connect with the priority group's perception of their environment. **Discussion:** This study showed that the classical health education approach with one-way communication did not succeed in reaching the priority group. **Translation to health education practice:** To select appropriate theoretical methods and practical strategies, such as using storytelling and personal invitation, we recommend involvement of the priority group.

Background

Data from the *Elderly Health Monitor 2005* published by the community health services in the eastern part of the Netherlands showed that 41 percent of inhabitants aged 65 years and over were mildly to severely lonely [1]. Trend analysis of repeated cross-sectional data suggested an increase from 32 percent in 1996/1997 to 41 percent in 2005 [2]. Loneliness results in decreased mental and physical health and negatively affects people's quality of life [3-6]. These individual consequences contribute to increased public costs for care and welfare, especially in the context of an ageing population. Together, these individual and collective consequences prompted the rural municipality of Epe in the eastern part of the Netherlands, with 32,970 inhabitants, 19 percent of whom were aged 65 years and over, to give priority to loneliness prevention among elderly people. As a result, in 2007, the municipality, together with the community health service, the mental health service, and the local elderly-welfare organization initiated the intervention *Healthy Ageing.* The intervention aims to reduce the prevalence of loneliness in the non-institutionalized elderly population, aged 65 years and over. Elderly people with physical disabilities, a low disposable income and depressive symptoms, and the widowed elderly were targeted as priority groups [3, 5-8].

In the literature, three pathways for the alleviation of loneliness are defined; that is, network development, reduction of personal norms, and coping with feelings of loneliness [9, 10]. In line with most loneliness interventions, *Healthy Ageing* focuses mainly on network development in order to reduce loneliness in the community [11-14]. A logic model was designed to visualize the causal chain between the intervention components and loneliness [7]. Improvement of the network quality is defined as an early marker for loneliness reduction and the long-term outcome of the intervention. Furthermore, frequent involvement in social engagement activities appears to be related to better self-perceived health, better mental health, and better physical functioning [15] and loneliness [16]. Therefore, being socially engaged and searching for professional or informal aid to support social engagement if needed are included as mid-term outcomes. Thereafter, improvement of knowledge, attitude, and abilities are formulated as short-term outcomes, according to theoretical behavioral models [17].

Healthy Ageing intended to become a complex intervention combining multiple strategies in different settings in order to influence a range of outcomes among the older residents and persons in their surroundings. Selection of the intervention components was determined by combining experiences and opportunities of the local project team, interviews with elderly people and professionals with older clients, and analysis of the local *Elderly Health Monitor*. This integrated approach

contrasts with other loneliness interventions in the Netherlands, which are most often single interventions developed for, and tested in, well-defined study populations with a high loneliness prevalence [13, 14].

Three intervention components of *Healthy Ageing* are discussed in this paper, namely, mass media communication materials, including articles in the local newspaper, the municipal information booklet, information brochures and posters, and further information meetings and psychosocial courses (see table 5.1). The mass media communication materials aimed to create awareness among elderly people in general about opportunities in the municipality to be involved in social activities, about care and welfare facilities in the municipality, and about personal opportunities to maintain health and quality of life. The monthly articles in the local newspaper contained advice about how to age healthily, a calendar with welfare and social activities for elderly people, and references to service providers. The municipal information booklet is provided by the local government and distributed house-to-house each year. It presents an overview of service providers for welfare and social activities and services for elderly people. Information brochures and posters to promote the interventions' psychosocial courses, as well as posters with an appealing slogan, such as 'Strangers are friends with whom you have to become acquainted', were distributed among for example GPs, pharmacies, the library, and residential complexes for elderly people, to be placed in waiting or meeting rooms.
Accordingly, the information meetings aimed to increase awareness about the opportunities to be involved in social activities, opportunities for professional help with personal problems, and personal opportunities to maintain health and quality of life. The information meetings were organized for members of societies for the elderly and took approximately two hours. During these meetings, tips were given about healthy ageing, such as setting aims about what one would like to achieve in one's life, staying physically active, keeping a sense of humor, cherishing friendships, and maintaining social contacts [18]. Finally, three evidence-based psychosocial courses, consisting of six to ten meetings each, were part of *Healthy Ageing*. These courses aimed at strengthening people's personal coping skills in relation to living with chronic diseases, bereavement, or depressive feelings [19, 20].

Purpose

To summarize, the inclusion of the three intervention components within *Healthy Ageing* was based on the assumption that they would increase awareness about opportunities for social engagement and about the importance of maintaining a good social network, and strengthen abilities to remain or become socially

engaged, the supposition being that this would in the end contribute to the prevention of loneliness.

However, after one year, it was clear that little interest was being shown in the psychosocial courses. Furthermore, people working with the priority group indicated that it was hard to stimulate these more vulnerable persons to participate in social activities [21]. These observations raised doubts about the effectiveness of the current mass media communications to steer the priority group towards social and welfare activities. Therefore, the purpose of the current study was to investigate how the different intervention components (i.e. mass media communication materials, information meetings, and psychosocial courses) were received by the priority group (see table 5.1). First, factors that influence the ability of the mass media communication materials –including brochures and posters about the psychosocial courses – to capture the attention of the priority group were studied. Second, factors that affect the acceptability of the content of the intervention components were explored.

Methods

Study population

The study took place in the municipality Epe, a group of four rural villages with about 33,000 inhabitants, 20 percent of whom were aged 65 years or over in 2010. Study participants consisted of community-dwelling clients of the meal-delivery service of the local elderly-welfare organization. Recent regional data from the *Elderly Health Monitor* showed that people who receive their meals from this kind of service are more likely to be older, less educated, and to live alone. They are at higher risk of depression, have lower self-perceived health, and more often have mobility problems and one or more chronic diseases or feelings of loneliness [22]. An invitation letter was delivered to approximately 250 clients together with their meal. In the letter, the interviewer introduced herself and the project. Participants' opinions about Healthy Ageing, with the aim of improving the project, constituted the objective of the interview. Fourteen persons were willing to participate in the study and reacted to the invitation by returning the reply coupon. In the end, 17 persons participated, as three of the initial respondents' partners also took part. Mean age was 84 years and most participants lived alone. See table 5.2 for participants' characteristics.

Table 5.1 Overview of intervention components targeting the primary target group of elderly people within *Healthy Ageing*

Activity	Description	Project objectives	Implementation [a]
	Information & education (mass media communications)		
Press releases and free publicity	Several press releases are disseminated through local media; these are either directly copied or resulted in newspaper article	To create awareness about the intervention components of *Healthy Ageing*	41 (of which 18 directed to *Neighbors Connected*)
Articles in newspaper	Monthly information article in local newspaper about different topics, e.g. bereavement, coping with physical limitations, optimism, participating in social activities Agenda of activities for the elderly in Epe (including advertisements about *Neighbors Connected*, psychosocial courses)	To increase awareness that small changes in daily life can be beneficial for wellbeing and to stimulate thinking about implementation of some advices in daily life; To create awareness about general social-recreational activities and project activities offered in the municipality and to stimulate thinking about participation	18
Municipal information booklet	Information booklet with addresses of organizations related to recreation, health care, welfare, living The *Healthy Ageing* courses and *Neighbors Connected* are mentioned	To create awareness about general social-recreational activities and project activities offered in the municipality and to stimulate thinking about participation	Door-to-door distribution
Posters with slogan	Poster with one-liner relating to healthy ageing disseminated among intermediaries and in public places *Life is a party. You just have to put up the decorations yourself* *Strangers are friends with whom you have to become acquainted*	To motivate elderly people to meet others and to think positively	2 mailings to 190 addresses

Table 5.1 Continued

Activity	Description	Project objectives	Implementation [a]
	Information and education (information meetings)		
Information meetings	Interactive presentation with ten tips about healthy ageing hosted by organizations for the elderly (+/- two hours)	To increase awareness that small changes in daily life can be beneficial for wellbeing and to stimulate thinking about implementation of some advices in daily life; To create awareness about general social-recreational activities and project activities offered in the municipality and to stimulate thinking about participation	11 workshops (11–100 participants per workshop, average 33 participants)
	Group interventions		
Psychosocial course *Searching for the meaning in life*	Course based on principles of reminiscence delivered by the mental health service (six meetings)	To increase social communication skills To stimulate the experience of a positive self-image, more self-efficacy, a meaningful life, a better quality of life, and diminished feelings of gloom	None
Psychosocial course *Life stories*	Course based on principles of reminiscence delivered by the mental health services (eight meetings)	To increase social communication skills To stimulate the experience of a positive self-image, more self-efficacy, a meaningful life, a better quality of life, and diminished feelings of gloom	One course (four participants)
Psychosocial course *Living with a chronic disease*	Course based on principles of reminiscence aimed at coping with physical limitations (ten meetings)	To increase awareness about the causes of stress and variations in mood To increase skills to cope with limited energy	One course (four participants)

Table 5.1 Continued

Activity	Description	Project objectives	Implementation [a]
		To stimulate the experience of more self-efficacy, a better quality of life, and diminished feelings of gloom	
Socio-recreational activities	A diversity of activities organized by the elderly-welfare organizations, e.g. coffee morning, discussion group, line dancing, etc.	To increase social engagement of the elderly and strengthen their social network	
		Social environment	
Activities of *Neighbors Connected*	Diverse activities initiated by *Neighbors Connected,* e.g. making Christmas cards, several excursions (six), cooking together, dialects day, musical bingo	To increase social engagement of the elderly and strengthen their social network To increase the three dimensions of Sense of Coherence: meaningfulness, manageability, and comprehensibility	Ten activities (220 participants in total)

[a] Based on registrations in the period June 2007–August 2010

Table 5.2 Characteristics of the participants

		# Participants
Age[a]	76 – 80	7
	81 – 85	2
	86 – 90	6
	91 or older	2
Marital Status	Married	4[b]
	Widowed	8
	Divorced	1
	Single	1
Village[c]	Epe	7
	Vaassen	7
	Oene	2
	Emst	1

[a] Mean age was 84 years
[b] One of the participants was married, but his wife was in a nursing home and did not participate
[c] The municipality of Epe is comprised of these four villages

Data collection

Data were collected using a standardized open-ended interview protocol, averaging 100 minutes in length. The first part of the interview concerned the ability of the mass media communications to draw attention to the project. First, familiarity with *Healthy Ageing* in general and the mass media communications in particular was probed. Thereafter, the communication materials were presented and clarified to the interviewees. Subsequently, interviewees were asked about the ability of these materials to capture their attention.

The second part of the interview focused on the acceptability of the content of the mass media communications, information meetings, and psychosocial courses. First, the interviewees were asked what they thought the main messages of the mass media communications were. Thereafter, the interviewer explained what the project group aimed to achieve with the communication materials, after which the interviewee was asked about the perceived probability of the materials achieving these objectives.

The information meetings and psychosocial courses were discussed in a comparable way. First, familiarity with the information meetings and psychosocial courses was investigated, after which the interviewer explained the content of the activities. Interviewees were then asked what the activities might aim for, in their opinion. Then, the interviewer explained the objective of the information meetings

and courses, respectively. Interviewees were asked whether they thought that the objective could be achieved by the activity.

Data analysis

The interviews were, with the interviewees' approval, audio-taped and thereafter transcribed. The computer software program Atlas.ti was used to facilitate qualitative analysis. The empirical cycle as derived from Wester and Smaling [2000], in which the phases of observation, analyses, and reflection are repeated, was used for analysis [23]. An inductive, open coding strategy was used. Text fragments were coded according to intervention component, interview question, and participant response. Similar answers to a posed question received the same code. Codes were named after the key words of the answer, also called in vivo coding. To illustrate this manner of coding, the answer to the question 'Now that you have heard about the course, Living with a chronic disease, would you like to go on this course?' might be: 'No, because I don't suffer from a chronic disease.' This fragment was coded as 'no, no disease.' New answers received a new code, if other participants had not said something similar before. One code was never assigned to one participant more than once, thus avoiding overrepresentation of repeated answers in the overall results. After the initial coding, fragments were integrated, analyzed, and interpreted cyclically in order to answer the study questions.

Results

Attention attracted by communication materials

Firstly, we were interested in whether the mass media communications of *Healthy Ageing* were able to attract the attention of the priority population. It appeared that the interviewees were familiar with the chosen communication channels. The local newspaper (n=15) and the municipal information booklet (n=10) were well-known information sources. Interviewees thought that almost everyone received and probably read the newspaper (n=9) and assumed that it was in theory a good way to inform elderly people about activities organized in the municipality. Also, they considered it a good channel to give health advice. Furthermore, all interviewees shared the opinion that the posters with an appealing slogan were in principle a good medium to reach elderly people.

However, the interviewees could not remember having seen any of the communication features or, if they had seen any, they did not associate the information with the program. Further, interviewees were not aware of the

existence of the *Health Ageing* project in their municipality. So, although the communication channels seemed in theory to be well accepted among the priority population, in practice they did not succeed in attracting their attention. Therefore, we were interested in the factors that explained this failure. Three factors are discussed: expectations about communication channels, relevance of the message, and presentation of the information.

The first factor concerned the prevailing expectations among the interviewees about the kind of information provided via the specific communication channels. In the newspaper, the articles with information on social activities and health were placed on the pages where official announcements about formal licenses or city council decisions were published. Therefore, interviewees did not expect information about social activities and health in that specific place. The official announcements were perceived by some interviewees as being boring, and they therefore skipped them (n=3):
Mostly I don't read that part, because it doesn't interest me who attends the municipal council, or who receives permission to cut down a tree. I just skip those parts. So no, I didn't come across that Healthy Ageing then. (76M)

The interviewees did not expect to find informative articles in the municipal information booklet either. They used this communication channel as a reference book to look up addresses or telephone numbers of organizations or municipal departments only when they desired to use that specific service. Interviewees did not read the booklet entirely from cover to cover with the intention of becoming informed about all available services in the municipality.

The second factor concerned the relevance of the message. Although some interviewees said that they recognized that the topics of the newspaper articles would be of interest to some elderly persons or that they had become curious about the articles during the interviews, most interviewees were not interested in the articles. They said that information about health and social-recreational activities was not relevant for themselves. Interviewees said that they felt either too old (n=5) or physically unable (n=5) to participate in activities as recommended in the articles. Therefore, the information had little appeal for them. Others said that they already lived healthily (n=5) and did not need the activities and thus did not need the information about them.
I feel too old to go to such a meeting. A lot of events are organized, but I don't see the sense in it anymore. I have never been a society person. But nowadays I am a member of the church's 'elderly afternoon.' I always went there, but actually I don't have transport anymore. That's the problem. (90F)

The content of the posters with the slogans did not match with the everyday reality of all interviewees. Some interviewees appreciated the slogan *'Life is a party. You just have to put up the decorations yourself'* and thought the message was nicely said and well-conceived (n=10); others criticized the content (n=5). They said that life is not a party at all when you are old.

There are people of 80, 90 years' old. Life is not a party. I often visit somebody who is 95 years old; she is looking forward to dying. Life is not a party for her. So the text does not relate to everybody. If people are still together, they can make something with their life. But someone who is alone…You will atrophy. (78F)

The slogan '*Strangers are friends with whom you have to become acquainted'* was believed to be nicely said (n=9), whereas others mentioned that becoming intimate friends is more difficult in reality than the poster implies (n=5).

Yes, but it takes a very long time before you really get to know somebody and really understand the other person. That you understand their thoughts and way of living. Well, that will take almost an entire life. It takes time and you have to be patient. (87F)

The third factor concerned the presentation of the information. The information about activities organized in the municipality was presented in a matter-of-fact tone in the local newspaper, and this seemed unappealing to the interviewees. Interviewees professed being more interested in stories in which other older persons describe their experiences than in a mere enumeration of advice and activities. In line with this, short reports about some excursions organized as part of *Healthy Ageing* [24], not reported in this study, were remembered by the interviewees (n=3) as they included personal stories.

I*: A small group went to a showing of Holiday on Ice and others made 3-D post cards.*

85M*: I think, I have read about these activities.*

87F*: I also read about a woman who cooked for people in her neighborhood once a month…. I think if this woman got some publicity, this would be more important than a leaflet. A picture of the woman in her kitchen or with the other guests. That would be more appealing.* (85M/87F)

Also, pictures of older villagers (n=2) or other illustrations and an appealing header (n=1) were suggested to improve the attractiveness of the articles.

If you read something about elderly men who cook, that will make curious. You need somebody who speaks to your imagination. You have to say, 'hey, I know him.' Then you will become curious. (77M)

Acceptability of the content intervention components

The second study objective was to explore the acceptability of the content of the intervention components. As none of the interviewees was familiar with the intervention components of *Healthy Ageing* before the interview, we asked them about the theoretical probability of the intervention components achieving the project objectives, such as: 'To create awareness about general social-recreational activities offered in the municipality' and 'to stimulate participation.' It appeared that the interviewees viewed the perceived probability of achieving the project objectives as low, due firstly to the low acceptability of the formulated project objectives themselves, and secondly to the low acceptability of the intervention components deployed in *Healthy Ageing* to reach these objectives.

With regard to the first factor, some interviewees said that they could imagine that the objectives were in theory achievable and realistic for some elderly people; however, most interviewees perceived that the objectives were not relevant for themselves. They said that they felt no need to become informed about the project activities, or to become involved in social-recreational activities, or make changes in their daily life. In other words, the interviewees did not approve of the objectives set by the project group and thus estimated the probability of the objectives being achieved as low. Interviewees' age was an important argument in this respect. On the one hand, interviewees said that they felt too old to be able to change habits.

Too old. You just become less interested. And slowly we also can't do it anymore. We went to movie nights and such sometimes, but that's done. In the evenings you prefer to stay at home, it becomes too much. But that's just a matter of age. Fifteen years ago we still did that. (85M)

On the other hand, interviewees gave their high age as proof of living a healthy life. They perceived that they already knew what was good for their body and nobody could know that better than them (n=8).

It's given that you become older. I believe I already live healthily, I'm doing my best. But to do everything possible now, like, if I drink this, I'll reach 100, or if I do that, I'll become even older… No, it's not like that for me. (89M)

Furthermore, with regard to the objectives of the psychosocial courses, the interviewees said that they did not belong to the target group of these courses as they were not chronically ill (n=4) or depressed (n=3), so they perceived that the objectives were not applicable to them. Others who did face disabilities said that they received sufficient support from their patient association (n=3) or friends and family (n=2) and experienced no additional need for support via a course.

The low acceptability of the intervention components was the second factor explaining the low perceived probability of reaching the objectives. The interviewees perceived that the 'classical' health education strategy with its one-way communication, such as the activity calendar and announcements in the newspaper, could not persuade people to participate in social activities in general or in the intervention's psychosocial courses specifically. Interviewees also expressed their doubts about the use of brochures to invite people to the psychosocial courses. Although some of the interviewees stated that brochures would be a necessary communication channel (n=3) for this kind of course, others doubted whether a brochure would be enough to persuade elderly people to participate (n=8). Being personally recommended or invited to the information meetings (n=2), the psychosocial courses (n=2), or social activities (n=3) by a professional or a friend or acquaintance was perceived to be more beneficial. It was stated that especially people who find it difficult to go out would benefit more from a personal approach (n=3). Interviewees explained that friends or acquaintances can give important moral support or can speak from their personal experience if they have already participated in such courses. Furthermore, it was said that older persons could stimulate each other by going together (n=3) to social activities.

If people enjoy the meetings, they will look forward to next week and you might hope that they talk about their enthusiasm to others. I think that would be the best advertisement. All those other things, posters and all that, that's ok, but you should not expect miracles. (76M)

Besides informal support, formal support or referral from a general practitioner (GP), social health worker, or pastor was suggested as a more effective strategy than written information (n=2).

Personal recommendation by your GP would be better than a brochure. There are so many of these brochures about all kind of topics. There will only be a few people who will be interested. So eh…a brochure in the waiting room would not make sense. But if you really have problems and your GP advises you to follow a course, that will have more effect. (91M)

Besides the fact that the interviewees did not expect a lot from the one-way communication to promote the psychosocial courses, they were also critical of the intervention component 'course' itself. Some interviewees believed that coping with grief or physical disabilities should be supported in a more natural way by family and relatives instead of a formal therapy (n=4).

I don't see the sense <of the Life Stories course >. I don't see the sense that such a course imposes that kind of thing on you. I see the sense of life stories

themselves, that you tell one another about your life, but I don't see that you have to do that in a course. Then you get a pre-fabricated story, I don't like that. (84M)

Furthermore, it was thought that a course would scare off elderly people, especially those who were experiencing problems (n=5).
Do you think that the people with problems for whom this course is meant will really go? I don't think so….I think the threshold will be too high. People who need help, they don't ask for help. That's the point. (M91)

Finally, some interviewees said that they were not willing to share their personal problems with others during a group meeting (n=6).
Why should I tell my life stories to others? That is not so interesting. Even my friends, I don't tell them anything. Small parts of my life they know….but what is the relevance to them? I don't think it is relevant to them….I don't want to tell my whole life story in a group…then it feels like you are placing it in the newspaper. (90F)

Discussion

The purpose of the current study was to assess how the mass media communications, information meetings, and psychosocial courses within the *Healthy Ageing* intervention were received by elderly people at increased risk of loneliness. We discussed, successively, the factors that explained the inability of the mass media communications to attract the attention of the priority group and the factors that explained the low acceptability of the content of the intervention components.

It appeared that, although the interviewees were familiar with the communication channels used, they were not familiar with *Health Ageing* or with any of the intervention components. The failure to attract attention could be explained by three factors. First, the chosen communication channels provided information other than that expected. Second, the message communicated was perceived as not relevant for the interviewees. Third, the presentation of mere facts was not appreciated by the interviewees.

The content of the intervention components was not well received due to low agreement with the intervention objectives and a critical attitude towards the effectiveness of the chosen intervention strategies to reach the objectives. A recurring argument for this was the advanced age of the participants and their limited willingness and ability to make changes in their daily life.

The results of this qualitative study are based on data on community-dwelling clients of the meal-delivery service of the local elderly-welfare organization. This group showed characteristics of the priority group with regard to age, living situation, and mobility disabilities. Therefore, we assume that the results of our study are a good indication of the range of existing opinions about the loneliness intervention *Healthy Ageing* among more vulnerable elderly people in the municipality. However, it is understandable that very isolated or disabled persons were not included in the study because clients had to respond actively and had to be willing to converse in an interview.

Translation to health education practice

Healthy Ageing aimed to prevent and reduce loneliness via improvement of the social network by stimulating social engagement. In the *Healthy Ageing* program, a classical health education strategy was used, based on one-way communication [25]. The results of this study showed that the project is challenged to make the message more attractive to people who are initially not interested in the content.

Involvement of the priority population in the development and implementation of the project, as recommended frequently in the literature [11-13, 26, 27], might have resulted in another intervention strategy. The specific needs of the priority group and the determinants that discourage them from social participation could have been better identified if the priority group had been more intensively involved. Furthermore, more explicit use of behavior change theories, such as Fishbein's integrative model [28], could have been a valuable tool to structure the behavioral determinants. Accordingly, behavioral change techniques or theoretical methods [29, 30] that can target these specific determinants could have been selected.

Some suggestions can be made to adapt *Health Ageing* to the priority groups' needs. First, interviewees expressed an interest in how other people experienced certain activities. Therefore, packaging the information in a story might be a welcome alternative. Experimental research has shown that narrative appeals or storytelling are effective methods to change attitudes and beliefs [31, 32]. These methods seem to be promising for elderly people as well [33]. It should be realized, however, that stories can either connect or disconnect people. Identification with the storyteller is an important precondition to feel connected, and this will be reflected in the degree to which the story is deemed acceptable by the receiver. Within *Healthy Ageing*, the theoretical method of storytelling has to be translated into a practical strategy taking into account the local situation. The publication of interviews with older people from the local community in the local newspaper might be a good way. These people could, for example, tell of their initial personal doubts about participating and about their actual experience. Including a picture of this

peer role model participating in the activity might augment the attention even more. The local newspaper is still a justifiable medium as almost all interviewees were familiar with the newspaper and read it regularly. The stumbling block that appeared from the interviews was the location of the articles on the municipal page. Changing the form of the newspaper articles from a formal announcement to an interview would result in publication in another part of the paper that the priority population is likely to come across more often.

Second, to improve the probability of the intervention succeeding in achieving its objectives, a more personal approach is recommended. The interviewees perceived that a personal invitation would be more effective than written information in convincing elderly people to go to socio-recreational activities or the psychosocial courses. First, family, friends, and acquaintances could provide informal support to go to activities or personally invite people in their surroundings. This type of support is often defined as appraisal support and relates to help in decision making and giving appropriate feedback. In addition, social influence can directly stimulate elderly people to participate in activities when network members share norms about social engagement [34]. This approach was also successfully used in the project *Neighbors Connected*, which was carried out in the same area under the umbrella of *Healthy Ageing*. It was shown that the approach of inviting less socially active people personally indeed leads to higher participation in activities [35]. Second, formal support by, for example, GPs was suggested by some interviewees. The GP is often seen as a key person in local society by other health and welfare professionals. GPs can play an important role in the observation of loneliness and referral to appropriate services, because lonely people visit their GP in general more often [36, 37]. An explorative study by van der Zwet, Koelewijn-van Loon, and van den Akker [2009] showed that Dutch GPs agree about the relevance of signalizing loneliness among elderly patients. However, GPs struggle about their role and responsibility in tackling this problem [37]. Important in this respect is the familiarity of the GP with the welfare and care facilities provided in the municipality. The involvement of GPs in *Healthy Ageing*, however, has to date been marginal. In the Netherlands, other initiatives have been taken around involvement of key persons in observing loneliness, but so far little is known about their effectiveness [38, 39].

Third, age-related health problems are an important factor in the development of a health promoting intervention for elderly people. In this study, interviewees said that they were unable to participate due to their old age. It appeared that health issues such as hearing problems, mobility disabilities, and lack of energy were perceived as barriers to going out, meeting new people, and interacting in groups. Some suggestions can be made about overcoming these barriers. Interviewees

suggested special group meetings with smaller group sizes for people with hearing disabilities to make it easier for them to follow the discussion. Furthermore, to create more confidence about joining new activities and meeting new people, the interviewees thought that 'identification' was important, whereby people realize that others suffer from the same problems as they do. A course leader who is an elder villager him/herself can increase this feeling of identification. The knowledge that other participants suffer with the same problems will also support involvement in the group. Finally, it appeared that some interviewees did not feel comfortable about leaving their house, especially in the evenings, or lacked transport to go to any activity. One could think about practical solutions to reduce these barriers, perhaps by organizing meetings closer to people's home, for example in the meeting room of senior housing accommodation, or by visiting individuals at home. A Dutch loneliness intervention, Goed gezelschap in een groot huis (Good company in a large home), including small-scale group activities in an elderly care home, showed a reduction in loneliness among the participants. Average loneliness scores in the intervention group decreased from 4.7 to 2.6 measured on De Jong Gierveld's Dutch loneliness scale after two years [13, 14]. Furthermore, several organizations have used home visits as a means to combat loneliness. These home visits can take different forms, i.e. activating home visits, observation home visits, or friendly home visits, but the evidence for their effectiveness is mostly weak, and only demonstrated in very specific groups (i.e. older Moroccan immigrants), or lacking because of the absence of an effect evaluation [13, 14, 38, 39].

To conclude, the results of this study show that the classical health education approach with one-way communication was not successful in reaching elderly persons at increased risk of loneliness. Therefore, it is important to involve the priority group in adapting the program and to select theoretical methods and practical strategies tailored to this group, for example by applying the methods of storytelling and personal invitation. By doing this, the objectives of the program can become more relevant for the priority population, the mass media communications will be followed with increasing interest, and the content of the intervention components is more likely to be deemed acceptable.

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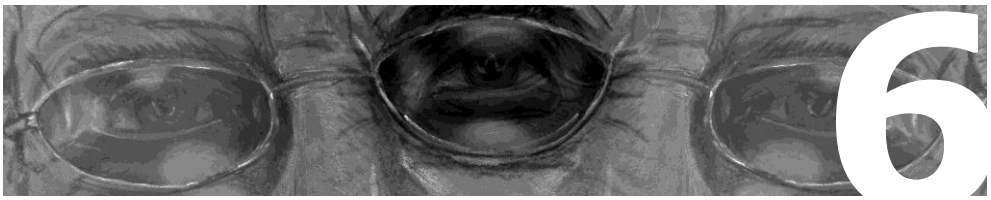

6

Process and effect evaluation of a two-year complex intervention to reduce loneliness in non-institutionalised elderly Dutch people

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Abstract

Introduction: Public health policy calls for intervention programmes to reduce loneliness in the ageing population. So far, numerous loneliness interventions have been developed, with effectiveness demonstrated for few of these interventions. Therefore, Healthy Ageing combines the insights of these studies with experiences gained from other community-interventions, and aims to evaluate the effects of an integrated approach on proximal and distal outcomes in the prevention of loneliness.

Methods: A quasi-experimental pre-test post-test intervention study was conducted among non-institutionalized elderly people age 65 years and over to evaluate the effectiveness of the programme by comparing the intervention community and the control community. Intervention components included a mass media campaign, information meetings, psychosocial group courses, social activities organised by neighbours, and training of intermediaries. Data on outputs, and initial, intermediate, and ultimate outcomes were collected by self-administered questionnaires. Follow-up scores for loneliness literacy and change scores for social support and loneliness of 858 elderly from both communities were compared using linear regression analyses with adjustments for age, gender, church attendance, and mental health. Satellite evaluation studies provided information about the reach of the intervention components.

Results: After two years, 39% of the elderly people were familiar with the intervention programme. The intervention group scored more favourably than the control group on the loneliness literacy subscales, motivation (-4.4%, 95% CI: -8.3, -0.7), perceived social support (-8.2%, 95% CI: -13.6, -2.4), and subjective norm (-11.5%, 95% CI: -17.4, -5.4). However, no overall effects were observed for the intermediate and ultimate outcomes, social support and loneliness. Within the intervention community, results for participants who were familiar with the intervention pointed in the same direction.

Conclusions: Two years after its initiation the reach and intensity of the intervention programme was modest. Though no effect of the complex intervention was found on social support and loneliness, more favourable scores on loneliness literacy subscales were induced.

Introduction

Loneliness among elderly people is of growing public concern because of population ageing, i.e. the absolute number of older people in general and of the oldest-old is increasing [1-3]. Furthermore, family structures are changing, i.e. decreasing number of off-spring and increasing distances between family members due to migration [4-6], and new policies emphasise independence, individual responsibility, and societal participation of citizens in old age [7]. Loneliness has often been defined as the unpleasant or inadmissible lack of the (quality of) certain relationships [8, 9]. Loneliness can be reduced by either improvement of network quality or coping with feelings of loneliness [10-12]. Numerous loneliness interventions have been developed during the last decades for very different target groups (general population, high-risk groups, or intermediaries) using different approaches (individual, group, and social environment interventions) [10, 13-16]. Few of these interventions were evaluated, and those that were, found evidence for effectiveness mainly in specific subgroups, e.g. persons with a handicap or a chronic disease [10].

Notwithstanding the limited availability of evidence-based loneliness interventions, public health policy calls for intervention programmes for the prevention of loneliness and the stimulation of social engagement on the community level. Based on experiences in other community interventions [17-19], an integrated approach was initiated, combining multiple strategies; delivering intervention components to different target groups and in different settings; and influencing a range of outcomes, i.e. it is a complex intervention [20, 21]. Accordingly, the *Healthy Ageing* project was developed within Epe, a rural municipality in the eastern part of the Netherlands. The project primarily aimed to reduce the average loneliness score among non-institutionalised elderly people aged 65 years or over by 10% in two years. From a public health perspective, the project was directed at all non-institutionalised older residents and persons in their surroundings. *Healthy Ageing* defined two sub-objectives: 1) to reduce loneliness in the high-risk groups (physical limitations, low income, recent widowhood, mild mental disabilities); and 2) to create more awareness about the existence of loneliness in the general population. At the start, the intervention activities were intended to follow a process of growth during the two-year project period, by mobilising stakeholders and obtaining political commitment. Therefore, the evaluation plan included the evaluation of the individual intervention components as well as of the overall complex intervention in order to be able to detect results at different levels. The aim of this paper is to present the results of the loneliness intervention *Healthy Ageing* in relation to the initial outcome, loneliness literacy, intermediate outcome, social support, and ultimate outcome, loneliness, after two years; and to explain the results by reference to the individual intervention components.

Methods

Study design

The evaluation of *Healthy Ageing* consisted of two parts, namely, the evaluation of the overall intervention and that of the individual intervention components (figure 6.1). To evaluate the overall effect of *Healthy Ageing*, a quasi-experimental pre-test post-test study design was used. A control community (Ermelo) was selected with characteristics comparable to the intervention community (Epe). In the control community, the usual municipal health and welfare services and social activities were offered. Data were collected by means of a self-administered written questionnaire over an 11-week period from mid-August to the end of October in 2008 and 2010, respectively.

To evaluate the contribution of the individual intervention components to the overall effect, different satellite studies took place. Data about the reach and acceptability of the individual intervention components were collected by means of registries of project team members, short evaluation forms after activities, and interviews [22, 23]. The current study focuses on the output indicator, reach.

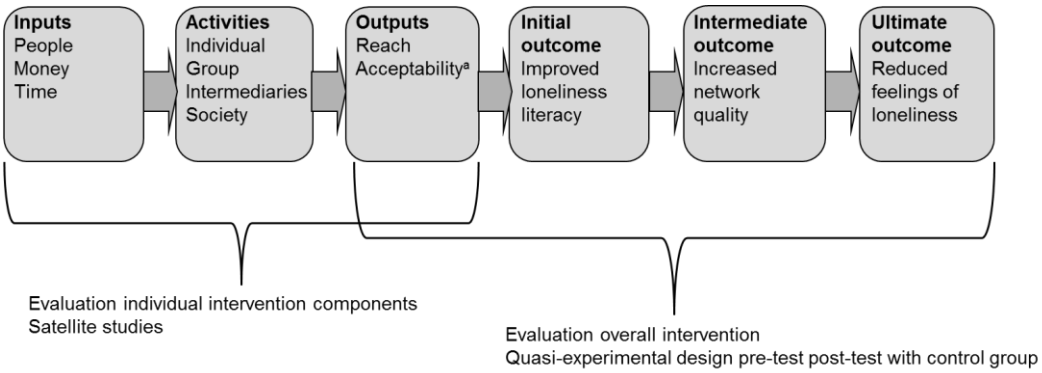

Figure 6.1 Logic model of *Healthy Ageing*
[a] Not included in this study

Intervention components *Healthy Ageing*

To develop the *Healthy Ageing* project, groups at high risk of loneliness were identified by secondary analyses of the *Elderly Health Survey 2005* of the community health service [24], e.g. elderly persons with physical limitations, a low income, and mild mental disabilities, and recently widowed persons. Further, interviews with elderly people, professionals, and policymakers gave insights into the needs and opportunities for promoting healthy ageing [25, 26]. The choice of intervention components was based on experiences and opportunities of the local

project team, consisting of the regional mental health service, the regional community health service, the local elderly welfare organisation, and the municipality. An initial project period of two years was fixed from September 2008 until September 2010. Five intervention components were incorporated: a mass media campaign, information meetings for interested local elderly people, psychosocial group courses for persons with mental health problems or chronic diseases, social activation by the community-based *Neighbours Connected* intervention [27], and training of intermediaries (e.g. homecare nurses, municipal advisors, and volunteers). The general elderly population and persons in their social environment were approached by means of a mass media campaign, including a stand at the municipal information fair in 2008 and 2009, a monthly article in the local newspaper, the distribution of a municipal information booklet, posters with an appealing slogan, and brochures. The information meetings were hosted and advertised by elderly associations and intended for their members in the first place. During the meeting, 10 tips about healthy ageing were discussed [28]. The psychosocial courses were directed at elderly people with mild depressive symptoms and chronic diseases, and focused on the development of coping and communication skills with regard to, e.g., stress situations, personal energy balance, and assertiveness. The group courses, consisting of eight to 10 meetings, were based on the principles of life history memory, shown to be effective for small-size depression reduction [29-31]. Participants were recruited by advertisements in the newspaper, leaflets in the waiting room of general practitioners (GP), and GP referral. *Neighbours Connected* was a newly developed sub-project of *Healthy Ageing* in which citizens were stimulated, and financially and practically supported, to organise a social activity [27]. Activities were organised in the neighbourhood, and organisers personally invited socially inactive neighbours to join the activity. All in all, the intervention components directed at the primary target group mainly targeted network development and focused to a lesser extent on coping with elderly persons' feelings of loneliness. Finally, for the intermediaries, workshops, Round Table meetings, and newsletters were developed to improve recognition of loneliness symptoms. More details about these intervention activities can be found elsewhere [22, 32].

Study participants and data collection

From both the intervention and control community, a random sample of 1,350 non-institutionalised elderly people aged 65 years and over was selected from the municipal administration. People aged 75 years or over were oversampled to constitute half of the study population [32]. At baseline, an invitation letter was sent to the home address of the selected inhabitants. If necessary, a reminder was sent after four weeks. A second reminder was sent after seven weeks and included

another written copy of the questionnaire. Complete baseline data were obtained from 905 (67%) and 899 (66%) participants in the intervention and the control community, respectively. Fourteen per cent and 19%, respectively, of these study participants were not accessible for the follow-up measurement in 2010 because they had moved to another city or to a nursing home, or were deceased. During the follow-up measurement, the same invitation and reminding procedure was followed. Approximately 15% of the participants invited at follow-up did not respond. Accordingly, persons with differences in reported gender and/or year of birth between two measurement points (8%) or missing values for the main outcome variables and confounders (25% and 26%, respectively) were excluded from the analyses, in total 32% and 33%, respectively. This resulted in a final two-year follow-up analytical sample of 440 and 418 participants in the intervention and the control group, respectively (see figure 6.2).

Measurements

A logic model was developed to visualise the hypothesised causal chain between intervention inputs and intervention outcomes (figure 6.1). This model guided the selection of indicators for the direct intervention outputs (reach is the focus of the current study), initial outcome (loneliness literacy), intermediate outcome (social support) and ultimate outcome (loneliness) to be included in the pre-test and post-test questionnaire. Furthermore, socio-demographic and health-related determinants were included in the questionnaire to describe the study population and to control for confounding.

Intervention output – reach

Reach was assessed by two different means. First, 'dose delivered' or 'theoretical exposure' was assessed by recording the implementation and delivery of, and attendance at, the intervention activities (recorded delivery and recorded reach). Secondly, 'dose received' was assessed in the post-test among study participants in the intervention group (recalled reach). In the post-test questionnaire, familiarity with the stand at the information fair, posters with slogan, newspaper articles, information meetings, psychosocial courses, and *Neighbours Connected* was individually questioned. Familiarity with any of the intervention components was calculated by summing the individual seven items. Furthermore, participation in, or organisation of, a *Neighbours Connected* activity and attendance at an information meeting were questioned (recalled participation).

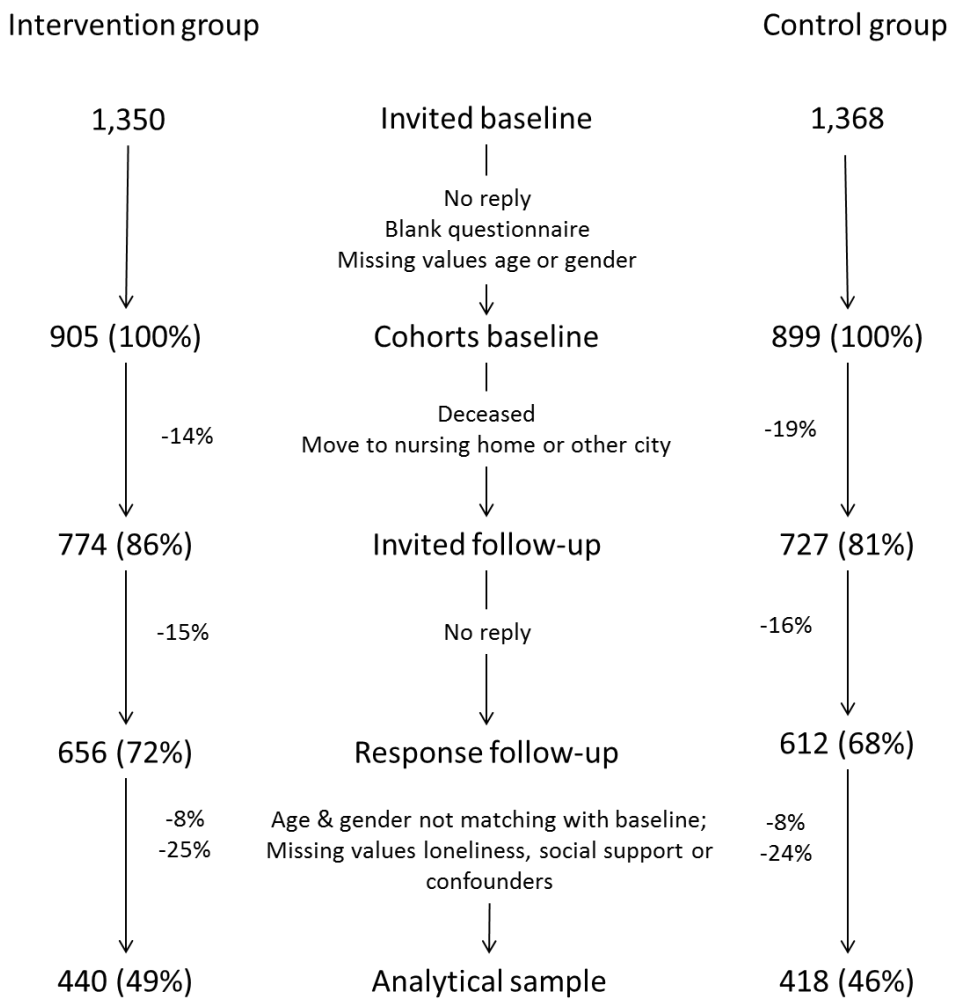

Figure 6.2 Flow chart of participants and response rates for questionnaires at baseline and follow-up measurements

Initial outcome – loneliness literacy

The Loneliness Literacy Scale was developed and validated to measure determinants relating to the behaviours 'becoming or staying socially active' and 'searching for support' [33]. This 22-item scale was included in the post-test measurement and consists of 22 items divided over four subscales, namely, motivation (referring to awareness about, expected outcomes of, and intention to use health and welfare services), self-efficacy (referring to perceived ability to interact socially), perceived social support (referring to previously experienced

social support and the motivation to comply with the opinion of important others), and subjective norm (referring to respondents' personal opinion and the perceived opinion of others with regard to participating in social activities). Responses to the questions were formulated on a 5-point Likert-scale ranging from '(fully) agree' to '(fully) disagree.' Sum scores for each subscale were calculated by dividing the totalled scores on the filled out items by the total number of items per subscale, allowing a maximum of one missing value for each subscale. A higher score on each subscale represents a less favourable literacy level.

Intermediate outcome – social support

Social support was measured using the short version of the Social Support List-Interactions (SSL12-I) by which the extent of received social support by means of social interactions with members of the primary social network was assessed [34-36]. The SSL12-I consists of 12 items, which can be divided equally over three subscales, namely, everyday support (referring to social companionship and daily emotional support), support in problem situations (referring to instrumental support, informative support, and emotional support in times of trouble), and esteem support (referring to support resulting in self-esteem and approval). Responses to these questions were formulated on a 4-point Likert-scale indicating 'seldom or never,' 'now and then,' 'regularly,' and 'very often.' The subscale scores ranged from 4 to 16 and the score for total social support ranged from 12 to 48. A higher score indicates that more support is experienced. The psychometric properties of the SSL12-I were found to be rather satisfactory in a sample of the Groningen Longitudinal Aging Study with persons aged 57 years and over [34].

Ultimate outcome – loneliness

Loneliness was measured using the De Jong Gierveld loneliness scale [37, 38]. This scale is composed of 11 questions, of which five are positively and six negatively formulated. Three answer categories were provided (yes, more or less, no). For the positive items, 'no' and 'more or less' answers were an indication of loneliness, whereas for the negative items 'yes' and 'more or less' were an indication of loneliness. A higher score represents an increase in severity of loneliness. A score of 0 to 2 corresponds to no loneliness, 3 to 8 to moderate loneliness, 9 to 10 to severe loneliness, and 11 to very severe loneliness. The De Jong Gierveld loneliness scale permits one missing value per respondent to which a score of 0 is given [37-39]. Validity and reliability of the scale [37, 38, 40] are reported to be satisfactory.

Background variables: socio-demographic and health characteristics

The socio-demographic characteristics age, sex, marital status, education level, managing on income, and social engagement were included in the study. Marital

status was categorised into married or living together, divorced or living separately, widowed, and never married or never lived together; education into illiterate or primary school, lower vocational education, intermediate vocational education, and higher vocational education or university; and having difficulties with managing on income was classified as 'having major or moderate difficulties' or 'having no difficulties.' Doing voluntary work and church attendance were included as proxy for social engagement. Voluntary work was classified as almost daily or weekly, or less frequent; regular church attendance as yes or no.
Suffering from chronic diseases was derived from a list of 13 chronic diseases and categorised into 'suffering from one or more diseases' or 'no diseases reported,' as diagnosed by a physician during the past 12 months.

Functional status was assessed using the Hierarchical Abilities of Daily Living (ADL) [41], consisting of 13 activities of daily living categorised in three domains, namely, basic activities of daily life (BADL), mobility activities of daily life (MADL), instrumental activities of daily life (IADL). Persons were assessed for each domain on the basis of being able to perform activities without difficulty or with minor difficulty, versus able to perform with major difficulty or not able to perform the activity without help from others. The Dutch version of the Mental Health Inventory (MHI-5), consisting of two positively and three negatively formulated questions, was included in the questionnaire to assess general mental health. MHI-5 scores ranged from 0 (poor) to 100 (excellent). Good mental health was determined as having a score above 60 [42-46]. Self-perceived health was assessed using the question: 'How would you classify your health in general?', using a 5-point scale ranging from excellent to poor. Good self-perceived health was defined as having good, very good, or excellent health [47].

Study size and data analysis
Descriptive statistics about the delivered dose of the intervention components were derived from records of the satellite studies. Coverage was estimated based on the total number of (elderly) inhabitants of the intervention municipality. Furthermore, familiarity with the intervention activities was derived from the post-test and prevalence estimated based on the number of study participants in the intervention group.

The study size for the quasi-experimental study was based on the intended 10% reduction in loneliness, i.e. from a mean score of 2.6 to 2.4 on the De Jong Gierveld loneliness scale [37, 38]; 930 individuals with complete data were needed in both the intervention and the control group (α=0.05;1-β=0.80). The sample size was raised to 1,350 participants in both groups to compensate for an anticipated

response rate of 70% [24]. Background characteristics of the two study populations and their mean scores for loneliness and the social support subscales at baseline were compared using the chi-square tests (categorical variables) and independent samples T-tests (continuous variables). To enable analysis of change in loneliness and the social support subscales, change scores were calculated by subtracting baseline scores from follow-up scores (2010 minus 2008), positive values indicating an increase in either loneliness or social support.

To evaluate the effect of the intervention, linear regression models were constructed with the change scores as dependent variable, with an indicator variable for the intervention (intervention community versus control community) as the effect measure. Adjustment was done for age and gender, followed by additional adjustment for mental health and church attendance (final model). For loneliness literacy, similar analyses were conducted albeit without subtraction of baseline scores as these were not available. In addition to the effect measures obtained from the regression models, effect sizes were expressed in percentages, relative to the baseline scores for loneliness and social support in the intervention community, or relative to the follow-up score for loneliness literacy. Finally, similar analyses were conducted within the intervention community to compare participants who were familiar with one or more of the intervention activities with those who were not. These analyses were restricted to the intervention community, and adjusted additionally for baseline values of marital status, education, church attendance, and regular volunteer work (final model). All analyses were conducted using the software IBM SPSS Statistics 19.

Results

Mean age was 74 years in both groups and on average 70% of the participants were married. Baseline scores for loneliness, total social support, and the social support subscales did not differ significantly between the intervention and the control group. There were more participants with poor mental health in the intervention than in the control group (14% versus 8%, $p < 0.01$), whereas church attendance was lower in the intervention group (43% versus 60%, $p < 0.01$). For the other determinants, the differences were not statistically significant (table 6.1).

Intervention output – reach

Table 6.2 presents the recorded delivery, recorded reach, recalled reach, and recalled participation. With regard to the mass media campaign, the project team of *Healthy Ageing* was present at the municipal information fair in two successive

Table 6.1 Socio-demographic and health characteristics intervention and control group at baseline

		Intervention (n=440) [a]	Control (n=418) [a]
Age (%)	65–75 years	61	59
	75+ years	39	41
	Mean (sd) age (years)	73.6 (5.9)	73.8 (6.4)
Gender (%)	Male	44	47
Marital status (%)	Married/living together	71	69
	Never married/ never lived together	3	2
	Divorced/separated	4	4
	Widowed	23	25
Education (%)	Illiterate/primary education	18	18
	Low	51	45
	Intermediate	14	16
	High	18	22
Difficulties managing on income (%)		12	10
One or more chronic diseases (%)		73	79
Mentally unhealthy (%)		14*	8*
Self-perceived health poor (%)		22	18
Difficulty BADL [b] (%)		4	4
Difficulty MADL [b] (%)		17	16
Difficulty IADL [b] (%)		33	34
Loneliness (%)	Not lonely (0-2)	51	55
	Mildly lonely (3-8)	41	39
	Severely lonely (9-10)	7	5
	Very severely lonely (11)	2	2
Mean (sd) score loneliness		3.18 (3.13)	2.89 (2.89)
Mean (sd) score social support	Total social support)	28.31 (6.09)	28.62 (5.73)
	Everyday social support	10.37 (2.10)	10.32 (1.86)
	Support in problem situations	8.74 (2.54)	8.79 (2.45)
	Esteem support	9.21 (2.38)	9.50 (2.29)
Doing voluntary work frequently (%)		16	21
Church attendance (%)		43*	60*

*Significant difference between intervention and control group (Chi-square or t-test; $p<0.05$)

[a] Percentages exceed 100% due to rounding off; for individual variables 0.2 to 4% of data may be missing

[b] Difficulties in activities of daily living (ADL) are hierarchical; persons with difficulties in BADL are likely to be also included in MADL and IADL

years. Furthermore, each month (except holiday periods) an article was published in the local newspaper, and posters with an appealing slogan were distributed in the municipality in months 2, 14, and 18 of the two-year period. In addition, 11 information meetings, 10 activities of *Neighbours Connected*, and two psychosocial courses were organised and attended by respectively 350, 220, and eight residents, i.e. approximately 6% of the total non-institutionalised elderly population in Epe. Thirty-nine per cent of the intervention group participants stated that they were familiar with one or more of the abovementioned intervention components. The newspaper articles (20%) and information meetings (19%) were the best known intervention components; 10% of the participants were familiar with both.

Initial outcome – loneliness literacy

The unadjusted mean value for the loneliness literacy subscale, subjective norm, was significantly more favourable in the intervention group than in the control group at follow-up. In the final model, the intervention group scored significantly more favourably (i.e. a lower score) on the three subscales, motivation, perceived social support, and subjective norm, than the control group. The relative effect size was -4.4% (95% CI: -8.3, -0.7) for motivation, -8.2% (95% CI: -13.6,-2.4) for perceived social support, and -11.5% (95% CI: -17.4, -5.4) for subjective norm. In line with this, a (borderline) significant difference between the participants who were and who were not familiar with *Healthy Ageing* was observed for the subscales motivation (-5.6%, 95% CI: -11.5, 0.14) and subjective norm (-8.6%, 95% CI: -18.4, 1.2) in the final model. Participants who were familiar with the intervention had more favourable scores on these subscales (table 6.3).

Secondary long-outcome – social support

In both the intervention and the control group, total social support, everyday support, social support in problem situations, and esteem support significantly increased after two years, except for esteem support in the control group. Mean changes in total social support and the social support subscales did not differ significantly between the intervention and the control group in either the crude or the adjusted analysis, with relative effect sizes ranging between -1.4% (95% CI: -3.6%, -1.0%) and 2.2% (95% CI: -1.1, 5.5). Similarly, no significant differences were found for changes in social support between participants within the intervention group who were or were not familiar with the intervention activities (table 6.4).

Table 6.2 Dose delivered and dose received of intervention components of *Healthy Ageing* directed at the primary target group in the period 2008–2010

Activity	Dose delivered – Records		Dose received – Post-test	
	Delivery	Recorded reach	Recalled reach: study population's familiarity with activities (n=440)	Recalled participation
Information fair	Yearly one day Twice in total	± 80 visitors each year ± 160 in total (0.5%)[a]	40 (9%)	n/a
Newspaper article	Monthly publication 19 in total	Distributed door-to-door, no recorded data available	87 (20%)	n/a
Posters with slogan	Three mailings to 190 addresses (e.g. municipal offices, GPs, physiotherapists, housing agencies for the elderly, welfare organisations) Print number 100	Not evaluated	8 (2%)	n/a
Information meeting	11 workshops	11–100 participants per workshop, on average 33 participants per meeting ±350 in total (6%)[b]	84 (19%)	11 (3%)
Course Life Stories	1 course (8 meetings)	4 participants (0.1%)[b]	35 (8%)	1 (0.2%)
Course Living with a Chronic Disease	1 course (10 meetings)	4 participants (0.1%)[b]	39 (9%)	0
Neighbours Connected	10 activities	6–50 participants per activity ± 220 participants in total (4%)[b]	48 (11%)	8 (2%)
Familiar with one or more activities			**172 (39%)**	

Table 6.3 Effect evaluation of initial outcomes on loneliness literacy: Mean (sd) follow-up scores loneliness literacy and regression coefficients for the comparison of the intervention (n=372) versus the control group (n=339) and participants who were familiar (n=152) versus participants who were not familiar (n=220) with *Healthy Ageing*

Initial outcome loneliness literacy	Mean (sd) follow-up[a]		Effect estimates			
			Crude effect[b]	Age- and gender adjusted [c] (p-value)	Final model[d] (p-value)	Relative effect size[e] % (95% CI)
Intervention/control	**Intervention**	**Control**				
LL motivation	2.98 (0.74)	3.07 (0.77)	-0.09	-0.09 (0.12)	-0.13 (0.02)*	-4.4 (-8.3; -0.7)
LL self-efficacy	1.93 (0.76)	1.86 (0.81)	0.08	0.07 (0.20)	-0.01 (0.87)	-0.5 (-6.0; 15.1)
LL social support	2.07 (0.77)	2.17 (0.80)	-0.10	-0.11 (0.07)	-0.17 (0.01)*	-8.2 (-13.6; -2.4)
LL subjective norm	2.44 (1.00)	2.65 (1.00)	-0.21*	-0.20 (0.01)*	-0.28 (0.00)*	-11.5 (-17.4; -5.4)
Intervention only	**Familiar**	**Not familiar**				
LL motivation	2.84 (0.64)	3.07 (0.79)	-0.22*	-0.20 (0.01)*	-0.16 (0.06)	-5.6 (-11.5; 0.14)
LL self-efficacy	1.86 (0.68)	1.97 (0.83)	-0.11	-0.17 (0.04)*	-0.06 (0.46)	-3.2 (-12.2; 5.6)
LL social support	2.02 (0.77)	2.09 (0.77)	-0.07	-0.07 (0.38)	-0.06 (0.51)	-3.0 (-11.8; 5.9)
LL subjective norm	2.32 (0.97)	2.55 (1.00)	-0.23*	-0.23 (0.04)*	-0.20 (0.08)	-8.6 (-18.4; 1.2)

*significant at p<0.05

[a] Lower loneliness literacy scores are more favourable

[b] Difference in mean score at follow-up between intervention group and control group; or between participants who were or were not familiar with the intervention components

[c] Multivariate model for the comparison intervention versus control, and for the comparison familiar versus not familiar, adjusted for age and gender

[d] Multivariate model for the comparison intervention versus control additionally included church attendance and mental health. The model comparing familiar versus not familiar additionally included marital status, education, church attendance, and doing voluntary work

[e] Effect measure obtained from final model relative to the baseline score for loneliness and social support in the intervention community

Table 6.4 Effect evaluation of intermediate and long-term outcomes: Mean change (sd) scores social support and loneliness and regression coefficients for the comparison of the intervention (n=440) versus the control group (n=418) and participants who were familiar (n=172) versus participants who are not familiar (n=268) with *Healthy Ageing*

Intermediate and long-term outcomes	Mean change (SD) in comparison groups		Effect estimates			
			Crude effect[a]	Age- and gender adjusted[b] (p-value)	Final model[c] (p-value)	Relative effect size % (95% CI)[d]
Intervention/control	**Intervention**	**Control**				
Total social support	1.18 (5.10)	1.00 (5.61)	0.18	0.18 (0.63)	0.20 (0.59)	0.71 (-1.9; 3.3)
Everyday social support	0.16 (1.73)	0.32 (1.75)	-0.16	-0.17 (0.16)	-0.14 (0.26)	-1.4 (-3.6; 1.0)
Support in problem situations	0.67 (2.49)	0.53 (2.69)	0.14	0.14 (0.42)	0.13 (0.46)	1.5 (-2.5; 5.6)
Esteem support	0.34 (2.18)	0.15 (2.25)	0.20	0.20 (0.20)	0.20 (0.20)	2.2 (-1.1; 5.5)
Loneliness	0.05 (2.43)	0.11 (2.43)	-0.07	-0.05 (0.75)	-0.07 (0.67)	-2.2 (-12,0; 7.7)
Intervention only	**Familiar**	**Not familiar**				
Total social support	1.18 (4.44)	1.17 (5.48)	0.01	-0.05 (0.93)	-0.07 (0.90)	-0.25 (-4.0; 3.5)
Everyday social support	0.13 (1.63)	0.18 (1.80)	0.05	-0.08 (0.65)	-0.02 (0.91)	-0.19 (-3.8; 3.3)
Support in problem situations	0.75 (2.14)	0.61 (2.69)	0.14	0.14 (0.57)	0.05 (0.85)	0.58 (-5.4; 6.6)
Esteem support	0.29 (2.22)	0.38 (2.16)	0.08	-0.12 (0.58)	-0.12 (0.60)	-1.29 (-6.2; 0.33)
Loneliness	0.24 (2.49)	0.08 (2.38)	-0.33	0.34 (0.18)	0.23 (0.39)	8.0 (-9.9; 25.6)

*significant at p<0.05

[a] Difference between mean change in intervention as compared to control group; or difference between mean change among participants who were familiar as compared to not familiar with *Healthy Ageing*.

[b] Multivariate model for the comparison intervention versus control, and for the comparison familiar versus not familiar, adjusted for age and gender

[c] Multivariate model for the comparison intervention versus control additionally included church attendance and mental health. The model comparing familiar versus not familiar additionally included marital status, education, church attendance, and doing voluntary work

[d] Effect measure obtained from final model relative to the baseline score for loneliness and social support in the intervention community

Primary long-term outcome – loneliness
No significant changes in loneliness could be observed over time in either the intervention or the control group. Accordingly, changes did not differ significantly between the intervention and the control group, relative effect size -2.2% (95% CI: -12.2, 7.7). Similarly, no significant differences were found for changes in loneliness between participants within the intervention group who were or were not familiar with the intervention activities (table 6.4).

Discussion

Two years after baseline, we found more favourable scores on the loneliness literacy subscales, motivation, perceived social support, and subjective norm (initial outcomes), in the intervention group as compared to the control group. However, we did not find an effect of the complex intervention *Healthy Ageing* on the intermediate outcome, social support, or the ultimate outcome, loneliness.

Characteristics of the *Healthy Ageing* project
Healthy Ageing was one of the first community projects targeting loneliness among elderly people in the Netherlands. In close collaboration with local authorities and stakeholders, the local project team developed preventive intervention activities adapted to the local organisational infrastructure around preventive elderly health care. Because of this practice-driven approach, it was initially not explicitly stated how the intervention activities would contribute to the formulated objectives. Thus, in retrospect, it can be concluded that *Healthy Ageing* was not yet mature after two years and changes in loneliness and social support could not yet be expected based on the logic model. Because of this the reach and intensity of the intervention components after two years were modest.

Methodological considerations
The SSL12-I and the De Jong Gierveld loneliness scale are considered as reliable and valid instruments to assess received social support and loneliness, respectively [34-36, 39, 40, 48]. The Loneliness Literacy Scale was developed within the framework of *Healthy Ageing* in order to be context and topic specific. The internal consistency of the subscales appeared to be adequate as Cronbach's coefficient α exceeded 0.7 [33]. Furthermore, the concurrent validity of the scale, cross-sectionally assessed by the association between loneliness literacy and loneliness, appeared to be acceptable for the subscales, self-efficacy, perceived social support, and subjective norm, in the validation study [33], and this was confirmed in the follow-up data of the current study. Responsiveness, i.e. the ability

of the instrument to detect change over time in the construct to be measured [49], has not been formally tested for the three selected scales: the De Jong Gierveld loneliness scale, SSL12-I, and the Loneliness Literacy Scale. However, the De Jong Gierveld loneliness scale is frequently used in evaluation studies and appears to be sensitive enough to assess intervention effects [10, 11, 15, 50].

In this study, a quasi-experimental design, including a pre-test and post-test and a control group, was used, which contributes to the internal validity of the results [51]. We could not randomly assign participants to the intervention activities, but selected a rural community with comparable population characteristics as control. Nevertheless, church attendance and mental health differed and were accounted for in the analysis. Unfortunately, for loneliness literacy change scores could not be calculated because only post-test data were available. Because of the comparability of baseline characteristics of the intervention and the control group and adjustment for relevant covariables, we assume that this has not interfered with the results.

Thus, the intervention group scored significantly more favourable on the loneliness literacy subscales, motivation, perceived social support, and subjective norm after two years compared to the control group, but in this two-year programme these effects did not yet progress to changes in social support and loneliness. Selective response at baseline and follow-up might have influenced the estimated effect of the intervention. However, drop-out percentage in the intervention and control group was similar in each step (figure 6.2) and characteristics of the drop-outs were highly comparable for both communities. At baseline, respondents' gender, age, and marital status were comparable with the source population [52]. However, persons who dropped out after baseline were older, more likely to be unmarried, and less educated, in both the intervention and control community. Nevertheless, this resulted in a slightly healthier and less lonely analytical sample. Therefore, the associations found might be either an over- or underestimation of the overall effect in the intervention community as a whole. Within the intervention community, it appeared that those who were familiar with the intervention were already slightly healthier at the pre-test which suggests that healthy people were better reached by the intervention activities. It might be assumed that these healthier elderly persons were better able to incorporate advices in their daily life, resulting in more favourable literacy scores. However, effects of this investment on experienced social support and loneliness will need more time to become measurable. Moreover, among healthier persons there is less room for improvement, resulting in an underestimation of the effect among moderate and severe lonely elderly people.

Explanation of the observed effect

In order to conclude that the positive effect on the loneliness literacy subscales, motivation, perceived social support, and subjective norm, is a reliable indication of the effect of the intervention, three criteria must be assessed: 1) the strength of the relationships between the intervention and the literacy outcomes; 2) the strength of the theoretical model, i.e. the association between loneliness literacy and loneliness; and 3) the plausibility that the intervention activities could have changed the literacy constructs. Firstly, the effect sizes of the association between the intervention and loneliness literacy subscales, motivation, social support, and subjective norm were meaningful (4.4 – 11.5%). Furthermore, the effects in persons who were familiar with *Healthy Ageing* pointed in the same direction (3.0 – 8.6%), albeit of borderline significance. Secondly, the hypothesised logic model between the intervention, loneliness literacy, social support, and loneliness was confirmed as more favourable scores on the loneliness literacy subscales, self-efficacy and social support, were associated with more social support and with less loneliness. However, the subscale, motivation, was not associated with the intermediate and ultimate outcome whereas favourable scores on the subscale, subjective norm, were associated with more loneliness and not with social support. Thirdly, the mass media communications and information meetings focused mainly on raising awareness among elderly people and the general population about the importance of social engagement and opportunities to receive professional support or meet other people. The subscale, motivation, included items relating to awareness about these opportunities for support in the municipality. This supports the observed effect on this subscale. The literacy constructs, perceived social support and subjective norm, reflect an individual's experience about the attitude of important persons in his/her social environment. As argued above, *Healthy Ageing* might have raised awareness among social network members, i.e. the general population in Epe. However, a change in attitude and behaviour among these network members is needed as an additional step before elderly people will experience a difference. Therefore, based on the complexity of the mechanism, it is less likely that the subscales, perceived social support and subjective norm, were changed by *Healthy Ageing*. Finally, skill training and stimulating self-efficacy were mainly embedded in the psychosocial courses. As the reach of these courses was very low (n=8), an effect on the subscale, self-efficacy, was very unlikely. All in all, regarding the third criterion, it can be concluded that the effect of *Healthy Ageing* on the loneliness literacy subscale, motivation, is plausible, on the subscales, perceived social support and subjective norm, probable, and on the subscale, self-efficacy, unlikely. Whether the effect on motivation is an early indication of effects on the long-term outcomes, social support and loneliness, needs further confirmation.

Comparison with other studies

Healthy Ageing distinguishes itself from other loneliness interventions by its community and integrated approach, resulting in a combination of intervention components directed at elderly people themselves and persons in the social environment. Therefore, it is not possible to directly compare our results with other studies. With regard to single interventions, few have proven to be effective in the reduction of loneliness [10, 13-15, 53], more have shown effects on social indicators such as participation, support satisfaction, and frequency of contacts [14, 53]. Initial outcomes such as coping skills and self-confidence are rarely included in the evaluation of loneliness intervention [11, 54]. Positive results on loneliness have been attained among specific groups of elderly people with a handicap or chronic disease by an individual internet-at home project [10]. Similarly, evidence of a reduction in depression was found for the psychosocial course included in *Healthy Ageing* [29-31]. Furthermore, social support interventions, such as a friendship enrichment course or discussion groups, aimed at increasing opportunities for social engagement, seem to be promising [10, 13, 14, 55]. However, it has to be noted that the success of loneliness interventions depends largely on the characteristics of the target group, e.g. cause of loneliness and social skills [14], and the local context, e.g. intervention providers and social and physical resources. Within *Healthy Ageing*, the local infrastructure was taken into account, but target group differentiation probably needs further attention to distinguish lonely elderly people, elderly people with an (identifiable) increased risk of loneliness, social network members of elderly people and professionals. These groups have clearly different needs to combat loneliness, requiring different messages and different strategies. Consequently, changes in constructs like the loneliness subscales, perceived social support and subjective norm, will become more likely. Therefore, for *Healthy Ageing* as well as for other community interventions, involvement of representatives of different segments of the local target population and intervention providers during all stages of the intervention is highly relevant and highly recommended [10, 13, 14].

To conclude, though the *Healthy Ageing* faces opportunities for improvement, this study did show initial effects on the loneliness literacy subscales, motivation, perceived social support and subjective norm, whereas the effects did not carry forward to the intermediate and ultimate outcomes, social support and loneliness.

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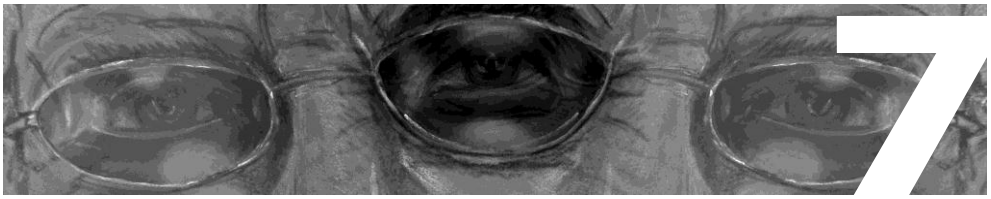

7

General discussion

Introduction

The current PhD research took place within the context of the Academic Collaborative Centre, AGORA. AGORA aimed to generate new insights by joining knowledge from policy, practice, and research and from epidemiology and health promotion in order to improve healthy ageing. The general aim of this thesis was to evaluate the effectiveness of the intervention *Healthy Ageing in Epe*, the Netherlands, a loneliness prevention project targeting non-institutionalised elderly people aged 65 years and over. To this end, we studied determinants of trends and regional variation in loneliness, designed an evaluation study, developed a loneliness literacy indicator, and conducted a process and effect evaluation. This chapter summarises the main findings and discusses the methodological considerations. Furthermore, implications for public health practice are discussed, and the overall conclusions close the chapter.

Main findings

Tables 7.1 and 7.2 present the main findings of this thesis. Table 7.1 presents a basic logic model and illustrates the combined research-driven and practice-driven approach applied within *Healthy Ageing*. Table 7.2 additionally summarises the observed effects of *Healthy Ageing* on loneliness literacy, social support, and loneliness, and the evidence and theory base for these effects.

The first row of table 7.1 represents the start of *Healthy Ageing*. At that time, the logic model was empty except from the extremities. The left side of the model was determined by the multidisciplinary local project group – the 'practice' element – responsible for the development and implementation of the project. The professionals involved brought their own expertise in health promotion, mental health, and welfare. In addition, the available resources and organisational interests were already in place. From the start, *Healthy Ageing* aimed to combine different intervention components and to target the micro-, meso-, and macro-level, i.e. it is a complex intervention. Thus, it is one of the first projects on loneliness prevention using a population-level approach and one of the first targeting preventive elderly healthcare. Therefore, the available experience to design, implement, and evaluate such a complex intervention was limited. Furthermore, 'practice' required a quick start in order to deliver visible outputs from the project after a short period. As a result, the intervention plan of *Healthy Ageing* was primarily driven by the available resources of the project group and knowledge from the literature, and later enriched by results emerging from research by AGORA [1-

3]. The right side of the model reflects the central health problem. The main argument related to the 40% estimated prevalence of loneliness based on the regional *Elderly Health Survey* in 2005 and concerns about rising trends because of demographic and societal changes. The health problem was converted into the overall project goal, using the 2005 loneliness score in Epe. Accordingly, the overall aim of *Healthy Ageing* was to reduce loneliness among non-institutionalised elderly people aged 65 years and over by 10% in two years, i.e. from a mean score of 2.6 to 2.4 on the De Jong Gierveld loneliness scale. Furthermore, elderly persons with physical limitations, a low income, and mild mental disabilities, and recently widowed persons, were identified as high-risk groups. Accordingly, it was aimed to reduce loneliness within these groups. To summarise, *Healthy Ageing* started with a practice-driven approach. Time pressure and scarce availability of 'best practice' resulted in pragmatic choices. Results from research by AGORA were incorporated along the way, thus introducing a more systematic approach.

The second row of table 7.1 illustrates the logic model developed following a problem-oriented approach in order to design the evaluation plan for *Healthy Ageing* (chapter 3). Theory and available evidence was used to identify the key components in the causal chain (see also chapter 1, table 1.1). Croezen (2010) concluded that well-functioning social relationships were associated with good physical, mental, and self-perceived health (core project 1 AGORA). In addition, the associations between, respectively, social engagement, social network, and social support, and loneliness have been shown in the literature. As a result, the model focuses on the coping style, network development, and ignores the coping styles, lowering standards and adjusting the relevance of the problem [4]. The model further suggests that the association between social engagement and loneliness is mediated by social support. However, in reality it is assumed that the interrelationship between these determinants is more dynamic. In addition to social engagement, searching for support was later identified as another necessary behaviour to prevent loneliness. It reflects the interaction between elderly people and persons in their social environment in the prevention of loneliness. Furthermore, by use of the Intervention Mapping approach and behavioural theories, behavioural determinants for social engagement and searching for support were systematically identified, resulting in the loneliness literacy constructs (chapter 4). We evaluated the association between loneliness literacy and social support, and loneliness, respectively. The loneliness literacy subscales, self-efficacy and perceived social support, appeared to correlated well with social support and loneliness. However, the subscale, motivation, was not associated with both long-term outcomes and the subscale, subjective norm, was negatively associated with loneliness and not with social support. The evidence base of the logic model is summarised in column 1 of table 7.2.

Table 7.1 Logic model for *Healthy Ageing* including main research findings

	Input	Activities	Output	Initial outcomes	Intermediate outcomes	Long-term outcomes	Overall aim
1.	Project group: community health service; mental health service; elderly welfare service; municipality Epe	Activities on micro-, meso-, and macro-level					To reduce loneliness among non-institutionalised elderly people aged 65 years or over by 10% in two years; To reduce loneliness in the high-risk groups
2.	People Money Time	Individual Group Intermediaries Society	Reach Acceptability Integrity	Improve loneliness literacy	Improve social engagement and searching for support	Increase network quality	Reduce loneliness
3.			**Evaluation overall intervention: quasi-experimental pre-test post-test design with control group (Effect evaluation)[a]**				
	Evaluation individual intervention components: satellite studies (Process evaluation)[a]						
		Reach intervention components: Mass media communication, psychosocial courses (2 courses, 8 participants), information meetings (11 meetings, 350 participants), *Neighbours Connected* (10 activities, 220 participants), training intermediaries (2 meetings, 18 participants); Overall reach: 39% participants post-test are familiar with one or more activities Acceptability: personal relevance low, presentation not attractive		The intervention group scored more favourably on the loneliness literacy subscales, motivation, perceived social support, and subjective norm	Not measured	No effects on social support after two years	No effects on loneliness after two years

Table 7.2 Summary of results of the effect evaluation of *Healthy Ageing* after two years

Outcome indicator	Evidence base and theory base for effectiveness *Healthy Ageing*		Results of *Healthy Ageing* obtained after two years	
	Column 1 Evidence of causal relationship	Column 2 Theory-based likelihood of intervention effect after two years[c]	Column 3 Effect intervention versus control group[d]	Column4 Effect familiar versus not familiar with *Healthy Ageing*[d]
Loneliness	N/A	Unlikely	No	No
Social support	More social support associated with less loneliness[a,b]	Unlikely	No	No
Social network structure	Integrated network, frequent contact with network members, satisfied with contacts are associated with less loneliness[b]	Unlikely	-	-
Social engagement	Frequent participation associated with less loneliness[b]	Unlikely	-	-
Loneliness literacy, motivation	No association with loneliness & social support[a]	Plausible	Yes	Yes
Loneliness literacy, self-efficacy	Favourable literacy scores associated with less loneliness & more social support[a]	Unlikely	No	No
Loneliness literacy, perceived social support	Favourable literacy scores associated with less loneliness & more social support[a]	Probable	Yes	No
Loneliness literacy, subjective norm	Favourable literacy scores associated with more loneliness & no association with social support[a]	Probable	Yes	Yes

[a] Association assessed in current study; [b] Association shown in literature and core project 1 of AGORA [1] as summarised in table 1.1 in chapter 1.
[c] A priori probability that the intervention activities could have changed the loneliness literacy constructs as discussed in chapter 6.
[d] Results of *Healthy Ageing* obtained by the quasi-experimental study after two years, presented in chapter 6.

Three research questions were formulated to evaluate *Healthy Ageing*, namely: 1) Can we observe changes over time in the prevalence of loneliness and in the determinants of loneliness in the general non-institutionalised elderly population of the intervention community, Epe, and specifically in high-risk groups?, 2) Can these changes be attributed to the complex intervention?, and 3) How can the observed changes be explained and what are the active components of the intervention? (see chapter 3).The third row in table 7.1 presents the main findings of the overall evaluation study and the satellite studies (chapters 5 and 6), providing information to answer these questions. After two years, *Healthy Ageing* comprised five intervention components, namely, mass media communications, psychosocial courses, information meetings, *Neighbours Connected*, and training of intermediaries. In chapter 6 it is shown that 39% of the study participants in the intervention group appeared to be familiar with one or more intervention components. Furthermore, the intervention group scored more favourably on the loneliness literacy constructs, motivation, perceived social support, and subjective norm, at follow-up than the control group did. However, no effects on the intermediate outcome, social support and ultimate outcome, loneliness, were found. Moreover, in the comparison between persons who were familiar with *Healthy Ageing* and those who were not, the effects pointed in the same direction, and they were borderline significant for the literacy subscales, motivation and subjective norm (table 7.2 column 3 and 4). Finally, given the content of the intervention components, the effect of *Healthy Ageing* on the loneliness literacy subscale, motivation, is plausible, on the subscales, perceived social support and subjective norm, probable, and on the subscale, self-efficacy, unlikely (table 7.2 column 2). The moderate effects on loneliness literacy and the absence of an effect on social support and loneliness can be explained by organisational issues at the start of the intervention, which delayed the delivery and duration of the intervention activities; this resulted in a modest reach and intensity of the intervention components.

The results in chapter 5 additionally provided information to explain our results. An in-depth study was performed to assess the acceptability of the mass media communication materials, information meetings, and psychosocial courses (chapter 5). This study was performed among clients of the meal delivery service, who were assumed to be at increased risk for loneliness. The mass media communication materials were not successful in attracting attention because the communication channels differed from what interviewees expected them to be. Furthermore, the perceived personal relevance of the message was low and the presentation was found unattractive. The contents of the communication materials, information meetings, and psychosocial courses were not well received because the objectives

and components did not connect with the priority group's perception of their environment.

Justification

The definition of a health problem is generally based on prevalence, severity – i.e. influence on quality of life –, trends, and the consequences for the individual and society [5-7]. Apart from this, it is important to consider by whom the health problem is identified. Within *Healthy Ageing*, loneliness was chosen as the health problem to be addressed because 1) the loneliness prevalence of about 40% was perceived as too high and unacceptable by local policymakers, 2) there were real public concerns about demographic and societal changes, and 3) local policymakers are responsible for enhancing social participation of vulnerable groups and maintaining people's independence in old age. Furthermore, policymakers decided to combine a population strategy and a high-risk prevention strategy [8]. That is, it was aimed to reduce loneliness prevalence by preventing loneliness among those who are not yet lonely and by diminishing the severity of loneliness among those who are lonely. In this section, we discuss the evidence base to prioritise loneliness as a health problem and to justify the combined prevention strategy.

First, loneliness has often been defined as the unpleasant or inadmissible lack of (the quality of) certain relationships. In this sense, loneliness is a subjective experience, and therefore it is difficult to distinguish whether persons are lonely or not. The De Jong Gierveld loneliness scale assesses loneliness indirectly and is generally accepted as a reliable and valid scale [9-11]. The currently used cut-off points for this scale were derived by comparing self-reports of loneliness with scale scores in a study among 54–89-year-old independently living people in 1992 (n=3,823) [12]. Although the authors found different thresholds for specific categories of elderly people, the cut-off points for the scale were set at 3 or higher and 8 or higher for mild and severe loneliness, respectively. The observed sensitivity (0.74) and specificity (0.81) were quite good. However, the positive predictive value was quite low (56%), meaning that 56% of the persons indicated as lonely on the De Jong Gierveld scale also considered themselves as being lonely. This means that the seriousness of the loneliness of persons scoring just below or above the first cut-off does not substantially differ. Therefore, we suggest that the severity of the problem loneliness might be somewhat less alarming than the 40% estimate suggests.

Second, public concerns about an increasing trend in loneliness seemed to be supported by cross-sectional comparison of the consecutive reports of the *Elderly Health Survey* of the community health service, GGD Gelre-IJssel in 1996/1997 (32%) and in 2005 (40%). The decision to study trends in the Gelre-IJssel region was actuated when new survey data became available in 2010, enabling us to study a 14-year period. Comparability of the studies seemed to be good because the target groups, scale, and modes of data collection (self-administered questionnaire) were identical. However, at a later stage we concluded that the comparability of the De Jong Gierveld loneliness scale with five answering categories (used in 1996/1997) and the same scale with three answering categories (used in 2005 and 2010) could not be guaranteed because our data suggested a response bias (see the individual item responses for the three consecutive studies in table A5.2 of appendix 5). In the three-category version, the category 'yes' was assumed to correspond to the combined 'yes' plus 'yes!' from the five-category scale. It appeared that, for the positively formulated items, the 'more or less' answers were more frequently given in 2005 and 2010 (three answering categories), whereas the positive extreme 'yes' and 'yes!' were more frequently given in 1996/1997 (five answering categories). We suggest that this observation originates from a general tendency to avoid extreme answers [13, 14]. Persons not answering whole-heartedly 'yes!' are likely to score 'yes' in the five-category version and 'more or less' in the three-category version. As the De Jong Gierveld loneliness scale prescribes that the 'more or less' answers are an indication of loneliness and are not neutral [10], more persons were considered as lonely in 2005 and 2010 than in 1996/1997. Our observations led us to decide not to include data from 1996/1997 in our trend analyses as response bias and real time effects would remain indistinguishable. Interestingly, in cross-sectional analyses of the data from each time period, the same predictors for loneliness were observed (chapter 2). Apparently, this classification issue is especially relevant if measurement of changes is the aim. Accordingly, the trend study in chapter 2 was limited to the change between two time points, resulting in a relatively short study period of five years. Therefore, no firm conclusions can be drawn about trends. However, we found no difference in loneliness between 2005 and 2010 at population level; this supports the existing body of evidence of stable trends in loneliness [15-19]. Notable, our results suggest an increase in loneliness among those with mobility disabilities.

To conclude, the main justification is not the a priori perceived rising trend in loneliness, but rather concerns about demographic change. The absolute number of elderly people is increasing rapidly, and this in itself legitimises concerns about loneliness within this group. For the future, we would like to emphasise the need to pay special attention to persons with mobility disabilities, as these persons might be unequally affected by new policies which stimulate social engagement and

independence into old age. So, combining a population strategy with a high-risk strategy is still justifiable.

Methodological considerations

In this section, we discuss a couple of methodological issues on the evaluation design and outcome indicators, in addition to those already discussed in the previous chapters. First, the study population and dosing, then the reach and quality of the intervention, and finally the quality of the outcome indicators are discussed.

Study population

Healthy Ageing focused on non-institutionalised elderly people in general and specific high-risk groups. For this reason, older participants were randomly selected from the municipal administration. People aged 75 years or over were oversampled to constitute half of the study population. As indicated in chapter 6, persons who were included in the final analytical sample were younger, more likely to be married, and better educated than in the source population. This resulted in a slightly healthier analytical sample and therefore the real associations might be either over- or underestimated [20-22].

Like in other community interventions, random assignment of inhabitants of Epe to an intervention and control group was undesirable. Therefore, controls were selected from Ermelo, a municipality with comparable population characteristics. The control group was highly comparable with the intervention group, except for mental health problems and church attendance. There are no reasons to believe that regular services for elderly people were different in both municipalities, or that national policies or campaigns have influenced the intervention and control municipality unequally.

Evaluation design quasi-experimental study and satellite studies

Healthy Ageing was designed as a quasi-experimental study. The practice-driven approach of *Healthy Ageing* challenged the evaluation design and the selection of the related outcome indicators. First, the intervention delivery was not stable over the two-year period, but was refined and extended over time. Second, the ‘dose’ was not standardised at individual level because there was little control over who received the intervention components and with what intensity. Third, the multiple intervention components were expected to interact. However, a posteriori, the

modest implementation of the intervention makes this not a very important issue. Furthermore, a large and heterogeneous target group, as this one was, generally produces smaller effects. Moreover, the intervention activities were intended to follow a process of growth during the two-year project period. Therefore, the logic model presented in table 7.1 was developed to identify a range of outcomes preceding loneliness in the causal chain. Furthermore, it was decided to combine the quasi-experimental evaluation study with different satellite studies. The quasi-experimental evaluation design aimed to evaluate the overall effect of *Healthy Ageing* and focused mainly on the initial, intermediate, long-term, and ultimate outcomes among the primary target group. The satellite studies looked more in-depth at the different intervention components and focused on process outcomes, namely, inputs, activities, and outputs. In chapter 6, we concluded that the quasi-experimental pre-test post-test design contributed to a high internal validity of the results.

Finally, the satellite studies gave insight into the intermediate steps on the left side in the logic model. Table A3.1 in appendix 3 presents the indicators and data collection methods applied for each intervention component. To date, the effect of the individual intervention activities on loneliness literacy, social engagement, social support, and loneliness have not been evaluated as they were not expected. If *Healthy Ageing* becomes more comprehensive, it is highly recommended to extend the satellite studies with the assessment of initial and intermediate outcomes of the individual intervention components, thereby making it possible to draw conclusions about the contribution of the individual intervention components to the overall effect.

Data collection method: self-administered questionnaire

To collect the data for the pre-test and post-test, self-administered questionnaires were used as this is an easy and relatively cheap method to reach large groups of study participants. In addition, self-administration is generally indicated as less prone to socially desirable answers on sensitive topics, such as loneliness [23]. Conversely, though, self-administered questionnaires are limited in their ability to the assess complex constructs, which often need more explanation, such as social network structure, including e.g. intimacy, physical distance, frequency of contacts, and so forth. Above all, question order might have affected the loneliness estimates in our study [24, 25]. Accordingly, we observed that the prevalence of loneliness (not weighted) in the intervention community was higher in the pre-test (48%) and post-test (46%) questionnaire of *Healthy Ageing* than in the data derived from the *Elderly Health Survey* in 2005 (40%) and 2010 (38%) used for the trend analyses. It has been recommended to place the loneliness scale somewhere in the middle

of an interview or questionnaire because then a considerable degree of self-disclosure might be expected. Ideally, the scale should be placed after questions about social network characteristics [10]. This advice was applied in the *Elderly Health Surveys*. However, within *Healthy Ageing,* the loneliness scale was placed before the scales for social support, social network, and social engagement. The main argument for this alternative order was to avoid an assimilation effect [24, 25]. That is, previous questions about social contacts might increase the accessibility of information about the quality of these relationships, and this might lead to more positive or more negative responses on the loneliness scale items. Consequently, it might be that the *Elderly Health Survey* has underestimated loneliness because a positive evaluation of the social network results in a positive evaluation of the items of the loneliness scale. In turn, *Healthy Ageing* might have overestimated loneliness, if positive characteristics of the social network were not yet activated in the brain.

Reach and intensity of the intervention

Healthy Ageing aimed to influence non-institutionalised elderly people who were not lonely, lonely, or at increased risk of loneliness. Furthermore, the project aimed to reach persons in the social environment of elderly people, e.g. other citizens and professionals. As a consequence of *Healthy Ageing*'s population strategy, all older citizens in the intervention community were in theory exposed, but in practice not equally reached. Therefore, the question 'Who are actually reached by *Healthy Ageing*?' is very relevant. From the records of the individual intervention components (satellite studies) we know that the information meetings were mainly attended by members of associations for the elderly or residents of sheltered housing. We do not have information about the health status and level of loneliness of these participants. *Neighbours Connected* seems to reach elderly people who do not regularly participate in social activities, and these persons are assumed to be at higher risk of loneliness [26, 27]. Also, the psychosocial courses reached participants who indeed have psychological problems. Results from the in-depth interviews suggest that the content and format of the mass media communications, information meetings, and psychosocial courses did not sufficiently connect with more vulnerable elderly people's perception of the environment (chapter 5). Finally, from the post-test measurement we know that persons who were familiar with *Healthy Ageing* were more often women, married, and better educated, and more regularly performed voluntary work and attended church. Further, loneliness at baseline was substantially, though not significantly, lower among persons who were reached than among those who were not (2.88 vs. 3.37; p=0.1). However, misclassification due to self-assessment of familiarity should be taken into account. First, participants might have forgotten intervention components to which they were

exposed in the first year. Second, participants might not have recognised intervention components as part of *Healthy Ageing*. However, the opposite is also possible; for example, newspaper articles about a preventive medical health-check for elderly people might have been seen as intervention components, whereas in fact they were not.

Given the content and intensity of the intervention activities, the effects which might be expected from *Healthy Ageing* are limited (see table 7.2 column 2). In the first place, *Healthy Ageing* consisted mainly of communication activities and activities with once-off contact occasions. These kinds of activities are appropriate to put issues on the public agenda and raise consciousness, but they are not likely to teach skills, shift attitudes, or change behaviour in the absence of other enabling factors, like in mass media campaigns in general [28]. The psychosocial courses were more intensive (8–10 meetings); however, the number of people reached was low (n=8). For *Neighbours Connected*, it has not yet been studied whether once-off participation leads to more frequent participation in other social activities. In the second place, we observed a decline in exposure in the second year of the intervention, e.g. the last newspaper article was published in March 2010 and the last information meeting was organised in April 2010.

With regard to persons in the social environment of elderly people, *Neighbours Connected* was successful in motivating active older citizens to organise social activities for socially inactive neighbours. The extent to which the general population in Epe was reached by the mass media communications was not assessed; however, it is not likely that these communications induced behaviour change, as argued above. Furthermore, in total 19 professionals and volunteers followed a workshop about observing loneliness and referring lonely persons to available support services. The effect of these workshops on actual referral has not been evaluated, but given the number of participants we do not believe that this is substantial at population level.

In sum, it seems that healthier and more socially integrated elderly persons were reached by the mass media communication materials and information meetings in *Healthy Ageing*. This group was also reached to organise *Neighbours Connected*. On the other hand, *Neighbours Connected* and the psychosocial courses seem to have reached better the more vulnerable elderly people at increased risk of loneliness. However, the overall exposure and intensity were rather limited.

Logic model guides choice of outcome indicators

As already mentioned, the logic model was designed to guide the evaluation process at a time when the intervention content had not yet been established. To measure our overall goal (loneliness), long-term outcomes (network quality: social support and network structure), intermediate outcomes (social engagement), and initial outcome (loneliness literacy) validated measurement instruments were selected or developed. The De Jong Gierveld loneliness scale and Wengers' network typology, both of which are validated instruments, were also used in the *Elderly Health Survey* of the community health service, and consequently they were chosen to enable comparison between the studies. The indicator for social engagement is not formally validated but was also used in the *Elderly Health Survey* and therefore included. The indicator for social support (SSL12-I) was derived from the literature. For loneliness literacy, an appropriate indicator was not available and one was therefore developed. This section discusses for each indicator the validity and reliability of the scale. Moreover, based on the theoretical ability of the scale to assess change induced by interventions in general and by *Healthy Ageing* specifically, we justify the exclusion of network structure and social engagement from the final analyses. The discussed indicators are included in appendix 6 in the format of the pre- and post-test questionnaire.

Overall goal: De Jong Gierveld loneliness scale

The De Jong Gierveld loneliness scale was developed by De Jong Gierveld and Kamphuis in 1985 to indicate loneliness at group level [9]. The 11-item loneliness scale is frequently used in public health surveys, epidemiologic studies, and intervention studies by means of interviews and in self-administered questionnaires [10]. Caution is required in comparisons of studies with different modes of data collections because it has been reported that self-administered questionnaires deliver significantly higher loneliness scores [10]. To develop the scale, the meaning of the term loneliness was thoroughly studied, thus making the construct validity reliable [29, 30]. In 1991, Van Tilburg and De Leeuw validated the scale by comparing six individual studies among single women aged 25–64 year, using different modes of data collection. This study concluded that the scale met the psychometric requirements of item non-response, scale homogeneity, and person scalability [11]. However, the homogeneity of the 11-item scale is not very strong; this made other authors suggest using the De Jong Gierveld scale as bi-dimensional [4, 10, 31-33], separating the positively and negatively formulated items corresponding to social and emotional loneliness, respectively. Furthermore, a gender bias was observed on the two subscales, with men scoring less extremely on the positive items (social loneliness) [32] and with mean social loneliness scores being lower among men than among women [31]. De Jong Gierveld and Van Tilburg have stated that the choice of whether to use the 11-item scale or the

positive and negative subscales separately depends on the research question under consideration [10, 34]. In this thesis, the uni-dimensional scale was used because *Healthy Ageing* was directed towards a heterogeneous elderly population including a variety of causes of loneliness. In this context, Cronbach's coefficient α appeared to be sufficient in the pre- and post-test (α=0.86 and 0.88, respectively). Finally, although the responsiveness of the De Jong Gierveld scale has not been formally tested, the uni-dimensional scale is frequently used in evaluation studies and appears to be sensitive enough to find intervention effects [35-38]. If the intensity of *Healthy Ageing* had been great enough, we believe that intervention effects of *Healthy Ageing* might be traceable by indicator in the long term.

Long-term outcome: Short Social Support List-Interactions (SSL12-I)

In the original study design (chapter 3), the SSL12-I was selected as outcome indicator for network function and Wenger's network typology as indicator for network structure [39, 40]. The SSL12-I is an indicator for perceived social support received and is the shortened version of the original 34-item Social Support List of Interaction [41, 42]. The SSL12-I covers situations of interaction of an individual with his or her social environment, such as receiving invitations to parties (everyday support), receiving compliments (esteem support), receiving support at special times such as illness (support in problem situations) [43, 44]. Van Eijk et al. [1994] validated the shortened 12-item scale among a Dutch population aged 60 years and over by means of a self-administered questionnaire. The SSL12-I appeared to correlate well with loneliness, and the psychometric properties were satisfactory [44]. Furthermore, although the SSL12-I is rarely used for evaluation purposes [45], we considered the scale as suitable for our study. In the first place, it appeared that the observed mean scores were of the same order as in other studies among independently living elderly people [22, 43, 44]. Moreover, we observed that the SSL12-I was sensitive to detecting changes (chapter 6). It is likely that these changes reflect natural maturation like in a study by Van Heuvelen et al. [2005] among elderly people aged 65–96 years [22]. So, an intervention should be intensive enough to result in an effect above natural shifts in received social support.

Long-term outcome: Wenger's network typology

Wenger's network typology was originally developed as an assessment tool for practitioners (Practitioner Assessment of Network Type: PANT) but has also been applied for population research [46-48]. The scale focuses on the core of an individual's social network and not on the whole social network. It consists of eight questions that classify individuals to five network types, namely, family dependent, local self-contained, private restricted, locally integrated, and wider community focused. Wenger showed that persons with locally integrated and wider

community-focused support networks are less lonely than persons with a restricted network [39]. During the research period, we considered network structure to be a relatively stable personal characteristic and therefore not suitable for our evaluation purpose.

Intermediate outcome: Social engagement

Within *Healthy Ageing*, social engagement was indicated as health promoting behaviour to develop or sustain a high quality social network [49] (chapter 3). The 17-item scale for social engagement as used in the *Elderly Health Survey 2005* [50] was extended to 25 items in the evaluation of *Healthy Ageing*. The scale covered eight domains for social engagement, namely: doing paid work, doing voluntary work, delivery of informal support, active or passive membership of a society, participating in cultural activities, participating in recreational activities, regular maintenance of social contacts, social involvement [51, 52]. In addition to these domains, physical activities were included, namely, walking, cycling, sport for the elderly, and other sports. During the project, it was decided that the scale was not suitable enough for our evaluation purpose. In the first place, the scale did not distinguish clearly between activities generally undertaken individually or together with others, such as walking or cycling. Individual activities might give meaning to life; however, these kinds of activities do not improve social network quality as hypothesised in the logic model of *Healthy Ageing*. In the second place, problems arose about setting norms for meaningful changes in participation in order to prevent or alleviate loneliness. The response option of performing an activity '(almost) daily or weekly' appeared to be too general to assess changes from once a week to twice a week. Finally, *Healthy Ageing* did not specifically promote a particular type of activity; this made it difficult to select a couple of items as proxy for social engagement instead of evaluating all 25 items.

Initial outcome: Loneliness Literacy Scale

The validity of the loneliness literacy scale and its suitability for our evaluation purpose are described in chapters 3 and 6. To summarise, the internal consistency reliability of the subscales appeared to be adequate as indicated by Cronbach's coefficient α above 0.7. Moreover, the concurrent validity of the scale, assessed by the association between loneliness literacy and loneliness, appeared to be acceptable for the subscales, self-efficacy, perceived social support, and subjective norm, in the validation study (chapter 3), and this was confirmed in the follow-up data of the evaluation study (chapter 6). However, we cannot be conclusive on the basis of our studies about the responsiveness of the scale. Finally, the Loneliness Literacy Scale was not optimally tailored to the intervention components of *Healthy Ageing*, mainly because the project did not clearly define which behavioural determinants were necessary to change.

Despite these limitations, the Loneliness Literacy Scale is one of the first topic- and context-specific literacy scales. As indicated in chapter 1, causes of loneliness are diverse, and likewise the cause of limited social participation and support-seeking behaviour might differ between individuals. Consequently, different intervention approaches are preferred for different target groups. Therefore, ideally a separate loneliness literacy scale for each individual intervention component should be developed. However, the drawback of very specific literacy scales is that they become inappropriate for use at population level, which we also wished to assess. To conclude, there is a need for further investigations about how to develop topic- and context-specific literacy instruments for the evaluation of complex interventions in public health practice.

Implications for public health practice

This section addresses the implications of the experience gained within the research undertaken in AGORA's *Healthy Ageing* programme. Thus, we elaborate on lessons for population-level loneliness interventions and conclude with some experiences of working in an Academic Collaborative Centre.

Lessons for the development of healthy ageing programmes

Policies and intervention programmes for preventive elderly healthcare are still in their infancy but are high on the policy agenda because of population ageing. The *Healthy Ageing* project was a pioneer in the establishment of a local healthy ageing project in the Dutch region Gelre-IJssel. Although the implementation of *Healthy Ageing* lagged behind expectations, valuable lessons were learned which are relevant for other healthy ageing programmes in general and other loneliness programmes specifically.

Healthy Ageing combined a population strategy and a high-risk prevention strategy, focusing on the former. Consequently, the project targeted all non-institutionalised elderly people in the municipality with the same set of intervention activities. However, a population strategy does not preclude differentiation in intervention strategies for different subgroups. As the population aged 65 years and over, as well as the causes of loneliness, are very heterogeneous, it is recommended to differentiate explicitly between target groups and to adapt intervention components to the needs of these specific subgroups. For example, some elderly people might suffer from social loneliness on moving to another city. This group might benefit from participation in social activities to expand their network. Accordingly, these persons' barriers to participation should be ascertained

[26]. Other persons, however, might suffer from emotional loneliness after the passing away of their partner. They have to learn to cope with these feelings by reducing the importance of the problem. Furthermore, the scales in chapter 1 (figure 1.1), with on the one side support needs and on the other side support received, illustrates the importance of the social environment in the prevention of loneliness. This holds true especially for elderly persons with increased support needs because of health disabilities, i.e. mobility disabilities. *Healthy Ageing* approached informal support givers by means of the mass media communications and professional support givers by means of newsletters and workshops. However, the project will benefit if intervention activities are better targeted at different actors in the social environment as these persons have to act differently and have different needs for enablement. Therefore, involvement of representatives of primary and secondary target groups is highly recommended (see also chapters 5 and 6). This advice is also given by other authors studying the effectiveness of loneliness interventions [35, 53-55].

Other important lessons were learned with regard to the formulation of objectives. In the literature, it is frequently recommended to formulate objectives for different target groups at the micro-, meso-, and macro- level, and at the level of outputs, behavioural determinants, behaviour, and health [5, 51, 56-58]. Therefore, it is essential to discuss from the start what the expected outcomes of individual intervention components are. Within *Healthy Ageing*, we discussed these expected outcomes after one year by using the logic model. This discussion clarified previous decisions but did not result in project adaptations. Fortunately, in the second phase of AGORA's *Healthy Ageing* project in another city (Apeldoorn), a logic model was developed right from the start together with the stakeholders. Now, the stakeholders better understand how their intervention components contribute to loneliness prevention, but also admit that changes in loneliness at population level can only be expected in the long term. Moreover, the absence of intermediate objectives interferes with the development of an optimal evaluation design and requires a flexible attitude on the part of the evaluator. Within *Healthy Ageing*, we coped with the situation by close monitoring and inclusion of a range of outcome indicators. To conclude, it is important to define more proximal outcome objectives, which give insight into mid-term results, in order to judge whether the project is on track and whether project adaptations are necessary.

Considerations about the Academic Collaborative Centre, AGORA

Healthy Ageing was the first AGORA programme and the first formal pilot in the collaboration between policy, practice, and research within the Gelre-IJssel region. Commitment to collaboration was established in a formal covenant in 2005 signed

by the boards of the municipalities, the community health service, the university, and the National Institute for Public Health and the Environment (RIVM). Furthermore, within *Healthy Ageing*, knowledge from the disciplines of epidemiology and health promotion was combined. In practice, we experienced a couple of challenges to successful collaboration about which we elaborate in this section.

First, consensus about roles and responsibilities appeared to be essential. Besides the official partners of AGORA, other organisations from practice were involved in the local loneliness project, namely, the mental health service and the elderly welfare service. Accordingly, project ownership was not clear from the start. To illustrate: although the alderman of Epe was the formal commissioner of the project, the community health service provided a project leader as they initiated the project. As a consequence, decision making was hampered. Fortunately, the communication between the project group and municipal government improved and eased decision making after a civil servant became involved in the project group. On the other hand, a posteriori, responsibilities for the development of the intervention plan and evaluation plan, respectively, were somewhat too strictly defined. Practice developed the intervention plan and research developed the evaluation – mutually inspired by each other however. Both examples illustrate the importance of mutual trust. Therefore, in a multidisciplinary project like *Healthy Ageing*, time should be scheduled to get to know one another and rely on one another's expertise.

Second, the *Healthy Ageing* programme was challenged by the different lifespan of the working cycles of practice and research [59]. Consequently, the local project group aimed to deliver visible outputs from the project after a short time, whereas the researchers of core projects 1 and 3 needed more time to deliver results from the needs assessment and context analysis. Accordingly, results were incorporated in the intervention activities in Epe along the way. Therefore, it appeared to be somewhat overambitious to establish an epidemiological needs assessment and context analysis, to develop and simultaneously implement an intervention in close collaboration with local partners, and to evaluate long-term health outcomes within a time period of about four years. In the daily practice of the community health service, this resulted in more attention being given to, among other things, the establishment of a local network structure with relevant stakeholders, the involvement of the target population in intervention development, discussions about expected outcomes, and the formulation of SMART objectives.

Despite the teething problems described above, the collaborations between policy, practice, and research resulted in successful deliverables for each of the fields,

which are worth mentioning. First, the results of five years' research around healthy ageing resulted in the development of a vision report to advise municipalities about policies for elderly people [60]. Second, at the community health service, an evaluation bureau has been set up to support the evaluation of other health promotion projects. Third, partly in collaboration with other Academic Collaborative Centres, the book *Epidemiology in Public Health Practice* was published for the education of students and public health professionals [61], master classes were organised, the MSc course on public health at Wageningen University was renewed, and e-learning modules were developed. Finally, for research, the experiences from the *Healthy Ageing* programme resulted in scientific articles in peer-reviewed journals, contributions at national and international conferences, and four doctoral theses, namely:

- Social relationships and healthy ageing. Epidemiological evidence for the development of a local intervention programme. Simone Croezen, 2010 (core project 1) [1].
- Healthy aging in complex environments. Exploring the benefits of systems thinking for health promotion practice. Jenneken Naaldenberg, 2011 (core project 3) [3].
- Towards salutogenic health promotion. Organising healthy ageing programs at the local level. Jeanette Lezwijn, 2011 (core project 2b) [2].
- Healthy Ageing: prevention of loneliness among elderly people. Evaluation of a complex intervention in public health practice. Rianne Honigh-de Vlaming, 2013 (core project 2a, this thesis).

Overall conclusion

This PhD thesis has shown that concerns about an increasing trend in loneliness cannot be supported by survey data of the community health service. However, our data suggest an increase in loneliness among persons with mobility disabilities; this legitimises special attention being given to this group by policymakers and health professionals. Furthermore, this thesis has shown that the reach and intensity of the loneliness intervention *Healthy Ageing* lagged behind the initial expectations. Therefore, *Healthy Ageing* did not achieve results on the intermediate and ultimate outcomes, social support and loneliness. However, the favourable effect within the intervention group on the loneliness literacy subscale, motivation, is plausible, and the favourable effects on the subscales, perceived social support and subjective norm, are probably induced by *Healthy Ageing.* Whether these favourable initial effects would lead to an increase in social support and a reduction of loneliness in the long term cannot be conclusively assessed. Furthermore, it is recommended to

continue targeting subgroups at the micro-, meso-, and macro-level, however, the project is challenged to differentiate the strategies for these specific subgroups.

Nevertheless, this thesis provides valuable lessons for the development of high-quality evaluation designs in public health practice. The evaluation of *Healthy Ageing* illustrates how researchers can cope with the evaluation challenges of complex interventions which cannot be fully controlled. In the first place, this study emphasises that the formulation of specific proximal and distal objectives and related evaluation questions is essential for a high-quality design. Accordingly, a logic model can serve as a valuable tool in the development of an integrated intervention and evaluation plan. In the second place, this study confirms the importance of combining process and effect evaluations. Our satellite studies, for example, provided insight into how the intervention components were received by the target population and made it possible to understand the outcomes of the quasi-experimental evaluation study. In the third place, it appears that the use of a control municipality and an internal control group, based on intervention reach, are design elements which can feasibly be applied in public health practice and can increase the internal validity of the results.

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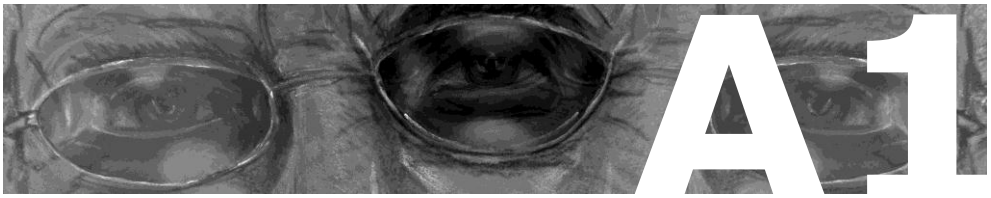
Appendices



Appendix 1 as used in chapter 3

Overview of intervention activities, the target groups, and intended objectives within *Healthy Ageing*

Table A1 Overview of intervention activities, the target groups, and intended objectives within *Healthy Ageing*

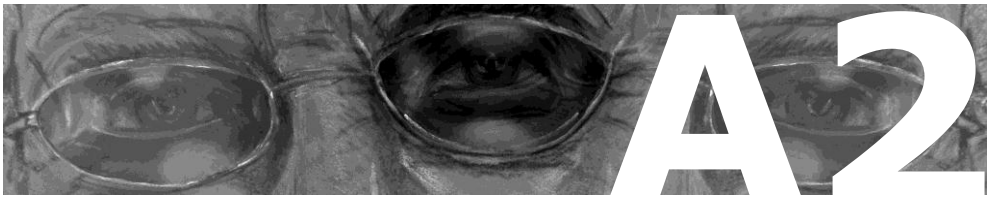
Activity	Target groups	Description	Objectives
Press releases and free publicity	General population General elderly population Intermediaries	Several press releases are disseminated through local media	To create awareness about intervention activities directed at healthy ageing
Articles in newspaper	General population General elderly population	Monthly information article in local newspaper about different topics, e.g. bereavement, coping with physical limitations, optimism, participating in social activities	To increase awareness about personal opportunities to maintain health and quality of life To increase awareness about the opportunities in Epe to be involved in social activities To increase awareness about the care and welfare facilities in Epe
Posters *Healthy Ageing*	General population General elderly population	Poster with one-liner relating to healthy ageing, disseminated among intermediaries and in public places	To increase awareness about the importance of social and emotional wellbeing
Posters *Neighbors Connected*	Active elderly people	Poster with information about *Neighbors Connected*, disseminated among intermediaries and in public places	To increase awareness about the possibility to get financial and organizational support in organizing an activity in the neighborhood
Flyers *Neighbors Connected*	Active elderly people	Flyer with information about *Neighbors Connected*, disseminated via intermediaries, distributed among the elderly with personal explanation	To increase awareness about the possibility of getting financial and organizational support in organizing an activity in the neighborhood

Table A1 continued

Information meetings	General elderly population	Interactive presentation with 10 tips about healthy ageing hosted by organizations for the elderly	To increase awareness about personal opportunities to maintain health and quality of life To increase awareness about the opportunities in Epe to be involved in social activities To increase awareness about the opportunities for professional help with personal problems
Psychosocial course 'Look for a meaningful life'	Elderly with mild depressive symptoms	Course based on principles of reminiscence delivered by the mental health service	To increase social communication skills To stimulate the experience of a positive self-image, more self-efficacy, a meaningful life, a better quality of life, and diminished feelings of gloom
Psychosocial course 'Life stories'	Elderly with mild depressive symptoms	Course based on principles of reminiscence delivered by the mental health services	To increase social communication skills To stimulate the experience of a positive self-image, more self-efficacy, a meaningful life, a better quality of life, and diminished feelings of gloom
Psychosocial course 'Living with a chronic disease'	Elderly with a chronic disease	Course based on principles of reminiscence aimed at coping with physical limitations	To increase awareness about the causes of stress and variations in mood To increase skills to cope with limited energy To stimulate the experience of more self-efficacy, a better quality of life, and diminished feelings of gloom
Social activities	General elderly population	Diverse activities organized by the welfare organization for the elderly	To increase social engagement of the elderly and strengthen their social network

Table A1 continued

Activities of *Neighbors Connected*	Less active elderly	Diverse activities initiated by *Neighbors Connected*	To increase social engagement of the elderly and strengthen their social network To increase the three dimensions of Sense of Coherence: meaningfulness, manageability, and comprehensibility
Newsletter	Intermediaries	Newsletter with information about different topics concerning healthy ageing	To inform intermediaries about activities of the project group To inform intermediaries about each other's expertise and services
Workshops to recognize symptoms of loneliness	Intermediaries	Half-day training about how to recognize early symptoms of loneliness and how to make this observation a subject for discussion	To increase awareness about the common prevalence of loneliness among the elderly To increase knowledge and skills to recognize early symptoms of loneliness To increase skills to speak about observed symptoms of loneliness with clients To increase awareness about services of other professionals
Round table discussions	Intermediaries Policymakers	Yearly meeting with stakeholders	To stimulate cooperation between intermediaries To develop a prevention network around the elderly
Lobby work	Intermediaries Policymakers	Individual meetings with intermediaries and policymakers	To stimulate cooperation between intermediaries To develop a prevention network around the elderly



Appendix 2 as used in chapter 3

Indicators included in questionnaire pre-test and post-test

Table A2 Indicators included in questionnaire pre-test and post-test

	Indicator	Description	# items	Scale
Loneliness	Loneliness scale of De Jong Gierveld [1, 2]	Scale consists of 6 positively formulated statements indicating emotional loneliness and 5 negatively formulated statements indicating social loneliness	11	3-point scale: yes; more or less; no
Determinants of loneliness				
Social participation	Social activities of daily life [3]	Scale consists of 8 domains of social participation: doing paid work, doing voluntary work, delivery of informal support, membership of a society, participating in cultural activities, participating in recreational activities, regular maintenance of social contacts, passive engagement	26	4-point scale with extremes from (almost) daily to (almost) never
Network structure	Network typology of Wenger [4]	Questions about geographical distance from close relatives, contact frequency, and attending church or societies Five network types are identified: family dependent, locally integrated, locally self-contained, wider community focused, private restricted.	8	Geographical distance: within same household, 1.5 km, 1.5-8 km, 9-24 km, 25-80 km, more than 80 km, n.a. Frequency: daily, 2-3 times a week, at least weekly, at least monthly, never, n.a. Social involvement: regularly, occasionally, never
Network function	Social Support List (SSL-12) [5]	Scale consists of 3 domains: everyday support, support in problem situations, esteem support Statements concern experiences in regular social contacts	12	4-point scale with extremes from never to very often

Table A2 continued

Health indicators				
Functional status	Hierarchical abilities of daily living (ADL) [6]	Scale consists of 3 domains: basic activities of daily life (BADL), mobility activities of daily life (MADL), instrumental activities of daily life (IADL)	13	3-point scale: without difficulty, with difficulty, only with assistance
Self-perceived health	Self-perceived health	Direct question: How would you describe your health in general?	1	5-point scale with extremes from excellent to very bad
Mental health	Mental Health Inventory (MHI-5) [7, 8]	Feelings of wellbeing in the previous month	5	6-point scale with extremes from always to never
Personal indicators				
Sense of coherence	Life Orientation Questionnaire [9, 10]	Scale consist of 3 domains: meaningfulness, manageability and comprehensibility Questions concern several aspects of life	13	7-point scale with extremes from fully agree to fully disagree
Life events	Life events [11, 12]	Appearance of life events in past 12 months	12	Yes or no

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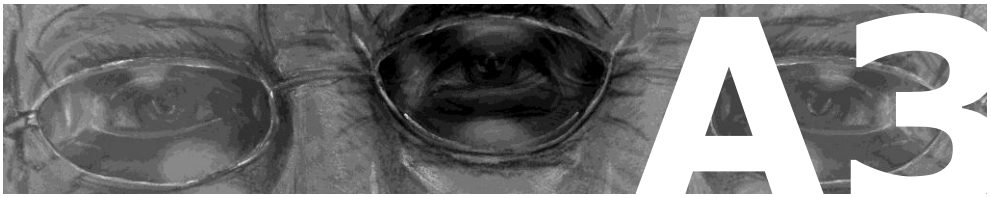

Appendix 3 as used in chapter 3 and chapter 7

Indicators and methods to assess inputs, activities, outputs, short-term, intermediate and long-term outcomes of *Healthy Ageing*

Adapted from Published in BMC Public Health 2010, 10:552 (additional file 3)

Table A3 Indicators and methods to assess inputs, activities, outputs, short-term, intermediate and long-term outcomes of *Healthy Ageing*

Component logic model	Intervention component	Indicators	Method
Inputs	Reflection functioning project group	Appreciation of e.g. collaboration, contribution of different project members; Perceived value of e.g. project in general, ability to spend enough time and effort on the project, ability to contribute personal expertise to the project, agreement between members about goals, planning, and activities of project, mid-term successes of project; Opinion about e.g. expertise of project members, personal commitment, each organization's interest in contributing to the project, working procedure within project group.	Coordination Action Checklist [1] after one and two years; outcomes of checklist will be discussed within project group
	Reflection functioning steering committee	Perceived aims of the project; Opinion about potential continuation of collaboration after project period.	Short questionnaire by email after one and two years
	All meetings of the project group and individual meetings with external stakeholders	Name of organization, topics discussed, decisions made.	Registration by project members
Activities	All activities targeting elderly people	Delivery: Number of press releases, published articles; number of distributed posters, flyers; number of organized courses, information meetings, workshops, activities of *Neighbors Connected*, other social activities; Duration of an activity (once-off or repeated meetings); length of meetings; interval between meetings.	Minutes of meetings Registration by project members

Table A3 continued

Outputs	All activities targeting elderly people (except mass media communications)	Reach: number of participants on courses, meetings, workshops, activities of Neighbors Connected, other social activities; compliance of participants during courses; Estimation of age and gender distribution of participants; Dose received: Participation in one or more intervention activities; elderly read or heard about the project.	Registration by project members Recall in post-test among study participants in intervention group
	Mass media communications	Insight in factors that influenced the ability to draw the attention of the target group.	In-depth interviews (chapter 4)
	Information meetings	Appreciation of hosting organization about meeting in general, discussed topics, length of meeting, cooperation between presenters, information material; Appreciation of participants about meeting in general advices to improve the meeting; Insight in factors that influenced the acceptability of the content of the intervention components.	Evaluation form for contact persons Short evaluation form for participants after meeting In-depth interviews (chapter 4)
	Psychosocial course 'Life stories'	Appreciation of course in general, course leaders, discussed topics, length of meetings, interval between meetings, time of course, group size, group ambience, fulfillment of expectations; Intention to recommend the course to other people with depressive complains.	Standard evaluation forms of mental health service after course
	Psychosocial course 'Living with a chronic disease'	Appreciation of course in general, intake, organizational issues, course materials, discussed topics, examples used; Perceived usefulness of skills learned; Intention to recommend the course to other people with a chronic disease.	Standard evaluation forms of mental health service after course

Table A3 continued

Outputs (continued)	*Psychosocial course 'Look for a meaningful life'	Appreciation of course in general, course leaders; Intention to recommend the course to other people with depressive complains	Standard evaluation forms of mental health service after course
	Psychosocial courses in general	Insight in factors that influenced the acceptability of the content of the intervention components	In-depth interviews (chapter 4)
	Neighbors Connected organizers	Appreciation of organized activity in general, support received from the coordinator Insight into strategies used by organizers to invite participants	Observations by coordinator Interviews with organizers [2]
	Neighbors Connected participants	Appreciation of activity in general Factors which enable participate in the activity (3-item scale of Life Orientation Questionnaire) Opinion about the way of being informed about or invited to the activity; factors which reduced barriers to participate	Short evaluation forms by participants after activity Observations by coordinator Interviews with participants [2]
	Workshop to recognize symptoms of loneliness (intermediaries)	Fulfillment of expectations; Appreciation of topics discussed, course leaders, length of meeting.	Evaluation form after meeting
	Round table meetings (intermediaries)	Appreciation of the meeting in general Suggestions about how to improve the meeting	Short evaluation form after the meeting; Notes during interactive sessions.
Short-term outcomes	Psychosocial course 'Life stories'	Perceived contribution of the course to improved wellbeing; Perceived contribution of the course to increase insight into personal life experiences; Perceived value of reminisce of life stories to the experience of new inspiration for the future.	Standard evaluation forms of mental health service after course

Table A3 continued

Short-term outcomes (continued)	Psychosocial course 'Living with a chronic disease'	Perceived contribution of the course to reduction of complains; Perceived contribution of the course to the experience of increased coping capacities; Perceived contribution of the course to reach personal goals; Intention to ask for additional professional support if a necessary.	Standard evaluation forms of mental health service after course
	*Psychosocial course 'Look for a meaningful life'	Perceived reduction of depressive symptoms since the start of the course; Perceived contribution of the course to the reduction of depressive symptoms; Perceived increase in feeling of control over personal life since the start of the course; Perceived contribution of the course to an increased feeling of control; Intention to ask for additional professional support if necessary.	Standard evaluation forms of mental health service after course
	Neighbors Connected participants	Intention to participate in any social activity another time.	Participants comment in visitors' book after activity
	Overall complex intervention	Loneliness literacy including the constructs motivation, self-efficacy, social support and subjective norm	Post-test in intervention and control group (chapter 6)
	Workshop to recognize symptoms of loneliness (intermediaries)	Perceived increase in knowledge about risk factors for loneliness; Perceived importance of being attentive to loneliness among the elderly; Perceived ability to recognize signs of loneliness; Perceived ability to help the elderly with feelings of loneliness, by accurate referral to other specialists	Evaluation form after meeting

Table A3 continued

Intermediate outcome	Overall complex intervention	**25-item social engagement questionnaire	Pre-test post-test in intervention and control group (chapter 6)
Long-term outcomes	Overall complex intervention	12-item Social Support list for Interaction (SSL12-I) [3, 4] **Wenger's network typology [5]	Pre-test post-test in intervention and control group (chapter 6)
Overall aim	Overall complex intervention	11-item De Jong Gierveld loneliness scale [6, 7]	Pre-test post-test in intervention and control group (chapter 6)

*Planned activity not implemented.
**Not included as outcome indicator in effect evaluation.

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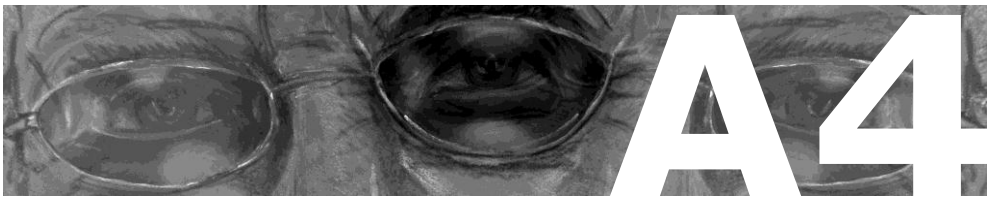


Appendix 4 as used in chapter 4

Loneliness Literacy Scale: Development and evaluation of an early indicator for loneliness prevention

Table A4.1 Items Loneliness Literacy Scale

	Item	Scale	Theoretical construct [a] / target behaviour (1/2) [b]	
motivation	If I have problems, a conversation with the elderly advisor helps me to solve my problems	(fully) agree – (fully) disagree	Attitudinal belief (expected outcome)	2
	Meetings for bereavement are offered in my municipality	(fully) agree – (fully) disagree	Awareness	2
	In my municipality there are professionals who can help people who feel gloomy or lonely	(fully) agree – (fully) disagree	Awareness	2
	A support group would help me to give ageing problems a place	definitely – definitely not	Attitudinal belief (expected outcome)	2
	If I felt lonely, I would search for professional help to reduce these feelings	definitely – definitely not	Intention	2
	If I lost my partner, I would follow a bereavement course	definitely – definitely not	Intention	2
self-efficacy	I feel self-efficacious enough to go to an activity on my own	(fully) agree – (fully) disagree	Self-efficacy belief	1
	I am able do almost anything if I really want to	(fully) agree – (fully) disagree	Self-efficacy belief	1/ 2
	If I need help from others, I am able to arrange it myself	(fully) agree – (fully) disagree	Self-efficacy belief	2
	In a group of friends/acquaintances, I speak up regularly	(fully) agree – (fully) disagree	Self-efficacy belief	1/ 2
	I can manage in daily living as regards arranging transportation to activities	(fully) agree – (fully) disagree	Self-efficacy belief	1
	I can manage in daily living as regards finding information	(fully) agree – (fully) disagree	Self-efficacy belief	1/ 2
perceived social support	I perceive my family's opinion as important	(fully) agree – (fully) disagree	Motivation to comply (subjective norm)	1
	My family is there for me if I ask for help	(fully) agree – (fully) disagree	Attitudinal belief (outcome expectation)	2
	I perceive my neighbours' opinion as important	(fully) agree – (fully) disagree	Motivation to comply (subjective norm)	1

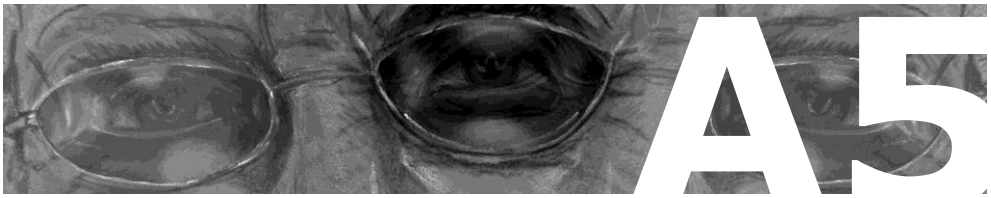
Table A4.1 continued

perceived social support	My neighbours are there for me if I ask for help	(fully) agree – (fully) disagree	Attitudinal belief (outcome expectation)	2
	I perceive my friends' opinion as important	(fully) agree – (fully) disagree	Motivation to comply (subjective norm)	1
	My friends are there for me if I ask for help	(fully) agree – (fully) disagree	Attitudinal belief (outcome expectation)	2
subjective norm	My family thinks it is important for me to participate in activities	(fully) agree – (fully) disagree	Normative belief	1
	My neighbours think it is important for me to participate in activities	(fully) agree – (fully) disagree	Normative belief	1
	My friends think it is important for me to participate in activities	(fully) agree – (fully) disagree	Normative belief	1
	By participating in activities I remain among men	(fully) agree – (fully) disagree	Attitudinal belief (outcome expectation)	2
not included	Do you know where you have to be to join sporting activities? [b]	Yes – no	Knowledge	1
	Do you know where you have to be to join recreation activities? [b]	Yes – no	Knowledge	1
	Do you know where you have to be to join courses? [b]	Yes – no	Knowledge	1
	Do you know where you have to be to apply for a walking frame? [b]	Yes – no	Knowledge	2
	Do you know where you have to be for financial support? [b]	Yes – no	Knowledge	2
	Do you know where you have to be for assistance with household? [b]	Yes – no	Knowledge	2
	Do you know where you have to be for transport services? [b]	Yes – no	Knowledge	2
	Do you know where you have to be for help with administration? [b]	Yes – no	Knowledge	2
	Do you know where you have to be for help in the house with little chores? [b]	Yes – no	Knowledge	2
	Do you know where you have to be for meal services? [b]	Yes – no	Knowledge	2
	If I had physical restrictions, I would apply for a mobility scooter, walking frame, hearing aids, etc. [c]	definitely – definitely not	Intention	2

Table A4.1 continued

not included	I know where I have to be if I want to participate in activities in the neighbourhood [c]	(fully) agree – (fully) disagree	Knowledge	1
	I enjoy participating in activities in the neighbourhood [d]	(fully) agree – (fully) disagree	Attitudinal belief	1
	If I go to activities in the neighbourhood, I can forget my little discomforts and worries [d]	(fully) agree – (fully) disagree	Attitudinal belief (outcome expectation)	1
	If I want to participate in an activity, nothing will stop me [d]	(fully) agree – (fully) disagree	Self-efficacy belief	1
	In comparison to other elderly people, I perceive I can manage well in daily living [d]	(fully) agree – (fully) disagree	Self-efficacy belief	1/ 2
	I can solve most of the problems in daily life myself [d]	(fully) agree – (fully) disagree	Self-efficacy belief	1/ 2
	Normally, I take the initiative and introduce myself to an unknown person [d]	(fully) agree – (fully) disagree	Self-efficacy belief	1/ 2
	I like to meet new people [d]	(fully) agree – (fully) disagree	Attitudinal belief	1
	I perceive it as important to stay among men [d]	(fully) agree – (fully) disagree	Attitudinal belief	1
	I can manage in daily living as regards applying for certain facilities [d]	(fully) agree – (fully) disagree	Self-efficacy belief	2

[a] Target behaviours: 1) becoming or staying social engaged; 2) searching for support
[b] Excluded because of 2-point Likert scale items with a lot of missing values
[c] Excluded because item did not load on any of the components (factor loading <0.4)
[d] Improvement Cronbach's coefficient α after exclusion of item; or exclusion of item to reduce number of items within component with minor reduction of Cronbach's coefficient α



Appendix 5 as used in chapter 7

Comparability of De Jong Gierveld loneliness scale with three or five answering categories

Study design and study population

In 1996-1997, 2005 and 2010, three independent cross-sectional surveys were performed to measure the health status of non-institutionalised elderly people aged 65 years or older living in the region Gelre-IJssel, the Netherlands. Data were collected by means of written questionnaires containing questions about various determinants and outcomes of health. For 15 municipalities, data were available for each of the three consecutive time points. Population size ranged between 21.200 – 156.000 inhabitants in 2010 of which 14-23% aged 65 years and over.

For each study age-stratified random samples were taken from the municipal population registries. The first survey was conducted a one year period, 1996-1997, in two sub-regions. For one sub-region of 13 municipalities a random sample of 10% of the non-institutionalised older people of the sub-region was selected. In the second sub-region of 15 municipalities the 10% sample was stratified by municipality.

In the second and third survey, a study sample of respectively 500 and 600 individuals was randomly selected per municipality. People aged 75 years or older were oversampled to constitute half of the study population. As a result 250 respectively 300 persons aged 65-74 years and 250 respectively 300 persons aged 75 years or older were selected. For one larger city the sample was raised to 2500 persons, again stratified by age.

For the first and second survey a questionnaire with reply-envelope was sent to the selected subjects. After a period of 2.5-3 weeks and 5-6 weeks, the non-responders received a reminder by mail. With the second reminder the questionnaire was included again. In the first survey, non-responders were phoned by volunteers, who offered help with filling in the questionnaire; this was not done in the two other surveys. In the third survey, the first mailing was an invitation to conduct the survey online. After 2.5 week the questionnaire on paper was send to the non-responders. After an additional 3.5 week a reminder was send, this time without a copy of the questionnaire.

The response on regional level in the three studies was 80% in 1996-1997, 81% in 2005 and 61% 2010, of which 44% on paper and 15% digital.

De Jong Gierveld Loneliness Scale

Loneliness was measured using the De Jong Gierveld loneliness scale, which is based on a cognitive approach to loneliness [1, 2]. Loneliness is defined as an unpleasant or inadmissible lack of certain relationships or quality of these relationships. The scale is composed of 11 questions of which five are positively and six negatively formulated. In 1996/1997, the loneliness scale was used with 5 answer categories (yes!, yes, more or less, no, no!). In 2005 and 2010, 3 answer categories were provided (yes, more or less, no). For the positive items, 'no!' 'no' and 'more or less' answers were an indication of loneliness, whereas, for the negative items, 'yes!' 'yes' and 'more or less' were an indication of loneliness. So more or less answers were not neutral. A score of 0–2 corresponds to no loneliness, 3–8 to moderate loneliness, 9–10 to severe loneliness, and 11 to very severe loneliness. The scale permits one missing value per participant to which a score of 0 is given [1-3].

Observations

Looking to the positive formulated items it can be observed that 'more or less' answers more frequent in 2005 and 2010 (3-point scale), whereas the positive extreme 'yes' is more frequent in 1996/1997 (5-point scale). No structural differences are observed for the extreme negative answer 'no'. It can be argued that survey respondents are not keen to choose an extreme. 'Mean is normal' is one of the heuristics in survey response[4]. Accordingly, imagine a participant who doesn't give a wholehearted 'yes' on a positive question like 'There is always someone I can talk with', although he is quite satisfied with his social contacts, but is 'realistic' and admit that there is not *always* somebody to talk with. This person will be likely to choose 'yes' if there is also a 'yes!' (so in case of a 5-point scale), but if there is no 'yes!' option (so in case of a 3-point scale) this person will be likely to choose 'more or less'. As a consequence in the first situation his answer will be valued with a 0 (not lonely), whereas in the second situation his answer with a 1, counting for loneliness.

Table A5.1 General characteristics of study population in 1996/1997, 2005 and 2010 in percentages [a]

		1996/'97 (n=6144)	2005 (n=4868)	2010 (n=4773)
Gender (%)	Men	45	46	48
Age (%)	65-74	65	57	58
	75-84	29	36	34
	85+	6	7	7
Marital status (%)	Married or living together	67	68	71
	Divorced, separate living	2	3	4
	Widowhood	27	26	22
	Never been married	4	3	3
Education (%)	Illiterate or primary school	33	26	15
	Low	45	48	53
	Intermediate	12	14	15
	High	11	13	18
Disability in mobility (%)	1 or more disabilities	26	23	19
Chronic disease (%)	1 or more disease	65	64	67
Self-rated health (%)	Fair or poor	40	25	24
Loneliness (%) [b]	Not lonely (0-2)	68	60	62
	Mildly lonely (3-8)	27	34	32
	Severely lonely (9-10)	4	4	4
	Very severely lonely (11)	2	2	2

[a] Rounding off make that some total scores exceed 100%

[b] Loneliness is measured with the De Jong Gierveld Loneliness Scale: 5-point scale in 1996/1997 and 3-point scale in 2005 and 2010

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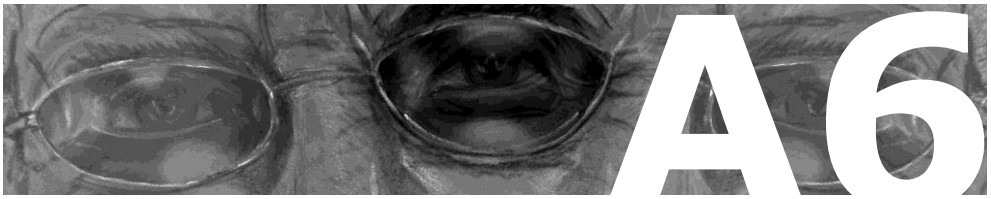
Table A5.2 Items response on the De Jong Gierveld loneliness scale in 1996/1097, 2005 and 2010

	Answer	1996/1997 5-point scale[c]	2005 3-point scale[d]	2010 3-point scale[d]
Positive formulated items[a]		%	%	%
1. There is always someone I can talk with	'No' and 'No!'	6	7	4
	More or less	14	20	19
	'Yes' and 'Yes!'	81	73	76
4. There are plenty of people I can lean on when I have problems	'No' and 'No!'	7	6	6
	More or less	13	17	17
	'Yes' and 'Yes!'	81	78	77
7. There are many people I can trust completely	'No' and 'No!'	11	10	10
	More or less	19	29	30
	'Yes' and 'Yes!'	70	61	59
8. There are enough people I feel close to	'No' and 'No!'	7	8	7
	More or less	14	21	21
	'Yes' and 'Yes!'	79	72	72
11. I can call on my friends whenever I need them	'No' and 'No!'	8	7	6
	More or less	15	21	21
	'Yes' and 'Yes!'	76	72	73
Negative formulated items[b]				
2. I miss having a really close friend	'No' and 'No!'	83	79	80
	More or less	8	12	13
	'Yes' and 'Yes!'	9	9	7
3. I experience a general sense of emptiness	'No' and 'No!'	82	80	81
	More or less	10	13	13
	'Yes' and 'Yes!'	9	7	6
5. I miss the pleasure of the company of others	'No' and 'No!'	81	7	79
	More or less	11	15	15
	'Yes' and 'Yes!'	8	6	5
6. I find my circle of friends and acquaintances too limited	'No' and 'No!'	80	77	77
	More or less	10	16	16
	'Yes' and 'Yes!'	10	8	6
9. I miss having people around me	'No' and 'No!'	83	81	82
	More or less	10	14	14
	'Yes' and 'Yes!'	8	5	5
10. I often feel rejected	'No' and 'No!'	90	90	9
	More or less	6	7	8
	'Yes' an 'Yes!'	4	3	3

[a] Neutral and negative answers ('no' of 'no!') indicate loneliness on positive formulated items
[b] Neutral and positive answers ('yes' of 'yes!') indicate loneliness on negative formulated items; [c] 5-points Likert scale range: 'yes!' 'yes' 'more or less' 'no' 'no!'; [d] 3-points Likert scale range: 'yes' 'more or less' 'no'



A6

Appendix 6 as used in chapter 7

Outcome indicators included in questionnaire of Healthy Ageing (In Dutch)

Loneliness: De Jong Gierveld loneliness scale [1, 2]

Er volgen nu enkele uitspraken. Wilt u voor elk van de volgende uitspraken aangeven in hoeverre die op u, zoals u de laatste tijd bent, van toepassing is? (Let u er a.u.b. op dat u bij elke regel een hokje aankruist.)

		Ja	Min of meer	Nee
a.	Er is altijd wel iemand in mijn omgeving bij wie ik met mijn dagelijkse probleempjes terecht kan.	❑	❑	❑
b.	Ik mis een echt goede vriend of vriendin.	❑	❑	❑
c.	Ik ervaar een leegte om mij heen.	❑	❑	❑
d.	Er zijn genoeg mensen op wie ik in geval van narigheid kan terugvallen.	❑	❑	❑
e.	Ik mis gezelligheid om mij heen.	❑	❑	❑
f.	Ik vind mijn kring van kennissen te beperkt.	❑	❑	❑
g.	Ik heb veel mensen op wie ik volledig kan vertrouwen.	❑	❑	❑
h.	Er zijn voldoende mensen met wie ik me nauw verbonden voel.	❑	❑	❑
i.	Ik mis mensen om mij heen.	❑	❑	❑
j.	Vaak voel ik me in de steek gelaten.	❑	❑	❑
k.	Wanneer ik daar behoefte aan heb, kan ik altijd bij mijn vrienden terecht.	❑	❑	❑

Social support: Short Social Support List- Interactions (SSL12-I) [3, 4]

De volgende vragen gaan over uw omgang met andere mensen. Wilt u steeds aangeven of u de omschreven situatie weleens ervaart. Wilt u bij iedere vraag het antwoord dat het meest op u van toepassing is aankruisen?

	Gebeurt het wel eens dat men……	Zelden of nooit	Af en toe	Regelmatig	Erg vaak
a.	…u uitnodigt voor een feestje of etentje?	❑	❑	❑	❑
b.	…gezellig bij u op bezoek komt?	❑	❑	❑	❑
c.	…genegenheid voor u toont?	❑	❑	❑	❑
d.	… u troost?	❑	❑	❑	❑
e.	… u complimenten geeft?	❑	❑	❑	❑
f.	… interesse in u toont?	❑	❑	❑	❑
g.	… u hulp biedt in bijzondere gevallen zoals bij ziekte en verhuizing?	❑	❑	❑	❑
h.	… u geruststelt?	❑	❑	❑	❑
i.	… u goede raad geeft?	❑	❑	❑	❑
j.	… u in vertrouwen neemt?	❑	❑	❑	❑
k.	… u om hulp of advies vraagt?	❑	❑	❑	❑
l.	… uw sterke punten naar voren haalt?	❑	❑	❑	❑

Social network: Wenger's network typology [5]

a. Op welke afstand woont uw kind of een ander familielid dat het dichtst bij woont?

- ❑ In hetzelfde huishouden
- ❑ Binnen een straal van 1,5 km
- ❑ 1,5 - 8 km
- ❑ 9 - 24 km
- ❑ 25-80 km
- ❑ Meer dan 80 km
- ❑ Niet van toepassing; ik heb geen familieleden (meer)

b. Indien u kinderen heeft, waar woont het kind dat het dichtst bij woont?

- ❑ In hetzelfde huishouden
- ❑ Binnen een straal van 1,5 km
- ❑ 1,5 - 8 km
- ❑ 9 - 24 km
- ❑ 25-80 km
- ❑ Meer dan 80 km
- ❑ Niet van toepassing; ik heb geen familieleden (meer)

c. Indien u broers of zusters heeft, waar woont de broer of zus die het dichtst bij woont?

- ❑ In hetzelfde huishouden
- ❑ Binnen een straal van 1,5 km
- ❑ 1,5 - 8 km
- ❑ 9 - 24 km
- ❑ 25-80 km
- ❑ Meer dan 80 km
- ❑ Niet van toepassing; ik heb geen familieleden (meer)

d. Hoe vaak ontmoet u uw kinderen of andere familieleden?

- ❑ Dagelijks
- ❑ 2 tot 3 keer per week
- ❑ Ten minste wekelijks
- ❑ Ten minste maandelijks
- ❑ Minder dan 1 keer per maand
- ❑ Nooit
- ❑ Niet van toepassing; ik heb geen familie (meer)

e. Indien u vrienden of kennissen in uw gemeenschap of buurt hebt, hoe vaak maakt u een praatje met hen of doet u iets gezamenlijk?

- ❑ Dagelijks
- ❑ 2 tot 3 keer per week
- ❑ Ten minste wekelijks
- ❑ Ten minste maandelijks
- ❑ Minder dan 1 keer per maand
- ❑ Nooit
- ❑ Niet van toepassing; ik heb geen familie (meer)

f. Hoe vaak maakt u een praatje met de buren of doet u iets gezamenlijk met hen?

- ❑ Dagelijks
- ❑ 2 tot 3 keer per week
- ❑ Ten minste wekelijks
- ❑ Ten minste maandelijks
- ❑ Minder dan 1 keer per maand
- ❑ Nooit
- ❑ Niet van toepassing; ik heb geen familie (meer)

g. Bezoekt u kerkelijke bijeenkomsten?

- ❑ Ja, regelmatig
- ❑ Ja, af en toe
- ❑ Nee

h. Bezoekt u wel eens bijeenkomsten van een vereniging, een club, een lezing, of iets dergelijks?

- ❑ Ja, regelmatig
- ❑ Ja, af en toe
- ❑ Nee

Social engagement

Hieronder staat een aantal activiteiten. Wilt u aangeven hoe vaak u deze activiteiten doet?
(Let u er a.u.b. op dat u bij elke regel (a, b, c, enz.) een hokje aankruist.)

		(Vrijwel) dagelijks	Een paar keer per maand	Eén keer per maand of	(Vrijwel) nooit	Niet van toepassing
a.	Op bezoek gaan	❑	❑	❑	❑	❑
b.	Bezoek ontvangen	❑	❑	❑	❑	❑
c.	Wandelen	❑	❑	❑	❑	❑
d.	Fietsen	❑	❑	❑	❑	❑
e.	Meedoen met ouderensport (zoals ouderengym, ouderenzwemmen, (volks)dans)	❑	❑	❑	❑	❑
f.	Overige sporten (zoals bijvoorbeeld: tennis, zwemmen, dansen)	❑	❑	❑	❑	❑
g.	Gezelschapsactiviteiten (zoals jeu de boules, biljart, kegelen, koersbal)	❑	❑	❑	❑	❑
h.	Verenigingsactiviteiten anders dan sport (zoals toneel, schutterij, carnaval)	❑	❑	❑	❑	❑
i.	Activiteiten voor politieke of belangenvereniging	❑	❑	❑	❑	❑
j.	Culturele activiteiten (zoals bezoek museum, bioscoop, theater)	❑	❑	❑	❑	❑
k.	Naar het buurthuis, ouderensoos, koffieochtend	❑	❑	❑	❑	❑
l.	Vrijwilligerswerk doen	❑	❑	❑	❑	❑
m.	Betaald werk doen	❑	❑	❑	❑	❑
n.	Hobby uitvoeren, cursus doen	❑	❑	❑	❑	❑
o.	Werk voor de kerk doen	❑	❑	❑	❑	❑
p.	Passen op de kleinkinderen	❑	❑	❑	❑	❑
r.	Verzorgen van zieke partner	❑	❑	❑	❑	❑
s.	Verzorgen van zieke, anders dan partner.	❑	❑	❑	❑	❑
t.	Bij anderen klusjes doen	❑	❑	❑	❑	❑

u.	Bibliotheek bezoeken	❑	❑	❑	❑	❑
v.	Internetten/ e-mailen	❑	❑	❑	❑	❑
w.	Tv kijken, radio luisteren	❑	❑	❑	❑	❑
x.	Lezen (kranten, tijdschriften, boeken)	❑	❑	❑	❑	❑
y.	Tuinieren	❑	❑	❑	❑	❑
z1.	Overige recreatieve activiteiten (zoals bezoek sportwedstrijd, naar natuur- of recreatiegebied, op vakantie gaan)	❑	❑	❑	❑	❑
z2.	Anders, namelijk	❑	❑	❑	❑	❑

Loneliness Literacy Scale (Chapter 4)

Met het ouder worden kunnen mensen uiteenlopende problemen ervaren. Dit kunnen praktische problemen zijn, bijvoorbeeld bij het doen van het huishouden of de boodschappen. Ook kunt u te maken krijgen met emotionele problemen zoals gevoelens van somberte of gemis na het verlies van uw partner.
Hieronder staan een aantal stellingen over het hulpverleningsaanbod bij emotionele problemen. Wilt u aangeven in hoeverre u het eens bent met de stellingen.

		Helemaal eens	Beetje eens	Eens noch oneens	Beetje oneens	Helemaal oneens
a.	In mijn gemeente worden bijeenkomsten rondom rouwverwerking aangeboden.	❑	❑	❑	❑	❑
b.	In mijn gemeente zijn er professionele hulpverleners die kunnen helpen als mensen zich somber of eenzaam voelen.	❑	❑	❑	❑	❑

Hieronder staan een aantal stellingen over hoe u om gaat of om denkt te gaan met uiteenlopende problemen.

	Zeker wel	Waar-schijnlijk wel	Misschien	Waar-schijnlijk niet	Zeker niet
c. Als ik problemen zou hebben, zou een gesprek met een ouderenadviseur mij zeker helpen bij het vinden van een oplossing.	❑	❑	❑	❑	❑
d. Een gespreksgroep zal me helpen mijn problemen m.b.t. het ouder worden een plekje te geven.	❑	❑	❑	❑	❑
e. Als ik me eenzaam zou voelen, dan zou ik professionele hulp zoeken, zodat ik kan leren omgaan met deze gevoelens.	❑	❑	❑	❑	❑
f. Als ik mijn partner zou verliezen, zou ik naar een rouwverwerking-cursus gaan.	❑	❑	❑	❑	❑

In de volgende stellingen gaan over uw zelfredzaamheid. Wilt u de volgende zin aanvullen: “Ik kan me goed redden in het dagelijks leven als het gaat om…”

	Helemaal eens	Beetje eens	Eens noch oneens	Beetje oneens	Helemaal oneens
a. Het regelen van vervoer naar activiteiten.	❑	❑	❑	❑	❑
b. Het aanvragen van bepaalde voorzieningen.	❑	❑	❑	❑	❑
c. Het vinden van informatie.	❑	❑	❑	❑	❑

De volgende stellingen gaan over de rol van vrienden en familie in uw leven. Kunt u voor iedere stelling aangeven in hoeverre u het hiermee eens bent. (Let u er a.u.b. op dat u bij elke regel één hokje aankruist.)

		Helemaal eens	Beetje eens	Eens noch oneens	Beetje oneens	Helemaal oneens
a.	Mijn kinderen en familie vinden het belangrijk dat ik deelneem aan activiteiten waarbij ik anderen ontmoet.	❑	❑	❑	❑	❑
b.	Ik vind de mening van mijn kinderen en familie belangrijk.	❑	❑	❑	❑	❑
c.	Mijn kinderen en familie staan altijd voor mij klaar als ik om hulp vraag	❑	❑	❑	❑	❑
d.	Mijn buren vinden het belangrijk dat ik deelneem aan activiteiten waarbij ik anderen ontmoet.	❑	❑	❑	❑	❑
e.	Ik vind de mening van mijn buren belangrijk.	❑	❑	❑	❑	❑
f.	Mijn buren staan altijd voor me klaar als ik om hulp vraag.	❑	❑	❑	❑	❑
g.	Mijn vrienden vinden het belangrijk dat ik deelneem aan activiteiten waarbij ik anderen ontmoet.	❑	❑	❑	❑	❑
h.	Ik vind de mening van mijn vrienden belangrijk.	❑	❑	❑	❑	❑
i.	Mijn vrienden staan altijd voor mij klaar als ik om hulp vraag.	❑	❑	❑	❑	❑

De volgende stellingen gaan over hoe u in het dagelijks leven staat. Kunt u voor iedere stelling aangeven in hoeverre u het hiermee eens bent. (Let u er a.u.b. op dat u bij elke regel één hokje aankruist.)

		Helemaal eens	Beetje eens	Eens noch oneens	Beetje oneens	Helemaal oneens
a.	Door deel te nemen aan activiteiten, blijf ik onder de mensen.	❑	❑	❑	❑	❑
b.	Ik voel me zelfverzekerd genoeg om alleen naar een activiteit te gaan.	❑	❑	❑	❑	❑
c.	Ik kan ongeveer alles als ik mijn zinnen erop gezet heb.	❑	❑	❑	❑	❑
d.	Als ik hulp van anderen nodig heb, kan ik dat zelf regelen.	❑	❑	❑	❑	❑
e.	In een groep vrienden voer ik regelmatig het woord.	❑	❑	❑	❑	❑

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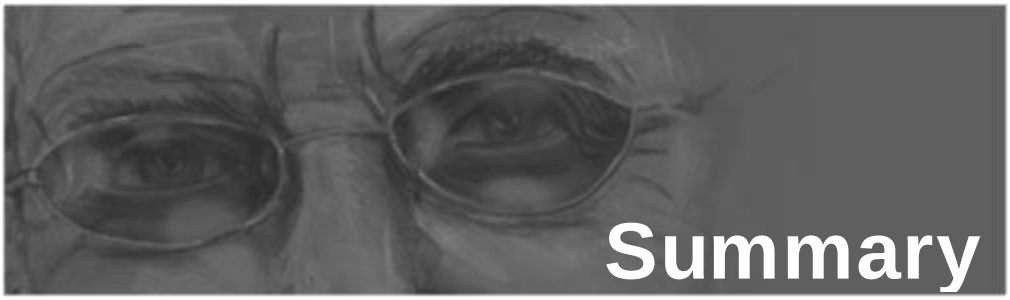


Summary

Summary

Concerns about the ageing population and formal responsibilities of local governments to promote social cohesion and enhance participation of vulnerable groups in society placed loneliness prevention high on the local policy agenda of Dutch municipalities. The study described in this thesis was part of the Healthy Ageing programme of the Academic Collaborative Centre AGORA and aimed to contribute to more effective, evidence-based and problem-oriented approaches to healthy ageing at the local level. The general aim of this thesis was to evaluate the effectiveness of a local intervention project – called *Healthy Ageing* – targeting loneliness among non-institutionalised elderly people. This was done by studying determinants of trends and regional variation in loneliness, developing an evaluation study design including a process and effect evaluation, developing an indicator to assess short-term outcomes of *Healthy Ageing*, and by performing a process and effect evaluation.

Loneliness has often been defined as the unpleasant or inadmissible lack of (the quality of) certain relationships, caused by a discrepancy between the desired and realised social contacts of an individual. Age-related life events, such as retirement, moving to sheltered housing, death of a partner or other relatives, and age-related health problems affect on the one hand the social network ties and on the other hand the social support needs of elderly people, two important factors related to loneliness. Three coping styles can be distinguished to reduce feelings of loneliness, namely, network development, lowering standards regarding relationships, and reducing the importance of the loneliness experience.

The ageing of society is associated with demographic and societal changes such as more single-family households and changing network ties, which are risk factors for loneliness. So far, it is unclear what the consequences of these changes are for trends and regional variation in loneliness, as scientific data are limited. Therefore, in chapter 2, we investigated the influence of socio-demographic and health characteristics on time trends and regional differences in the prevalence of loneliness. Data were gathered from 9,641 persons who participated in the Elderly Health Survey of the community health service, GGD Noord- en Oost-Gelderland (former GGD Gelre-IJssel), in 2005 or 2010. Male gender, older age, not being married, difficulties with managing on income, mobility disabilities, and suffering from a chronic disease were independently associated with higher loneliness scores. Overall and across municipalities, trends in loneliness remained stable between 2005 and 2010. However, among the subgroup with mobility disabilities, loneliness increased over time. Furthermore, mobility disabilities and marital status were the most important factors explaining regional differences.

Chapter 3 described the study protocol for the evaluation of *Healthy Ageing*. The project aimed to reduce loneliness among non-institutionalised elderly people aged 65 years or older by 10% in two years, i.e. from a mean score of 2.6 to 2.4 on the De Jong Gierveld loneliness scale. The most important sub-objectives were: 1) to reduce loneliness in the high-risk groups (physical limitations, low income, recent widowhood, mild mental disabilities) and 2) to create more awareness about the existence of loneliness in the general population. A logic model was developed to guide the evaluation design. The model included the components inputs, activities, outputs, short-term or initial outcomes (loneliness health literacy – also called loneliness literacy), intermediate outcomes (social participation – also called social engagement), long-term outcomes (network quality), and the overall goal (loneliness). In order to address the complexity of a real-life setting, the evaluation design comprised two components. First, a quasi-experimental pre-test post-test design was used to evaluate the effectiveness of the overall intervention. A control community comparable to the intervention community was selected, with baseline measurements in 2008 and follow-up measurements in 2010. Complementarily, different side studies (also called satellite studies) were planned to evaluate the individual intervention components which aimed to focus on delivery, reach, acceptance, and short-term outcomes. Different means were used to collect these data, i.e. project records and surveys among participants.

Chapter 4 reported the development and evaluation of the Loneliness Literacy Scale. The scale aimed to be topic- and context-specific for the assessment of short-term outcomes of *Healthy Ageing* at the level of behavioural determinants. Scale development was based on evidence from the literature and experiences from local stakeholders and representatives of the target group. Accordingly, the scale was pre-tested among 303 elderly persons. Four constructs, labelled as motivation, self-efficacy, perceived social support, and subjective norm, were derived from the principal component analysis. Cronbach's coefficient α was above 0.7 for each construct. Concurrent validity was sufficient for three constructs as self-efficacy and social support were positively and subjective norm was negatively associated with loneliness.

Chapters 5 and 6 discussed the results of the evaluation study. *Healthy Ageing* distinguished itself from other loneliness interventions by its population strategy and integrated approach, resulting in a combination of intervention components directed at elderly people themselves and persons in their social environment. After two years, Healthy Ageing consisted of five intervention components, namely, a mass media campaign, information meetings, psychosocial group courses, social activities organised by neighbours – Neighbours Connected –, and training of intermediaries.

Chapter 5 focused on the acceptability of the mass media communication materials, information meetings, and psychosocial courses according to clients of the meal delivery service. The mass media communication materials appeared not to be successful in attracting attention because interviewees' expectations about the communication channels differed from what was provided, the perceived personal relevance of the message was low, and the presentation was not attractive. Moreover, the content of the intervention components was not well received because the objectives and components did not connect with the priority group's perception of their environment. The study concluded with the recommendation to adapt intervention strategies to the needs of the target population by involving them in the intervention development. Strategies like storytelling and personal invitation were suggested as potential alternatives.

Chapter 6 reported the results of the quasi-experimental study and the satellite studies. The satellite studies showed that the reach and intensity of the intervention components were modest. It appeared from the quasi-experimental study that 39% of the study participants from the intervention community were familiar with Healthy Ageing at follow-up. Moreover, the intervention group scored more favourably on the loneliness literacy subscales, motivation (4.4%), perceived social support (8.2%), and subjective norm (11.5%). However, no overall effects were observed for the intermediate and ultimate outcomes, total social support and loneliness. Within the intervention community, results for participants who were familiar with the intervention pointed in the same direction. Finally, given the content of the intervention components, the effect of *Healthy Ageing* on the loneliness literacy subscale, motivation, is plausible, on the subscales, perceived social support and subjective norm, probable, and on the subscale, self-efficacy, unlikely. However, whether the initial effects will carry forward to the intermediate and ultimate outcomes needs further confirmation.

Study participants were not randomly assigned to the intervention and the control group, but a control community was selected based on relevant population characteristics. Consequently, the intervention and the control group were highly comparable except for church attendance and mental health, for which the analyses were adjusted. Furthermore, the persons in the analytical samples were slightly healthier than the source populations. However, as the overall intervention exposure was marginal, disturbance of the observed effects is perceived to be negligible.

The modest effects of *Healthy Ageing* can be explained by the challenges on organisational level, i.e. mobilising stakeholders and obtaining political commitment at the start of our community intervention delayed and suppressed project implementation. Furthermore, the project might have benefited from a more

systematic approach in order to ensure better alignment between the intervention components and formulated objectives, and to target subgroups by using different strategies for each subgroup.

Chapter 7 discussed the main findings, methodological considerations, and the implications of this study for public health practice. It was concluded that, despite the fact that an increasing trend in loneliness is not proven by our study and by other studies in the literature, loneliness among elderly people is still an important topic to prioritise. Persons with mobility disabilities, in particular, need attention as our results suggest increases in loneliness within this subgroup. Furthermore, disabled persons might be unequally affected by new policies which stimulate social engagement and independence into old age.

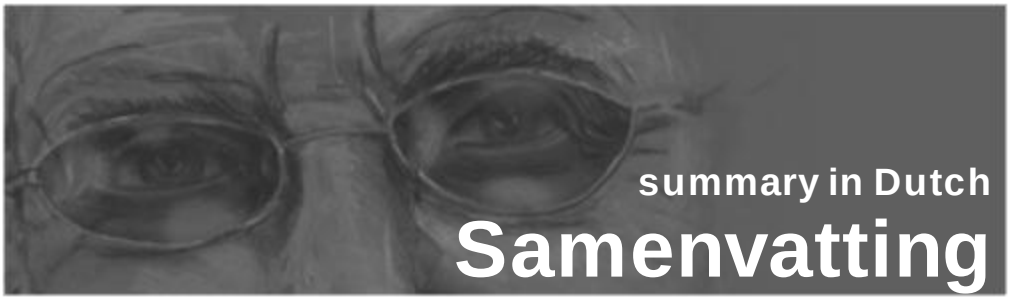
The nature of *Healthy Ageing*, using a population strategy and an integrated approach, challenged the evaluation design and the selection of related outcome indicators. Therefore, a logic model was developed to identify a range of outcomes preceding loneliness. It was concluded that the evidence base for the right side of the logic model was quite strong. Furthermore, the loneliness literacy subscales, self-efficacy and perceived social support, appeared to correlate well with total social support and loneliness. However, the subscale, motivation, was not associated with either of the distal outcomes, and the subscale, subjective norm, was negatively associated with loneliness and was not associated with total social support. In addition, we argued that the responsiveness of the indicators for social engagement and social network structure was insufficient and therefore these outcomes were not included in the effect evaluation.

With regard to the implementation of *Healthy Ageing*, it seemed that healthier and more socially integrated elderly persons were reached by the mass media communication materials and information meetings, and for the organisation of activities within Neighbours Connected. On the other hand, Neighbours Connected and the psychosocial courses seem to have reached better the more vulnerable elderly people. However, the overall exposure and intensity were rather limed. Furthermore, the mass media communication and information meetings seemed to be appropriate to raise awareness, but they were not likely to induce behaviour change.

Chapter 7 concluded with the implications of the results of this study for the improvement of Healthy Ageing; these implications are also highly relevant for other healthy ageing and loneliness prevention programmes. First, we recommend differentiating explicitly between subgroups of elderly people and persons in their social environment, and adapting the intervention components accordingly to the needs of these subgroups by involving representatives during all stages of

intervention development. Second, it is essential to formulate objectives for proximal as well as distal outcomes and for different target groups at the micro-, meso-, and macro-level together with local stakeholders. This will enable the project team to judge whether the project is on track and whether project adaptations are necessary.

To conclude, *Healthy Ageing* was the first formal study performed in close collaboration with policy, practice, and research within the Gelre-IJssel region. Further, it was the first formal programme targeting preventive elderly healthcare in this region and one of the first community intervention programmes targeting loneliness prevention. All in all, this thesis provides valuable lessons for the development of high-quality evaluation designs in public health practice. The evaluation of Healthy Ageing illustrates how researchers can cope with the evaluation challenges of complex interventions which cannot be fully controlled.



summary in Dutch

Samenvatting

Samenvatting

Achtergrond

Veranderingen in de Wet Publieke Gezondheid en de nieuwe Wet Maatschappelijke Ondersteuning benadrukken de verantwoordelijkheid van lokale overheden voor preventieve ouderengezondheidszorg. Gemeenten streven naar het versterken van de sociale cohesie en stimuleren participatie van kwetsbare groepen. Daarnaast vraagt de vergrijzende samenleving om activiteiten die gezond ouder worden bevorderen om de stijgende zorgkosten in de hand te houden. De preventie van eenzaamheid sluit hierbij aan en staat hoog op de politieke agenda van gemeenten in Nederland.

De studie die beschreven wordt in dit proefschrift was onderdeel van het programma Gezond Ouder Worden van de Academische werkplaats AGORA. Gezond Ouder Worden had tot doel een bijdrage te leveren aan een kwalitatieve en effectieve aanpak om gezond ouder worden op lokaal niveau te bevorderen. Het overkoepelende doel van dit proefschrift is het evalueren van het lokale interventieproject *'Gezond Ouder Worden in Epe'* dat zich richt op de preventie van eenzaamheid onder zelfstandig wonende ouderen. Deze studie omvat verschillende onderdelen, namelijk: een analyse van de determinanten van veranderingen in eenzaamheid over de tijd en regionale verschillen in eenzaamheid, de ontwikkeling van een evaluatieplan bestaande uit een proces- en effectevaluatie, de ontwikkeling van een meetinstrument om korte termijnuitkomsten van *Gezond Ouder Worden* te meten, en tot slot de uitvoering van de proces- en effectevaluatie.

Wat is eenzaamheid?

Eenzaamheid wordt gedefinieerd als het subjectief ervaren van een onplezierig of ontoelaatbaar gemis aan (kwaliteit van) bepaalde sociale relaties. Aan leeftijd gerelateerde levensgebeurtenissen, zoals pensioneren, verhuizing naar een seniorenappartement, het overlijden van de partner of andere naasten beïnvloeden aan de ene kant de structuur van sociale netwerken. Aan de ander kant kunnen gezondheidsproblemen ten gevolge van het ouder worden de behoefte aan sociale steun van ouderen vergroten. Eenzaamheidsgevoelens kunnen ontstaan als ouderen minder steun ervaren dan waar zij behoefte aan hebben. In de literatuur worden drie oplossingsrichtingen geïdentificeerd die gevoelens van eenzaamheid kunnen verminderen. Iemand kan zijn sociale netwerk verbeteren door nieuwe contacten aan te gaan of bestaande contacten te intensiveren. Daarnaast kan iemand zijn behoeften ten aanzien van relaties bijstellen of proberen het ervaren gemis te relativeren.

Trends in eenzaamheid

Als gevolg van de vergrijzing veranderen de demografische kenmerken van de populatie en ook sociale netwerken veranderen, bijvoorbeeld kleinere gezinnen en grotere afstanden tussen familieleden. Deze veranderingen hebben mogelijk invloed op het voorkomen van eenzaamheid in onze maatschappij. Daarom hebben we in hoofdstuk 2 gekeken naar de invloed van sociaal-demografische factoren en gezondheidsfactoren op de mate van eenzaamheid in de tijd en op verschillen in eenzaamheid tussen gemeenten. Voor deze studie zijn gegevens van 9,641 ouderen gebruikt die deelnamen aan de ouderenmonitor van de GGD Noord- en Oost-Gelderland (voormalig GGD Gelre-IJssel) in 2005 of 2010. Uit het onderzoek bleek dat geslacht (mannen), leeftijd (oude ouderen), burgerlijke staat (weduwen, gescheiden ouderen, alleenstaande ouderen), moeite met rondkomen, mobiliteitsproblemen en chronische ziekten onafhankelijk van elkaar het risico op eenzaamheid vergroten. Binnen de gehele regio en binnen gemeenten was de mate van eenzaamheid in 2005 en 2010 niet significant verschillend. De mate van eenzaamheid onder ouderen met mobiliteitsproblemen was echter hoger in 2010 dan in 2005. Daarnaast bleken mobiliteitsproblemen en burgerlijke staat de belangrijkste factoren voor de verschillen tussen gemeenten.

Evaluatieplan

Hoofdstuk 3 beschrijft het onderzoeksprotocol voor de evaluatie van *Gezond Ouder Worden*. Het doel van het project was een vermindering van eenzaamheid onder zelfstandig wonende ouderen van 65 jaar en ouderen van 10% in 2 jaar. Dit betekent dat de gemiddelde score van eenzaamheid verschuift van 2.6 naar 2.4 op de eenzaamheidsschaal van De Jong Gierveld. De belangrijkste subdoelen waren: 1) het verminderen van eenzaamheid in hoog risicogroepen (ouderen met lichamelijke beperkingen, een laag inkomen, recent verlies van de partner, mild depressieve klachten) en 2) het verhogen van het bewustzijn van het vóórkomen van eenzaamheid bij de algemene bevolking. Voor de ontwikkeling van het evaluatieplan is een logisch model ontwikkeld. Het logisch model bestaat uit verschillende componenten, namelijk: inputs, activiteiten, outputs, korte-termijn of initiële uitkomsten (aan eenzaamheid gerelateerde gezondheidsvaardigheden – loneliness literacy), intermediaire uitkomsten (sociale participatie), lange-termijn uitkomsten (kwaliteit van het sociale netwerk) en het einddoel (eenzaamheid). Omdat *Gezond Ouder Worden* uit meerdere componenten bestond en werd uitgevoerd in de dagelijkse praktijk bestond het evaluatieplan uit twee onderdelen. Het eerste evaluatieonderdeel betreft een quasi-experimentele studie met een voormeting in 2008 en een nameting in 2010 om het effect van het totale project op populatieniveau te bepalen. Voor deze studie is een controlegemeente geselecteerd met vergelijkbare kenmerken als de interventiegemeente. Aanvullend zijn verschillende satelliet studies gepland om de individuele interventie onderdelen

te evalueren. Deze studies richtten zich op de implementatie, het bereik, de acceptatie en de korte-termijn uitkomsten. Voor deze studies zijn verschillende methoden van dataverzameling gebruikt, zoals registraties van het aantal deelnemers en evaluatieformulieren om de waardering van bijeenkomsten inzichtelijk te maken.

Ontwikkeling van Loneliness Literacy Scale

Hoofdstuk 4 beschrijft de ontwikkeling en evaluatie van de 'Loneliness Literacy Scale'. We beoogden een schaal te ontwikkelen die specifiek was voor het onderwerp eenzaamheid en de lokale context en die veranderingen in de korte-termijn uitkomsten van *Gezond Ouder Worden*, op het niveau van gedragsdeterminanten, kon meten. Voor de ontwikkeling van de schaal is gebruik gemaakt van wetenschappelijk literatuur en ervaringen van lokale partners en ouderen zelf. De schaal is getest onder 303 ouderen. Door het gebruik van principale componenten analyses zijn vier constructen onderscheiden, namelijk motivatie, self-efficacy, ervaren sociale steun en subjectieve norm. De Cronbach's coefficient α was groter dan 0.7 voor elk van de vier constructen. Dit duidt op een goede interne consistentie van de items binnen het construct. De positieve associatie tussen self-efficacy en respectievelijk ervaren sociale steun en eenzaamheid, en de negatieve associatie tussen subjectieve norm en eenzaamheid leidde tot de conclusie dat de concurrent validity naar behoren was.

Resultaten van *Gezond Ouder Worden*

Hoofdstuk 5 en 6 beschrijven de resultaten van de evaluatiestudie. *Gezond Ouder Worden* richtte zich op de vermindering van eenzaamheid binnen de gehele ouderenpopulatie in de gemeente, een zogenaamde populatiestrategie. Daarnaast beoogde het project een geïntegreerde aanpak door verschillende interventieactiviteiten gericht op ouderen zelf en op mensen in hun omgeving te combineren. Hiermee onderscheid het project zich van andere eenzaamheidsinterventies die zich vaak met een enkelvoudige interventie richten op een selectieve groep. Na 2 jaar bestond *Gezond Ouder Worden* uit vijf onderdelen: een massa mediale campagne, voorlichtingsbijeenkomsten, psychosociale groepscursussen, sociale activiteiten georganiseerd door en voor buren – Voor Elkaar in de Buurt – en de training van professionals en vrijwilligers die met ouderen werken.

In hoofdstuk 5 is de acceptatie van de massa mediale communicatiematerialen, de voorlichtingsbijeenkomsten en groepscursussen onder cliënten van de maaltijdservice in de interventiegemeente onderzocht. Uit de interviews bleek dat de communicatiematerialen niet goed in staat waren om de aandacht van de ouderen te trekken. De geïnterviewden gaven aan andere verwachtingen te

hebben van de gebruikte communicatiekanalen. Daarnaast ervoer men een lage persoonlijke relevantie van de boodschap en vond men dat de krantenartikelen niet erg aantrekkelijk waren door de feitelijke insteek. Verder bleek dat de doelen en de inhoud van de interventieactiviteiten in beperkte mate aansloten bij het dagelijks leven van de geïnterviewden. Hoofdstuk 5 wordt afgesloten met de aanbeveling om de doelgroep actiever te betrekken bij de ontwikkeling en de verbetering van de interventieactiviteiten zodat de activiteiten beter aansluiten bij de behoeften van de doelgroep. Verhalen vertellen (storytelling) en het persoonlijk uitnodigen van de doelgroep zijn interventiestrategieën die mogelijk een goede aanvulling zijn.

Hoofdstuk 6 rapporteert de resultaten van de quasi-experimentele studie en satelliet studies. De satelliet studies laten zien dat het bereik en de intensiteit van de interventieonderdelen beperkt waren. Uit de nameting van de quasi-experimentele studie bleek dat 39% van de deelnemers van het onderzoek uit de interventiegemeente bekend was met *Gezond Ouder Worden*. Daarnaast scoorde de interventiegroep gunstiger dan de controlegroep op de loneliness literacy sub-schalen motivatie (4.4%), ervaren sociale steun (8.2%) en subjectieve norm (11.5%).Er werden echter geen effecten op de lange-termijn uitkomstmaat sociale steun en de hoofduitkomstmaat eenzaamheid gevonden. Op basis van de inhoud van de interventieactiviteiten wordt in hoofdstuk 6 geconcludeerd dat het gevonden effect van *Gezond Ouder Worden* op de loneliness literacy sub-schaal motivatie aannemelijk, op de sub-schalen ervaren sociale steun en subjectieve norm mogelijk en op de sub-schaal self-efficacy onwaarschijnlijk is. Aanvullend onderzoek is nodig om te kunnen concluderen dat de initiële effecten in de toekomst zullen leiden tot verbeteringen in de langere termijn uitkomsten.

Implicaties voor de praktijk

In hoofdstuk 7 worden de belangrijkste resultaten, methodologische overwegingen en implicaties van het onderzoek voor de praktijk van de publieke ouderengezondheidszorg besproken. Wij bevelen de preventie van eenzaamheid van harte aan als beleidsprioriteit, ondanks het feit dat van een stijgende trend in eenzaamheid geen sprake lijkt te zijn in de algemene oudere bevolking. De resultaten uit dit promotieonderzoek wijzen erop dat ouderen met mobiliteitsbeperkingen extra aandacht verdienen aangezien eenzaamheid lijkt toe te nemen in deze subgroep. Daarnaast is het voor ouderen met beperkingen moeilijker om actief mee te doen in de maatschappij en hebben zij extra ondersteuning nodig om hun zelfstandigheid te behouden. Dit zijn belangrijke uitgangspunten van het huidige gezondheids- en WMO-beleid.

Bij de ontwikkeling van het evaluatieplan en de selectie van de uitkomstindicatoren is rekening gehouden met de kenmerken van het project *Gezond Ouder Worden*,

namelijk de populatiestrategie en de geïntegreerde benadering. Om het onderzoek te ondersteunen is daarom een logisch model ontwikkeld dat de keten van uitkomsten voorafgaand aan eenzaamheid visualiseert. In hoofdstuk 7 reflecteren we op de kwaliteit van het model. We concluderen dat het wetenschappelijk bewijs voor het verband tussen eenzaamheid, sociale steun en sociale participatie vrij sterk is. Daarnaast blijken de loneliness literacy sub-schalen self-efficacy en ervaren sociale steun goed te correleren met totale sociale steun en eenzaamheid. De sub-schaal motivatie was echter niet geassocieerd met de lange-termijn uitkomsten en de sub-schaal subjectieve norm was negatief geassocieerd met eenzaamheid en niet met totale sociale steun. De betekent dat niet kan worden aangenomen dat de gevonden effecten in loneliness literacy op de langere termijn zullen leiden tot effecten in ervaren sociale steun en eenzaamheid. Tenslotte waren maatschappelijke participatie en structuur van het sociale netwerk, naast kwaliteit van het sociale netwerk (sociale steun), als intermediaire respectievelijk lange-termijn uitkomst opgenomen in het logisch model. Gedurende het onderzoek bleek echter dat de gevoeligheid van de indicatoren voor maatschappelijke participatie en sociaal netwerk niet voldoende was om verandering op te merken. Daarom zijn deze indicatoren niet opgenomen in de uiteindelijke effectevaluatie, waardoor ook de relatie tussen deze variabelen en andere variabelen in het logische model niet geëvalueerd konden worden.

De satelliet studies wijzen er op dat gezonde en meer sociaal geïntegreerde ouderen beter werden bereikt door de massa mediale communicatiematerialen, de informatiebijeenkomsten en voor Elkaar in de Buurt. Anderzijds zijn Voor Elkaar in de Buurt en de psychosociale cursussen er in geslaagd om meer kwetsbare ouderen te bereiken. We concluderen echter dat het totale bereik en de intensiteit van *Gezond Ouder Worden* na 2 jaar nog beperkt waren. Bovendien concluderen we dat massa mediale communicatiematerialen en informatiebijeenkomsten er waarschijnlijk in geslaagd zijn om bewustzijn over het belang van 'mee doen' te creëren, maar dat het niet aannemelijk is dat zij hebben geleid tot gedragsverandering. Het beperkte effect van *Gezond Ouder Worden* kan onder andere verklaard worden door de organisatorische uitdagingen waarvoor het project heeft gestaan. Het mobiliseren van organisaties in de gemeente die voor en met ouderen werken heeft meer tijd gekost dan van tevoren werd gedacht. Hierdoor heeft de implementatie van het project vertraging opgelopen en waren de interventieactiviteiten na 2 jaar nog niet volledig uitontwikkeld.

Hoofdstuk 7 besluit met de implicaties van de resultaten van dit promotieonderzoek voor de verbetering van *Gezond Ouder Worden*. De discussiepunten zijn ook zeer relevant voor andere programma's die zich richten op gezond ouder worden en/of eenzaamheidspreventie. Ten eerste wordt aanbevolen explicieter onderscheid te

maken tussen verschillende groepen ouderen en personen in de sociale omgeving. De interventie activiteiten zouden moeten worden toegespitst naar de behoeften van de specifieke doelgroep. Dit kan mede door de doelgroepen te betrekken tijdens alle fases van de interventieontwikkeling, zoals de probleemanalyse, het stellen van doelen en het ontwikkelen of selecteren van activiteiten. Ten tweede is het noodzakelijk om doelen te formuleren voor vroege en late uitkomsten en voor verschillende doelgroepen. Dit gebeurt bij voorkeur samen met lokale stakeholders. Deze doelen zullen het projectteam in staat stellen om te beoordelen of het project verloopt volgens plan en of het project bijgesteld dient te worden.

Gezond Ouder Worden was de eerste studie die is opgezet in nauwe samenwerking tussen praktijk, beleid en wetenschap in de regio Gelre-IJssel. Daarnaast was het project het eerste formele programma dat zich richtte op preventieve ouderengezondheidszorg in deze regio en een van de eerste community interventies die zich richtte op eenzaamheidspreventie. Terugkijkend levert dit proefschrift waardevolle lessen voor de ontwikkeling van evaluatieontwerpen met een hoge kwaliteit binnen de publieke gezondheid. De evaluatie van *Gezond Ouder Worden* illustreert hoe onderzoekers kunnen omgaan met de uitdagingen die een complexe interventie in de dagelijkse praktijk met zich meebrengt als niet alles volledig gecontroleerd kan worden.

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Rianne

About the author

Curriculum vitae

Rianne Honigh - de Vlaming was born on April 9th, 1984 in Gouda, the Netherlands. After completing secondary school at the 'Comenius College' in Capelle aan den IJssel, she started the Bachelor's programme Voeding en Gezondheid at Wageningen University. After having received her Bachelor's degree in 2005, she enrolled in the Master programme Nutrition and Health with the specialisation Public Health Nutrition and Epidemiology at Wageningen University. During her Masters she did an internship at the North-West University in Potchefstroom, South-Africa, on the benefits of vegetable gardens in relation to a school feeding programme at farm schools. She wrote her Masters' thesis on the effects of the Alcohol Moderation Project among youth in the Achterhoek, in collaboration with the Community Health Service GGD Gelre-IJssel. After having received her Master's degree in 2007 she was appointed as research assistant at the department of Human Nutrition, Wageningen University, and preformed a literature study on overweight prevention among elderly people by order of the Netherlands Nutrition Centre. In March 2007, she was appointed as research assistant and in May 2007 as PhD-fellow within the Healthy Ageing programme of AGORA, a collaboration between Wageningen University and GGD Noord- en Oost-Gelderland (former GGD Gelre-IJssel). Her research focussed on the evaluation of a local Healthy Ageing project directed on the prevention of loneliness among elderly people. During her PhD project, Rianne joined the education programme of the graduate school VLAG, she attended several (international) conferences and courses and she was involved in teaching at the BSc and MSc level. Additionally, she was a member to the organising committee of the PhD study tour to the Nordic Countries in 2009. In 2010, she contributed to the book 'Epidemiology in Public Healthy Practice'. From 2010 to 2012 she was also appointed as coordinator of the Master course Public Health Nutrition: development of nutrition intervention programme. After her PhD, Rianne was involved in a short research project of AGORA studying alcohol moderation policies among sport clubs.

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De Vlaming R, Croezen S, Lezwijn J, Naaldenberg J, Coenen I. GTST in de Academische Werkplaats, we zijn ONM: 'ervaringen uit het programma gezond ouder worden'. *Tijdschrift voor Gezondheidswetenschappen, 2010;88,3:21-22.* Nederlands Congres Volksgezondheid, Rotterdam, NL (2010).

Haveman-Nies A, de Weert L, de Vlaming R, Janssen D. Preventie van eenzaamheid: hoe dragen beleid, praktijk en wetenschap hun steentje bij? *Tijdschrift voor Gezondheidswetenschappen,* 2009;87:54. Nederlands Congres Volksgezondheid, Rotterdam, NL (2009).

De Vlaming R, Haveman-Nies A, van 't Veer P, de Groot L. Evalueren van een complexe interventie rondom eenzaamheid. WEON Conference, Amsterdam, NL (2009).

De Vlaming R, Croezen S, Haveman-Nies A, van 't Veer P, de Groot L. Using local epidemiologic data in public health practice: an illustration of healthy ageing. WEON Conference, Amsterdam, NL (2009) & Wageningen Nutrition Science Forum, Arnhem, NL (2009).

Book contributions

De Vlaming R. Construct a logic model. In: Haveman-Nies A, Jansen SC, van Oers JAM, et al., editors. Epidemiology in public health practice. 1 ed. Wageningen: Wageningen Academic Publishers; 2010. p. 159-83.

Reports

De Vlaming R, Lezwijn J, Coenen-van der Burg I. Praktijk + wetenschap = Waardevolle lessen in de preventieve ouderengezondheidszorg. Lessen en aanbevelingen uit het AGORA programma 'Gezond ouder worden'2006-2010 (intern rapport). GGD Gelre-IJssel; Academische werkplaats AGORA (2012).

De Vlaming R, Lezwijn J, de Weert L, Coenen-van der Burg I. Eindrapportage 'Gezond ouder worden in Epe' 2006-2010. GGD Gelre-IJssel; Academische werkplaats AGORA (2010).

De Vlaming R. Tussenrapportage 'Gezond ouder worden in Epe'. GGD Gelre-IJssel; Academische werkplaats AGROA (2009).

De Vlaming R, Oude Groeniger I. Rapportage Nulmeting 'Gezond ouder worden'. GGD Gelre-IJssel; Academische werkplaats AGORA (2009).

Overview of completed training activities

Discipline specific activities

Courses

- Nutritional and lifestyle epidemiology, Graduate School VLAG, Wageningen (NL), 2009.
- 1st Master class: "Linear and Logistic Regression", Graduate School VLAG, Wageningen (NL) , 2010.
- Cognitive Issues in Survey Response, Mansholt Graduate School of Social Science, Wageningen (NL), 2010.
- MSc Course Multivariate techniques, Research Methodology, Wageningen University (NL), 2010.
- 1st Master class AGORA: "Public health interventions in real-life settings: the AGORA experience", Graduate School VLAG, Wageningen (NL), 2010.
- Sociology and psychology of ageing, Leyden Academy on Vitality and Ageing, Leiden (NL), 2010.
- Healthy longevity and vitality, Leyden Academy on Vitality and Ageing, Leiden (NL), 2011.
- 2nd Master class "Multilevel analysis", Graduate School VLAG, Wageningen (NL), 2011.
- 2nd Master class AGORA: "Public Health Research in Practice: How to develop effective interventions in public health practice?", Graduate School VLAG, Wageningen (NL), 2012.

Conferences and meetings

- Methodologen dag, NOSMO, Amsterdam (NL), 2008.
- 9th, 10th, 11th Nationaal Gerontologie Congres, Nederlandse Vereniging voor Gerontologie, Ede (NL), 2008, 2010, 2012.
- WEON, Nederlandse Vereniging voor Epidemiologie, Amsterdam (NL), 2009.
- Nutrition Science Forum, Division of Human Nutrition, Wageningen University, Arnhem (NL), 2009.
- Werkconferentie Health Literacy, NIGZ, Amersfoort (NL), 2009.
- Nederlands Congres Volksgezondheid, Rotterdam (NL), 2010.
- Multidisciplinary seminar AGORA, Academic Collaborative Centre AGORA, Zutphen (NL), 2009, 2010.
- European Public Health Conference, EUPHA, Amsterdam (NL), 2010.
- Symposium Research for Health & Society, Health and Society, Wageningen University (NL), 2011.
- IAGG, International Association of Gerontology and Geriatrics, Bologna (Italy), 2011.

- European Health Psychology Conference, European Health Psychology Society, Herakleion (Greece), 2011.

General courses and workshops

- PhD introduction week, Graduate School VLAG, Wageningen (NL), 2008.
- Hoe werkt de gemeente? Bestuursacademie Nederland, Apeldoorn (NL), 2009.
- Information Literacy, Wageningen Graduate Schools, Wageningen (NL), 2009.
- Scientific Writing, Wageningen Graduate Schools, Wageningen (NL), 2009.
- Projectmatig werken, Bestuursacademie Nederland, Apeldoorn (NL), 2009.
- PhD competence assessment, Wageningen Graduate Schools, Wageningen (NL),2009.
- Project and time management, Wageningen Graduate Schools, Wageningen (NL), 2010.
- Training onderhandelen en overtuigen, GGD Gelre-IJssel, Apeldoorn (NL), 2011.

Optional courses and activities

- Preparation research proposal, Division of Human Nutrition, Wageningen University (NL), 2009.
- Participation PhD tour, Division of Human Nutrition, Wageningen University (NL), 2009.
- PhD tour commission, Division of Human Nutrition, Wageningen University (NL), 2009.
- Literature group Old Mobiles, Division of Human Nutrition, Wageningen University (NL), 2008-2011.
- Research, epidemiology and methodology meetings, Division of Human Nutrition, Wageningen University (NL), 2008-2012.
- Discipline and team meetings GGD Gelre-IJssel, GGD Gelre-IJssel, Apeldoorn (NL), 2008-2012.
- Research meetings AGORA, Academic Collaborative Centre AGORA, Wageningen, Apeldoorn (NL), 2008-2012.
- Rothman lunches, Division of Human Nutrition, Wageningen University (NL), 2011-2012.

Colophon

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