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Green in long-term care

The role of green on the quality of life of
long-term care facilities

Masterthesis Vraagstukken van Beleid en

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Abstract

Over the years, there has been increasing attention for the quality of life of elderly residents in long-term care facilities and how this may be improved. Yet, little is known about how green may contribute to the quality of life of residents, despite numerous studies that show the importance of green for the general wellbeing of adults and children in society.

This study investigates the relationship between green and quality of life of residents of long-term care facilities. We use two sources of data: 1) data from questionnaires of the study 'Quality of life in the elderly care sector' (N=556 residents, n=22 facilities); 2) Observational data of green of those facilities that were collected at the same time. Data were analyzed using multilevel analyses.

We found that presence of green in public spaces within the facility (indoor green) is positively related to physical wellbeing, social participation and total quality of life of residents. Furthermore, the frequency of which residents go outside is positively related to physical wellbeing, social participation and total quality of life. No relationship was found between outdoor green, environment of the facility, views of green and quality of life of residents.

Our findings indicate that indoor green plays an important role in the quality of life of elderly residents in long-term care. Although no effect was found for outdoor green, going outside was related to quality of life as well. This indicates that outdoor spaces must be accessible, attractive and safe to use for residents. Implications for further research are discussed.

Key words: elderly care, long-term care facilities, residents, green, indoor green, outdoor green, views of green, green environments, elderly persons, quality of life

Foreword

In front of you lies a graduate study which is the result of a research that investigates the role of green on the quality of life of residents of long-term care facilities. This study has been conducted from March to August 2011 for the master Sociology of Utrecht University.

After letting go an internship elsewhere, I got offered an internship at NIVEL, the Netherlands institute for health services research. In accordance with NIVEL and in the spirit of the *Vitamin G* project, I decided to chose this subject.

One of the things I learned during the process it that nothing comes easily. At the start of this paper, I was unsure if I could do it. I never worked such a big project alone. I had hardly any knowledge on interrater reliabilities, scale analyses and multilevel analyses. I experienced difficulties in defining the focus of this study as well. Nevertheless, I really enjoyed raising my knowledge and during the process, I became more confident, even although I had to do some things over and over again. While writing this study, I found it hard to find the right balance between my internship tasks and my part-time job. The process of writing this study took longer than expected, I in the end did it and reached the deadline in time.

I would like to express my special thanks to Peter Groenewegen, who offered me an internship at NIVEL. Together with Sandra van Beek, he helped me throughout the process with my focus, critics and advice. I would like to thank both of them for the time they invested. Next, I would like to thank Thijs Hingstman and Maaike Langelaan for helping me with my internship tasks. Last, but not least, I would also like to thank Erik, my friends and family for all the support they gave me.

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Contents

Chapter 1

Introduction and Research Questions

Inner garden in a residential care facility[1]

Over the last decades, there has been increasing attention for the quality of life of elderly residents in long-term care facilities and how this may be improved. Yet, little is known about the relationship of natural (or green) elements of the long-term care environment on quality of life. This study aims to investigate the relationship between green and quality of life of elderly persons who live in long-term care facilities.

In this chapter, we first shortly define the terms we use in this paper. Secondly, we explain the current context of elderly persons in long-term care. Third, we explain the value of using

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[1] The pictures used in this study are for illustrative purposes only. They are captured in the period April-June 2011. All facilities have given permission to take the pictures and use them in this study. The pictures in this study can only be re-used with permission of the auteur.

green elements in long-term care facilities. Fourth, we describe the aim of this study and conduct our research questions. Finally, we define our empirical strategy.

1.1. Definitions

Green can refer to green elements in both indoor and outdoor environments. It can be any single element in the environment (such as (cultivated pot) plants, flowers, bushes, trees aquariums, animals, ponds, lakes, fountains), but also green elements as a whole, such as gardens, forests or balconies. Green can as well refer to views of green through windows. In the literature, outdoor green environments are sometimes divided into four subgroups, namely urban green, agricultural nature, natural green and wild nature (i.e. De Vries et. al. 2003).

Quality of life: Quality of life concerns wellbeing in a broad sense. In literature, there is discussion on how quality of life should be defined. Overall, it is agreed that quality of life is a multidimensional concept in which the dimensions are interrelated (Gerritsen, 2004). In this paper, we divide quality of life into four subdimensions, namely physical wellbeing, living conditions, social participation and mental wellbeing (Van Nispen et al, 2005).

- Physical wellbeing indicates the health, physical limitations and physical care of residents. It also indicates to what extend residents can enjoy food and drinks.
- Living conditions indicates the own place of residents, the living environment, the experienced safety, the daytime spending, the possibility to decide the daytime spending and financial resources.
- Social participation indicates aspects of social contacts of residents, social roles, experiencing intimacy and experiencing pleasure.
- Mental wellbeing indicates feelings of autonomy, privacy, experiencing the own identity, personal growth, spirituality and seeing a future (Poortvliet et al, 2006)

These four dimensions of quality of life form the basis of the national database to measure quality of life in long-term care in the Netherlands as well (Kwaliteitskader Verantwoorde Zorg, 2010).

Long-term care facilities, also referred to as long-term health care. Long-term care in the Netherlands is provided in nursing homes and residential care homes. Nursing homes provide multi-disciplinary care for elderly residents with long-term, complex health problems (Ribbe, 1993). Residential homes in the Netherlands provide daily and basic medical care for infirm elderly (Eisses et al, 2004).

1.2 Context

The Netherlands, as many other Western countries, is experiencing a demographic shift towards an aging society. Aging usually involves reduction of cognitive health and physical changes, such as a reduction in mobility. But aging comes with social changes as well, like retirement, which involves lower income and a loss of friends, relatives or partner (Uslu, 2005). As a result of these changes, about 164.000 elderly persons are admitted to long-term care facilities (Mot, 2010). Due to the social changes to an aging society, the number of elderly citizens who need long-term care during their later years of life is expected to increase.

In current politics, much attention is paid to long-term healthcare and related costs. In this discussion, quality of life of elderly residents is viewed as an important topic. There is many interest in how quality of life of residents can be improved, without actually increasing the costs of long-term care.

1.3 Green in health care

In the past, there has been a lot of attention for the negative aspects of green elements in health care facilities, especially in hospitalized environments. Plants and flowers were seen as 'reservoirs for pathogenic bacteria that may cause disease' (Van den Berg, 2005). Studies have focused on health risks rather than the health benefits of green elements.

Over the last decades, there has been an attention shift to the beneficial effects of green elements in health care. Studies show that supportive and green environments may enhance the quality of life and reduce costs of health care (Van den Berg & Winsum-Westra, 2006) Green has a direct effect on physical health. The use of plants in indoor environments reduces mental fatigue and stress levels, absorbs harmful substances from the air and improves peoples mood (Van den Berg, 2005). It also reduces 'sick' building syndrome, which can involve dry throat, dry hands, fatigue, headache and feeling heavy headed (Fjeld, 2000). Besides those findings, studies show that plants are beneficial for peoples self rated health as well (Van den Berg, 2006). Therefore, more and more health care facilities transfer into healing environments, where the quality of the (indoor) environment has gotten a prominent place (Van den Berg, 2005). This is particularly interesting since, due recent developments such as urbanized society and compact city policy, natural environments are not part of everyday life anymore (Health council of the Netherlands, 2004). Therefore, healthcare facilities are less often surrounded by green, while the use of green environments gets emphasized in the literature spaces (Health council of the Netherlands, 2004; Maas, 2009).

Although many scientific findings point to an increase in the use of green in indoor and outdoor spaces, green is not being used to its full extent. Currently, there is a lack of scientific evidence on the effects of green in health care settings (Maas, 2009). Much uncertainty lies in the practical use of green, since it is not sure what types of green are needed to improve the environment. Besides, there are uncertainties about the underlying mechanisms. Because of these uncertainties, there are big differences in the use of green between healthcare facilities. While some facilities emphasize the use of green in indoor or/and outdoor spaces and arrange activities involving green or going outside, other facilities pay less attention to different uses of green (Diek et al, 2004).

Although health care facilities slowly increases the percentage of green in their indoor and outdoor environments, less is known of how green elements specifically affects the quality of life of elderly persons (Health council of the Netherlands, 2004). A lot of studies that investigate the relation between green and wellbeing, are conducted in natural environments, working environments or hospitals. These studies usually involve adults who are aged 64 or under. It is not sure whether the same mechanisms are applicable in elderly care settings. Therefore, this study aims to investigate the relationship between green elements and quality of life of elderly persons who live in long-term care facilities.

Investigating the relationship between green and quality of life is particularly relevant since elderly persons differ from adults in several aspects. Elderly persons generally have reduced physical health. This reduction involves reduced mobility issues, which means elderly persons are more bound to their direct environment. Many elderly persons experience some cognitive limitations as well. Furthermore, they usually experience social changes due to retirement, loss of income and loss of relatives and friends. Elderly persons in long-term care facilities often experience reduced autonomy since they are bound to the day schedule and regulations of the facility they live in and have less influence on their direct living environment as well.

1.4 Aim of the study and research questions

The aim of this study is to investigate the relationship between green and quality of life of elderly residents of long-term care facilities. Investigating this relation has scientific and social relevance. This will be explained below.

1.4.1 Scientific relevance

The scientific relevance of this study can be found in the fact that over the last decades, lots of studies have been published on the role of green on wellbeing of people in general. Nevertheless, less is known on the influence of green on the quality of life of elderly persons,

especially if they live in long-term care facilities. This study investigates to what extent existing theories and mechanisms on the relationship between green and wellbeing are applicable to elderly residents of long-term care facilities. With this study, we aim to contribute to the scientific knowledge on this subject. We also hope to give concrete recommendations for future research.

1.4.2 Social relevance

This study also has social relevance. Because of the shift towards an aging society, a lot of (financial) pressure has come to long-term care facilities. If this research finds that green elements can enhance the quality of life of elderly persons, this might be beneficial for elderly residents' quality of life. It might be useful for long-term care facilities as well, since they could raise the use of green elements to enhance the quality of life of their residents at minimum costs.

1.4.3 Research Questions

Based on the aim of this study, the following research questions have been constructed. Our main question is: *Is there a relationship between green and quality of life of elderly residents of long-term care facilities?* Whatever the answer to this question is, it is interesting to see how this can be explained.

To answer the main question, we use several subquestions. The first one is: *What are the underlying mechanisms of the relationship of green on wellbeing?* Although wellbeing is commonly used for healthy adults, we will look at wellbeing rather than quality of life, because we assume more information can be found on the general relationship between green and wellbeing than on the specific relationship between green and quality of life of elderly persons. Therefore our second subquestion is: *To what extent does green affect the quality of life of residents of long-term care facilities?* Here, we will examine the specific relation of green on elderly residents.

Table 1.1: Summary of research questions

Main questions
Is there a relationship between green and quality of life of elderly residents of long-term care facilities? If yes/no, how can this relationship be explained?
Subquestions
What are the underlying mechanisms of the relationship of green and wellbeing?
To what extent does green affect the quality of life of residents of long-term care facilities?

1.5 Empirical strategy

To answer the research questions above we use the following strategy. First, we study the current state of the literature, which will be summarized in chapter 2. The aim of this literature study is to investigate the general relation of green on wellbeing and more specifically the relation of green on the quality of life of elderly persons (who live in long-term care facilities). Based on the findings from the literature, we conduct our hypotheses. We describe the available data to test our hypotheses in chapter 3. There are several sources of data available to test our hypotheses: first there are data collected in the study 'Quality of life in the elderly care sector: the relation between quality of life of residents and the characteristics of the facility' (Poortvliet et al, 2007). Secondly, there are additional data which examine the presence of green in long-term care facilities that participated in this study. Based on these data we will conduct a meaningful strategy to test our hypotheses. In chapter 4, we conduct our statistical analyses with multilevel analyses. If the statistical analysis have been conducted, we can compare them with our hypotheses. On base of this, our main questions will be answered in chapter 5. Findings of this study will be compared with findings from other studies in this chapter. In this part, we also give recommendations for further research and possible policy implications.

Chapter 2

Review of the Literature and Hypotheses

View on a garden from residential care facility.

In this chapter, we investigate the current state of literature on the relationship between green and wellbeing and quality of life of elderly persons. Therefore, we first explain our search strategy. After that, we describe the general findings on the relationship between green and wellbeing. It is important to note that in literature, several dependant variables have been used, such as self rated health, morbidity and recovery from illness. In this chapter we scale this under the broader term wellbeing. After that, we describe the (assumed) underlying mechanisms of this relationship. We will specify the relationship between green and wellbeing of elderly persons as we speak of quality of life. Finally, we conduct several hypotheses on the relationship between green and quality of life of elderly residents of long-term care facilities.

2.1 Search strategy

At the starting point of the literature study, there were three literature reviews that provided useful information on the state of the literature (Health Council of the Netherlands, 2004; van den Berg et al, 2006; Rappe, 2001). We found several useful studies via their reference lists (i.e. Kaplan, Ulrich, Takano, Kweon, Hartig) which we decided to use in this study. We used scientific databases such as Pubmed, Google Scholar and Omega as well to find other relevant (recent) studies. For those searches we used the following search words: quality of life (QOL), wellbeing, green, green environments, plants, health, elderly people/persons, stress, stress reducing, garden, green views, views of green, natural environments, Alzheimer, healing environments, long-term health care, nursing homes, residential care. Also, if we found relevant studies, we used the related article function on Pubmed to find other useful studies. In total, we found approximately 580.000 studies, of which 53 were relevant to use in the literature study. Overall, the literature study has taken place from march until may 2011.

2.2 Green and Wellbeing

Over the last decades, the relationship between green elements and wellbeing has been widely investigated. Numerous studies have found a positive relationship between nature and mental and physical health (Health Council of the Netherlands, 2004; Diek et al, 2004; Mitchell and Popham, 2007). Persons who live in a green environment report less health complaints (De Vries et al, 2003). They also perceive their health as better than persons who live in a less green environment (De Vries et al, 2003; Maas, 2009).

Relf (1990) found that both passive and active interaction with plants can affect the mental state of humans: it helps to change behaviors, attitudes and physiological responses. Even viewing natural environments is said to improve several dimensions of mental wellbeing, such as mental alertness and attention. Many studies show there is a relation between views of green and cognitive performance (Hartig et al 1991, 1996; Cimprich, 1993, 2003; Tennessen and Cimprich, 1995). Furthermore, there is evidence that viewing natural environments affects the physiological state as well (Tennessen and Cimprich, 1995).

2.2.1 Being in nature

Being in natural environments has direct physiological effects. Studies show that being in natural environments lowers heart rate and blood pressure (Ulrich et al, 1991). Being in nature is related to stress reduction as well (Kaplan, 2001). There are indications that being in nature restores directed attention (Kaplan, 2001). Grahn and Stigdotter (2003) found that the amount of time persons spend in green, open spaces reduces the risk of developing

stress related illnesses. Studies by Hartig et al (1991) found that the mood of students who walked in an urban park improved. They performed better on a post-walk concentration test than students who were assigned to other activities. Furthermore, activities in nature have found to be mood enhancing (Lazarus et al, 1980)

Green environments are generally divided into four types: urban green, agricultural green, natural green and wild nature. All types of green environments have beneficial effects on wellbeing, although different types of green environments show different effects. Exposure to natural green, agricultural green and wild nature have a stronger beneficial effect on wellbeing than exposure to urban green (Maas, 2009; De Vries, 2000). Green environments do not have to be present in the direct living environment to have a beneficial effect. For persons who are more bound to their residents, nearby green plays a greater role, because they have got less opportunities to go outside (Maas, 2009). Persons can be bound to their residents for various reasons, such as sickness, reduced mobility and unemployment. But also being in prison or living in other institutions or facilities can make persons more dependent of their direct environment.

2.2.2 Views of nature

Although going outside seems to be important to enjoy stress reducing effects of green environments, there is empirical evidence that it is not necessary to actually go outside to enjoy beneficial effects of green. Nature views from windows are also considered to be a strong factor in wellbeing and residential satisfaction (Kaplan, 2001). Studies have shown that persons who have views of green spaces through a window, have better cognitive performance (Tennessen and Cimprich, 1995). A study by Ulrich (1984) indicates that, after surgery, persons with a nature view through a window recovered faster and needed less medication than patients with other types of views. Similar results have also been found in a more recent study by Diette et al (2003). Kaplan (1993) investigated the relation between job satisfaction and nature views and found that employees experienced a higher job satisfaction when their view implicated green elements. Views of nature also have been shown to improve cognition, concentration and attention in a study with college students (Tennessen & Cimprich, 1995).

2.2.3 Green in indoor spaces

Indoor plants directly affect air quality since they filter harmful emission from the air (Oyabu et al, 2004). This affects physical health, which is beneficial for persons who live or work in an environment with green elements. Plants personalize indoor spaces and play an important role in indoor space satisfaction (Lavinia, 1983; Shoemaker, 1992). A study by

Kaplan (1993) shows that the presence of plants and flowers in indoor space benefits wellbeing. Russel (1999) showed that performing tasks in green indoor environments reduces stress as well.

2.3 Underlying mechanisms

As we have seen in the section above, green can influence the wellbeing of persons in several ways. Although these influences of green/natural environments have been widely acknowledged and investigated, less is known about the underlying mechanisms.

Before we go on, it is important to note that there is uncertainty about the causality of the relationship between green and wellbeing (De Vries et. al, 2000). It is not sure whether the beneficial effect of green on wellbeing can be ascribed to selection or causation. Do healthy persons tend to move to greener areas or do green environments provide opportunities for persons to get healthier? Since a lot of studies control for background variables nowadays, it seems plausible that nature has beneficial effects on wellbeing. But still, we cannot be completely sure of this relationship.

Besides the uncertainty about the causality, underlying mechanisms on the effects of green are not clear. Overall, it is assumed that green environments are stress-reducing, stimulate physical activity and can facilitate social contacts (Maas, 2009; Health Council of the Netherlands, 2004). A spiritual role of natural elements can be added as well (Health Council of the Netherlands, 2004). Nature is also assumed to play a role in the motoric development of children, but since this paper investigates the role of green on the quality of life of elderly persons in long-term care facilities, we will not take this into consideration.

The next four mechanisms, some more than others, have been investigated in the literature and will be shortly explained below:

2.3.1 Stress reductive function

Most empirical evidence has been found on a stress reducing function of green environments. It is assumed that persons can concentrate better after spending time in natural environments (Kaplan, 1995). This is described in Kaplans' attention restoration theory. This theory states that being in nature, firstly, creates opportunities for *being away* from daily routine. Secondly it assumes that natural elements can effortlessly draw directed attention away, so called soft fascination (Kaplan, 1995). Systems that regulate the directed attention can get to rest, which restore negative emotions and pessimistic thoughts (Hartig et al., 1996). The stress reductive function of green has been investigated in a study by Ulrich et al (2003), which showed that videotapes of natural

settings can lower blood pressure and pulse. Hartig et al (1996) showed that students performed better after a walk in natural settings.

2.3.2 Stimulating physical activity

Another function of nature, stimulating physical activity, has not been adequately investigated yet. It is assumed is that green in the direct living environment stimulates physical activity, since it motivates persons to take a walk or to exercise in such an environment. Several studies confirm that attractive environments motivates to exercise (Hilsdon et al, 1996; Owen et al, 2000). However, those studies could not find a significant relation between the presence of natural environments and physical activity. Anyhow, a relation has been found between green environments and persistence of physical activity: persons who exercise in natural environments have a smaller tendency to quit than persons who exercise indoors (Hilsdon et al, 1996). A longitudinal study by Takano et al (2000) found a relationship between longevity and walkable green spaces, but it is not clear if this result can be ascribed to a higher performance of physical activity.

2.3.3 Stimulating social contacts

More research is needed as well on the third mechanism, which assumes that natural environments stimulate social contacts. Research by Coley et al. (1997), Kuo et al (1998) and Kweon et al (1998) found indications that there might be a relationship between social integration and green environments. Coley et al (1997) indicated a relationship between the availability of green and use of public spaces, although it is not sure if this can be ascribed to the social contacts mechanism. Kuo et al (1998) found that woman who live near green facilities and have window views on these facilities have a bigger social involvement. Kweon et al (1998) concluded that elderly persons who spend more time in green public spaces have higher levels of social integration. Rappe (2005) found indications that green gardens motivate elderly persons to go outside to see others and interact with them.

2.3.4 Spiritual role

The last possible mechanism is the spiritual role of green elements. Nature can make persons aware of their belonging to bigger whole. Cycles of growth, flowing and death make people remind of birth and death (van den Berg et al, 2006). Throughout history, there has always existed a link between spirituality and nature. People have always worshipped animals, trees and mountains (Burns, 2005). Seasons and plants can help people to deal with negative feelings, like fear of old age, illness and death (Health Council of the Netherlands, 2004). Furthermore, wilderness experiences can provide

spiritual inspiration, feelings of autonomy and competence (Fredrickson & Anderson, 1999; Health Council of the Netherlands, 2004). They can also improve mood (Hartig et al, 1991). It is important to note that there are only few studies that investigated this mechanism.

Overall, we can conclude that there are several possible mechanisms through which green can affect wellbeing. There is more than enough scientific evidence for the stress reducing effects of green, but limited empirical evidence for the other mechanisms.

2.4 Green and elderly persons

As we have seen above, there is a relationship between green and wellbeing. Several underlying mechanisms are assumed. In this section, we specify the relation between green and wellbeing to the level of elderly persons. First, we describe the state of the art of the relationship between green and various subdimensions of the quality of life of elderly persons, because quality of life as whole is barely investigated yet. Secondly, we summarize all these studies and valuate them on methodological quality.

Some studies show that certain categories of persons are more sensitive to the effects of green than others. There are indications that elderly persons, housewives and persons with a low social economic status benefit stronger from green environments than other groups (De Vries, 2000; Maas 2009). Elderly persons seem to have a higher sensitivity for health benefits of nearby green (de Vries, 2000). For example, they benefit from urban green while this type of green barely affects other groups. The possible explanation could be that elderly persons are more dependent on the availability of green in their direct living environment, because they generally experience reduced mobility (De Vries, 2000; Maas, 2009).

2.4.1 Mental wellbeing

Most studies, specified on elderly persons, focus on mental wellbeing. Elderly persons seem to value nature highly. Interaction with green spaces improves levels of concentration and also reduces stress (Talbot & Kaplan, 1991; Ottosson & Grahn, 2005). Rodiek (2002) found similar results in an experimental study. Older adults who were assigned to garden activities showed greater reduction in salivary cortical hormone than a group who was assigned to a non-garden activity. This indicates that stress levels reduced after a garden visit. Rappe and Evers (2001) found clues that outside nature activities, such as horticulture and nurturing plants, influenced the mood and self esteem of elderly persons. There are indications that outside activities have positive influence on elderly who have cognitive limitations, although this is not adequately investigated yet (Rappe & Kivelä, 2005). Another study found that contact with nature lowers aggression of elderly Alzheimer patients (Mooney & Nicell, 1992).

2.4.2 Living Conditions

Some of the studies we found focus on the living conditions of elderly persons. Andreoli (2003) indicates that elderly persons value to be involved in their own living environment. Taking care of green or participate in green related activities make elderly persons feel more self worthy. Rappe & Kivelä (2005) found that elderly persons in long-term care highly value the presence and use of a garden. Furthermore Wentzel et al (2001) found that elderly persons who live in well maintained environments seem to remain independent for a longer period of time. This indicates that the environment can make an important contribution to the wellbeing of elderly persons.

2.4.3 Physical Wellbeing & Social participation

A very limited number of studies are present on the relationship between green and physical wellbeing and social participation. On physical wellbeing, a longitudinal study by Takano et al (2002) showed that green nearby residents of elderly persons in Tokyo is positively associated with life expectancy. A study by Edwards and Beck (2002) found indications that Alzheimer patients tend to eat more when they have a view on an aquarium. Finally, on social participation, a study by Kweon et al (1998) found that elderly persons had higher levels of social integration when they experienced higher exposure to green spaces.

2.4.4 Quality of life

One study has been found on quality of life. Andreoli (2003) found that green day activities contribute to the quality of life of psychogeriatic elderly persons living in long-term care facilities.

2.4.5 Summing up the evidence

Empirical evidence on the role of indoor spaces on the quality of life of elderly persons would be particularly interesting, since elderly persons who live in long-term care facilities seem to spend a lot of time indoors for several reasons, such as reduced mobility, absence of gardens, problems with the accessibility of gardens, lack of personnel who can take tham outside or other priorities of the facilities. Unfortunately, we only found one study on indoor spaces (Edwards and Beck, 2002). This study found a relation between aquariums and the food intake of elderly persons with Alzheimer disease.

Overall, we must conclude that there is limited literature available on the relationship between green and the quality of life of elderly persons, and even less literature with good methodological quality. Most of the studies only have a small sample size or only focus on a limited number of long-term care facilities. Most studies were unable to examine the causality

of the relationship as well. Only few studies with good methodological quality are present. In the table below, we examine all studies and investigate their methodological quality.

Table 2.1: Overview of the studies found on the relation of green on (aspects of) quality of life of elderly persons

Study		Aim	Findings	Quality
Ottosson & Grahn, 2005	Experimental study on 15 elderly persons who live in a long-term care facility.	To test whether being outdoors in a green recreational environment causes residenys to be more focused, compared to being in a room indoors.	Respondents who had a one-hour rest outdoors in a garden setting had higher powers of concentration than respondents who were in a room indoors.	-Very small sample size -Gives indications but cannot draw strong conclusions about causality - Respondents all lived in the same facility - No matching between test group and control group
Rappe & Kivelä, 2005	Survey study on 30 elderly persons who live in a nursing home in Helsinki.	Investigate the perceived effects and meanings related to garden visits and associations between experiences from garden visits and self rated depression ,	Being in the garden and views from the balcony are of great value for the residents. Half of the participants said it improved their mood, quality of sleep and their ability to concentrate.	-Small number of participants -All respondents live in the same facility -Only self reported data -Some 'effects' might be the result of other mechanisms (i.e. quality of sleep might be related to the fact that garden visits might be more intensive than other day activities)
Andreoli, 2003	Evaluate the effect of green related activities of residents of a long-term care facility in the Netherlands.	To evaluate whether green related activities contributes to quality of life of residents.	Attention for the social structure and environment of residents of geriatric facilities enhances the wellbeing of residents and leads to a reduction on claims for medical care. Nature activities can play an important role in this process.	-Only one facility has been investigated -Small number of participants
Edwards & Beck, 2002	Observational study on 62 individuals with Alzheimer's	Examine if the presence of aquarium has effect on the food	Alzheimer patients who viewed an aquarium while eating showed higher increases in food intake than other Alzheimer	-Well controlled study but lack of ethnicity -Other forms of dementia besides Alzheimer could not

	disease.	intake of Alzheimer patients.	patients who watched a scenic ocean picture or no picture. They also gained more weight.	have been ruled out. -Conditions in control group were not constant over the period of the study (they were not constantly exposed to the same picture)
Rodiek, 2002	Experimental study on 17 elderly (71-98) persons.	To explore methods for assessing psychological and physiological outcomes associated with natural environment.	Respondents who were assigned to activities in a garden environment showed lower cortisol hormone than the control group who were assigned to indoor activities, indicating greater reduction in stress level.	- Small sample size - Participants from only one facility - No matching between experimental and control group - Voluntary selection
Rappe & Evers, 2001	Interview study on 12 residents of sheltering housing for aged persons.	Explore the meaning elderly persons associate with growing plants.	The results suggest that growing plants may have effect on the wellbeing of elderly persons. Growing plants gives autonomy, a sense of control, identity and the opportunity to form social relationships.	- Very small sample size -Subjective interviews -Causality cannot be established -Conducted in only one facility
Wentzel et al, 2001	Study on 8,134 community-dwelling individuals.	To characterize the relationship between the health status of elderly persons and their physical environment.	A significant relationship was found between classification of physical environment and the outcomes of institutionalization and mortality.	-A relation was found as well for less than average maintained environments which makes the study less strong
Takano et al, 2000	Cohort study on 3144 elderly persons living in Tokyo.	Examine if green nearby has effects on longevity of elderly persons.	Living in areas with walk able green spaces positively influenced the longevity of urban senior citizen.	-Self selection cannot be ruled out -Nearby green does not automatically imply use of these green spaces.
Kweon et al, 1998	Interview study on 91 (aged 64-91) older adults from one inner city neighborhood.	Examine if physical environment can be designed to promote older adults' social	The use of green outdoor common spaces predicted both the strength of neighborhood social ties and sense of community.	-Gives indications of the possible mechanism -Only conducted in one neighborhood, which implies the mechanism might work different in other

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			integration with their neighbors.	setting -Causality could not be established
Mooney & Nicell, 1992	Examination numbers of aggression related incidents in five nursing homes for elderly with Alzheimers disease.	Determine the value that specially designed exterior space have in reducing undesired behaviors.	The use of exterior environments reduced incidents of aggressive behaviour, and contributed significantly to a risk management program. Aggressive behavior in nursing homes without exterior environments raised during the study.	-Study has been conducted over 2 years -Contextual differences between nursing homes were not taken into account. -Only 5 nursing homes participated
Talbot & Kaplan, 1991	Interview study on 48 elderly persons from two apartment complexes.	Examine the availability of and the importance of different nearby natural settings.	Respondents considered access to nature near their homes very important. Levels of satisfaction were higher among residents whose apartments overlooked natural settings and among those who lived closer to certain kinds of outdoor settings.	-Explorative study -Relative small sample size -Interviews makes the study subjective and therefore causality could not be established

In the table above, the studies on the relationship between green and (subdimensions of) quality of life are examined. The strongest studies are the studies by Takano et al (2000) and Wentzel et al (2001). These studies are both longitudinal studies on many persons. Although both studies give an indication of the relation they investigate, the study by Takano en al (2000) could not indicate the use of green spaces. The biggest implication in the study by Wentzel et al (2006) is that the results draw an ambiguous conclusion on well-maintained environments. The study does not specifically focus on green elements which is an implication for this study as well. Another relative strong study is the study by Mooney & Nicell (1992), since this study is longitudinal as well and implies that outdoor green spaces can reduce problem behavior on elderly persons who suffer from dementia. All the other studies are relatively weak, although all together they can create a image of the relation between green spaces or elements and certain aspects of quality of life.

2.5 Hypotheses

As we have seen in the first section of this literature study, there is a relationship between green and wellbeing. If there is green available in the living environment (indoor, outdoor or views of green), persons generally enjoy a higher level of wellbeing. This relationship has

several underlying mechanisms, such as stress reduction, facilitating social contacts and stimulating physical exercise.

Before we conduct our hypotheses, we want to make clear that residents of long-term care facilities have a different situation than normal adults. Most residents of long-term care facilities enjoy less physical mobility. There might be a possibility that inside green or views of green are more important for them since, due to their reduced mobility, elderly persons have less opportunities to go outside. If there is green outside, it is important that this green is reachable and useable for elderly persons who might need attributes (such as walking racks or wheelchairs) to move around. Some elderly persons might also need assistance to go outside. This makes them more dependable to the efforts of facilities, volunteers or family. They are dependent on long-term care facilities as well for arranging green related activities, such as growing plants, horticulture or arranging flowers, which can create opportunities to interact with green elements.

Getting older involves social changes, such as reduced income, a bigger dependency on others and a loss of social contacts or even the loss of a partner. Moving to a long-term care facility also involves social changes such as a loss of autonomy and a loss of social contacts. Many residents of long-term care facilities indicate they feel lonely. Some even get bullied or ignored by other residents.

Due to the different situation of elderly persons, we assume that the relationship between green and wellbeing is greater for elderly persons than for adults. Therefore we hypothesize*: If there is green in the living environment, residents of long-term care facilities enjoy a higher quality of life*. Because of their different situation, we also assume that the mechanisms which are stated in the literature might work different on residents of long-term care facilities. Therefore, we will discuss the assumed effect of all mechanisms on the quality of life of residents of long-term care facilities.

2.5.1 Stress reduction

First, we make assumptions on the stress reducing mechanism of green. In literature, there is many empirical evidence for stress reducing effects of green. We do not see many reasons why this would work differently for elderly persons. It might be harder for elderly persons to reach green that is further away from the living environments (i.e. a forest, lake or beach) but since we assume that normal adults do not use this type of green on a daily or weekly basis, we assume that this would not make a big difference. We hypothesize: *If there is green available in the living environment, than the quality of life of residents of long-term care facilities is higher through stress reducing mechanisms.*

2.5.2 Enhancing physical exercise

Secondly, we will take the physical exercise enhancing mechanism into consideration. This is particularly interesting because elderly persons usually have reduced mobility. In literature, the term physical exercise is generally used in a context of moderate or heavy physical exercise, which is assumed to have positive effects on the physical condition. For most elderly persons, and especially those who living in long-term care facilities, it is impossible to better their physical condition due to physical limitations. Nevertheless, taking a (short) walk can also been seen as physical exercise as well. This might not only enhance the physical condition slightly, but this has also effect on persistence of the physical condition. Any kind of physical exercise can help not to get in a worse physical condition. Therefore, we assume that green can have an positive effect on the physical condition of elderly persons. We hypothesize: *If there is green available in the living environment, than the quality of life of residents of long-term care facilities is higher through physical exercise mechanisms.*

2.5.3 Stimulating social contacts

Now, we look at the social contact mechanism which is associated with green environments. Getting older and moving to a long-term care facility usually involves loss of contacts. Many elderly persons indicate they feel lonely. Based on literature, we assume that green can enhance social contacts, because green environments facilitate meeting opportunities. Therefore we hypothesize: *If there is green in the living environment, this enhances the quality of life for residents of long-term care facilities through contact enhancing mechanisms.* We assume that this relation is stronger than on regular adults, since adults usually have a more satisfactory social network than elderly persons.

2.5.4 Spiritual role of green

Lastly, we formulate our expectation towards the last mechanism, the spiritual role of green. Getting older involves physical, mental and social changes. Also, death gets a lot closer. Elderly deal with problems to accept this. In the literature, there are indications that green environments can have a spiritual function and help persons to deal with different stadiums of life. Therefore, we assume that the spiritual mechanism works stronger on older persons, since they experience the last stadium of their life. We hypothesize: *If there is green in the living environment of residents of long-term care facilities, than this enhances the quality of life through spiritual mechanisms.*

To formulate hypotheses, we can also make a division between certain uses of green. In this paper, we mostly use indoor green, outdoor green and views of green. As we know, elderly persons in long-term care facilities commonly have a reduced mobility and therefore don't go

outside a lot. Therefore, we expect that indoor green and views of green are more powerful than (use of) outside green. We hypothesize: *If residents of long-term care facilities less go outside, than indoor green and views of green are more important on quality of life than outdoor green.*

To formulate hypotheses, we also take the four dimensions of quality of life into account. Those dimensions are: physical wellbeing, living conditions, social participation and mental wellbeing. We assume that green has effect on total quality of life, but we also assume that green has effect on the subdimensions of quality of life.

2.5.5 Physical Wellbeing

First we focus on physical wellbeing. Elderly persons generally have lower physical mobility. Some elderly persons are not physical active at all, due to loss of physical functions. In the literature, it has been assumed that green environments can motivate to go outside to walk around or exercise. Therefore, if there is a relationship between green and physical wellbeing, we assume that exercise enhancing mechanisms are underlying. Therefore we hypothesize: *If there is a relationship between green and physical wellbeing, than this can be ascribed to physical exercise enhancing mechanisms.*

2.5.6 Living environment/conditions

Because of their lower physical mobility, elderly persons spend many time in their direct living environment. Studies indicate that elderly persons value nature highly. More green can enhance the valuation of the living environment. We predict that therefore there is a relationship between green and living conditions of elderly persons. We hypothesize: *If there is a relationship between green and living conditions, than this can be described to the valuation of the living environment.*

2.5.7 Social participation

Elderly persons usually have less social contacts as they had when they were adults. A lot of elderly persons indicate they feel lonely sometimes. In literature, it is assumed that green environments can create meeting opportunities and can enhance social integration. We assume that if green relates to social participation, this can be ascribed to contact enhancing mechanisms. Therefore we hypothesize: *If there is a relationship between green and social participation, than this can be described to contact enhancing mechanisms.*

2.5.8 Mental wellbeing

Lastly, we focus on mental wellbeing. Elderly persons usually spend a lot of time indoors, since they are highly dependent on efforts of other persons to go outside. In the literature, evidence has been found for stress reductive functions of indoor plants, views of green and garden visits. Also, it is assumed that green can contribute to spiritual needs of persons, especially elderly persons who are in a certain stage of life where they need more spirituality. Therefore, we assume that is green relates to mental wellbeing, this can be described to stress reductive and/or spiritual mechanisms. We hypothesize: *If there is a relationship between green and mental wellbeing, than this can be ascribed to stress reductive and/or spiritual mechanisms.*

2.5.9 Summing up the hypotheses

Above, we have conducted our hypotheses. In the table below we summarize them.

Table 2.2: Summary of the conducted hypotheses

Summary of hypotheses
H1: If there is green in the living environment, residents of long-term care facilities enjoy a higher quality of life.
H2: If there is green available in the living environment, than the quality of life of residents of long-term care facilities is higher through stress reducing mechanisms.
H3 If there is green available in the living environment, than the quality of life of residents of long-term care facilities is higher through physical exercise mechanisms.
H4: If there is green in the living environment, this enhances the quality of life for residents of long-term care facilities through contact enhancing mechanisms.
H5: If there is green in the living environment of residents of long-term care facilities, than this enhances the quality of life through spiritual mechanisms.
H6: If residents of long-term care facilities less go outside, than indoor green and views of green are more important on quality of life than outdoor green.
H7: If there is a relationship between green and physical wellbeing, than this can be ascribed to physical exercise enhancing mechanisms.
H8: If there is a relationship between green and living conditions, than this can be described to the valuation of the living environment.
H9: If there is a relationship between green and social participation, than this can be described to contact enhancing mechanisms.

H10: If there is a relationship between green and mental wellbeing, than this can be ascribed to stress reductive and/or spiritual mechanisms.

In the next chapter we will examine which hypotheses are testable with the available data.

Chapter 3

Data & Methods

Garden of a nursing home

In this chapter, we first describe the available sources of data. Secondly, we examine which hypotheses -that have been formulated in the previous chapter- will be tested. Finally, we describe the methods which we use to test our hypotheses.

3.1 Sources of data

This study uses two available sources of data. The first source is data has been collected during the study 'Quality of life in the elderly care sector' (Kwaliteit van leven in de V&V sector) (Poortvliet et. al, 2007). These data provide information on quality of life of residents of long-term care facilities in the Netherlands.This dataset is based on the validated questionnaire 'Notion on own life' (Zicht op eigen leven*). The second dataset consists of observational data on the green situation of the same facilities who have participated in the

'Quality of life in the elderly care sector' study. These data are present in the dataset *'Green list'.*

3.1.1 Study 'Quality of life in the elderly care sector'

All sources of data have been collected during the study 'Quality of life in the elderly care sector' (Poortvliet at al, 2007). In this study, the aim was to give insight in the quality of life of residents of long-term care facilities and to examine to what extend characteristics of long-term care facilities contribute to quality of life. In total, 22 long-term care facilities participated in the study. Of those facilities, 6 were nursing homes, 15 facilities were residential care homes and 1 facility was a mixed facility. Those facilities were concentrated in 6 of the 12 provinces of the Netherlands. The image below will show the (approximately) location of the facilities.

Figure 3.1: The spreading of the participating facilities in the Netherlands

All facilities were asked to randomly select 80 residents for an interview. For every resident, it was checked if they matched criteria to participate. Residents were excluded if they matched one or more of the criteria in the following table.

Table 3.1: Exclusion criteria for residents

1. Is the resident seriously ill at the moment?
2. Is the resident terminally ill?
3. Does the resident realize he/she is in a long-term care facility?
4. Does the resident knows (approximately) his/her age?
5. Is the resident capable of answering a more complex question? (in example: To what extend is it important that your health complaints are taken seriously)

On base of these criteria, 18 percent (n=288) of the residents were excluded to participate in the study.

All other residents were asked for written informed consent. In total, 44 percent of the selected residents (n=581) gave permission to participate in the interviews. The interviews with the residents took place from October 2005 until January 2006. Eventually, the answers of 556 residents have been used for analysis, since the answers of 25 residents were not found to be consistent or reliable by the researchers afterwards

3.1.2. Notion on own life

Now we describe the questionnaire 'Notion on own life'. The questionnaire can be found in appendix 1.

The questionnaire starts with three opening questions. The respondents were firstly asked if they have a good life. Secondly they were asked what they thought that contributes to a good life. Thirdly, they were asked what makes their life less good. The answers were, if possible, directly scaled under a subdimension of quality of life. Next, the respondents were asked to indicate to what extent they agreed to certain statements. They could answer the questions on a scale from one to five, where 1= totally disagree and 5=totally agree. In total, there were 33 statements. There were 8 statements on physical quality of life, 8 statements on life/live situation, 9 statements on social participation and 8 statements on mental quality of life. Also, the respondents were asked to what extent they found these statements important. This was on a scale from 1 to 3, where 1= not very important, 2=important and 3=very important. Finally, there was a possibility for the resident to make remarks on the interview.

When the interview was over, the interviewers were asked to note some characteristics of the residents: the gender and age of the respondent, to which resident group they belonged, their care requirements, their marital status and for how long they lived in the long-term care facility. During the interviews, additional questions were asked on the long-term care facilities. For instance, questions were asked about visits by volunteers, possibilities to go

outside, to the hospitality of the facility, dinner times et cetera. The list of all additional questions can be found in appendix 2.

The additional questions involved one question on the use of outside spaces. The question '*How many times do you go outside to sit or walk*' indicates how many times residents go outside. This question could be answered with 'once a month or less', 'once a week', 'several times a week', 'once a day', or 'several times a day'. This question is especially relevant for this study, because it provides background on the use of outdoor spaces.

3.1.3 'Green List'

During the data collection of the study 'Quality of life in the elderly care sector', additional observations on the supply of green in the participating long-term care facilities took place. These observations were structured through an observation list. This observation list consists of 15 items which measures the presence of green in the long-term care facilities. This list can be found in appendix 3.

The first two items of the green list specifically focus on the location of the facility and examine environmental characteristics of the location. Item 3 to 7 examine the outdoor situation. These items relate to whether the facility has a front garden and/or another garden. Item 7 examines whether the garden is accessible. Item 8 and 9 concern the characteristics of the garden and measure to what extent green characteristics (trees, bushes, plants, flowers, benches) are present. It is measured to what extent the garden makes a green impression as well. Item 10, 11 and 12 indicate how many indoor green is available in the reception, sitting room and restaurant. There are also questions on the view on green from these public spaces. Item 13 and 14 examines to what extent the corridors give a green impression for every floor of the facility, except for closed compartments. Finally, item 15 measures the presence of green and the views of green in the communal living room. This was only been done in nursing homes since residential care facilities usually don't have communal living rooms.

3.1.4 Data conduction 'Green list'

The 'Green list' examines the green situation of long-term care facilities. This observation list has been structured by researchers of NIVEL (Netherlands institute for health services research), who collaborated in the 'Quality of life in the elderly care sector'-study. The list has not been used before and therefore it is not validated.

The observations on green took place between 07-10-2005 and 03-01-2006. In total, 9 different researchers collaborated in the observations. In total, 59 observations of 22 long-

term care facilities were completed. To collect the data, researchers independently examined the availability of green in and around the facilities. From 19-12-2005, an updated version of the green list has been used. This version had some additional questions on green in the garden, the location of the facility and examines whether there was an indoor garden or greenhouse. This version of the green list had been used for 25 of the 59 observations. Because these additional information is not collected for all long-term care facilities, we will only focus on the information that is present in both versions of the green list.

It is important to note that some facilities have been visited more than once to collect the data. This is important because some conditions on facility level were not the same at both times. For example, one facility has been visited November 7th and December 12$^{th.}$ This can partly explain differences in observations, since for instance Christmas decoration could have make the facility look greener.

3.1.5 Description of the participating residents

Of the 556 residents who participated in the interviews, 27 percent was male and 73 percent was female. About 51 percent of the respondents stayed in long-term care facilities for over two years. The mean age of the respondents was 82,5 year (SD = 9,1), varying from 28 to 98 years. Four percent of the respondents were 64 or younger. Because we assume those younger persons were in a comparable situation as other residents of long-term care facilities (reduced mobility, loss of physical and cognitive functions, loss of social contacts and control over own life), we do not exclude them from the analysis. In the study, the mean score for quality of life is 7.3 (SD=0,84), on a scale of 1 to 10.

3.2 Selection of hypotheses

Above, we have described the available datasets which we use to test our hypotheses. We can now select the hypotheses which we are able to test, based on the given data. We chose the following hypotheses (see table 3.2).

Table 3.2: Hypotheses tested in this study

H1: If there is green in the living environment, residents of long-term care facilities enjoy a higher quality of life.

H6: If residents of long-term care facilities less go outside, than indoor green and views of green are more important on quality of life than outdoor green.

H7: If there is a relationship between green and physical wellbeing, than this can be ascribed to physical exercise enhancing mechanisms.

H8: If there is a relationship between green and living conditions, than this can be described

to the valuation of the living environment.

H9: If there is a relationship between green and social participation, than this can be described to contact enhancing mechanisms.

H10: If there is a relationship between green and mental wellbeing, than this can be ascribed to stress reductive and/or spiritual mechanisms.

3.3 Methods

In this part of the paper, we describe the methods we have used to modify the data. We will start below with the interrater reliability of the green list. At last, we will explain which methods we use to conduct our multilevel analysis.

3.3.1 Interrater reliability

As explained earlier, 9 different observers completed the observations of the green list. During these observations, every observer filled in the green list independently. This has lead to 59 observations for 22 facilities. In the table below the distribution of the number of researchers is presented.

Table 3.3: Number of observers during data collection of the LTC facilities (N=22)

	Number of facilities	Percentage
One observer	1	4,5%
Two observers	9	40,9%
Three observers	9	40,9%
Four observers	2	9,1%
Five observers	1	4,5%

Overall, data was collected on the green situation of every facility by a mean of 2,68 observer (SD=0,90) (not displayed in table). One facility has only been observed by one observer, while one facility has been visited by five observers. Most facilities have been visited by two or three researchers (82%)

Because almost all facilities has been visited by more than one observer, differences in the observations of the observers have occurred. Therefore, we had to calculate to what extend the observations of different observers corresponded with each other. To calculate the interrater reliability, we only have used variables who were present in both the first and second version of the green list and filtered out non-numeric variables. In total, we had to 39 items left for interrater analysis. To calculate the interrater reliability, we used Cohen's Kappa. Because Cohen's Kappa requires a two way table, which means that values from the

first observer must be present in the observations of the second observer as well, we sometimes had to make minor modifications to the data. If this was the case, we changed an observation to an observation in the adjacent category. The table below displays they way we qualify the Kappa values in this paper.

Table 3.4: Qualification of Kappa Coefficient

Kappa	Interpetation
< 0	Poor agreement
0.0 – 0.20	Slight agreement
0.21 – 0.40	Fair agreement
0.41 – 0.60	Moderate agreement
0.61 – 0.80	Substantial agreement
0.81 – 1.00	Almost perfect agreement

Landis & Koch (1977)

In the table below, the total interrater reliability of the observers has been calculated.

Table 3.5: Interrater reliability

Kappa	Percentage
0.21 – 0.40: Fair agreement	15,6%
0.41 - 0.60: Moderate agreement	41,3%
0.61 – 0.80: Substantial agreement	31%
0.80 – 1: (almost) perfect agreement	12,1%

In total, the values of the Cohen's Kappa vary from 0,26 to 1. The mean Alpha is 0,60 (not displayed in table) with a standard deviation of 0,18. 16 percent of the Cohen's Kappa values displayed fair agreement between observers. 41% of the Kappa values displayed moderate agreement. Substantial agreement has been found in 31% of the cases. The Kappa values of 12% of the observations indicate almost perfect agreement.

There are several explanations for the lower Kappa values. Most lower values can be ascribed to different moments of observation, were at least one of the observers did not visit the facility on the same day as the other(s). Other differences in observations can be mainly found in the five-point scaled items, where one observer gave a certain value to an item and the other observer(s) gave an answer in the adjacent category.

3.3.2 Data modification Green list

We had to make two major changes in the green list to make it useful for analysis. First of all, we had to recode all observations. The observational answers were formulated from positive to negative. For example, when it was possible to answer yes or no, yes has a value of '1' and no had value of '2'. Because we wanted our data to be coded from negative to positive, we recoded value '1' (no) into value '0' and value '2' (yes) into value '1'. We did the same for

the scaled items. If an item was scaled from value '1' (very much) to value '6' (none), we recoded the variable so that '6' got value 0 and '1' got value 5 (6=0, 5=1, 4=2, 3=3, 2=4, 1=5). We did this throughout the whole dataset so that it was coded from negative to positive.

Secondly, to reduce the data from 59 observations to characteristics of 22 facilities, we had to make substantial choices on how to reduce the data. Because, overall, the data had moderate interrater reliability, we made the choice to calculate the mean score of deviant values. If there were 2 observations for 1 facility, and observer one gave the score of '2' and observer one gave the score of '3', we mediated this to 2.5. We did this to all 59 observations to reduce the observations to facility level, so that every facility got one score for each item.

3.3.3 Combining the Data

To combine the Quality of life dataset and the Green list, we had to create useful variables to examine the presence of green in the facilities. These variables can be found in chapter 4. In both sources of data, the number of the facility was present. We added the variables we created on the presence of green from the green list for every resident with the same facility number in the Quality of life data, so that every resident in the Quality of life data got scores on the presence of green on facility level.

3.4 Method for analyses

In this paper, we use various methods to analyze the data. To test our hypotheses, we use a multilevel analysis (Snijders & Bosker, 1999). A multilevel analysis is necessary, because our data encloses information on the quality of life of 556 residents within 22 long-term care facilities. It is not possible to consider the 556 residents as independent observations, because they are dependent on the conditions of the long-term care facility they live in. Because we would like to take the conditions of the various facilities into account, a multilevel analysis is the best possible method. In the analyses, we identify two levels: facilities (level 2) and residents within these facilities (level 1). In the analyses the four dimensions of quality of life of residents are our main dependent variables. For every multilevel analysis, we take the following steps. First, we estimate an empty model, to see if quality of life differs between facilities and residents. In model 2 we correct for characteristics of residents that may influence their quality of life (gender, age, length of stay and care-requirements). In model 3, we look at the relationship between the presence of green and quality of life. For this we add green related variables one by one to the model. In model 3, we only use one variable on green –that were measured on facility level – at one time, because we only got data on 22 facilities and we want to prevent an over identified model. For every analyses, we removed facilities with less than 10 residents. All analyses will be conducted in SPSS.

Chapter 4

Results

Garden in mixed facility

In this part of this paper, we conduct our analyses. Therefore, we first describe the availability of green in the long-term care facilities. Next, we construct useful variables, on resident and facility level, which we use in the multilevel analysis. We test these variables on internal consistence. Finally, we conduct the multilevel analyses to answer our hypotheses.

4.1 Presence of green

In this section ,we describe the outdoor situation of long-term care facilities. We examine the environmental characteristics of the facility, examine the views of green from the facilities and examine the presence of indoor green.

4.1.1 Outdoor green situation

To examine the outdoor situation, we explore the presence of gardens in long-term care facilities and if they are accessible. We examine the characteristics of the gardens and their appearances as well. The table below described the outdoor situation of the facilities which have participated in the study.

Table 4.1: Presence of a garden and accessibility (N=22)

Garden related questions	Percentage yes
Does the facility has a front garden?	55%
Does the facility have a garden, other than a front garden ?	96%
Is there a door to access the garden?	100%
Is the door open (not locked)?	71,%
Is the garden accessible for residents in a wheelchair?	96%

All the facilities had at least one garden (not displayed in table). Of those facilities, 55 percent had a front garden and 96 percent had another garden than a front garden. In all facilities there was a door through which the garden could be accessed, although this door was not always open. In 29 percent of the cases, the door was closed and therefore the garden could not be accessed by residents. The garden was wheelchair-friendly in 96 percent of the facilities.

The next table examines the presence of certain types of green (characteristics) in the gardens. The presence of green is measured on a scale from 0 to 5 (0=not green, 1=very little, 2= little 3=neutral 4=much 5=very much).

As we can see in table 4.2, there are many differences between the gardens. Overall, the gardens mostly consisted of bushes. Besides bushes, there were also many plants. The use of trees and sitting spaces can be qualified as neutral. Overall, there were not many flowers in the gardens. The presence of flowers can therefore be qualified as little, although this might be attributed to the time of data-collection.

Because these individual items involve many information, we have created a variable which calculates the mean of the presence of the 5 items. This variable examines to what extend the different characteristics are available in the garden. With this new variable, we can give a qualification of the gardens. In 12 facilities, the presence of the items (plants, flowers, bushes, sitting places, trees) can be classified as neutral. In 5 gardens, the presence of the items can be classified as little. In 4 facilities, all items are much available. One facility has gotten the highest classification, namely 'very much'.

Table 4.2: Characteristics of the garden (N=22, Scale 0-5)

Facility ID	Does the garden has trees?	Does the garden has bushes?	Does the garden has plants?	Does the garden has flowers?	Does the garden has sitting spaces?	Mean of 5 items*	Classification
1	3,50	4,00	4,00	1,50	3,50	3,30	Neutral
2	5,00	5,00	4,33	1,67	1,67	3,53	Much
3	4,50	4,50	4,50	3,00	4,50	4,20	Much
4	3,00	3,50	3,50	1,50	2,00	2,70	Neutral
5	4,00	3,67	4,00	,67	3,00	3,07	Neutral
6	3,00	3,00	2,50	,00	3,00	2,30	Little
7	4,00	4,50	3,00	,00	1,50	2,60	Neutral
8	1,33	3,67	4,00	2,67	2,67	2,87	Neutral
9	4,00	4,00	3,00	2,00	4,00	3,40	Neutral
10	2,33	2,67	3,00	2,33	2,67	2,60	Neutral
11	4,33	4,33	3,67	2,67	4,00	3,80	Much
12	1,00	2,67	3,00	1,00	2,33	2,00	Little
13	4,20	4,20	3,60	2,00	2,40	3,28	Neutral
14	2,50	4,25	2,50	,00	2,00	2,25	Little
15	3,25	3,50	3,74	,67	2,00	2,63	Neutral
16	2,67	4,00	3,67	,00	3,33	2,73	Neutral
17	5,00	5,00	5,00	5,00	5,00	5,00	Very Much
18	2,50	4,00	3,00	3,00	2,00	2,90	Neutral
19	3,33	4,00	4,00	2,67	4,00	3,60	Much
20	4,00	4,00	4,00	1,00	3,00	3,20	Neutral
21	2,50	3,00	2,50	1,00	1,50	2,10	Little
22	2,33	2,67	2,67	,00	1,67	1,87	Little
Mean (SD)	3,29 (1,08)	3,82 (,69)	3,51 (,70)	1,56 (1,30)	2,81 (1,02)	3,00 (1,87)	

*Cronbach's Alpha = ,820

We have information of how green the gardens looked to the observers as well. This information is displayed in the table below. The range of this table is from 0 to 4 (0=not green, 1=little green, 2=neutral, 3=green, 4=very green).

Table 4.3 shows the classification of the gardens. The majority (11) of the gardens made a green impression on the observers. Nine of the gardens did make a neutral green impression. Two gardens can be classified as little green. Overall, the gardens can be classified as making a neutral green impression.

Table 4.3: Impression of the garden (N=22, Scale 0-4)

Facility ID	Does the garden makes a green impression	Interpertation
1	3,00	Green
2	1,00	Little green
3	2,00	Neutral
4	3,00	Green
5	1,67	Neutral
6	3,00	Green
7	2,00	Neutral
8	2,67	Green
9	3,00	Green
10	1,67	Neutral
11	3,00	Green
12	1,67	Neutral
13	2,20	Neutral
14	2,00	Neutral
15	3,00	Green
16	3,00	Green
17	1,00	Little green
18	3,00	Green
19	3,00	Green
20	2,50	Green
21	2,00	Neutral
22	1,67	Neutral
Mean (SD)	2,32 (,687)	Neutral

4.1.2 Environmental conditions

Besides examining the gardens of the facilities, it is also interesting to look at other outdoor characteristics of the facilities. We assume this might contribute to a green impression as well. In our data, we have information on the environmental conditions of the long-term care facilities. In the table below, the environmental characteristics have been summarized.

Table 4.4: Environmental conditions (N=22, No=0, Yes=1)

Facility ID	Next to the street	Next to a park	Next to a pond	Next to a forest	Next to a meadow	Green environment
1	Yes	No	No	No	No	No
2	No	Yes	Yes	No	No	Yes
3	Yes	No	No	No	No	No
4	No	No	No	No	No	No
5	No	No	Yes	Yes	No	Yes
6	No	No	No	No	No	No
7	Yes	Yes	Yes	No	No	Yes
8	Yes	Yes	Yes	No	No	Yes
9	No	No	No	No	No	No
10	Yes	Yes	Yes	No	No	Yes
11	Yes	No	Yes	Yes	No	Yes
12	No	No	No	Yes	No	Yes
13	Yes	Yes	Yes	No	No	Yes
14	No	No	Yes	No	Yes	Yes
15	No	Yes	Yes	No	No	Yes
16	Yes	No	Yes	No	No	Yes
17	Yes	Yes	Yes	No	No	Yes
18	No	No	No	No	No	No
19	Yes	Yes	Yes	No	No	Yes
20	No	No	No	No	No	No
21	Yes	No	No	No	No	No
22	Yes	No	No	No	No	No
Mean(SD)	,55 (,51)	,36 (,49)	,55 (,51)	,14 (,35)	,05 (,21)	

Of all the facilities, 55 percent directly lay next to the street. 36 percent of the facilities lay next to a park. None of the facilities lay next to a lake (not displayed in table); 55 percent of the facilities lay next to a pond. 14 percent of the facilities lay next to a forest and 5 percent lay next to a meadow. We also calculated to what extend facilities lay next to green spaces based on these items (not displayed in table). Laying next to a street has been excluded in this calculation. Ten facilities lay next to 3 out of 5 (60%) of the environmental characteristics. Two facilities lay next to 2 (40%) environmental characteristics. One facility lays next to one green element (20%). Nine facilities did not lay next to any green space. Facilities laying to one or more natural environments are classified as laying in a green environment.

4.1.3 Views of green

Now, that we examined the outdoor situation, we examine views of green. We have information on views of green from three public spaces of the long-term care facilities, namely the restaurant, sitting space and reception. For one facility, no information is available on the view of green from the sitting room. The table below indicates the views of green. All variables are measured on a scale from 0 to 4 (0=not green, 1=little green, 2=neutral 3=green 4=very green)

Table 4.5: Views of green (N=22*, Scale 0-4 (0=not green, 4 = very much))

Facility ID	View of green from reception	View of green from sitting space	View of green from restaurant	Total view of green*	Qualification
1	1,00	1,00	3,00	2,00	Neutral
2	2,67	1,00	2,00	2,34	Neutral
3	2,50	1,50	2,50	2,50	Green
4	1,00	2,00	2,50	1,75	Neutral
5	1,67	2,00	2,33	2,00	Neutral
6	1,50	1,00	1,00	1,25	Little green
7	1,50	3,00	3,00	2,25	Neutral
8	1,67	2,00	2,33	2,00	Neutral
9	,00	3,00	2,00	1,00	Neutral
10	2,33	1,67	2,33	2,33	Neutral
11	3,00	,00	3,00	3,00	Green
12	2,33	2,00	1,00	1,67	Neutral
13	1,80	2,00	2,60	2,20	Neutral
14	3,00	2,00	3,00	3,00	Green
15	2,67	2,50	2,75	2,71	Green
16	1,00	1,67	3,00	2,00	Neutral
17	3,00	1,00	3,00	3,00	Green
18	1,50		2,50	2,00	Neutral
19	1,33	2,67	2,67	2,00	Neutral
20	1,00	2,67	3,00	2,00	Neutral
21	1,50	,50	1,00	1,25	Little Green
22	1,67	1,67	1,67	1,67	Neutral
Mean (SD)	1,80 (,80)	1,75 (,80)	2,37 (,67)	2,09 (,55)	Neutral

* Cronbach's Alpha =,194

Overall, the views from the restaurant were most green, but can be qualified as neutral. The reception and sitting space both were less green, but can be qualified as neutral as well. We also created a variable which examines the view from all public spaces. We excluded the sitting spaces from this variable, since the view from the sitting spaces correlated negatively with the view from the reception, which resulted in a negative Cronbach's Alpha. Therefore,

we choose only to use the view from the reception in combination with the view from the restaurant in the multilevel analyses. In this way, 15 of the 22 facilities can be qualified as neutral green. Two facilities can be qualified as little green and 5 facilities can be qualified as green.

4.1.4 Indoor green

Now that we have examined the outdoor situation and the views of green, we will examine the indoor green situation. Of every long-term care facility, we have information on indoor green in corridors for every floor. This indoor green exist of flowers or plants. The availability of plants and flowers can vary from 0 = none to 5 = very many. Because the number of floors can differ per facility, we had to create a variable which considers the overall green situation of all corridors. For this, we added up the observations for each floor level and divided it through the number of floors of the facility. This is displayed in the table below

Table 4.6: Availability of green in the corridors (N=22, Scale 0-5 (0=none, 5 = very many))

Facility ID	Plants in Corridors*	Interpetation	Flowers in Corridors**	Interpetation
1	2,50	Neutral	,25	None
2	1,33	Very Little	,56	Very Little green
3	4,00	Many	1,63	Little green
4	2,00	Little	1,00	Very Little green
5	1,00	Very Little	,00	None
6	1,00	Very Little	1,00	Very Little green
7	1,00	Very Little	,50	Very Little green
8	1,00	Very Little	,07	None
9	1,00	Very Little	,00	None
10	2,33	Little	1,11	Very Little green
11	2,50	Neutral	,68	Very Little green
12	1,33	Very Little	,89	Very Little green
13	2,00	Little	1,13	Very Little green
14	2,00	Little	,38	None
15	1,00	Very Little	,623	Very Little green
16	2,00	Little	,40	None
17	3,33	Neutral	2,67	Neutral
18	2,67	Neutral	2,00	Little green
19	2,50	Neutral	1,50	Little green
20	2,50	Neutral	1,00	Very Little green
21	3,00	Neutral	1,00	Very Little green
22	2,33	Little	1,00	Very Little green
Mean (SD)	2,01 (,85)	Little	,88 (,66)	Very Little green

* Cronbach's Alpha = ,964, ** Cronbach's Alpha = ,728

In the table above, the availability of plants and flowers are displayed. The table shows that overall, there are more plants in the corridors than flowers, although the availability of both is limited. The mean score for the availability of plants is little. Only one facility scored higher than neutral. The mean score for the presence of flowers is very little. Only one facility got the ranking neutral. The lack of green in corridors might be related to the physical problems of residents. For instance, plants or flowers may hinder elderly residents who have difficulties walking or who move around in a wheelchair.

Next to information on the availability of green in corridors, we also have information the availability of green of public spaces (reception, sitting room and restaurant).

Table 4.7: Availability of green in public spaces (N=22, Scale 0-5 (0=none, 5 = very many)

Facility ID	Plants in public Spaces*	Flowers in public spaces**	Total green public spaces***	Interpetation
1	3,67	2,00	2,83	Neutral
2	2,89	2,67	2,78	Neutral
3	4,33	3,33	3,83	Very green
4	3,33	2,17	2,75	Neutral
5	3,11	1,22	2,17	Little green
6	1,50	1,667	1,58	Little green
7	2,17	,00	1,08	Very Little green
8	2,33	,22	1,28	Very Little green
9	3,33	1,00	2,17	Little green
10	3,56	2,33	2,95	Neutral
11	2,67	2,22	2,45	Little green
12	2,77	1,89	2,33	Little green
13	2,27	1,87	2,07	Little green
14	3,00	1,75	2,38	Little green
15	3,58	2,00	2,79	Neutral
16	2,22	1,22	1,72	Neutral
17	4,67	4,67	4,67	Very green
18	3,33	2,67	3,00	Neutral
19	3,56	2,44	3,00	Neutral
20	2,67	1,00	1,83	Little green
21	3,00	,67	1,83	Little green
22	3,11	1,45	2,28	Little green
Mean (SD)	3,04(,73)	1,84 (1,03)	2,44 (,81)	Little green

* Cronbach's Alpha =,648 ** Cronbach's Alpha = ,778 *** Cronbach's Alpha = ,83

The table shows that the mean availability of plants in public spaces can be qualified as neutral. The availability of flowers can be qualified as little. We have created a variable which calculates the mean of both items. The mean availability of green in public spaces is 2,44,

which can be qualified as little. Three facilities can be qualified as very little green, 10 facilities as little green, 8 facilities as neutral, and one facility as very green. In this study, we only take the green in public spaces into consideration, due to that the lack of green in corridors might be related to physical problems of residents.

4.2 Variables for multilevel analysis

Now, we examine the variables which we will use in the multilevel analysis. We start with the dependent variables before we examine the independent variables.

4.2.1 Dependent variables

In the questionnaires 'Notion on own life', residents answered 33 statements regarding quality of life. Every statement represented a subscale of quality of life, namely physical wellbeing, living conditions, social integration and mental wellbeing. We computed the total score for each subscale (see chapter 3 for the number of items in each subscale) with the statements recoded to a scale from 1 to 10 (see Poortvliet et al 2007). Based on all items, we also computed the total quality of life of residents. The table below shows the dependent variables.

Table 4.8: Dependent variables

	Mean	SD	Range	N
Physical wellbeing	7,15	1,11	3,25-9,25	486
Living Conditions	7,68	1,14	3,25-10	479
Social Participation	7,41	1,12	3,25-10	470
Mental Wellbeing	7,03	1,11	2,41-10	458
Total quality of life	7,34	,42	5,08-9,72	413

4.2.2 Independent variables

The data provides independent variables on facility and on resident level. First we will explain the variables on facility level (the variables regarding green). Because, due to the small number of facilities, we are limited in the number of variables we can use on facility level, we had to create meaningful variables which we can use in the multilevel analysis. These variables are summed up in the table below.

Table 4.9: Independent variables (Facility level)

	Description	Cronbach's Alpha	Mean	SD	Range	N
Green Environment (1 item)	Whether the facility lays in a green environment or not (0= no 1=yes)	-	,59	,50	0-1	22
Impression garden (1 item)	To what extent the garden makes a green impression (0=not green, 4=very green)	-	2,32	,69	1-3	22
Characteristics garden (scale)	The availability of green characteristics (sitting spaces, plants, trees, bushes, flowers) in the garden (0=none , 5=very many)	,820	2,99	, 75	1,87-5	22
Indoor green (scale)	Presence of green (plants and flowers) in public spaces (0=none, 5=very many)	,830	2,44	,81	1.08-4,67	22
Total view of green (scale)	Views of green from the restaurant and reception (0=not green, 4=very green)	,194	2,09	,55	,1-3	22

Now, we explain the variables we use on resident level. We use the same independent variables on resident level as in the Quality of life in the elderly care sector report (Poortvliet et al, 2007).

Table 4.9: Independent variables (Resident level)

	Description	Percentage	Mean	SD	Range	N
Gender	Gender of the respondent (0=male, 1=female)		,72	,45	0-1	502
Age	Age of the respondent		83,02	8,89	28-98	530
Length of stay	Time in current residence 1= less than 2 years 2=more than 2 years		1,51	,50	1-2	504
Care requirements:	1= Residential Care Home: housekeeping	15,7%				470
	2=Residential Care Home: Personal Care and/or Nursing	61,9%				
	3=Nursing Home: Rehabilitation	5,5%				
	4=Nursing Home: Long-term Stay	16,8%				
Going outside	How many times do you go outside? (1= 'once a month or less' to 5= 'several times a day')		2,78	1,29	1-5	425

It is important to note that the division of the care requirements in this study is not exactly identical to the division in the 'Quality of Life in the elderly care sector'-study. In the original study, variables have been created on the care needs of the residents of long-term care facilities by information from the original interviews. Since not all of this information is present in the dataset, and it was impossible to track back the decisions that were made five years ago. Therefore we had to create a variable by ourselves that examines the care requirements of the residents.

Next to the variables which are used in the 'Quality of life in the elderly care sector'- study, we also use a variable which considers the number of times a resident goes outside to sit and walk. We use this variable to see it there is a indirect relationship between the number of times a resident goes outside on (the subdimensions of) quality of life.

4.3 Multilevel analyses

Now that we have examined the variables which we use in the multilevel analyses, we conduct our multilevel analyses. We examine the relationship between all green variables and quality of life, both the four subdimensions and the total score-. All analyses can be found in appendix 4 to 7. We describe our findings below. We will begin with the physical wellbeing dimension.

4.3.1 The influence of green on physical wellbeing

In all our multilevel analysis, we first create an empty model to estimate the variance components and the interclass correlation (ICC) on facility level. In model 2, we add the independent variables on resident level, namely age, gender, length of stay in current residence and the care requirements of the resident In model 3, we add, besides the resident related variables, variables regarding on the green characteristics of the long-term care facilities, as explained in chapter 3.4.

First, we describe the direct relationship of the green related variables on physical wellbeing. In literature, effects on physical wellbeing has been found for green in indoor environments and outdoor environments.

Table 4.10 Multilevel analysis: The influence of resident characteristics and indoor green on physical wellbeing (N=396 residents, n=19 facilities)

Physical Wellbeing	Base Model		Step 1: Resident Characteristics		Step 2: Resident Characteristics and Facility characteristics	
	B	SE	B	SE	B	SE
Intercept	7,09*	,09	6,59*	,54	5,98*	,609
Resident Characteristics						
Male (Ref=female)			-,026	,119	-,034	,119
Age			,003	,007	,004	,007
Length of Stay < 2 years (Ref= > 2 years)			-,072	,106	-,073	,106
Care Requirements						
-RCF: Basic Care[a]			1,02*	,227	1,08*	,216
-RCF: Extended Care[a]			,276	,198	,332***	,186
-Nursing Home: Short Stay/Rehabilitation[a]			,046	,291	,046	,291
Facility Characteristics						
Indoor Green					,232***	,109
Variance Components	B	SE	B	SE	B	SE
Facility level	,079	,048	,046	,034	,026	,029
Resident Level	1,09	,079	1,03	,075	1,03	,075
ICC Facility level	7,2%		4,5%		2,5%	

*p<,01 **p<,05 ***p<,10   [a]Ref=Nursing Home Long Stay

When we look at our empty model, we see no differences in the physical wellbeing of residents, both on the level of facilities as on the level of individual residents. The interclass correlation (ICC)- a measure for the variance that be ascribed to the facilities- is 7,2%. In model 2, we have added the resident characteristics. We find that care requirements of residents are positively related to their physical wellbeing: residents with less care requirements (residential care facility – basic care) experience more psychical wellbeing than residents with higher care requirements (nursing home: long stay). By adding characteristics of residents, the IIC on facility level decreases to 4,5%. In model 3, we add green variables to the analyses on facility level –one by one. In this model, the presence of indoor green shows a significant relationship with physical wellbeing. The more green is available in the restaurant, sitting spaces and reception, the higher the physical wellbeing of the residents (B=,232, p<0,10). By adding indoor green to the analyses the ICC reduces to 2,5%.

We have examined the other green related variables (environmental conditions, the availability of garden characteristics, the green appearance of the garden and the views of green) as well but those did not gave a significant relationship with physical wellbeing (see appendix 4).

Next to examining a possible direct relationship between green on physical wellbeing, we also investigate if physical wellbeing is related to going outside. Therefore, we added the frequency that residents go outside as independent variable on the level of individual residents to our model. The findings are displayed in the table below.

Table 4.11 Multilevel analysis: The influence of resident characteristics and going outside on physical wellbeing (N=308 residents, n=16 facilities)

Physical Wellbeing	Base Model		Step 1: Resident Characteristics	
	B	SE	B	SE
Intercept	7,09*	,09	6,59*	,54
Resident Characteristics				
Male (Ref=female)			-,026	,119
Age			,003	,007
Length of Stay < 2 years (Ref= > 2 years)			-,072	,106
Care Requirements				
-RCF: Basic Care[a]			1,02*	,227
-RCF: Extended Care[a]			,276	,198
-Nursing Home: Short Stay/Rehabilitation[a]			,046	,291
Going Outside			,143*	,048
Variance Components	B	SE	B	SE
Facility level	,079	,048	,061	,048
Resident Level	1,09	,079	1,02	,085
ICC Facility level	7,2%		6,0%	

*p<,01 **p<,05 ***p<,10 [a] Ref=Nursing Home: Long Stay

The table above shows 2 models: the empty model and the model where we have added the resident characteristics. In model 2, we have added -besides the characteristics of the residents- the number of times residents goes outside. We find that care requirements of residents are positively related to their physical wellbeing: residents with less care requirements (residential care facility – basic care) experience more psychical wellbeing than residents with more requirements (nursing home: long stay). This model shows that the number of times a resident goes outside significantly relates to physical wellbeing. Residents who go outside more often enjoy a higher physical wellbeing. By adding the characteristics of the residents and their frequency of going outside, the ICC on facility level deceases to 6%.

Next, we added all variables regarding the outside environment (whether the facility lay in a green environment, the appearance of the garden and the availability of certain characteristics in the garden) to see if -when going outside was taken into account- a relationship was found between this type of green and physical wellbeing. No relationship was found. The relationship between physical wellbeing and indoor green slightly increased when we controlled for the number of times residents go outside (B=0,26, p<0,10).

4.3.2 The influence of green on living conditions

Now that we have examined the relationship between green and physical wellbeing, we will examine the relation between green and living conditions. In literature, both indoor and outdoor green are indicated to play a role in satisfaction of the living environment. Our multilevel analyses on the relation between green and living conditions is showed in the table below.

Table 4.12 Multilevel analysis: The influence of resident characteristics and indoor green on living conditions (N=393 residents, n=19 facilities)

Living Conditions	Base Model		Step 1: Resident Characteristics		Step 2: Resident Characteristics and Facility characteristics	
	B	SE	B	SE	B	SE
Intercept	7,68*	,124	6,88	,566*	6,26*	,706
Resident Characteristics						
Male (Ref=female)			-,086	,122	-,088	,122
Age			,004	,007	,005	,007
Length of Stay < 2 years (Ref= > 2 years)			-,228**	,109	-,229**	,109
Care Requirements						
-RCF: Basic Care[a]			,970*	,278	1,032*	,275
-RCF: Extended Care[a]			,690**	,253	,756*	,250
-Nursing Home: Short Stay/Rehabilitation[a]			,257	,299	,258	,299
Facility Characteristics						
Indoor Green					,246	,170
Variance Components	B	SE	B	SE	B	SE
Facility level	,232	,099	,129	,062	,115	,060
Resident Level	1,09	,079	1,07	,078	1,07	,079
ICC Facility level	21,3%		12,1%		10,7%	

*p<,01 **p<,05 ***p<,10   [a] Ref=Nursing Home: Long Stay

When we look at our empty model, we see no differences in the living conditions of residents, both on the level of facilities as on the level of individual residents. The ICC is 21,3%. In model 2, we have added the resident characteristics. We find that the length of stay is positively related to living conditions: residents who live in the facility for less than 2 year score lower on living conditions. Care requirement of residents are positively related to their living conditions: residents with less care requirements (residential care facility – basic or extended care) experience better living conditions than residents with higher requirements (nursing home: long stay). By adding characteristics of residents, the IIC on facility level decreases to 12,1%. In model 3, we add green variables to the analyses on facility level. In this model, we have added indoor green. Indoor green does not significantly relate to living conditions. None of the green variables significantly relates to living conditions as well (see appendix 5). By adding indoor green to the analyses, the ICC reduces to 10,7%.

4.3.3 The influence of green on social participation

Now, we examine the relationship between green and social participation. In literature, the outdoor environment plays an important role in social participation, since people usually have to go outside to meet others. Therefore, we will start with the direct relationship of green on social participation. This is displayed in the table below.

Table 4.13 Multilevel analysis: The influence of resident characteristics and indoor green on social participation (N=385 residents, n=18 facilities)

Social Participation	Base Model		Step 1: Resident Characteristics		Step 2: Resident Characteristics and Facility characteristics	
	B	SE	B	SE	B	SE
Intercept	7,38*	,097	7,48*	599	6,70*	,716
Resident Characteristics						
Male (Ref=female)			-,018	,129	-,023	,129
Age			-,003	,007	-,002	,007
Length of Stay < 2 years (Ref= > 2 years)			-,063	,114	-,064	,114
Care Requirements						
-RCF: Basic Care[a]			,325	,294	,387	,282
-RCF: Extended Care[a]			,142	,269	,208	,256
-Nursing Home: Short Stay/Rehabilitation[a]			,381	,323	,387	,322
Facility Characteristics						
Indoor Green					,313***	,164
Variance Components	**B**	**SE**	**B**	**SE**	**B**	**SE**
Facility level	,111	,055	,123	,062	,098	,055
Resident Level	1,11	,081	1,12	,083	1,12	,083
ICC Facility level	10%		11%		8,7%	

*p<,01 **p<,05 ***p<,10

[a] Ref=Nursing Home: Long Stay

When we look at our empty model, we see no differences in the social participation of residents, both on the level of facilities as on the level of individual residents. The ICC of this model is 10%. In model 2, we have added the resident characteristics. We find that none of the resident characteristics has a significant relationship with social participation. In this model, the ICC on facility level increases to 11%. In model 3, we add green variables to the analyses on facility level. In this model, only the presence of indoor green shows a significantly relates to social participation. The more green is available in the restaurant, sitting spaces or reception, the higher the social participation of the residents (B=,313, p<0,10). By adding indoor green to the analyses the ICC reduces to 8,7%. The analyses on other aspects of green can be found in appendix 6. None of the other green characteristics significantly related to social participation.

Next to examining a possible direct relationship between green on social participation, we also investigate if social participation is related to going outside. Therefore, we added the

frequency that residents go outside as independent variable on the level of individual residents to our model. The findings are displayed in the table below

Table 4.14 Multilevel analysis: The influence of resident characteristics and going outside on social participation (N=322 residents, n=17 facilities)

Social Participation	Base Model		Step 1: Resident Characteristics	
	B	SE	B	SE
Intercept	7,38*	,097	7,17	,708
Resident Characteristics				
Male (Ref=female)			-,078	,142
Age			,000	,008
Length of Stay < 2 years (Ref= > 2 years)			-,025	,124
Care Requirements				
-RCF: Basic Care[a]			-,025	,311
-RCF: Extended Care[a]			-,126	,276
-Nursing Home: Short Stay/Rehabilitation[a]			,228	,328
Going Outside			,104**	,049
Variance Components	**B**	**SE**	**B**	**SE**
Facility level	,111	,055	,114	,065
Resident Level	1,11	,081	1,11	,090
ICC Facility level	10%		10,2%	

*p<,01 **p<,05 ***p<,10
[a] Ref=Nursing Home: Long Stay

The table above shows 2 models: the empty model and the model where we have added the resident characteristics. In model 2, we have added -besides the characteristics of the residents- the number of times residents goes outside. This model shows that the number of times a resident goes outside significantly relates to social participation. Residents who go outside more often enjoy more social participation. By adding the characteristics of the residents and their frequency of going outside, the ICC on facility level increases to 10,2%. Next, we added all variables regarding the outside environment (whether the facility lay in a green environment, the appearance of the garden and the availability of certain characteristics in the garden) to see if -when going outside was taken into account- a relationship was found between this type of green and social participation. No relationship was found. The relationship between social participation and indoor green slightly increased when we controlled for the number of times residents go outside (B=0,33, p<0,10).

4.3.4 The influence of green on mental wellbeing

Now, we investigate the last subdimension of quality of life, namely mental wellbeing. In literature, indoor green, garden visits, and views of green are related to mental wellbeing. Our multilevel analyses on the relation between green and living conditions is showed in the table below.

Table 4.15 Multilevel analysis: The influence of resident characteristics on mental wellbeing (N=373 residents, n=18 facilities)

Mental Wellbeing	Base Model		Step 1: Resident Characteristics	
	B	SE	B	SE
Intercept	6,97*	,081	7,38*	,558
Resident Characteristics				
Male (Ref=female)			,097	,126
Age			-,012***	,007
Length of Stay < 2 years (Ref= > 2 years)			-,0004	,113
Care Requirements				
-RCF: Basic Care[a]			1,14*	,212
-RCF: Extended Care[a]			,682*	,173
-Nursing Home: Short Stay/Rehabilitation[a]			,196	,302
Variance Components	**B**	**SE**	**B**	**SE**
Facility level	,059	,043	0	0
Resident Level	1,14	,086	1,11	,082
ICC Facility level	5,2%		0%	

*p<,01 **p<,05 ***p<,10
[a] Ref=Nursing Home: Long Stay

When we look at our empty model, we see no differences in the mental wellbeing of residents, both on the level of facilities as on the level of individual residents. The ICC of this model is 2,2%. In model 2, we have added the resident characteristics. We find that age is negatively associated with mental wellbeing: the lower the age, the higher mental wellbeing. We also find that care requirements of residents are positively related to their mental wellbeing: residents with less care requirements (residential care facility – basic and extended care) experience a higher mental wellbeing than residents with more requirements (nursing home: long stay). By adding characteristics of residents, the IIC on facility level decreases to 0%, which means that individual differences in mental wellbeing can explain all differences between facilities. Therefore, we do not investigate green variables on mental wellbeing.

4.3.5 The influence of green on total quality of life

Now that we have examined all subdimensions of quality of life, we investigate the relationship between green and total quality of life. Our multilevel analyses on the relation between green and living conditions is showed in the table below.

Table 4.16 Multilevel analysis: The influence of resident characteristics and indoor green on quality of life (N=325 residents, n=16 facilities)

Quality of life	Base Model		Step 1: Resident Characteristics		Step 2: Resident Characteristics and Facility characteristics	
	B	SE	B	SE	B	SE
Intercept	7,28*	,085	7,28*	,482	6,56*	,543
Resident Characteristics						
Male (Ref=female)			-,050	,108	-,052	,108
Age			-,004	,006	-,004	,006
Length of Stay < 2 years (Ref= > 2 years)			-,069	,095	-,069	,095
Care Requirements						
-RCF: Basic Care[a]			,801*	,224	,894*	,206
-RCF: Extended Care[a]			,423**	,200	,500*	,181
-Nursing Home: Short Stay/Rehabilitation[a]			,159	,268	,158	,267
Facility Characteristics						
Indoor green					,289**	,109
Variance Components	B	SE	B	SE	B	SE
Facility level	,079	,042	,053	,032	,027	,023
Resident Level	,681	,055	,667	,054	,667	,054
ICC Facility level	11,6%		7,9%		4%	

*p<,01 **p<,05 ***p<,10
[a] Ref=Nursing Home: Long Stay

When we look at our empty model, we see no differences in the quality of life of residents, both on the level of facilities as on the level of individual residents. The ICC is 11,6%. In model 2, we have added the resident characteristics. We find that care requirements of residents are positively related to their quality of life: residents with less care requirements (residential care facility – basic and extended care) experience a higher quality of life than residents with more requirements (nursing home: long stay). By adding characteristics of residents, the IIC on facility level decreases to 7,9%. In model 3, we add green variables to the analyses on facility level –one by one. In this model, only the presence of indoor green shows a significant relationship with quality of life. The more green is available in the

restaurant, sitting spaces or reception, the higher the quality of life of the residents (B=,289, p<0,05). By adding indoor green to the analyses the ICC reduces to 4%.

We have examined the other green related variables as well, but those did not significantly relates to quality of life. All our analyses on quality of life can be found in appendix 7.

Next to examining a possible direct relationship between green on quality of life, we also investigate if quality of life is related to going outside. Therefore, we added the frequency that residents goes outside as independent variable on the level of individual residents to our model. The findings are displayed in the table below

Table 4.17: Multilevel analysis: The influence of resident characteristics and going outside on quality of life (N=274 residents, n=15 facilities)

Quality of life	Base Model		Step 1: Resident Characteristics	
	B	SE	B	SE
Intercept	7,28*	,085	6,79*	,545
Resident Characteristics				
Male (Ref=female)			-,180	,112
Age			,001	,006
Length of Stay < 2 years (Ref= > 2 years)			-,103	,010
Care Requirements				
-RCF: Basic Care[a]			,513**	,228
-RCF: Extended Care[a]			,188	,198
-Nursing Home: Short Stay/Rehabilitation[a]			,034	,261
Going outside			,112*	,040
Variance Components	**B**	**SE**	**B**	**SE**
Facility level	,079	,042	,045	,054
Resident Level	,681	,055	,613	,033
ICC Facility level	11,6%		7,3%	

*p<,01 **p<,05 ***p<,10
[a] Ref=Nursing Home: Long Stay

The table above shows 2 models: the empty model and the model where we have added the resident characteristics. In model 2, we have added -besides the characteristics of the residents- the number of times residents goes outside. We find that care requirements of residents are positively related to their quality of life: residents with less care requirements (residential care facility – basic care) experience higher quality of life than residents with more requirements (nursing home: long stay). This model shows that the number of times a resident goes outside significantly relates to quality of life. Residents who go outside more often, enjoy a higher quality of life. By adding the characteristics of the residents and their frequency of going outside, the ICC on facility level deceases to 7,3%.

Next, we added all variables regarding the outside environment to see if -when going outside was taken into account- a relationship was found between this type of green and physical wellbeing. No significant relationship was found.

Chapter 5

Conclusion and Discussion

Indoor Green in Nursing Home

In this chapter, we first examine the main findings of our study and how this relates to our hypotheses. Secondly, we answer our research questions. Third, we describe the methodological implications of this study. Fourth, we describe how our findings contribute the literature. Last, we describe how results of this study can be used by long-term care facilities.

5.1 Findings and Hypotheses

In this study, we have investigated the role of green elements on the quality of life of residents in long-term care facilities. We examined the role of the outside environment of the facility and indoor elements of green within the facility on four dimensions of quality of life, as well as the total quality of life of residents. Therefore, we reconstructed measures for aspects of outdoor green, indoor green and views of green, as well for quality of life and it's aspects.

In this study, we found a positive relationship between indoor green and physical wellbeing, social participation and total quality of life. We found a positive relationship between the number of times residents go outside and physical wellbeing, social participation and total quality of life. We did not find any relationships between outdoor green, views of green and (aspects of) quality of life. We could not estimate a relation between green and mental wellbeing and living conditions as well.

Now, we examine to what extend our hypotheses can be accepted.

H1: *If there is green in the living environment, residents of long-term care facilities enjoy a higher quality of life.*

We partly accept this hypothesis. In this study, we have found a positive relationship between indoor green and physical wellbeing, social participation and total quality of life. Indoor green contributes to a higher quality of life. However, no relationship has been found between quality of life and outdoor green.

H6: *If residents of long-term care facilities less go outside, than indoor green and views of green are more important on quality of life than outdoor green.*
We partly accept this hypothesis. In this study, we found a positive relationship between indoor green and physical wellbeing, social participation and total quality of life. This indicates indoor green plays an important role in quality of life for long-term care residents. If we control for the frequency residents go outside, the relation between indoor green and physical wellbeing and social participation strengthens slightly. This indicates that residents who go less outside, benefit stronger from indoor green for their social participation. Nevertheless, we could not find any relation between views of green and (subdimensions) of quality of life.

H7: *If there is a relationship between green and physical wellbeing, than this can be ascribed to physical exercise enhancing mechanisms.*
We partly accept this hypothesis. In this study, we found two relationships regarding green and physical wellbeing. First, we found a positive relationship between indoor green and physical wellbeing. This indoor green is measured in public spaces, which means that respondent who use this spaces must be able to reach this spaces. This might be related to physical exercise.
Secondly, we found a positive relationship between the number of times a resident goes outside and physical wellbeing. Residents who go outside more often have a higher physical wellbeing. Although our results indicate that physical exercise might be the underlying

mechanism, the relationship can also be ascribed to direct health effects of green elements.

H8: If there is a relationship between green and living conditions, than this can be described to the valuation of the living environment.
In this study, we did not find any relationship of green on living conditions. Therefore, we have to reject this hypothesis.

H9: If there is a relationship between green and social participation, than this can be ascribed to contact enhancing mechanisms.
We accept this hypothesis. In this study, we have found a direct relationship between indoor green and social participation. Indoor green was measured in various public spaces of the long-term facilities. If there is more green available in those spaces, the social participation was higher. Therefore, we assume that this relationship can be ascribed to contact enhancing mechanisms, since this mechanism is the only mechanism for a possible relationship between green and social participation stated in literature..

H10: If there is a relationship between green and mental wellbeing, than this can be ascribed to stress reductive and/or spiritual mechanisms.
In our analyses, we found no relationship between green and mental wellbeing. We therefore have to reject this hypothesis.

5.2. Answering the research questions
In chapter one, we conducted our research questions. We answer them below. The main question of this study is: *Is there a relationship between green and quality of life of elderly persons living in long-term care facilities? If yes/no, how can this relationship be explained?* This question will be answered after we have answered our two subquestions.
The first subquestion is: '*What are the underlying mechanisms of an effect of green on quality of life?*'.

In literature, there are many studies available on the effect of green on wellbeing. Most of these studies have been conducted on adults. Less studies are available on the effect of green on elderly persons, especially those who live in long-term care facilities. If there are concrete results, these are mostly very specific or very general, which make them hard to interpret. Most of these studies have methodological implications as well, for example a small sample size or a very limited number of participating long-term care facilities. Nevertheless, in literature, four major mechanisms on the relation of green and wellbeing are mentioned. The first one is the stress reducing mechanism. For this mechanism, most empirical proof

has been found. Other mechanisms are enhancing social participation and creating opportunities for physical exercise. These mechanisms have not been investigated extensively yet. The last mechanism is the spiritual role of green. This mechanism lacks empirical proof. In this study, regarding the relation between green and quality of life, we have found indications for two mechanisms: enhancing social participation and physical exercise.

The second subquestion is: *To what extent does green affect the quality of life of residents of long-term care facilities?* In literature, green is assumed to have influence on quality of life of residents of long-term care facilities. In those studies, many attention is paid to the relation between outdoor environments and quality of life. Outdoor visits are said to improve autonomy, satisfaction and mental wellbeing. Less attention is paid to the relation between other types of green on (subdimensions of) quality of life of residents of long-term care facilities.

In this study, we found a positive relationship between indoor green and quality of life. This relationship has been found on total quality of life and on the subdimensions physical wellbeing and social participation. We assume the relationship between indoor green and social participation can be ascribed to contact enhancing mechanisms. The relationship between indoor green and physical wellbeing can probably be ascribed to direct health effects of green elements. In this study, we could not estimate a relationship between outdoor green and quality of life, although based on literature we expected to find a relationship between quality of life and outdoor green. Nevertheless, we have found a positive relationship between the frequency residents of long-term care facilities go outside and quality of life, which indicates that outdoor environments do matter. This relationship has been found on total quality of life and the subdimensions physical wellbeing and social participation. The relationship between physical wellbeing and going outside can be ascribed to physical exercise enhancing mechanisms.

The main question of this study can be answered now. In this study, we found a positive relationship between indoor green and quality of life. This relationship has been found on total quality of life and on the subdimensions physical wellbeing and social participation. The positive relationship between indoor green and social participation are somewhat in line with results from studies by Kweon et al (1998) and Rappe (2005). These studies indicate a greater social participation if green is used in public spaces outdoors. Although green in this study is measured in public spaces indoors, our results are comparable, since all studies indicate public spaces. The relationship between physical wellbeing and indoor green are not in line with former studies. Nevertheless, an explanation for this relationship can be sought in

studies from Kaplan (1993) and Oyabu et al (2004). These studies indicate that the presence of green indoors has direct health effects, which might be the underlying mechanism of the relationship we have found in this study. In this study, we measured indoor green in public spaces of long-term care facilities. Use of this public spaces might need a certain physical condition. Even if we controlled for care requirements –which might be a indication for physical condition- the relation between indoor green and physical wellbeing persisted.

In this study, we have found a positive relationship between the frequency residents of long-term care facilities go outside and quality of life. This relationship has been found on total quality of life and the subdimensions physical wellbeing and social participation. The relationship between going outside and social participation is in line with results from studies by Kweon et al (1998) and Rappe (2005). Although Kweon et al and Rappe specifically indicate green outside spaces, going outside might imply going to these spaces. The relationship between physical wellbeing and the frequency residents go outside can be ascribed to physical exercise mechanisms. This is partly in line with a study from Takano et al (2000). This study found a relationship between longevity and walkable green spaces, which indicates that physical exercise play an important role on longevity of elderly persons. Going outside to sit and walk relates to physical wellbeing, even when we control for care requirements.

We did not find a relationship between outdoor green (the environment of the long-term care facility, the availability of green and benches in the garden and how green the garden looked) and views of green on quality of life and it's subdimensions. This might be caused by the way outdoor green and views of green are measured. We did not find significant relations on mental wellbeing and living conditions as well. The absence of a relation on mental wellbeing can be explained by the fact that characteristics of residents explained all the variance on facility level.

5.3 Methodological Implications

In this study, we used two sources of data. We have used the 'Green list', an observation list which examines the presence of green in long-term care facilities. We have also used data from the 'Quality of life in the elderly care sector' study, which is based on answers of questionnaires and investigates the quality of life of residents of those facilities. Both datasets had several methodological implications.

To collect data on green in long-term care facilities, the 'Green list' observation list has been used. Since it is the first time the green situation in so many facilities has been examined in a study, it was the first time the 'Green list' has been used. Therefore, the green list has not

been validated, which is the greatest methodological implication of this study. The 'Green list' only examined the presence of green on facility level and not on resident level (i.e. the rooms of the residents), which could have provided useful information, certainly based on our finding of indoor green in relation to quality of life. The observations took place during one season, namely in the winter. This can cause a less green appearance of the outdoor environment. Besides, some observations took place in December, a month were in the Netherlands a lot of Christmas decoration is used. This might have caused unwanted differences between facilities that has been observed in December and facilities that has been observed in other months.

The 'Quality of life' dataset provided information on a big number of residents. Before the collection of the data –which has been done by interviews- residents had to meet requirements to participate. Based on these requirements, some residents got excluded from participation. Via this process, residents with cognitive limitations or serious illnesses have been excluded from the study Nevertheless, after the data conduction many residents got excluded from the study as well, because their answers were not consistent or they were not able to finish the interview. In the original study by Poortvliet et al (2007), the care requirements of the residents have been examinated by the original interviews. Because the original interviews were not available for us, we had to estimate the care needs of the residents by the available data. Therefore, the care requirements used in this study slightly differed from the study 'Quality of life in the elderly care sector'.

Both sources of data were already collected at the start of this study and therefore we were not able to add additional questions, for example regarding the use of green environments. Although the number of long-term care facilities in this study is high compared to other studies, we could only add one facility characteristic to every multilevel analyses due to statistical limitations caused by the small number of facilities.

5.4 Recommendations for future research

In current literature, many attention is paid to the relationship between green and wellbeing of adults. This study is one of the first studies who examines the influence of green on a vulnerable group of elderly persons. This study systematically examines green in long-term care facilities, by adding characteristics of 556 residents and characteristics of 22 long-term care facilities to our analyses. It is one of the first studies who examine such great number of facilities and their residents. In this study, we found a positive relationship between indoor green and quality of life of residents of long-term care facilities. Until now, most studies have focused on the role of outdoor environments on quality of life. This study shows that indoor environments of long-term care facilities are of great importance as well, on social

participation, physical wellbeing and total quality of life. This positice relationship has not been found until now and might indicate other mechanisms than those assumed in current literature. In this study, indoor green is measured in public spaces of long-term care facilities. For future research, it would be interesting to examine the relationships between green on the rooms of residents of long-term care facilities and quality of life. Also, it would be interesting to see whether indoor green has the same relationships on the quality of life of (vulnerable) elderly persons who do not live in a long-term care facility.

Next to the relationship between quality of life and indoor green, we found a positive relationship between the number of times residents go outside and their quality of life. This is in line with findings from other studies. Because we could not find a direct relation between outside green and quality of life, future research could focus on if other measurements of outdoor green can provide a direct relationship between outdoor green and quality of life.

In this study, a group of vulnerable residents - residents with cognitive limitations- have been excluded to participate. In future research, more attention must be paid to the influence of green on their quality of life. Due to the small number of facilities in this study, we were not able to add many facility characteristics to the multilevel analyses. In future research it would be interesting to investigate if the relation between green and quality of life still persist if other facility characteristics are added.

5.5 Practical implications

The results of this study suggest two practical implications for long-term care facilities. First, more green in indoor spaces positively relates to physical wellbeing, social participation and total quality of life. Facilities usually seek ways to improve the quality of life of their residents. Since indoor green positively related to quality of life, and indoor green relates to physical wellbeing and social participation, facilities can, against limited costs, (slightly) improve the total quality of life of their residents by increasing the use of green in indoor spaces. This study shows that there is many room for improvement in the use of indoor green, since almost all facilities who participated had little green or neutral green indoor spaces.

Second, the number of times residents go outside plays an important role in quality of life as well. Going outside positively relates to physical wellbeing, social participation and total quality of life. Although in this study we could not estimate a relationship between outdoor green and quality of life, it is assumed that, to stimulate the use of outdoor environments of long-term care facilities, these environments must be accessible, safe and attractive to use. The care requirements of residents of long-term care facilities usually are high. For a large group of residents, it is very difficult to go outside. Therefore, they depend on the effort of

others. Since long-term care facilities usually don't have enough employees and time to go outside with their residents, long-term care facilities should make arrangements with family or volunteers to take their less mobile residents outside.

In this study, we did not find a relation between green and mental wellbeing and living conditions. Since both indoor green and going outside positively relates with physical wellbeing and social participation, which affects total quality of life, green can contribute to the quality of life in long-term care and the quality of long-term care. Therefore long-term care facilities must focus on how they can improve the use of green.

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Appendix 1: 'Notion on own life questionnaire'

VRAGENLIJST
ZICHT OP EIGEN LEVEN

nivel   **Arcares**

Datum interview ➡ ☐☐-☐☐-☐☐

Instellingscode ➡ [_____]   Cliëntcode ➡ [_____]

INTRODUCTIE

De interviewer stelt zich voor. De interviewer benadrukt dat hij/zij niet vanuit de instelling komt, maar van buitenaf.

Ik wil vandaag met u een gesprek voeren over wat u belangrijk vindt in het leven. Aan de hand van een aantal stellingen wil ik met u praten over uw lichamelijke gezondheid, uw leefomstandigheden, uw contacten met anderen en de manier waarop u in het leven staat als persoon.

Het gesprek zal ongeveer een uur duren.

Uiteraard zullen uw gegevens vertrouwelijk worden behandeld. Wij zullen er zorg voor dragen dat de resultaten nooit herleidbaar zullen zijn tot de personen die de vragen hebben beantwoord.

De gegevens worden gebruikt om te onderzoeken hoe de mensen hier hun kwaliteit van leven ervaren, zodat de organisatie kan analyseren of er onderwerpen zijn waaraan meer aandacht besteed moet worden.

OPENINGSVRAGEN

- doorvragen indien de cliënt enkel met ja of nee antwoord.
- letterlijk de antwoorden noteren.
- bij voorkeur al tijdens het interview invullen onder welke domeinen de antwoorden van de cliënt vallen.

1. HEEFT U MOMENTEEL EEN GOED LEVEN?

- ⬤ Lichamelijk welbevinden/gezondheid
- ⬤ Woon-/leefsituatie
- ⬤ Participatie
- ⬤ Mentaal welbevinden

2. WAT DRAAGT VOOR U BIJ AAN EEN GOED LEVEN?

- ⬤ Lichamelijk welbevinden/gezondheid
- ⬤ Woon-/leefsituatie
- ⬤ Participatie
- ⬤ Mentaal welbevinden

3. WAT MAAKT HET LEVEN MINDER GOED?

- ⬤ Lichamelijk welbevinden/gezondheid
- ⬤ Woon-/leefsituatie
- ⬤ Participatie
- ⬤ Mentaal welbevinden

De eerste stellingen gaan over uw lichamelijk welzijn. Dit betreft onder andere uw gezondheid, lichamelijke verzorging en de mate waarin u kunt genieten van de maaltijden.

1.
IK VOEL ME GEZOND.

5
4
3
2
1

Hoe belangrijk is het voor u om u gezond te voelen?

3
2
1

TOELICHTING

2.
IK VIND DAT MIJN GEZONDHEIDSKLACHTEN SERIEUS WORDEN GENOMEN.

5
4
3
2
1

Hoe belangrijk is het voor u dat uw gezondheids- klachten serieus genomen worden?

3
2
1

TOELICHTING

3.
IK KAN OMGAAN MET MIJN LICHAMELIJKE BEPERKINGEN.

5
4
3
2
1

Hoe belangrijk is het voor u om te kunnen omgaan met lichamelijke beperkingen?

3
2
1

TOELICHTING

4.
HET LUKT ME OM HELDER NA TE DENKEN.

5
4
3
2
1

Hoe belangrijk is het voor u dat het u lukt om helder na te denken?

3
2
1

TOELICHTING

5.
MIJN LICHAMELIJKE VERZORGING GEBEURT ZOALS IK DAT WIL.

5
4
3
2
1

Hoe belangrijk is het voor u dat uw lichamelijke verzorging gebeurt zoals u dat wilt?

3
2
1

TOELICHTING

6.
HET TIJDSTIP VAN MIJN PERSOONLIJKE VERZORGING KAN IK ZELF BEPALEN.

5
4
3
2
1

Hoe belangrijk is het voor u om zelf het tijdstip van uw persoonlijke verzorging te kunnen bepalen?

3
2
1

TOELICHTING

5 helemaal eens
4 eens
3 eens noch oneens
2 oneens
1 helemaal oneens

3 heel belangrijk
2 belangrijk
1 niet zo belangrijk

– 2 –

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7.
DE MAALTIJDEN SMAKEN MIJ GOED.

5
4
3
2
1

Hoe belangrijk is het voor u dat de maaltijden goed smaken?

3
2
1

TOELICHTING

8.
IK KAN ETEN EN DRINKEN WANNEER IK WIL.

5
4
3
2
1

Hoe belangrijk is het voor u dat u kunt eten en drinken wanneer u wilt?

3
2
1

TOELICHTING

II WOON- / LEEFSITUATIE

De volgende stellingen gaan over uw leefomstandigheden. Daarbij kunt u denken aan uw woonruimte, uw omgeving en of u zich hier veilig en thuis voelt.

9.
IK VIND MIJN WOONRUIMTE COMFORTABEL.

5
4
3
2
1

Hoe belangrijk is comfortabele woonruimte voor u?

3
2
1

TOELICHTING

10.
IK VOEL ME HIER THUIS.

5
4
3
2
1

Hoe belangrijk is het voor u om u thuis te voelen?

3
2
1

TOELICHTING

11.
DE OMGEVING WAARIN DIT HUIS STAAT, HEEFT MIJ IETS TE BIEDEN.

5
4
3
2
1

Hoe belangrijk is het voor u dat de omgeving iets te bieden heeft?

3
2
1

TOELICHTING

5 helemaal eens
4 eens
3 eens noch oneens   3 heel belangrijk
2 oneens   2 belangrijk
1 helemaal oneens   1 niet zo belangrijk

–3–

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12. DE MENSEN IN MIJN OMGEVING ACCEPTEREN MIJ ZOALS IK BEN.	5 4 3 2 1	Hoe belangrijk is het voor u geaccepteerd te worden zoals u bent?	3 2 1	TOELICHTING
13. IK VOEL ME HIER VEILIG.	5 4 3 2 1	Hoe belangrijk is veiligheid voor u?	3 2 1	TOELICHTING
14. IK KAN ZELF BESLISSEN OVER DE ZAKEN DIE IK BELANGRIJK VIND.	5 4 3 2 1	Hoe belangrijk is het voor u om zelf te kunnen beslissen over de zaken die u belangrijk vindt?	3 2 1	TOELICHTING
15. IK VERVEEL ME NIET.	5 4 3 2 1	Hoe belangrijk is het voor u om u niet te vervelen?	3 2 1	TOELICHTING
16. IK HEB VOLDOENDE GELD OM EEN GOED LEVEN TE KUNNEN LEIDEN.	5 4 3 2 1	Hoe belangrijk is het voor u om voldoende geld te hebben om een goed leven te kunnen leiden?	3 2 1	TOELICHTING

5 helemaal eens
4 eens
3 eens noch oneens   3 heel belangrijk
2 oneens   2 belangrijk
1 helemaal oneens   1 niet zo belangrijk

– 4 –

Arcares   nivel

De volgende stellingen gaan over uw contacten met anderen. Daarbij kunt u bijvoorbeeld denken aan de contacten met familie of medebewoners, maar ook aan wat u voor anderen kunt betekenen.

17. IK HEB VOLDOENDE CONTACT MET FAMILIE.	5 4 3 2 1	Hoe belangrijk is contact met familie voor u?	3 2 1 — TOELICHTING
18. IK HEB GOED CONTACT MET MEDEBEWONERS.	5 4 3 2 1	Hoe belangrijk is goed contact met medebewoners voor u?	3 2 1 — TOELICHTING
19. IK HEB GOED CONTACT MET VERZORGENDEN.	5 4 3 2 1	Hoe belangrijk is goed contact met verzorgenden voor u?	3 2 1 — TOELICHTING
20. IK VOEL ME EENZAAM.	5 4 3 2 1	Hoe belangrijk is het voor u dat u zich niet eenzaam voelt?	3 2 1 — TOELICHTING
21. IK KAN REGELMATIG IETS BETEKENEN VOOR ANDEREN.	5 4 3 2 1	Hoe belangrijk is het voor u om iets voor anderen te kunnen betekenen?	3 2 1 — TOELICHTING
22. IK KAN MIJN BEZOEK OP PASSENDE WIJZE ONTVANGEN.	5 4 3 2 1	Hoe belangrijk is het voor u om uw bezoek op passende wijze te kunnen ontvangen?	3 2 1 — TOELICHTING

5 helemaal eens
4 eens
3 eens noch oneens   3 heel belangrijk
2 oneens   2 belangrijk
1 helemaal oneens   1 niet zo belangrijk

– 5 –

23. IK ERVAAR WARMTE EN GENEGENHEID IN DE CONTACTEN MET MENSEN OM MIJ HEEN.	5 4 3 2 1	Hoe belangrijk zijn warmte en genegenheid voor u?	3 2 1	TOELICHTING
24. ALS IK WIL, KAN IK MET MIJN ZORGEN EN VERDRIET BIJ ANDEREN TERECHT.	5 4 3 2 1	Hoe belangrijk is het voor u om met uw zorgen en verdriet bij anderen terecht te kunnen?	3 2 1	TOELICHTING
25. IK BELEEF LEUKE MOMENTEN MET ANDERE MENSEN.	5 4 3 2 1	Hoe belangrijk is het voor u om leuke momenten te beleven met andere mensen?	3 2 1	TOELICHTING

IV MENTAAL WELBEVINDEN

De volgende stellingen gaan over de wijze waarop u in het leven staat. De vragen gaan bijvoorbeeld over uzelf als persoon en hoe u uw leven leidt.

26. IK KAN ZELF BEPALEN HOE MIJN DAG ER UIT ZIET.	5 4 3 2 1	Hoe belangrijk is het voor u om zelf te kunnen bepalen hoe uw dag er uit ziet?	3 2 1	TOELICHTING
27. IK KAN KOMEN WAAR IK WIL IN HUIS.	5 4 3 2 1	Hoe belangrijk is het voor u om te kunnen komen waar u wilt in huis?	3 2 1	TOELICHTING

5 helemaal eens
4 eens
3 eens noch oneens
2 oneens
1 helemaal oneens

3 heel belangrijk
2 belangrijk
1 niet zo belangrijk

– 6 –

Arcares nivel

28. IK KAN KOMEN WAAR IK WIL BUITENSHUIS.	● 5 ● 4 ● 3 ● 2 ● 1	Hoe belangrijk is het voor u om te kunnen komen waar u wilt buitenshuis?	● 3 ● 2 ● 1	TOELICHTING
29. IK KAN MIJ ONGESTOORD TERUGTREKKEN WANNEER IK DAT WIL.	● 5 ● 4 ● 3 ● 2 ● 1	Hoe belangrijk is het voor u dat u zich ongestoord kunt terug-trekken?	● 3 ● 2 ● 1	TOELICHTING
30. IK BEN TEVREDEN MET MIJZELF, ZOALS IK BEN ALS MENS.	● 5 ● 4 ● 3 ● 2 ● 1	Hoe belangrijk is het voor u om tevreden te zijn met uzelf?	● 3 ● 2 ● 1	TOELICHTING
31. IK KIJK TEVREDEN TERUG OP HET DEEL VAN MIJN LEVEN DAT ACHTER MIJ LIGT.	● 5 ● 4 ● 3 ● 2 ● 1	Hoe belangrijk is het voor u om tevreden terug te kijken op het deel van uw leven dat achter u ligt?	● 3 ● 2 ● 1	TOELICHTING
32. IK BLIJF NIEUWE DINGEN VAN MEZELF ONTDEKKEN.	● 5 ● 4 ● 3 ● 2 ● 1	Hoe belangrijk is het voor u om nieuwe dingen van uzelf te blijven ontdekken?	● 3 ● 2 ● 1	TOELICHTING
33. MIJN LEVENSOVERTUIGING OF GELOOF STEUNT MIJ.	● 5 ● 4 ● 3 ● 2 ● 1	Hoe belangrijk is het voor u dat uw levens-overtuiging of geloof u steunt?	● 3 ● 2 ● 1	TOELICHTING

5 helemaal eens
4 eens
3 eens noch oneens   3 heel belangrijk
2 oneens   2 belangrijk
1 helemaal oneens   1 niet zo belangrijk

–7–

Arcares   nivel

AFRONDING

Dit waren de laatste vragen van het interview.
Heeft u nog op- of aanmerkingen naar aanleiding van dit gesprek? Dan wil ik deze graag noteren.
Hartelijk dank voor uw medewerking.

HOE LANG DUURDE HET INTERVIEW:　　　　　　　.......　**MINUTEN**

OPMERKINGEN VAN BEWONER:

NOTEREN NA AFNAME DOOR DE INTERVIEWER:

GESLACHT	**CLIËNTGROEP**	**ZORGINDICATIE**
⬤ man	⬤ intramuraal verzorgingshuis	⬤ huishoudelijke verzorging
⬤ vrouw	⬤ extramuraal verzorgingshuis (aan/inleun)	⬤ persoonlijke verzorging (bv. wassen)
	⬤ intramuraal verpleeghuis (somatiek)	⬤ verpleging (bv. medicijnen, wondverzorging)
	⬤ kortdurend verblijf (reactivering)	⬤ dagbehandeling PG
		⬤ paramedische zorg (bv. fysiotherapie)

LEEFTIJD	**SITUATIE PARTNER**	**TIJD IN HUIDIGE WONING**
----------	⬤ alleenstaand	⬤ minder dan 6 maanden
	⬤ met partner, samenwonend	⬤ 6 tot 12 maanden
	⬤ met partner, gescheiden wonend	⬤ tussen 1 en 2 jaar
		⬤ langer dan 2 jaar

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Appendix 2: 'Additional questions Notion on own life'

Extra vragen

1. Komen medewerkers wel eens langs om gewoon een praatje te maken (dus niet een praatje tijdens iets anders)?
   - ☐ ja
   - ☐ nee

   Zo ja, hoe vaak gebeurt dit?
   - ☐ 1 keer per maand of minder
   - ☐ 1 keer per week
   - ☐ meerdere keren per week
   - ☐ 1 keer per dag
   - ☐ meerdere keren per dag

2. Komt er een vrijwilliger bij u op bezoek?
   - ☐ ja
   - ☐ nee

   Zo ja, hoe vaak?
   - ☐ 1 keer per maand of minder
   - ☐ 1 keer per week
   - ☐ meerdere keren per week
   - ☐ 1 keer per dag
   - ☐ meerdere keren per dag

3. Vindt u de instelling gastvrij voor uw bezoek?
   - ☐ ja
   - ☐ nee

   Waarom (niet?) (meerdere antwoorden mogelijk)
   - ☐ consumpties
   - ☐ eten
   - ☐ activiteiten meedoen
   - ☐ sfeer
   - ☐ .....

4. Kunt u met bezoek een kopje koffie/ thee of een andere consumptie nuttigen?
   - ☐ ja
   - ☐ nee

5. Kan bezoek mee- eten met de warme maaltijd (al dan niet op afspraak)?
   - ☐ ja
   - ☐ nee

6. Waarmee brengt u zoal uw week door? / Wat doet u zoal in de week? (meerdere antwoorden mogelijk)*
   ☐ kaarten/ spelletjes
   ☐ handwerk/kunst
   ☐ oefeningen/sport
   ☐ muziek/zingen
   ☐ lezen/schrijven
   ☐ geestelijke/
      godsdienstige activiteiten
   ☐ uitstapjes/ winkelen
   ☐ TV-kijken
   ☐ tuinieren/ verzorgen planten
   ☐ gezellig praten
   ☐ helpen van anderen

   Zijn er taken die u hier in huis doet?
   (bijvoorbeeld lid cliëntenraad, introduceren van nieuwe bewoners et cetera)

   ....

   ....

   ....

7. Kan familie deelnemen aan activiteiten in huis?
   ☐ ja
   ☐ nee

   Zo ja, op welke wijze?

   ....

   ....

   ....

8. Zou u, in het algemeen, zeggen dat de meeste mensen te vertrouwen zijn, of dat u niet voorzichtig genoeg kunt zijn in uw omgang met anderen?
   ☐ de meeste mensen zijn te vertrouwen
   ☐ je kunt niet voorzichtig genoeg zijn
   ☐ weet niet

   eventuele toelichting gegeven bij het antwoord:

   ....

   ....

   ....

---

* Deze lijst is overgenomen uit de RAI MDS 2.1.

9. Heeft u spullen die voor u belangrijk zijn mee kunnen nemen toen u hier kwam wonen?
   ☐ ja
   ☐ nee

   Zo ja, welke spullen?

   ....

   ....

   ....

10. Had u graag iets meegenomen, wat niet kon?
    ☐ ja
    ☐ nee

    Zo ja, welke spullen?

    ....

    ....

    ....

11. Kunt u kiezen of u 's middags of 's avonds de warme maaltijd eet?
    ☐ ja
    ☐ nee

    Eet u de warme maaltijd 's middags of 's avonds?
    ☐ 's middags
    ☐ 's avonds

    Alleen in verpleeghuizen
12. Heeft u kunnen kiezen voor een 1-,2- of meer-persoonskamer?
    ☐ ja
    ☐ nee

    Heeft u een 1-, 2- of meer-persoonskamer?
    ☐ 1- persoonskamer
    ☐ 2- persoonskamer
    ☐ meer- persoonskamer, namelijk.......

Appendix 3: 'Green list' observation list

Observatie lijst Groen

Naam van de beoordelaar:

Instellings identificatie nummer:

Datum:

Met behulp van deze vragenlijst kunnen aspecten van het groen worden geobserveerd. De observatielijst is bedoeld voor de hele instelling met uitzondering van gesloten afdelingen.

1. Ligt het verpleeghuis direct aan de straat?

1	2
Ja	Nee

2. Ligt het verpleeghuis aan een:

Park	Ja	Nee
Meer	Ja	Nee
Vijver	Ja	Nee
Bos	Ja	Nee
Weide	Ja	Nee

3. Heeft het verpleeghuis een voortuin?

1	2
Ja	Nee

4. Heeft het verpleeghuis een tuin?

1	2
Ja	Nee

5. Is er een deur naar de tuin?

1	2
Ja	Nee

6. Zo ja, is die deur open of op slot?

1	2
Open	Op slot

7. Is de tuin toegankelijk voor bewoners met een rolstoel?

1	2
Ja	Nee

8. Zijn er in de tuin:

8.1 Bomen:

1	2	3	4	5	6
heel veel	veel	niet veel/niet weinig	weinig	heel weinig	geen

8.2 Struiken:

1	2	3	4	5	6
heel veel	veel	niet veel/niet weinig	weinig	heel weinig	geen

8.3 Planten:

1	2	3	4	5	6
heel veel	veel	niet veel/niet weinig	weinig	heel weinig	geen

8.4 Bloemen?

1	2	3	4	5	6
heel veel	veel	niet veel/niet weinig	weinig	heel weinig	geen

8.4 Zitplaatsen voor bewoners:

1	2	3	4	5	6
heel veel	veel	niet veel/niet weinig	weinig	heel weinig	geen

9.   In hoeverre maakt de tuin een groene indruk? De tuin is:

1   2   3   4   5

Zeer groen   groen   niet erg / niet weinig groen   weinig groen   niet groen

_____

10.   In hoeverre is er sprake van groen in de receptie?

10.1   Zijn er planten?

1   2   3   4   5   6

heel veel   veel   niet veel/niet weinig   weinig   heel weinig   geen

10.2   Zijn er bloemen?

1   2   3   4   5   6

heel veel   veel   niet veel/niet weinig   weinig   heel weinig   geen

10.3   Hoe groen is het uitzicht vanuit de receptie?

1   2   3   4   5

Zeer groen   groen   niet erg / niet weinig groen   weinig groen   niet groen

_____

11.   In hoeverre is er sprake van groen in de zitruimte?

11.1   Zijn er planten?

1   2   3   4   5   6

heel veel   veel   niet veel/niet weinig   weinig   heel weinig   geen

11.2   Zijn er bloemen?

1   2   3   4   5   6

heel veel   veel   niet veel/niet weinig   weinig   heel weinig   geen

11.3   Hoe groen is het uitzicht vanuit de zitruimte?

1	2	3	4	5

Zeer groen   groen   niet erg / niet weinig groen   weinig groen   niet groen

---

12   In hoeverre is er sprake van groen in de restaurant?

12.1   Zijn er planten?

1	2	3	4	5	6

heel veel   veel   niet veel/niet weinig   weinig   heel weinig   geen

12.2   Zijn er bloemen?

1	2	3	4	5	6

heel veel   veel   niet veel/niet weinig   weinig   heel weinig   geen

12.3   Is er een aquarium?

1	2

Ja   Nee

12.4   Hoe groen is het uitzicht vanuit het restaurant?

1	2	3	4	5

Zeer groen   groen   niet erg / niet weinig groen   weinig groen   niet groen

---

13.   Hoeveel verdiepingen heeft het verpleeghuis

.... verdiepingen

Registreer de volgende zaken per verdieping.

14   In hoeverre is er sprake van groen in de gangen?

14.1   Zijn er planten?

1	2	3	4	5	6
heel veel	veel	niet veel/niet weinig	weinig	heel weinig	geen

14.2   Zijn er bloemen?

1	2	3	4	5	6
heel veel	veel	niet veel/niet weinig	weinig	heel weinig	geen

De volgende vragen hoeven alleen ingevuld te worden wanneer het gaat om een verpleeghuis.

15.   Hoe groen is de huiskamer?

15.1   Zijn er planten?

1	2	3	4	5	6
heel veel	veel	niet veel/niet weinig	weinig	heel weinig	geen

15.2   Zijn er bloemen?

1	2	3	4	5	6
heel veel	veel	niet veel/niet weinig	weinig	heel weinig	geen

15.3   Hoe groen is het uitzicht vanuit de huiskamer?

1	2	3	4	5
Zeer groen	groen	niet erg / niet weinig groen	weinig groen	niet groen

Appendix 4: Multilevel analyses on physical wellbeing

Multilevel analysis: The influence of resident characteristics and green environment on physical wellbeing (N=396 residents, n=19 facilities)

Physical Wellbeing	Base Model		Step 1: Resident Characteristics		Step 2: Resident Characteristics and Facility characteristics	
	B	**SE**	**B**	**SE**	**B**	**SE**
Intercept	7,09*	,09	6,59*	,54	6,54*	,551
Resident Characteristics						
Male (Ref=female)			-,026	,119	-,025	,119
Age			,003	,007	,003	,007
Length of Stay < 2 years (Ref= > 2 years)			-,072	,106	-,074	,106
Care Requirements						
-RCF: Basic Care[a]			1,02*	,227	1,04*	,230
-RCF: Extended Care[a]			,276	,198	,291	,202
-Nursing Home: Short Stay/Rehabilitation[a]			,046	,291	,042	,291
Facility Characteristics						
Green environment (Ref = No) Yes					,083	,152
Variance Components	**B**	**SE**	**B**	**SE**	**B**	**SE**
Facility level	,079	,048	,046	,034	,048	,037
Resident Level	1,09	,079	1,03	,075	1,03	,075
ICC Facility level	7,2%		4,5%		4,7%	

*p<,01 **p<,05 ***p<,10
[a]Ref=Nursing Home Long Stay

Multilevel analysis: The influence of resident characteristics and the characteristics of the garden on physical wellbeing (N=396 residents, n=19 facilities)

Physical Wellbeing	Base Model		Step 1: Resident Characteristics		Step 2: Resident Characteristics and Facility characteristics	
	B	SE	B	SE	B	SE
Intercept	7,09*	,09	6,59*	,54	6,99*	,689
Resident Characteristics						
Male (Ref=female)			-,026	,119	-,028	,120
Age			,003	,007	,003	,007
Length of Stay < 2 years (Ref= > 2 years)			-,072	,106	-,071	,106
Care Requirements						
-RCF: Basic Care[a]			1,02*	,227	,996*	,230
-RCF: Extended Care[a]			,276	,198	,253	,201
-Nursing Home: Short Stay/Rehabilitation[a]			,046	,291	,037	,291
Facility Characteristics						
Garden Characteristics					-,132	,141
Variance Components	B	SE	B	SE	B	SE
Facility level	,079	,048	,046	,034	,048	,035
Resident Level	1,09	,079	1,03	,075	1,03	,075
ICC Facility level	7,2%		4,5%		4,7%	

*p<,01 **p<,05 ***p<,10

[a] Ref=Nursing Home Long Stay

Multilevel analysis: The influence of resident characteristics and the impression of the garden on physical wellbeing (N=396 residents, n=19 facilities)

Physical Wellbeing	Base Model		Step 1: Resident Characteristics		Step 2: Resident Characteristics and Facility characteristics	
	B	SE	B	SE	B	SE
Intercept	7,09*	,09	6,59*	,54	6,50*	,574
Resident Characteristics						
Male (Ref=female)			-,026	,119	-,027	,119
Age			,003	,007	,003	,007
Length of Stay < 2 years (Ref= > 2 years)			-,072	,106	-,074	,106
Care Requirements						
-RCF: Basic Care[a]			1,02*	,227	1,03*	,228
-RCF: Extended Care[a]			,276	,198	,277	,199
-Nursing Home: Short Stay/Rehabilitation[a]			,046	,291	,041	,292
Facility Characteristics						
Garden Impression					,040	,079
Variance Components	B	SE	B	SE	B	SE
Facility level	,079	,048	,046	,034	,048	,037
Resident Level	1,09	,079	1,03	,075	1,03	,075
ICC Facility level	7,2%		4,5%		4,7%	

*p<,01 **p<,05 ***p<,10
[a]Ref=Nursing Home Long Stay

Multilevel analysis: The influence of resident characteristics and indoor green on physical wellbeing (N=396 residents, n=19 facilities)

Physical Wellbeing	Base Model		Step 1: Resident Characteristics		Step 2: Resident Characteristics and Facility characteristics	
	B	SE	B	SE	B	SE
Intercept	7,09*	,09	6,59*	,54	5,98*	,609
Resident Characteristics						
Male (Ref=female)			-,026	,119	-,034	,119
Age			,003	,007	,004	,007
Length of Stay < 2 years (Ref= > 2 years)			-,072	,106	-,073	,106
Care Requirements						
-RCF: Basic Care[a]			1,02*	,227	1,08*	,216
-RCF: Extended Care[a]			,276	,198	,332***	,186
-Nursing Home: Short Stay/Rehabilitation[a]			,046	,291	,046	,291
Facility Characteristics						
Indoor Green					,232***	,109
Variance Components	B	SE	B	SE	B	SE
Facility level	,079	,048	,046	,034	,026	,029
Resident Level	1,09	,079	1,03	,075	1,03	,075
ICC Facility level	7,2%		4,5%		2,5%	

*p<,01 **p<,05 ***p<,10

[a]Ref=Nursing Home Long Stay

Multilevel analysis: The influence of resident characteristics and views of green on physical wellbeing (N=396 residents, n=19 facilities)

Physical Wellbeing	Base Model		Step 1: Resident Characteristics		Step 2: Resident Characteristics and Facility characteristics	
	B	SE	B	SE	B	SE
Intercept	7,09*	,09	6,59*	,54	6,65*	,627
Resident Characteristics						
Male (Ref=female)			-,026	,119	-,024	,120
Age			,003	,007	,003	,007
Length of Stay < 2 years (Ref= > 2 years)			-,072	,106	-,073	,106
Care Requirements						
-RCF: Basic Care[a]			1,02*	,227	1,03*	,231
-RCF: Extended Care[a]			,276	,198	,280	,203
-Nursing Home: Short Stay/Rehabilitation[a]			,046	,291	,0463	,291
Facility Characteristics						
Views of green					-,0319	,165
Variance Components	B	SE	B	SE	B	SE
Facility level	,079	,048	,046	,034	,052	,037
Resident Level	1,09	,079	1,03	,075	1,03	,075
ICC Facility level	7,2%		4,5%		5,0%	

*p<,01 **p<,05 ***p<,10

[a] Ref=Nursing Home Long Stay

Appendix 5: Multilevel analyses on living conditions

Multilevel analysis: The influence of resident characteristics and the green environment on living conditions (N=393 residents, n=19 facilities)

Living Conditions	Base Model		Step 1: Resident Characteristics		Step 2: Resident Characteristics and Facility characteristics	
	B	SE	B	SE	B	SE
Intercept	7,68*	,124	6,88	,566*	6,98*	,581
Resident Characteristics						
Male (Ref=female)			-,086	,122	-,085	,122
Age			,004	,007	,004	,007
Length of Stay < 2 years (Ref= > 2 years)			-,228**	,109	-,227**	,109
Care Requirements						
-RCF: Basic Care[a]			,970*	,278	,937*	,285
-RCF: Extended Care[a]			,690**	,253	,658**	,260
-Nursing Home: Short Stay/Rehabilitation[a]			,257	,299	,265	,299
Facility Characteristics						
Green Environment (Ref=No)						
-Yes					-,164	,210
Variance Components	B	SE	B	SE	B	SE
Facility level	,232	,099	,129	,062	,135	,065
Resident Level	1,09	,079	1,07	,078	1,07	,078
ICC Facility level	21,3%		12,1%		12,6%	

*p<,01 **p<,05 ***p<,10

[a] Ref=Nursing Home: Long Stay

Multilevel analysis: The influence of resident characteristics and the characteristics of the garden on living conditions (N=393 residents, n=19 facilities)

Living Conditions	Base Model		Step 1: Resident Characteristics		Step 2: Resident Characteristics and Facility characteristics	
	B	SE	B	SE	B	SE
Intercept	7,68*	,124	6,88	,566*	6,24*	,782
Resident Characteristics						
Male (Ref=female)			-,086	,122	-,083	,122
Age			,004	,007	,004	,007
Length of Stay < 2 years (Ref= > 2 years)			-,228**	,109	-,228**	,109
Care Requirements						
-RCF: Basic Care[a]			,970*	,278	1,01*	,276
-RCF: Extended Care[a]			,690**	,253	,730*	,251
-Nursing Home: Short Stay/Rehabilitation[a]			,257	,299	,266	,299
Facility Characteristics						
Garden Characteristics					,213	,179
Variance Components	B	SE	B	SE	B	SE
Facility level	,232	,099	,129	,062	,121	,062
Resident Level	1,09	,079	1,07	,078	1,07	,079
ICC Facility level	21,3%		12,1%		11,3%	

*p<,01 **p<,05 ***p<,10
[a] Ref=Nursing Home: Long Stay

Multilevel analysis: The influence of resident characteristics and the impression of the garden on living conditions (N=393 residents, n=19 facilities)

Living Conditions	Base Model		Step 1: Resident Characteristics		Step 2: Resident Characteristics and Facility characteristics	
	B	**SE**	**B**	**SE**	**B**	**SE**
Intercept	7,68*	,124	6,88	,566*	6,74*	,619
Resident Characteristics						
Male (Ref=female)			-,086	,122	-,086	,123
Age			,004	,007	,005	,007
Length of Stay < 2 years (Ref= > 2 years)			-,228**	,109	-,230**	,109
Care Requirements						
-RCF: Basic Care[a]			,970*	,278	,982*	,281
-RCF: Extended Care[a]			,690**	,253	,699**	,256
-Nursing Home: Short Stay/Rehabilitation[a]			,257	,299	,252	,299
Facility Characteristics						
Garden Impression					,064	,110
Variance Components	**B**	**SE**	**B**	**SE**	**B**	**SE**
Facility level	,232	,099	,129	,062	,133	,067
Resident Level	1,09	,079	1,07	,078	1,07	,079
ICC Facility level	21,3%		12,1%		12,4%	

*p<,01 **p<,05 ***p<,10

[a] Ref=Nursing Home: Long Stay

Multilevel analysis: The influence of resident characteristics and indoor green on living conditions (N=393 residents, n=19 facilities)

Living Conditions	Base Model		Step 1: Resident Characteristics		Step 2: Resident Characteristics and Facility characteristics	
	B	SE	B	SE	B	SE
Intercept	7,68*	,124	6,88	,566*	6,26*	,706
Resident Characteristics						
Male (Ref=female)			-,086	,122	-,088	,122
Age			,004	,007	,005	,007
Length of Stay < 2 years (Ref= > 2 years)			-,228**	,109	-,229**	,109
Care Requirements						
-RCF: Basic Care[a]			,970*	,278	1,032*	,275
-RCF: Extended Care[a]			,690**	,253	,756*	,250
-Nursing Home: Short Stay/Rehabilitation[a]			,257	,299	,258	,299
Facility Characteristics						
Indoor Green					,246	,170
Variance Components	B	SE	B	SE	B	SE
Facility level	,232	,099	,129	,062	,115	,060
Resident Level	1,09	,079	1,07	,078	1,07	,079
ICC Facility level	21,3%		12,1%		10,7%	

*p<,01 **p<,05 ***p<,10

[a] Ref=Nursing Home: Long Stay

Multilevel analysis: The influence of resident characteristics and green views on living conditions (N=393 residents, n=19 facilities)

Living Conditions	Base Model		Step 1: Resident Characteristics		Step 2: Resident Characteristics and Facility characteristics	
	B	**SE**	**B**	**SE**	**B**	**SE**
Intercept	7,68*	,124	6,88	,566*	6,50*	,683
Resident Characteristics						
Male (Ref=female)			-,086	,122	-,089	,122
Age			,004	,007	,004	,007
Length of Stay < 2 years (Ref= > 2 years)			-,228**	,109	-,226**	,109
Care Requirements						
-RCF: Basic Care[a]			,970*	,278	,943*	,279
-RCF: Extended Care[a]			,690**	,253	,665**	,255
-Nursing Home: Short Stay/Rehabilitation[a]			,257	,299	,263	,299
Facility Characteristics						
Green Views					,205	,206
Variance Components	**B**	**SE**	**B**	**SE**	**B**	**SE**
Facility level	,232	,099	,129	,062	,130	,064
Resident Level	1,09	,079	1,07	,078	1,07	,078
ICC Facility level	21,3%		12,1%		12,1%	

*p<,01 **p<,05 ***p<,10

[a] Ref=Nursing Home: Long Stay

Appendix 6: Multilevel analyses on social participation

Multilevel analysis: The influence of resident characteristics and green environment on social participation (N=385 residents, n=18 facilities)

Social Participation	Base Model		Step 1: Resident Characteristics		Step 2: Resident Characteristics and Facility characteristics	
	B	SE	B	SE	B	SE
Intercept	7,38*	,097	7,48*	599	7,52*	,612
Resident Characteristics						
Male (Ref=female)			-,018	,129	-,017	,129
Age			-,003	,007	-,003	,007
Length of Stay < 2 years (Ref= > 2 years)			-,063	,114	-,064	,114
Care Requirements						
-RCF: Basic Care[a]			,325	,294	,318	,302
-RCF: Extended Care[a]			,142	,269	,136	,277
-Nursing Home: Short Stay/Rehabilitation[a]			,381	,323	,384	,323
Facility Characteristics						
Green environment (Ref=No) -Yes					-,067	,214
Variance Components	**B**	**SE**	**B**	**SE**	**B**	**SE**
Facility level	,111	,055	,123	,062	,134	,068
Resident Level	1,11	,081	1,12	,083	1,12	,083
ICC Facility level	10%		11%		12%	

*p<,01 **p<,05 ***p<,10

[a] Ref=Nursing Home: Long Stay

Multilevel analysis: The influence of resident characteristics and characteristics of the garden on social participation (N=385 residents, n=18 facilities)

Social Participation	Base Model		Step 1: Resident Characteristics		Step 2: Resident Characteristics and Facility characteristics	
	B	**SE**	**B**	**SE**	**B**	**SE**
Intercept	7,38*	,097	7,48*	599	6,69*	,806
Resident Characteristics						
Male (Ref=female)			-,018	,129	-,018	,129
Age			-,003	,007	-,003	,007
Length of Stay < 2 years (Ref= > 2 years)			-,063	,114	-,062	,114
Care Requirements						
-RCF: Basic Care[a]			,325	,294	,390	,290
-RCF: Extended Care[a]			,142	,269	,204	,264
-Nursing Home: Short Stay/Rehabilitation[a]			,381	,323	,388	,323
Facility Characteristics						
Garden Characteristics					,255	,177
Variance Components	**B**	**SE**	**B**	**SE**	**B**	**SE**
Facility level	,111	,055	,123	,062	,109	,059
Resident Level	1,11	,081	1,12	,083	1,12	,083
ICC Facility level	10%		11%		9,7%	

*p<,01 **p<,05 ***p<,10

[a] Ref=Nursing Home: Long Stay

Multilevel analysis: The influence of resident characteristics and impression of the garden on social participation (N=385 residents, n=18 facilities)

Social Participation	Base Model		Step 1: Resident Characteristics		Step 2: Resident Characteristics and Facility characteristics	
	B	**SE**	**B**	**SE**	**B**	**SE**
Intercept	7,38*	,097	7,48*	599	7,11*	,630
Resident Characteristics						
Male (Ref=female)			-,018	,129	-,028	,129
Age			-,003	,007	-,002	,007
Length of Stay < 2 years (Ref= > 2 years)			-,063	,114	-,065	,114
Care Requirements						
-RCF: Basic Care[a]			,325	,294	,319	,278
-RCF: Extended Care[a]			,142	,269	,132	,252
-Nursing Home: Short Stay/Rehabilitation[a]			,381	,323	,367	,323
Facility Characteristics						
Garden Impression					,170	,102
Variance Components	**B**	**SE**	**B**	**SE**	**B**	**SE**
Facility level	,111	,055	,123	,062	,096	,059
Resident Level	1,11	,081	1,12	,083	1,12	,083
ICC Facility level	10%		11%		8,6%	

*p<,01 **p<,05 ***p<,10

[a] Ref=Nursing Home: Long Stay

Multilevel analysis: The influence of resident characteristics and indoor green on social participation (N=385 residents, n=18 facilities)

Social Participation	Base Model		Step 1: Resident Characteristics		Step 2: Resident Characteristics and Facility characteristics	
	B	**SE**	**B**	**SE**	**B**	**SE**
Intercept	7,38*	,097	7,48*	599	6,70*	,716
Resident Characteristics						
Male (Ref=female)			-,018	,129	-,023	,129
Age			-,003	,007	-,002	,007
Length of Stay < 2 years (Ref= > 2 years)			-,063	,114	-,064	,114
Care Requirements						
-RCF: Basic Care[a]			,325	,294	,387	,282
-RCF: Extended Care[a]			,142	,269	,208	,256
-Nursing Home: Short Stay/Rehabilitation[a]			,381	,323	,387	,322
Facility Characteristics						
Indoor Green					,313***	,164
Variance Components	**B**	**SE**	**B**	**SE**	**B**	**SE**
Facility level	,111	,055	,123	,062	,098	,055
Resident Level	1,11	,081	1,12	,083	1,12	,083
ICC Facility level	10%		11%		8,7%	

*p<,01 **p<,05 ***p<,10

[a] Ref=Nursing Home: Long Stay

Multilevel analysis: The influence of resident characteristics and green views on social participation (N=385 residents, n=18 facilities)

Social Participation	Base Model		Step 1: Resident Characteristics		Step 2: Resident Characteristics and Facility characteristics	
	B	**SE**	**B**	**SE**	**B**	**SE**
Intercept	7,38*	,097	7,48*	599	7,08*	,712
Resident Characteristics						
Male (Ref=female)			-,018	,129	-,023	,129
Age			-,003	,007	-,003	,007
Length of Stay < 2 years (Ref= > 2 years)			-,063	,114	-,061	,114
Care Requirements						
-RCF: Basic Care[a]			,325	,294	,304	,296
-RCF: Extended Care[a]			,142	,269	,122	,271
-Nursing Home: Short Stay/Rehabilitation[a]			,381	,323	,385	,323
Facility Characteristics						
Green views					,211	,206
Variance Components	**B**	**SE**	**B**	**SE**	**B**	**SE**
Facility level	,111	,055	,123	,062	,125	,063
Resident Level	1,11	,081	1,12	,083	1,12	,083
ICC Facility level	10%		11%		11,2%	

*p<,01 **p<,05 ***p<,10

[a] Ref=Nursing Home: Long Stay

Appendix 7: Multilevel analyses on total quality of life

Multilevel analysis: The influence of resident characteristics and green environment on quality of life (N=325 residents, n=16 facilities)

Quality of life	Base Model		Step 1: Resident Characteristics		Step 2: Resident Characteristics and Facility characteristics	
	B	**SE**	**B**	**SE**	**B**	**SE**
Intercept	7,28*	,085	7,28*	,482	7,30*	,489
Resident Characteristics						
Male (Ref=female)			-,050	,108	-,048	,108
Age			-,004	,006	-,004	,006
Length of Stay < 2 years (Ref= > 2 years)			-,069	,095	-,069	,095
Care Requirements						
-RCF: Basic Care[a]			,801*	,224	,808*	,229
-RCF: Extended Care[a]			,423**	,200	,422***	,206
-Nursing Home: Short Stay/Rehabilitation[a]			,159	,268	,163	,268
Facility Characteristics						
Green environment (Ref=No) -Yes					-,037	,157
Variance Components	**B**	**SE**	**B**	**SE**	**B**	**SE**
Facility level	,079	,042	,053	,032	,060	,036
Resident Level	,681	,055	,667	,054	,667	,054
ICC Facility level	11,6%		7,9%		9%	

*p<,01 **p<,05 ***p<,10
[a] Ref=Nursing Home: Long Stay

Multilevel analysis: The influence of resident characteristics and characteristics of the garden on quality of life (N=325 residents, n=16 facilities)

Quality of life	Base Model		Step 1: Resident Characteristics		Step 2: Resident Characteristics and Facility characteristics	
	B	SE	B	SE	B	SE
Intercept	7,28*	,085	7,28*	,482	6,66*	,618
Resident Characteristics						
Male (Ref=female)			-,050	,108	-,052	,108
Age			-,004	,006	-,004	,006
Length of Stay < 2 years (Ref= > 2 years)			-,069	,095	-,068	,095
Care Requirements						
-RCF: Basic Care[a]			,801*	,224	,852*	,218
-RCF: Extended Care[a]			,423**	,200	,460**	,194
-Nursing Home: Short Stay/Rehabilitation[a]			,159	,268	,162	,268
Facility Characteristics						
Garden Characteristics					,202	,127
Variance Components	**B**	**SE**	**B**	**SE**	**B**	**SE**
Facility level	,079	,042	,053	,032	,043	,029
Resident Level	,681	,055	,667	,054	,668	,054
ICC Facility level	11,6%		7,9%		6,4%	

*p<,01 **p<,05 ***p<,10

[a] Ref=Nursing Home: Long Stay

Multilevel analysis: The influence of resident characteristics and impression of the garden on quality of life (N=325 residents, n=16 facilities)

Quality of life	Base Model		Step 1: Resident Characteristics		Step 2: Resident Characteristics and Facility characteristics	
	B	SE	B	SE	B	SE
Intercept	7,28*	,085	7,28*	,482	7,06*	,506
Resident Characteristics						
Male (Ref=female)			-,050	,108	-,059	,108
Age			-,004	,006	-,004	,006
Length of Stay < 2 years (Ref= > 2 years)			-,069	,095	-,070	,095
Care Requirements						
-RCF: Basic Care[a]			,801*	,224	,797*	,216
-RCF: Extended Care[a]			,423**	,200	,411**	,192
-Nursing Home: Short Stay/Rehabilitation[a]			,159	,268	,140	,268
Facility Characteristics						
Garden impression					,010	,076
Variance Components	B	SE	B	SE	B	SE
Facility level	,079	,042	,053	,032	,043	,032
Resident Level	,681	,055	,667	,054	,670	,054
ICC Facility level	11,6%		7,9%		6,4%	

*p<,01 **p<,05 ***p<,10
[a] Ref=Nursing Home: Long Stay

Multilevel analysis: The influence of resident characteristics and indoor green on quality of life (N=325 residents, n=16 facilities)

Quality of life	Base Model		Step 1: Resident Characteristics		Step 2: Resident Characteristics and Facility characteristics	
	B	SE	B	SE	B	SE
Intercept	7,28*	,085	7,28*	,482	6,56*	,543
Resident Characteristics						
Male (Ref=female)			-,050	,108	-,052	,108
Age			-,004	,006	-,004	,006
Length of Stay < 2 years (Ref= > 2 years)			-,069	,095	-,069	,095
Care Requirements						
-RCF: Basic Care[a]			,801*	,224	,894*	,206
-RCF: Extended Care[a]			,423**	,200	,500*	,181
-Nursing Home: Short Stay/Rehabilitation[a]			,159	,268	,158	,267
Facility Characteristics						
Indoor green					,289**	,109
Variance Components	B	SE	B	SE	B	SE
Facility level	,079	,042	,053	,032	,027	,023
Resident Level	,681	,055	,667	,054	,667	,054
ICC Facility level	11,6%		7,9%		4%	

*p<,01 **p<,05 ***p<,10

[a] Ref=Nursing Home: Long Stay

Multilevel analysis: The influence of resident characteristics and views of green on quality of life (N=325 residents, n=16 facilities)

Quality of life	Base Model		Step 1: Resident Characteristics		Step 2: Resident Characteristics and Facility characteristics	
	B	**SE**	**B**	**SE**	**B**	**SE**
Intercept	7,28*	,085	7,28*	,482	7,010*	,574
Resident Characteristics						
Male (Ref=female)			-,050	,108	-,050	,108
Age			-,004	,006	-,004	,006
Length of Stay < 2 years (Ref= > 2 years)			-,069	,095	-,068	,095
Care Requirements						
-RCF: Basic Care[a]			,801*	,224	,807*	,227
-RCF: Extended Care[a]			,423**	,200	,423**	,204
-Nursing Home: Short Stay/Rehabilitation[a]			,159	,268	,162	,268
Facility Characteristics						
Green views					,099	,166
Variance Components	**B**	**SE**	**B**	**SE**	**B**	**SE**
Facility level	,079	,042	,053	,032	,057	,035
Resident Level	,681	,055	,667	,054	,668	,054
ICC Facility level	11,6%		7,9%		8,5%	

*p<,01 **p<,05 ***p<,10

[a] Ref=Nursing Home: Long Stay