

EMPOWERING AGING

enhancing mobility and social
connections for active aging



Research Plan
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Colophon

RESEARCH PAPER

AR3AD110 Dwelling Graduation Studio:
Designing for Care in an Inclusive
Environment (2024/25 Q1)

TU Delft // Faculty of Architecture and
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Chapter 1

Introduction

Architectural and urban design can have an influence on active aging. The concept of active aging plays a role in the quality of life, by supporting a mental, physical, and social active lifestyle. It is not only influenced by healthcare or social services but also by the physical environments of daily lives.

A design focused on active aging can improve safety, facilitate movement, and encourage social interaction to reduce loneliness without excluding vulnerable groups, such as the elderly. Environments that are poorly designed can increase the risk of loneliness, isolation, and physical limitations, especially for vulnerable target groups.



Figure 1 – Tarwewijk (photo taken by the author)

1.1 Problem statement

Tarwewijk is a neighborhood located in the Charlois district in the South of Rotterdam, with a population of around 12.000 residents.¹ The majority of these residents are aged between 27 and 35 years old, followed by a majority age group of 40 to 55 years old. Only a smaller percentage of the population is older than 65 years old. Throughout the years, the elderly population in the neighborhood has decreased significantly, reaching almost half of the population present in 1992.² While there is no clear reason for the low percentage of elderly, there are some factors present that can play a role, such as life expectancy, housing types and lack of nursing homes and elderly care facilities.

Active Aging

The life expectancy of the people in the neighborhood is lower compared to the average on a national level. In Tarwewijk, women are expected to live until around 80 years old, and men until around 74.³ Lower education, access to the healthcare system, and unhealthy living conditions also affect life expectancy, as better-educated people tend to have healthier habits and better access

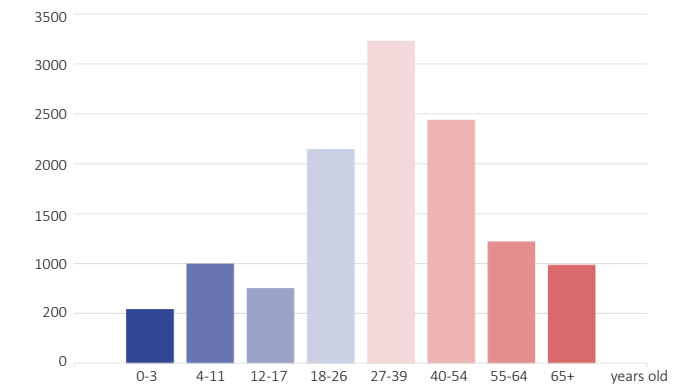


Figure 2 – age of residents (Wijkprofiel Rotterdam)

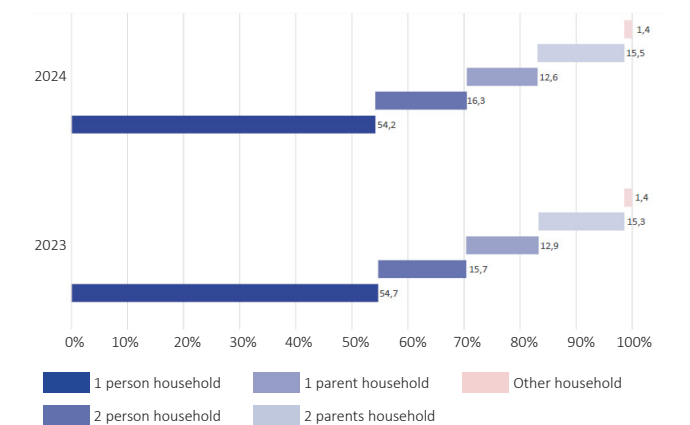


Figure 3 – Household type (Wijkprofiel Rotterdam)

to jobs and healthcare.⁴ Lifestyle factors such as diet, smoking, and lack of exercise and movement can also have a negative impact on life expectancy. They can lead to heart diseases, cancer, and diabetes and shorten the life duration.⁵ The unhealthy habits that lead to lower

¹ "Wijkprofiel Rotterdam," <https://wijkprofiel.rotterdam.nl/nl/2024/rotterdam>.

² "Dashboard - Bevolking - Charlois," accessed October 16, 2024, <https://gezondheidinkaart.nl/dashboard/dashboard/bevolking>.

³ Marleen Luijt, "In Tarwewijk leef je zeven jaar korter," NRC, June 24, 2014, <https://www.nrc.nl/nieuws/2014/06/24/in-tarwewijk-leef-je-zeven-jaar-korter-1393267-a308458>.

⁴ "The Relationship between Education and Adult Mortality in the United States," 2024.

⁵ MICHAEL ANNEAR et al., "Environmental Influences on Healthy and Active Ageing: A Systematic Review," *Ageing and Society* 34, no. 4 (2014): 590–622, <https://doi.org/10.1017/S0144686X1200116X>.

life expectancy in the neighborhood of Tarwewijk create an opportunity and a necessity for improvement and redesign focusing on active aging concepts. “Active aging” and “age-friendly” architectural and urban design follow principles based on accessibility, inclusivity, and adaptability, focusing on staying active both physically and mentally, and helping people grow old in a healthier way.⁶

Mobility limitations

The neighborhood is predominantly residential with low- and medium-rise buildings. Most of the building blocks consist of the portico typology and have three to four levels with no elevator. The portico typology causes accessibility issues, as it presents steep and narrow staircases that are not ideal for the elderly. The lack of elevators combined with the height of the buildings create complications for the elderly to live independently in this neighborhood. Mobility limitations are common among the elderly, as they are present in about 35% of the people aged 65 or older.⁷ The mobility limitations can have different levels of severity and based on that can include climbing the stairs, walking, or performing personal tasks such as cooking or showering. Mobility issues have an impact on the person’s independence, and depending on the severity, a formal or informal caregiver may be needed for partial or permanent help. The neighborhood lacks a nursing home

or elderly home that could provide such help for the elderly. In the Netherlands there is a high demand for nursing homes, causing long waiting lines for the existing ones. Nursing homes are primarily seen as places for your very last years and only for severe cases, such as severe chronic illnesses like dementia, or high-level care needs.⁸ For this reason, getting a spot in such a facility is very difficult. Since nursing homes are suited for the elderly with severe needs, the ones in need of light care rely on formal or informal caregivers. There is big pressure on informal caregivers.⁹

The lack of elderly facilities in the neighborhood leaves room for implementing caring facilities, focusing on light care, to release pressure from the informal caregivers.

Loneliness

Loneliness is a problem faced by all age groups, including elderly, and can result from emotional, social, and environmental circumstances. Among seniors, the lack of social interaction is a prime cause, often resulting from mobility issues, which make it difficult to go outside the house or meet with friends, living alone, and lack of physical exercise can also contribute to mental health issues.¹⁰ One sad case of a woman found dead in her apartment in Rotterdam ten years later shows the real traces of loneliness among people living alone.¹¹ In the neighborhood of Tarwewijk, 54.2% of the households are

one-person households, which means that more than half the population of the neighborhood lives alone.¹² The neighborhood hosts two community centers which shows that social integration and loneliness are something the neighborhood is dealing with for all age groups and provides spaces for such interaction.

One type of living environment where people can live on their own but still have shared facilities to increase social interaction is co-housing. Research on senior co-housing states that such communities offer emotional and social support for the elderly and help combat loneliness.¹³ Co-housing, also called “Living together on one’s own”,

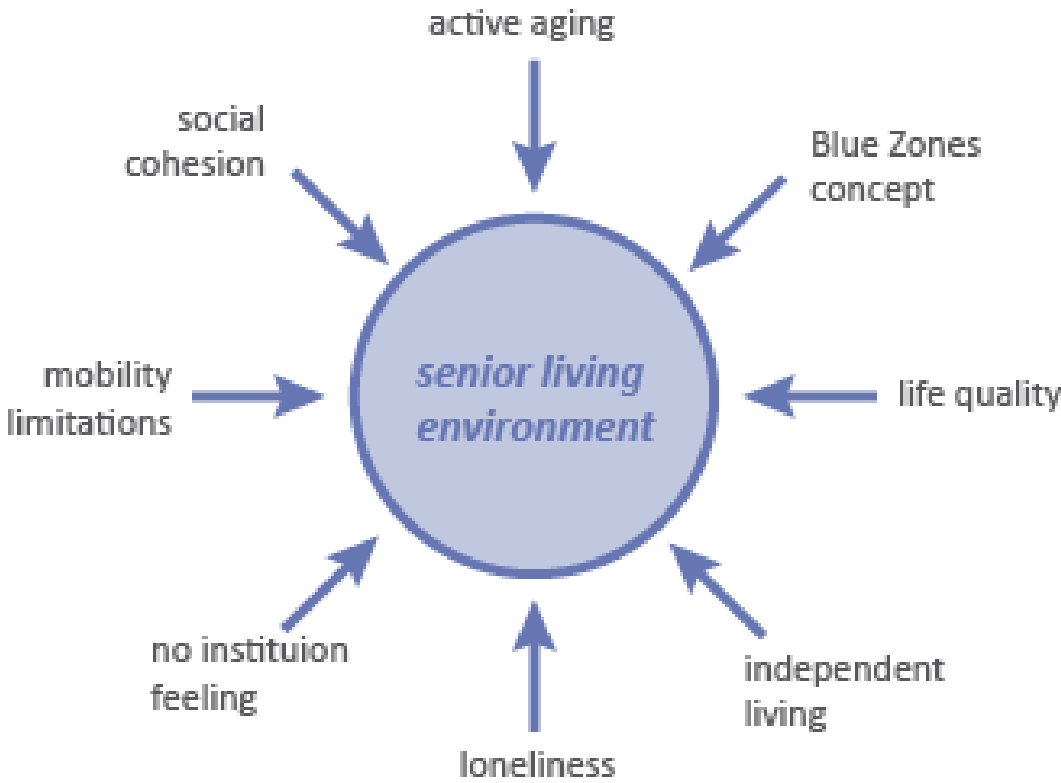


Figure 4 - Factors influencing the design for a senior living environment

This paper aims to investigate the intersection between active aging and architectural and urban design in order to combat loneliness, offer light-care facilities, and encourage movement and exercise for elderly. A senior living environment where people can live

individually, have common spaces and activities, be offered assisted living care facilities, and have freedom without feeling in an institution would be a missing addition to the Tarwewijk neighborhood, and maybe to the entire city of Rotterdam.

⁶ ANNEAR et al.
⁷ on behalf of the Council on Environment and Physical Activity (CEPA) – Older Adults working group et al., “Built Environmental Correlates of Older Adults’ Total Physical Activity and Walking: A Systematic Review and Meta-Analysis,” *International Journal of Behavioral Nutrition and Physical Activity* 14, no. 1 (December 2017): 103, <https://doi.org/10.1186/s12966-017-0558-z>.
⁸ Welzijn en Sport Ministerie van Volksgezondheid, “Nursing Homes and Residential Care - Government.NL,” onderwerp (Ministerie van Algemene Zaken, January 4, 2017), <https://www.government.nl/topics/nursing-homes-and-residential-care>.

⁹ Ministerie van Volksgezondheid.
¹⁰ Hawkey and Cacioppo, “Loneliness Matters: A Theoretical and Empirical Review of Consequences and Mechanisms.”
¹¹ Bewerkt door: Redactie, “Vrouw Ligt Tien Jaar Dood in Huis Rotterdam,” *AD.nl*, November 21, 2013, <https://www.ad.nl/rotterdam/vrouw-ligt-tien-jaar-dood-in-huis-rotterdam~abb67818/>.
¹² “Buurt Tarwewijk (Gemeente Rotterdam) in Cijfers En Grafieken (Bijgewerkt 2024!),” *AlleCijfers.nl*, July 1, 2016, <https://allecijfers.nl/buurt/tarwewijk-rotterdam/>.

¹³ Ann Bookman, “Innovative Models of Aging in Place: Transforming Our Communities for an Aging Population,” *Community, Work & Family* 11, no. 4 (November 1, 2008): 419–38, <https://doi.org/10.1080/13668800802362334>.
¹⁴ Katja Rusinovic, Marianne Van Bochove, and Jolien Van De Sande, “Senior Co-Housing in the Netherlands: Benefits and Drawbacks for Its Residents,” *International Journal of Environmental Research and Public Health* 16, no. 19 (October 8, 2019): 3776, <https://doi.org/10.3390/ijerph16193776>.

1.2 Theoretical framework

The theoretical framework of this research is composed of three theories, one for each point highlighted in the problem statement: active aging, mobility limitations and loneliness.

The theoretical framework for active aging is based on the concepts of the book “The Blue Zones ” by Dan Buettner. He identifies areas in the world where people have longer and happier lives due to lifestyle, habits and environmental factors.¹⁵ This framework will provide insights into how these factors will contribute to an increased lifespan and healthy aging. Further, these concepts will be used in designing aging-friendly living environments and elderly facilities. Buettner explains how the environment and lifestyle have a big impact on your life. He noticed that people from the Blue Zones incorporate natural movements, such as gardening, walking, and manual labor, into their daily routines. This study suggests that living environments that promote natural physical activities are more effective for the well-being of their residents. Other key concepts described by Buettner are the importance of community and diet. In Blue Zones people tend to keep close relationships with community members, friends and family, as it provides a sense of purpose and reduces loneliness, which

further reduces stress and other mental problems linked with it, influencing longevity.¹⁶ He also discovered that residents of the Blue Zones have primarily a plant-based diet rich in antioxidants, essential nutrients, and fiber and tend to stop eating when 80% full, to reduce the risk of obesity.¹⁶

The theories from Buettner’s “The Blue Zones” provide an understanding of the factors that contribute to healthy aging and longevity. This framework suggests that strong community feelings, healthy eating, natural movement, stress management, and purposeful living have an impact on life expectancy and should be integrated into urban and architectural design to promote and encourage this lifestyle.¹⁷ Although “The Blue Zones” theory promotes some good ideas, there is also critique about other concepts.

The theoretical framework for mobility limitations is based on the concepts from Lawton and Nahemow’s “Ecological Model of Aging”. Lawton was an American psychologist known for his work in the fields of environmental psychology and gerontology. His work focused on aging, specifically the relationship between the elderly and their physical and social environment.¹⁸ The main concept of the “Ecological

model of aging” is “Person-Environment Fit” which connects one’s functional abilities to the challenges of their environment. In the case of the elderly with mobility limitations, the degree of person-environment fit is critical in finding out their capacity to stay independent and perform daily tasks. When someone’s mobility is decreased, environmental aspects such as stairs, long distances to necessary functions, and uneven surfaces can become problematic obstacles.¹⁹

The theoretical framework for loneliness is based on the concepts of the “Loneliness and Health Model” by Hawkey and Cacioppo, which offers an understanding of the negative effects of loneliness on mental and physical health. Louise Hawkey is an expert on the topics of loneliness and social isolation and researches their association with health during aging.²⁰ John Cacioppo was a researcher in the field of social neuroscience, who focused on loneliness and his research had an impact on both psychology and neuroscience.²¹ In this model, it is researched how loneliness has an influence on stress levels, which can lead to weakened

immune systems, cardiovascular issues, and increased inflammation, which can increase the risk of diseases. Loneliness also increases the risk of mental health issues such as anxiety and depression.²² The concept of loneliness is seen as not only a result of social isolation but a factor that weakens mental and physical health. The text supports that loneliness should not only be addressed by increasing social connections but also by reducing the risks of diseases that can be an effect by it.²³

Hypothesis:

By designing a senior living environment focused on active aging, combating loneliness, and mobility limitations, elderly people in Tarwewijk would have more suitable places to live and have a healthy lifestyle.

¹⁵ Dan Buettner and Sam Skemp, “Blue Zones: Lessons from the World’s Longest Lived,” *American Journal of Lifestyle Medicine* 10, no. 5 (2016): 318–21.

¹⁶ Buettner and Skemp, “Blue Zones: Lessons from the World’s Longest Lived.”

¹⁷ Buettner and Skemp.

¹⁸ No indicated, “M. Powell Lawton (1923-2001).,” *Psychology and Aging* 16 (March 1, 2001): 30–30, <https://doi.org/10.1037/h0087879>.

¹⁹ M Powell Lawton and Lucille Nahemow, “Ecology and the Aging Process,” 1973.

²⁰ “Louise Hawkey | NORC at the University of Chicago,” accessed October 16, 2024, <https://www.norc.org/about/experts/louise-hawkey.html>.

²¹ “John T. Cacioppo, Pioneer and Founder of the Field of Social Neuroscience, 1951-2018 | University of Chicago News,” March

8, 2018, <https://news.uchicago.edu/story/john-t-cacioppo-pioneer-and-founder-field-social-neuroscience-1951-2018>.

²² Louise C. Hawkey and John T. Cacioppo, “Loneliness and Pathways to Disease,” *Brain, Behavior, and Immunity* 17 Suppl 1 (February 2003): S98-105, [https://doi.org/10.1016/s0889-1591\(02\)00073-9](https://doi.org/10.1016/s0889-1591(02)00073-9).

²³ Hawkey and Cacioppo.

1.3 Research question

Main research question:

How can the architectural and urban design of senior living environments be optimized to reduce loneliness, promote active aging, and enhance access to supportive care facilities?

Sub questions:

1. What architectural elements and design features effectively enhance social interaction among residents in senior living environments?
2. What design strategies can facilitate accessibility and mobility for seniors, thereby promoting active aging and encouraging physical engagement within the community?
3. How can the integration of supportive care facilities within architectural and urban designs enhance the overall well-being and independence of seniors in co-housing settings?

Definitions:

Co-housing: the term “co-housing” refers to a living environment in which people have the facilities to live on their own but have the possibility to share certain amenities, such as garden, common room, common kitchen, sport equipment.

Senior: the term “senior” is considered by the Dutch government as someone aged 75 or older, but this research will refer to people aged 65 or older, as it based on active aging and prevention as well

Elderly: the term “elderly” is considered by the Dutch government as someone aged 75 or older, but this research will refer to people aged 65 or older, as it based on active aging and prevention as well

Living environment: the term refers to the space and context in which someone lives and interacts with other people

Active aging: the term refers to the concept of promoting and encouraging a healthier lifestyle, from a physical, mental and social point of view

This research targets elderly people both in full power, but also with mobility problems or other types of issues that might require partial assisted living. It does not target advanced illnesses such as dementia or other chronic diseases that require intensive care facilities. This research will look into reference projects from different countries, but will in the end take into account factors and regulations specific to the Netherlands, as the project is based in Tarwewijk, Rotterdam.

1.4 Research methods

The methodology of this research paper is divided into three categories that help collect the knowledge needed to understand the target group and the needs for designing for them. These methods are analyzed individually and later the conclusions will be compiled together to produce design guidelines.

Literature

Firstly, literature research is used to deepen the knowledge needed to answer the research question and sub-questions. The articles and books analyzed focus on co-housing for seniors and elderly homes, as well as attributes for a healthy lifestyle. They were found by using the search terms from figure 5 on Google Scholar.

The main supporting text used is “Living for the Elderly, A Design Manual” by Eckhard Feddersen and Insa Lüdtkke, which provides insights into the relationship between architecture and the quality of life and independence of the elderly.²⁴ This text is particularly interesting for the research for discussing and providing practical guidelines for designing accessible, safe, and comfortable environments for elderly people. The first edition of this book was released in 2009, which can seem outdated for the

matter at hand. However, a new and revised version was released in 2018, which is the one used for this research, because it is more relevant for current problems. The first author, Eckhard Feddersen is a German architect who worked with the subject of the elderly in different architecture projects and papers. Among other projects, he also designed nursing homes. Insa Lüdtkke is a scientific journalist who contributed to different papers on the subject of the elderly and health.

The text “Senior Co-Housing in the Netherlands: Benefits and Drawbacks for Its Residents” written by by Katja Rusinovic, Marianne van Bochove and Jolien van de Sande will be used as support for analyzing and looking for opportunities in the co-housing environment.²⁵ Katja Rusinovic is a research and professor at Urban Development at The Hague University of Applied Sciences who focuses, among other themes, on housing for seniors.²⁶

The text “The Blue Zones” by Dan Buettner offers insights into the lifestyle from the people living in the area considered to have the longest lifespan. As mentioned in the theoretical framework, the text discusses the concepts used for active aging and healthy lifestyle.

²⁴ Eckhard Feddersen, Insa Lüdtkke, and Julian Reisenberger, *Living for the Elderly: A Design Manual*, Second and revised edition (Basel ; Boston: Birkhäuser, 2018).

²⁵ Rusinovic, Bochove, and Sande, “Senior Co-Housing in the

Netherlands.”

²⁶ “Urban Social Development | The Hague University of Applied Sciences,” <https://www.thu.nl/research/research-groups/urban-social-development>.



Figure 5 – Search terms

Fieldwork

Secondly, this research will be backed up by field research, which is conducted through mapping, observations, interviews and discussions.

Mapping the neighborhood, produced as groupwork, will provide qualitative and quantitative data for understanding Tarwewijk. It includes statistics of the neighborhood, visual representation and analysis of public spaces, residential areas and other characteristics.

Discussions will be held with elderly people from the neighborhood of Tarwewijk to analyze how they experience loneliness, what their ideal housing situation is, and how they feel about senior co-housing.

Interviews would be conducted at elderly facilities, where the answers from personnel and inhabitants would help understand what is needed and what is missing from living in such an environment. Templates for tracking a day in the life of the inhabitants, composing personas, and a set of questions were created as a group and will be used by more students to obtain more results that will later be compared.

²⁷ “Liv Inn Hilversum,” Habion biedt ouderen huisvesting waar ze zich thuis voelen. Verspreid over heel Nederland bezit Habion op ruim 120 locaties meer dan 11.000 wooneenheden voor ouderen; zelfstandige woningen en wooneenheden in verzorgingshuizen., <https://www.habion.nl/projecten/de-boomberg-hilversum/>.

The **observation** would bring insight into the interaction between the elderly and their daily activities.

Case studies

Lastly, the research will be backed up with case studies used to find strategies already applied in design. These case studies are chosen to analyze specific topics, such as functionality, design requirements, and measurements, within elderly homes, senior co-housing and community centers for elderly. Floorplans and sections will be used to analyze the already mentioned criteria. The atmosphere and materiality will be analyzed from elevations, renders and images.

1. Liv Inn Hilversum – It is an elderly home focused on active aging, that provides common facilities and activities for the residents to create a community feeling. It offers assisted living on demand.²⁷

2. The Hawkhead Centre (United Kingdom): It is retirement center for support and activities aimed for blind people. The center provides a wide range of activities and common rooms such as art room, gymnasium, sport halls, dining areas and a garden. The project is interesting for the research for its circulation design for blind as well as the activities provided.²⁸

3. Kungsparken Care Home (Kumla, Sweden): It is a residential care facility that offers common spaces while still allowing people to have individuality in their own apartment.²⁹

²⁸ “The Hawkhead Centre / Page\Park Architects,” ArchDaily, January 25, 2018, <https://www.archdaily.com/887435/the-hawkhead-centre-page-park-architects>.

²⁹ “Kungsparken Care Home by Marge Arkitekter,” Architizer, December 4, 2024, <https://architizer.com/projects/kungsparken-care-home/>.

1.5 Scope of research

The scope of the research is to examine the influence of design on active aging, loneliness, and mobility limitations among the elderly and produce guidelines for architectural and urban design. It includes an analysis of elderly homes and the design location, meaning Tarwewijk, on three levels: the interior of the housing units, the building block, and the neighborhood. The target group of this research is the elderly who choose to live in an elderly

home because of mild health, social, or personal problems. It includes elderly people both healthy and with mobility limitations. It excludes elderly suffering from chronic diseases, like dementia, that require intensive care.

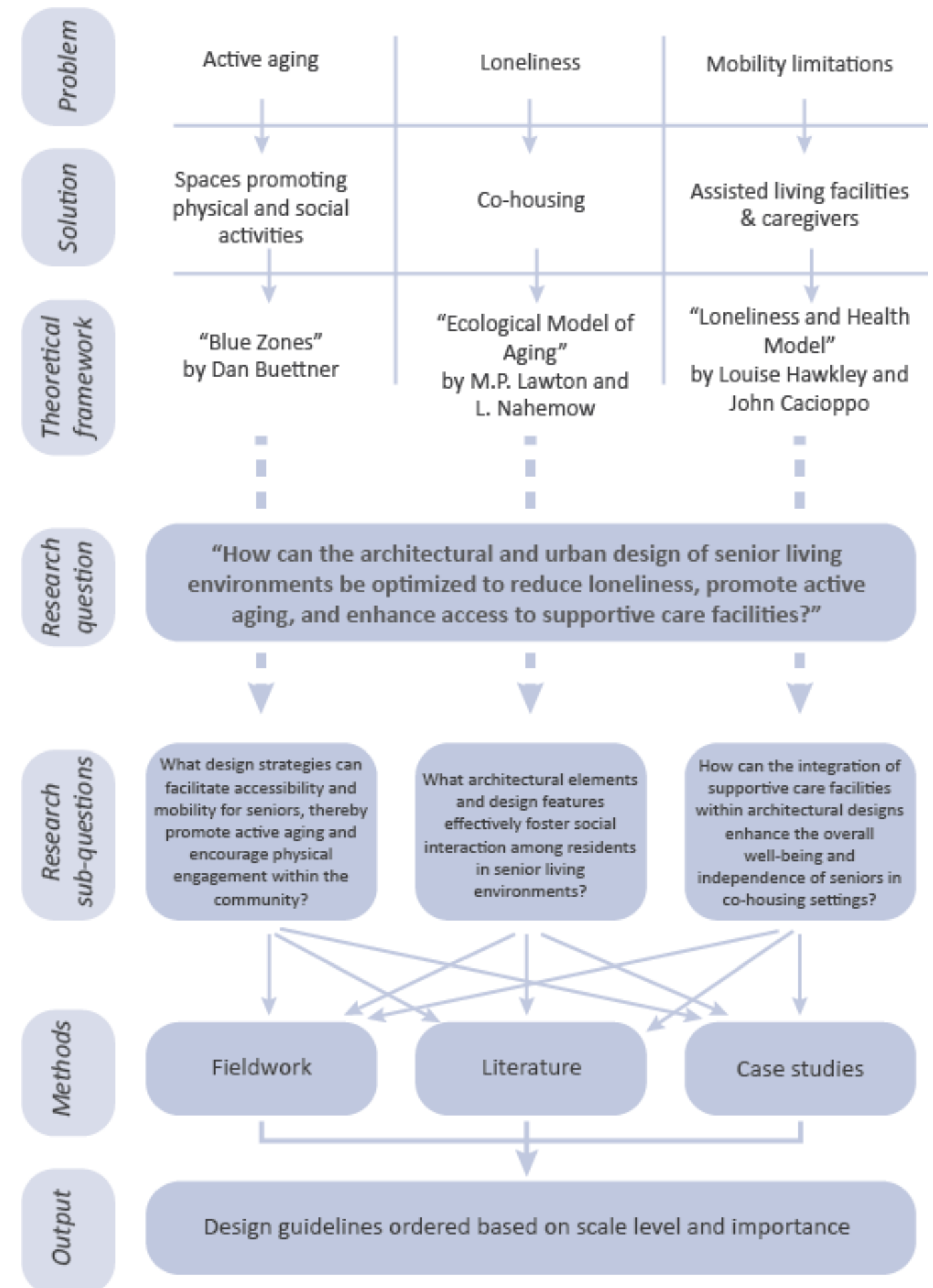
Output research:

The results are used to compose the design guidelines, which are going to be ordered based on their importance.

	Active aging	Loneliness	Mobility limitations
Neighborhood level	Reasons to keep active; spaces to interact	Community feeling; initiatives to bond with neighbors	Obstacles on pedestrian paths
Building level	Activities; spaces to interact	Proximity to common spaces; connection between private and public	Circulation, accessibility
Interior level	Dimensions rooms; space to move around	Possibility to invite people over	Placement furniture; dimensions circulation space

Figure 6 – Scope of study – levels of analysis

RESEARCH OUTLINE



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