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Planning, aging, and loneliness: Reviewing evidence about built environment effects

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Abstract

Large numbers of people in many countries report being lonely with rates highest among the very old. Does the built environment affect loneliness among older people and if so, how? Using a scoping review, we examined associations between loneliness and built environments at the block, neighborhood, and city scales. The (a) neighborhood environment has received most attention. Research has also examined (b) urban contexts, (c) housing, and (d) transportation access. Findings are mixed with the stronger evidence that local resources, walkability, overall environment quality, housing options, and nearby transportation alternatives can help combat loneliness.

Keywords: loneliness, aging, built environment, urban planning, neighborhood, housing, transportation, urbanicity, older people

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Introduction

As the world's population ages and increasing numbers of people outlive their peers, one issue of concern is loneliness. Loneliness refers to "an unwelcome feeling of lack or loss of companionship, the negative, unpleasant aspects of missing certain relationships as well as missing a certain quality in one's relationships" (de Jong Gierveld 1998, 73). Loneliness matters because it is a risk factor for both mental and physical health problems, including death, among those who are older. Loneliness affects health in older people via a set of behavioral, sleep, biological, and cognitive processes (Ong et al. 2016). Loneliness is not only a problem for older adults but can affect people who have moved to new places, migrated internationally, or have come to lack social supports in other ways. Of course, even if they appear quite alone, not all people are lonely. They may experience social isolation, grief, and social exclusion but not loneliness. They may also do very well.

Still, loneliness is a phenomenon that affects many, with surveys since the 1960s reporting loneliness in the range of 30–50% in places such as the UK and US with 10–30% of respondents saying such loneliness is intense (Snell 2017). Loneliness is a particular problem for older people, with the oldest often suffering most. Research in the US and China shows prevalence of loneliness in older people is around 40% (Perissinotto, Cenzer, and Covinsky 2012; Dang and Li 2019). Yang and Victor (2011) measured the prevalence of loneliness in 25 European nations examining a sample of 47,099 people aged 15 to 101. About 25–54% of people across age groups feel lonely sometimes or all the time, with those under 30 and above 70 being lonelier, and those above 80 being the loneliest. In a meta-analysis of 149 loneliness studies,

Pinquart and Sorensen (2001) have similar findings, though of course there is individual variation in loneliness at all ages.

In this paper we examine if the built environment is associated with loneliness, particularly among older people. Based on the findings, we provide recommendations on what can be done about loneliness by the field of urban planning. The built environment includes the constructed surroundings where people live, work, play, and travel (CDC 2019). We focus here on the block, neighborhood, and city scales examining built environment features such as the access to green space and daily destinations, land use mix, design aesthetics, residential density, housing types, and availability and distance of transportation facilities (Diez Roux and Mair 2010; Truong and Ma 2006).

Numerous scholars from psychology, sociology, gerontology, and public health have reviewed the relationship of loneliness with socio-demographics, social isolation, and social support (Pinquart and Sorensen 2001; Chen, Hicks, and While 2014; Cohen-Mansfield et al. 2016). However, no review article focuses on how the built environment is associated with loneliness. Our review can provide evidence-based insights on how to combat loneliness with planning and design strategies, especially among older people.

In this article, we first outline a conceptual framework of how loneliness is related to multiple individual and environmental factors. We then describe the methods for identifying the literature on the relationship between built environment and loneliness of older people. While strongly linked to people's personal and social situations, we find loneliness has dimensions related to the built environment, urban planning, and design. Studies of neighborhood environments find associations with amenities, walkability, and overall environmental quality (e.g. Kearns et al. 2015; Domènech-Abella et al. 2020a). However, fewer associations are found

when looking at the urban versus rural context, housing types, and transportation environments (e.g. Prieto-Flores et al. 2011b; Hagan 2020). While few built environment interventions addressing loneliness have been evaluated, this review shows potential for planners to address loneliness in new ways.

Framing loneliness and place

Loneliness is part of the human condition (Stearns 2015). It involves a sense that one lacks attachments and includes emotions such as "sorrow, sadness, and feelings of shame, guilt, frustration and desperation" (de Jong Gierveld 1998). Weiss (1973) identifies two kinds of loneliness, related to emotional isolation versus the lack of a social network, manifesting themselves differently. Loneliness is thus related to social isolation—that one objectively lacks attachments—but people can be lonely with many social attachments if they do not perceive them positively (de Jong Gierveld 1998). There are also more positive concepts related to being alone such as solitude or voluntary withdrawal (de Jong Gierveld 1998). It is possible to observe if someone is socially isolated, but one has to ask if someone is lonely.

In the rest of this section, we look briefly at socio-demographic factors that are most relevant to planning and loneliness, and the theories that implicate why built environment matters for loneliness. This provides a context for the remainder of the paper reviewing studies of how the built environment may affect loneliness among older people.

Socio-demographics and loneliness

While the built environment is the focus of this paper, loneliness has been associated with several other planning relevant issues such as household size and immigration status. In studies among older people, loneliness has been frequently associated with living alone (Cohen-Mansfield et al. 2016; Chen, Hicks, and While 2014). Increased longevity also means that as people age, they are likely to lose friends and relatives to death and to make moves related to care (Victor et al. 2000; Reichmann 1959; de Jong Gierveld 1998; Beal 2006). Migrants, especially older people who have moved to another country or city with their adult children, are likely to suffer from loneliness due to insufficient social support and companionship, declining health, language barriers, and inconvenient transportation (Syed et al. 2017). However, patterns are complex. For example, countries with strong family ties, such as those in southern Europe, may have more who are lonely than those in northwestern Europe where households are smaller and more people live alone (Dykstra 2009; Snell 2017).

Other socioeconomic factors commonly considered in urban planning may also be associated with loneliness among older people including gender and socioeconomic status (SES). Generally, women have been found to be more likely to report loneliness compared to men though at older ages this may be confounded by widowhood and women may be more likely to acknowledge feeling lonely (Weiss 1973; Victor et al. 2000; Pinquart and Sorensen 2001; Chen, Hicks, and While 2014; Cohen-Mansfield et al. 2016). Reviews and meta-analyses (N=149 studies) find that higher income and, to some extent, more education are correlated with reduced loneliness (Pinquart and Sorensen 2001; Chen, Hicks, and While 2014). People with lower incomes and educational levels may also inhabit neighborhoods with other social and environmental disadvantages, which can further reinforce loneliness.

Implications for studying loneliness from theories examining older people and place

Complementary theories examine how places can support or hinder the lives of older people as they age. The ecological theory of aging emphasizes the changing fit between the person and environment over time (Lawton and Nahemow 1973). Other theories focus on how environments have meaning for well-being and identity over time and the life course (Oswald and Wahl 2004; Wahl, Iwarsson, and Oswald 2012). These theories see the home and neighborhood environment as potentially creating stresses for older people or on the other hand providing support—physical, social, and psychological. Similarly, residential normalcy emphasizes how for older people places can provide a comfort zone providing mastery, competence, and control (Golant 2011; Stafford 2017; also Wahl, Iwarsson, and Oswald 2012; Kan, Forsyth, and Molinsky 2020).

Most work on loneliness looks at individual and social factors as major causes of loneliness, but theories of environment and aging offer opportunities for incorporating environmental features, with relevance to planning. As we illustrate in Figure 1, along with other individual, social environmental[i], and contextual factors, built environments may affect loneliness through supporting or hindering activities, behaviors, attitudes, and perceptions affecting loneliness. This includes allowing people to undertake physical activities, supporting their social interactions, or providing for mental well-being. They may also shape attitudes and perceptions, for example about belonging. The way this happens may change over time as the individual ages; those in their social networks die or move away; and as their physical environment changes e.g., busier traffic may make it harder for people to physically access social opportunities. On the other hand older people can also adapt to environments, compensating for

various physical, social, and psychological losses (Baltes and Baltes 1990; Lien, Steggell, and Iwarsson 2015).

[Insert Figure 1: Conceptual framework linking contextual, environmental, and individual factors to loneliness]

The built environment domains examined in this paper reflect this framework with the review emphasizing the pathway shaded in dark gray in Figure 1. Neighborhood features such as daily destinations, walkability, and green space provide opportunities for casual social interaction, physical activity, and mental restoration. The urban context and transportation infrastructure provide access to social opportunities, or not. Different types of housing potentially provide different opportunities for creating and maintaining social ties. This framework guided our investigation.

Methods

The literature on loneliness and the built environment examines several different types of environments using a variety of sampling approaches, data collection tools, and analytical methods. Articles also come from different countries, time periods, urban contexts, and age groups within older people. For a single topic like loneliness and housing there may be few studies yet each one may measure housing features and loneliness differently.

Therefore, this review is a form of a scoping review, designed to "identify and map available evidence" and identify gaps in knowledge (Munn et al. 2018, 2; Booth, Papaioannou, and Sutton 2012). While systematic reviews address precise questions—for example, the effect of a particular variable on loneliness—scoping reviews examine broader questions, aiming to

identify the scope and types of available evidence. Dealing with the emerging evidence of built environment effects on loneliness, such a scoping review is a more appropriate approach than a systematic review, because the literature body is still too small to support investigating a narrow question. This paper can also inform future systematic reviews. Meanwhile, while systematic reviews often synthesize results on a precise question and provide concrete guidance for practice, scoping reviews only provide a broad overview of evidence with preliminary recommendations for practice (Munn et al. 2018; Khan et al. 2003).

However, scoping reviews are still informed by rigorous methods. In this review, we used a protocol: making inclusion criteria transparent, clarifying searching strategies and limitations, using strategies to reduce error such as multiple reviewers, and extracting and presenting data in a structured way including quality of sampling and the examined built environment variables for each study (Tricco et al. 2018; Munn et al. 2018).

Our approach used several steps with the first step being to discover publications. Peer-reviewed journal articles in English were located using Web of Science and Google Scholar for any year up to 2020, though most studies were published in the past 20 years. Given we were mapping an emerging literature, we performed searches iteratively. We started searching with core concepts such as loneliness, built environment, planning, neighborhood, housing, transport, rural, urban, and aging. We also searched in the citations of papers, locating additional articles in that way. When the sub-themes emerged, we further investigated the literature with various combinations and spellings of a broad set of search terms related to the conceptual framework and sub-themes (Table 1).

[Insert Table 1: Keywords by Subthemes]

We used an article if it 1) was in English; 2) focused on loneliness rather than isolation, depression, and other related but different issues; 3) used loneliness as the outcome or mediating variable rather than an independent variable; 4) studied older people either as a specific focus or as an identified group within the general population; and most importantly, 5) examined the relationship of loneliness with built environment factors. Lastly, we did not examine studies focusing on care facilities, patients, or populations with a particular type of disability or disease unless it compared the care facility with housing outside such institutions. This review strategy may have missed studies of loneliness in books rather than articles. It may also have missed more ethnographic assessments where the built environment is a context or setting rather than a focus of the study.

A total of 36 studies using different research designs were reviewed for the built environment-loneliness evidence. We included studies of the general population where they clearly dealt with older people; we excluded those merely dealing with younger populations. We identify the age range of each study in the Appendix. As a result, 28 of the 36 studies focus on older people with minimum ages of 50 or above although one included some younger spouses and partners; and another two focus on those aged 45 and above. Six studies examine the general population, but include older people as identified sub-groups though they did not necessarily report differences for older people. The Appendix summarizes the results of this review.

Many studies are of high quality in terms of research design though some use convenience samples and other methods that make it more difficult to draw conclusions. Columns in the Appendix indicate these characteristics related to location, instruments, sampling, and the size of the respondent pool. The Appendix was drafted by one author and then checked and revised by the other.

Urban environment and loneliness connection: evidence from recent empirical studies

In general, better local resources, perceived walkability, perceived neighborhood quality, and physical access to transportation are associated with less loneliness. While loneliness is strongly influenced by personal factors and social environments (Cohen-Mansfield et al. 2016; de Jong Gierveld 1998), the reviewed studies demonstrate that the built environment can shape loneliness. Understanding these determinants of loneliness can inform urban planners and designers who hope to develop a less lonely urban environment. Table 2 summarizes the high-level findings of the studies and the following sections provide more detail. The Appendix describes the main components of each study more specifically.

[Insert Table 2: How Loneliness is Associated with Urban Planning Issues: General Findings and Planning Implications]

Neighborhoods

Evidence of how the built environment of neighborhoods is related to loneliness exists in several subsections. These include local resources, walkability, green spaces, and the overall environmental quality. We discuss findings in each subsection and summarize the evidence at the end of this section.

Local resources and daily destinations

The theme of neighborhood resources emphasizes the availability of destinations, including local services (e.g. grocery stores), social sites (e.g. cafes, clubs), public facilities (e.g. libraries), and facilities for physical activity. As is outlined below, measures have usually

emphasized destinations accessible by walking, but this has not been an exclusive focus. Having many places to go in the neighborhood, where people can meet others, exercise, relax, and fulfill daily errands, has been proposed as reducing loneliness.

Several studies dealing with neighborhood resources find a correlation between better resources and less loneliness (Domènech-Abella et al. 2020a; Kemperman et al. 2019; Finlay and Kobayashi 2018; Vitman Schorr and Khalaila 2018; van den Berg et al. 2016; Kearns et al. 2015). For instance, Domènech-Abella et al. (2020a) examine perceived neighborhood built environments, loneliness, and depression based on data from Finland, Poland, and Spain (N=5,912; aged 50 plus). They find reduced loneliness is related to better self-reported resources in the neighborhood including food stores, markets, post offices, libraries, leisure facilities, seating areas, and transit stops. In the Minneapolis metropolitan area, Finlay and Kobayashi (2018) conducted in-depth interviews finding scarcity of community resources such as services and social and recreational sites increases loneliness among the participants (N=124; aged 55 plus). Vitman Schorr and Khalaila (2018) draw on a survey of Europeans finding that easier access to local facilities such as banks, groceries, and pharmacies is associated with reduced loneliness, and in turn with higher quality of life (N=13,828; aged 65 plus).

One study finds no association between loneliness and neighborhood resource variables, however (Lee and Tan 2019). Using a random sample survey in Texas, Lee and Tan (2019) explore how self-reported presence, numbers, and frequency of visiting third places and walkable environments affect older people's loneliness and social connectedness (N=305; aged 65 plus). A third place refers to "a place outside of work or home visited at least once a week to socialize" (p.4). Results show no association between third places and loneliness, although third places positively influence social connectedness, demonstrating a complex relationship between

loneliness and social connectedness. These findings are reminiscent of those by Kearns et al. (2015) examining deprived areas of Glasgow in Scotland, UK that finds loneliness is not associated with using amenities outside the neighborhood, but those who used local amenities reported less loneliness (N=4,302). It may also imply that it is not enough to only provide socially focused resources but others are needed e.g. for physical activities or mental restoration.

Walkability

Meanwhile, research examining loneliness and walkable environments has covered more aspects than proximity to amenities, including land use diversity, street connectivity, and pedestrian infrastructure. Of course, walkability has many definitions, including overall neighborhood quality, and this is represented in these studies (Forsyth 2015). Studies typically propose that walkable environments, as defined in each study, have the potential to reduce loneliness through mechanisms such as facilitating healthy behaviors and social interaction (Lee and Tan 2019). This association has not always been found, however. Among the several studies examining variables related to the walking environment and described below, about half indicated that people felt less lonely in a walkable neighborhood, while the other half found no association.

Some studies find an association between walkability and loneliness and they generally use subjective and comprehensive measures of walkability (Domènech-Abella et al. 2020a; Rantakokko et al. 2014; Yu et al. 2017). Domènech-Abella et al.'s (2020a) European study finds that loneliness is related to the perceived problems with walkway continuity and conditions, street lighting, and aesthetics. Rantakokko et al. (2014) examine loneliness and environmental barriers to walking in Finland (N=858; aged 75-90). Participants were lonelier who perceived

more barriers such as high curbs, hills, long distances to services, lack of benches, noise, and dangerous crossroads. A study in Hong Kong likewise shows that better overall perceived walkability is associated with less loneliness (N=181, aged 60 plus) (Yu et al. 2017).

Studies that use either objective measurements or measured a single aspect are less likely to identify associations between walkability and loneliness (Lee and Tan's 2019; Timmermans et al. 2020; van den Berg et al. 2016; Finlay and Kobayashi 2018). For example, Lee and Tan's (2019) survey in Texas reveals no association of loneliness with both objective (Walk Score) and perceived neighborhood accessibility (ease of walking to stores and transit and whether there were many places to walk to). Timmermans et al. (2020), in a Dutch study, find no associations between loneliness and objectively measured land use mix within a one-kilometer radius around participants' homes (N=1,956; aged 63-98).

Green space

Many studies have examined the connections between green space and mental or physical health (Gascon et al. 2015; Di Nardo, Saulle, and La Torre 2010), but few have explored loneliness, especially among older people. Here we draw on studies of the general population that include data on older people and have some analysis by age groups, though often only descriptive statistics.

Studies generally find that more access to or use of green space reduces loneliness (Maas et al. 2009; van den Berg et al. 2019; Bergefurt et al. 2019). Maas et al. (2009) analyze a nationally representative sample survey in the Netherlands and the percent green space within one and three kilometers of homes (N=10,089; aged 12 and over). More green space is correlated with less reported loneliness, though not more contact with neighbors. Similarly, van den Berg et

al. (2019) investigate the mediating effects of loneliness, physical activity, and social cohesion on the relationship between green space and mental health in Europe (N=3,948; aged 18 to 75). They find that people who spend more hours per month in green space feel less lonely and report they are more physically active, both of which mediate the association between time visiting green spaces and mental health.

Overall neighborhood environments

While previous discussions focus on how specific aspects of the neighborhood built environment can affect loneliness, scholars have also attempted a more holistic understanding of how a neighborhood's overall quality can influence loneliness. The reviewed studies typically report that built environments demonstrating age-friendliness and higher quality are associated with less loneliness among older people and the general population.

Studies finding an association between environmental quality and loneliness use multidimensional measures of neighborhood quality, or measures of overall satisfaction (Gibney, Zhang, and Brennan 2020; Park, Kim, and Chung 2020; Kowitt et al. 2020; Kearns et al. 2015; Wee et al. 2019; van den Berg et al. 2016; Scharf and de Jong Gierveld 2008). Gibney, Zhang, and Brennan (2020) find an age-friendly environment index is associated with less loneliness in four Irish cities (N=2,094; aged 55 plus). The index includes perceived walkability, accessibility to local amenities, and safety. Similarly, Park, Kim, and Chung (2020) find age-friendliness, measured by perceived convenience and safety while walking, the presence of public transport, traffic signs, and green spaces, is correlated with less loneliness among older people in Korea. Kowitt et al. (2020) use survey data from 1,558 mostly rural older people in North Carolina, to examine the mediating effects of loneliness on the relationships between neighborhood features

(social cohesion, physical activity and walking facilities, and safety) and depressive symptoms finding that those who perceive their neighborhood environment is better are also less lonely.

Neighborhoods in summary

Though not all studies find associations of loneliness with the neighborhood built environment, the strongest evidence supports combating loneliness by providing better neighborhood resources or destinations and improving overall age-friendliness and environment quality. Further, reducing walking barriers and improving walking facilities for older pedestrians can reduce loneliness. Green space has the potential to reduce loneliness although more research is needed to examine the specific situation of older people. However, most studies measure perceived rather than actual environments meaning that interventions in physical space may not necessarily reduce loneliness if perceptions do not match. Rather, planning activities might need to focus on changing environmental perceptions through awareness and information campaigns, for example.

Urban context

How urban context or urbanicity is related to loneliness has been the subject of some attention. Here we examine studies that clearly define the urban context using built environment features. This is particularly important for studies of rural or urban areas which can be defined based on mode of production (e.g. agricultural or industry), occupation (peasant vs. other), and by administrative methods (Paúl et al. 2003; Kojima 1995). Degree of urbanization can also be defined by measures other than built environment ones, such as the residents in core cities and towns (vs. villages) as a percentage of total population of a region (Yan et al. 2014).

Degree of urbanization

Degree of urbanization studies often use simple measures, such as residential density, finding no associations with loneliness especially when perceived quality of neighborhood is controlled (Scharf and de Jong Gierveld 2008; Van den Berg et al. 2016; Finlay and Kobayashi 2018). Scharf and de Jong Gierveld (2008) measure urbanization degree by the mean number of addresses per square kilometer within a one-kilometer radius, exploring the effect of neighborhood quality on loneliness in the Netherlands (N=3,508; aged 60 plus). After controlling for perceived quality of neighborhoods, urbanization level is not associated with loneliness. Van den Berg et al. (2016) investigate the association of loneliness with mobility and addresses per kilometer in Noord-Limburg, Netherlands (N=344; half aged 65 plus). No association of urbanicity with loneliness is found, when controlling for other environment factors such as perceived neighborhood, and satisfaction with and distance to amenities.

Two studies find that more urbanized areas have more loneliness; however, they do not control for other environment qualities except for green space (Pun, Manjourides, and Suh 2019; Maas et al. 2009). For example, using a nationally representative sample of older people in the US, Pun, Manjourides, and Suh (2019) investigate the relationship of mental health with urbanicity and distance to roadways (N=4,118). Urbanicity is defined as the percentage of residential, industrial, commercial, and transportation land use within one kilometer of each residence. Controlling for demographics and socio-economics, more urbanized neighborhoods are associated with higher levels of loneliness and worse air pollution, both of which are associated with higher depressive scores.

Urban vs. rural

A concept related to urbanicity is the urban-rural context. There could be reasons for either rural or urban older people to be lonely. For example, rural older people may have strong kinship networks and lower living costs (Paúl et al. 2003). On the other hand, they may have less welfare provision, less health care, less family support due to adult children moving to cities, and suffer from boredom (Yang and Victor 2008; Tsiboe 2020). Note that we examine studies that define rural or urban with built environment measures. This strategy may miss studies that are possibly based on such definition but do not explicitly state so.

Studies often detect no or little difference in loneliness of older people between urban and rural areas, when controlling for social-demographics and health. This is the case for large studies with nationwide surveys from Canada, the UK, and New Zealand (Menec et al. 2019; Victor and Pikhartova 2020; Beere, Keeling, and Jamieson 2019).

Some scholars find differences between some types of urban or rural areas but not others (Henning-Smith, Moscovice, and Kozhimannil 2019). Henning-Smith, Moscovice, and Kozhimannil (2019) explore loneliness differences by rurality in the US (N=2,439; people aged 62 plus and their partners). They categorize rural-urban context using USDA rural-urban commuting areas (RUCA) codes which are based on density and commuting patterns (USDA 2020). Those in micropolitan rural locations, but not noncore (lowest density) rural areas, are less lonely than those in urban areas.

In contrast, very old people in sparsely populated rural areas are more lonely than their urban counterparts, when not controlling for other factors (Savikko et al. 2005). Based on data from Finland, Savikko et al. (2005) find that very old people living in sparsely populated rural areas more commonly felt lonely than those living in small and large cities (N=3,915; aged 75

plus). The authors suggest that constant migration in Finland means that older people have been left behind when their younger family members move to cities.

Urbanicity in summary

Most studies using built environment measures of urbanicity find no association with loneliness, especially after controlling for other factors such as socio-demographics, living alone, health status, and quality of neighborhood. Still, some studies provide evidence of higher loneliness in those living in more urbanized or more sparely populated rural areas. There could be a U-shape relationship that the most dense and sparely populated areas could be both more lonely than the areas of medium density. Further, the situation for the oldest old who need more help could be distinct. With so few studies it is hard to draw conclusions.

Housing

Housing is a complex domain mixing built environment features, tenures, and social arrangements. In this paper, we review studies with some plausible built environment components. These relate to living in the community versus an institution and types of housing.

Institutionalized vs. non-institutionalized

Focusing on studies that compare people in nursing homes with those in other settings, research from Europe finds those in nursing homes are lonelier (Prieto-Flores et al. 2011b; Ferreira-Alves et al. 2014; Savikko et al. 2005). For instance, Prieto-Flores et al. (2011b) compare loneliness between institutionalized and non-institutionalized people in Spain (N=468; aged 60 plus). Older people living in a nursing home are two times more likely to feel lonely

than those living at home even after controlling for health status, depression level, age, sex, education, marital status, having children, and social contacts. Meanwhile, the authors note a possible reversed causal relationship: people might choose a nursing home because they feel lonely.

However, other studies suggest no significant difference of loneliness in terms of institutionalized and non-institutionalized status or before and after entering residential care (Dykstra, van Tilburg, and de Jong Gierveld 2005; Nyqvist et al. 2017; Bondevik and Skogstad 1996). For instance, Dykstra, van Tilburg, and de Jong Gierveld (2005) draw on a seven-year longitudinal study of loneliness in the Netherlands to find entry into residential care does not influence loneliness (N=2,925). To investigate loneliness among the oldest old above 85, Nyqvist et al. (2017) analyze observations from three waves of a ten-year study in northern Sweden (N=1,034). They find that both living in an institutional setting and living alone in the community are powerful correlates of loneliness, compared with living with someone in the community.

Age-specific housing and type of dwelling

Among the many studies about age-specific housing such as retirement communities, assisted living, sheltered housing, or age care hostels, a limited number have examined loneliness (e.g. Gray and Worlledge 2018; Boyd et al. 2020). Only a few have compared levels of loneliness among residents in age-specific housing and other housing types with mixed results. Overall, living in age-specific housing has limited effects on loneliness, though it helps increase social contacts and sense of security, especially for those who need more help. Some studies find more loneliness in age-specific housing than those dwelling in the community, which may be

due to self-selection (Jeste et al. 2019). Meanwhile, others find moving from communities to age-specific housing reduces social loneliness but not emotional loneliness based on in-depth interviews (Ayalon and Green 2013). Still others find no difference in loneliness but higher sense of security and perceived quality of life in sheltered housing among older people at risk for institutionalization (Crisp et al. 2015; van Bilsen et al. 2008).

Some scholars have examined associations between loneliness, aging, and dwelling types but have generally not found an association (van den Berg et al. 2016; Kearns et al. 2015). For example, a survey (N=344) by van den Berg et al. (2016) in the Netherlands reveals that living in an apartment (vs. a house) is associated with being lonely but only for those under 66. Meanwhile, Kearns et al. (2015) find no association of loneliness with dwelling type (houses, flats of four floors or lower, or higher flats), in the general population (N=4,302) in deprived areas of Glasgow, Scotland, UK.

Housing in summary

Some of these studies show that older people living at home are less lonely compared to their counterparts living in nursing homes, however other studies find no effect. This indicates that aging in place, meaning living at home in the community, could help reduce loneliness (Forsyth and Molinsky 2021). However, this is a complex finding given those in care facilities are likely to be in worse health in ways that may not be easily measured and may be otherwise different to those living at home. For those who live alone and need help, a nursing home could offer additional benefits. Similarly, age-specific housing could provide more social opportunities and sense of security. This is an area where more research is needed.

Transportation

The built environment, mobility, and well-being are connected (Li 2020). Transport environment and behavior variables have been shown to be related to loneliness, especially use, availability, and affordability of public or community transport (Hagan 2020; Reinhard et al. 2018; van den Berg et al. 2016). In this review, however, we examine the built environment dimensions of transport such as distance to or availability of transport facilities, rather than transportation behavior such as mode choices or broad perceptions about transportation access.

Several studies find loneliness is associated with obstacles to convenient transport, particularly transit, walking, and cycling (Matsuda et al. 2019; Hagan 2020; Domènech-Abella et al. 2020b). Based on in-depth interviews with eleven older users of a rural community bus service in western Northern Ireland, Hagan (2020) shows how the door-to-door dial-a-lift rural community bus—which brings service much closer than traditional bus stops—helps reduce loneliness. In addition, Domènech-Abella et al. (2020b) find that perceived ease of walking or cycling in the neighborhood is correlated with better outcomes in terms of emotional and social loneliness in Belgium (N=869; aged 60 plus).

Interventions

We had assumed we would have a substantial section on built-environment interventions to reduce loneliness in this review. However, the literature in this area is scant. Many interventions to ameliorate loneliness are targeted at those in long-term care facilities such as nursing homes (Brimelow and Wollin 2017). Others focus on activities undertaken with individuals or small groups (Dickens et al. 2011; Gardiner, Geldenhuys, and Gott 2018). A few programs have addressed loneliness through interventions linked to neighborhoods though

generally focusing on social activities (Collins and Wrigley 2014). Built environment interventions to combat loneliness is obviously an area for future development.

Conclusion

The built environment, loneliness, and planning

This paper examines the range and types of available evidence on how loneliness is associated with the built environment, particularly for older people. Evidence on multiple domains demonstrates that a supportive built environment can potentially help reduce loneliness. While interventions to address loneliness have focused on individual and group activities, this review shows that it is possible to add some built environment strategies into the anti-loneliness toolkit. Strategies may include improving the planning and design of built environment features as well as promoting perceptions related to: 1) local resources and destinations; 2) walkability; 3) overall age-friendliness and environment quality; and potentially also 4) green space; 5) housing options; and 6) affordable and convenient transport facilities.

Among the stronger conclusions from the literature are that older people are less lonely when they have better resources or destinations in the neighborhood, and when they perceive their neighborhood to be walkable and of high overall quality. Studies of the general population, including older people, find they are less lonely when they have more access to green spaces, though more research is needed. They are less lonely when there are transportation facilities, especially affordable and convenient public transport. Loneliness is influenced by different factors among residents in different housing types. Aging in place can help reduce loneliness, but for those who need to receive help, other housing options may have benefits. Living in a rural or urban setting does not predict loneliness.

As described in detail in Table 2, the implications for planning depend on the topic. From studies using data on the built environment that is objectively measured as well as self-reported or perceived, there is reasonable evidence that options to remain in the community rather than going to a nursing home, and having good nearby transportation options, are associated with lower levels of loneliness.

Other aspects of the built environment have only been studied using self-reported information from surveys. Neighborhoods that are perceived to have more destinations and resources, and to be of higher quality, have less loneliness. What this means for planning depends on the relationship between the perceived and measured environments. Perceptions can be changed through such activities as social marketing; actual environments are changed through various capital works and regulations. Walkability is an interesting case as perceived overall walkability is associated with less loneliness but objectively measured walkability is not. However, there are so few studies it is difficult to interpret this.

Several other environmental dimensions either have no findings or mixed findings. A striking one is urban contexts, where many studies find no association, or differing associations, between urban contexts and loneliness. Something similar can be said for housing. Firmer implications for planning need to wait on more research and we turn to that next.

Future research

In considering future research we return to the conceptual framework in Figure 1 to identify gaps in existing research. In the framework, the built environment interacts with individual, social, and contextual factors to have a complex effect on loneliness. There are many gaps in these areas. For example, studies need to address more diverse geographic and economic

factors. Most findings have come from studies in a few countries, almost entirely in higher-income areas. More research from lower- and middle-income countries can contribute to comprehensive perspectives. Moreover, much more work could be done to look at how the built environment affects different subgroups of older people such as those with different cultural backgrounds, health statuses, economic situations, educational levels, family experiences, and ages.

In the built environment area, there are still many gaps. Surprisingly, little research on green space and loneliness has specifically targeted older people. Much more needs to be done in this area. We were also surprised at how little research on loneliness of older people had looked specifically at dwelling types in the community; adding housing variables (e.g. single houses vs. apartments) to the many studies of older people living in the community would be a good first step. Further, as noted earlier, studies have often examined the perceived rather than the actual environment in the neighborhood. More work that looks at environments objectively is needed. In addition, since this review shows the scope and types of available evidence, future studies could target beyond the identified domains, such as whether neighborhood aesthetic quality affects loneliness of older people.

At a broader level much more can be done to look at the interaction between older people, built environments, and loneliness over time. Research could use panel studies to examine how this intersection changes over time. If built environment interventions are tried, they could be evaluated. With an aging society there are many opportunities for useful research to help move the field forward.

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[Insert Appendix: Studies Examining the Associations between the Built Environment and Loneliness]

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[i] The social environment, listed in Figure 1, includes aspects such as neighborhood cohesion or trust, neighborhood attachment or sense of community, social contacts, support, and services, and socio-cultural constraints (Barnett and Casper 2001). Evidence shows these social environment elements are associated with loneliness of older people (Pinquart and Sorensen 2001; Chen, Hicks, and While 2014; Prieto-Flores et al. 2011a; Domènech-Abella et al. 2017; Yu et al. 2021).

Figure 1: Conceptual framework linking contextual, environmental, and individual factors with loneliness.

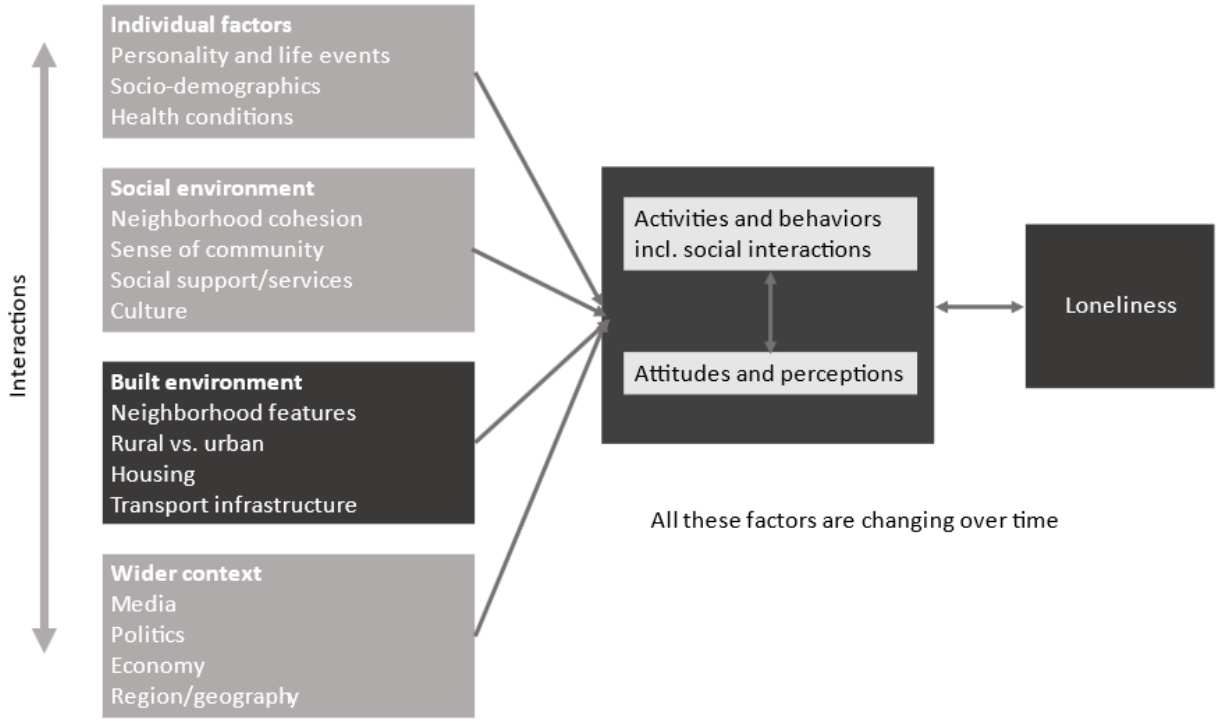

Table 1: Keywords by Subthemes

Literature category		*Keywords in combination with variations* of loneliness and older people, elderly, or aging
Built environment general		urban planning, built environment, physical environment, neighborhood, urban form, housing
Neighborhood specifics	Destinations, amenities	destinations, amenities, public facilities, third places
	Walkability	walkability, walkable, pedestrian
	Green space	green space, open spaces, natural outdoor environment, waterscape, landscape, park
	Overall	age-friendly, neighborhood quality
Urban context		rural, urban, urbanization, urbanicity
Housing		residential, high-rise, apartment, single-family, housing type, age-specific housing, retirement community, assisted living, sheltered housing, age care hostel, co-housing
Transport		transport, transportation, bus, bike lane, sidewalk, crosswalk, car-oriented, automobile-oriented, pedestrian-oriented

Note: We also located some literature that was not uncovered via keywords but was cited in sources we located.

Table 2: How Loneliness is Associated with Urban Planning Issues: General Findings and Planning Implications

Dimension	Environment Associated with Less Loneliness [1]	Planning Implications [2]
Neighborhood		
Local resources and daily destinations	Better perceived and self-reported neighborhood resources or destinations, though not in all studies	Depends on the relationship between perceived and measured destinations. Social marketing may change perceptions; improved transport and mixed-use development are options to improve destination access
Walkability	Perceived better overall walkability but not objectively assessed walkability or single measures	Depends on the relationship between perceived and measured walkability. Social marketing may change perceptions
Green space	More reported and measured access to/time in green spaces in and around the neighborhood, though little work on older people specifically	More research is needed on older people but providing opportunities for access to green spaces is general good practice
Overall neighborhood environments	A higher-quality perceived built environment assessed using multiple dimensions such as those above	Depends on the relationship between perceived and measured neighborhood quality. Social marketing may change perceptions; to change neighborhood quality use approaches above
Urban context		
Degree of urbanization	Generally, no association though in some studies very high density had more loneliness	Planning in many settings can have similar levels of loneliness, though with different challenges
Urban vs. rural	Generally weak associations	Planning in many settings can have similar levels of loneliness, though with different challenges
Housing		
Institutionalized vs. Non-institutionalized	Those living in the community in some studies but not others	Provide housing and care options, including to live in the community

Dimension	Environment Associated with Less Loneliness [1]	Planning Implications [2]
Age-specific housing	Mixed findings	Provide housing options
Type of dwelling	No associations based on a limited number of studies	Older people in many types of dwellings can have similar levels of loneliness
Transportation		
Transportation (physical access)	Easy access to transportation	Provide nearby transit stops, ease in walking and cycling, and rural community door-to-door bus service

1. Many of these findings are based on few studies from a narrow range of countries.
2. Implications start from the premise of providing options.

Appendix: Studies Examining the Associations between the Built Environment and Loneliness

Author	Year	Pop-ulation	N	Place	Study Instrument [1]	Sampling	Research Question	Built Environmental Variables
Ayalon and Green	2013	Older (CCRC residents and adult children)	48	Israel	In-depth interview	Purposive sample	What are the consistencies and differences regarding social ties within and across interviews with CCRC residents?	Age-specific housing vs. community setting
Beere, Keeling, and Jamieson	2019	Aged 65+	52,973	New Zealand	Home care assessment	Covered most (90%) frail older adults nation-wide	What are the sociospatial trends regarding aging, loneliness, socioeconomic status (SES), ethnicity, and urban/rural status among older adults in New Zealand?	Urban context (urban vs. rural) developed from census definitions
Bergefurt et al.	2019	General (incl. sub-group aged 56+)	200	The Nether-lands	Online questionnaire	Non-random: distributed via social media and networking with community centers and senior centers	How does public-space use mediate the relations between personal, neighborhood, and mobility characteristics on the one hand and loneliness and life satisfaction on the other?	Walkability Use of public green space Neighborhoods with different distances to retail, restaurant, train station, amounts of open space, and maintenance

Author	Year	Pop-ulation	N	Place	Study Instrument [1]	Sampling	Research Question	Built Environmental Variables
Bondevik	1996	Aged 80+	221	Norway	Interview survey	Users of community health services in a Norwegian city willing to participate	What are the different experience of loneliness and the influences of social relationships between the oldest old residents living in nursing homes and those living in the community?	Housing type (nursing home vs. own home)
Crisp et al.	2015	Aged 57–90	83 movers, 549 control	Australia	Mail questionnaire (baseline, 1, 6, and 12 months)	Census (movers) and random sample (control)	What are the effects of relocation to a retirement community on social networks and perceived loneliness?	Housing type (retirement vs. general community)
Dykstra et al.	2005	Aged 55+	2,925	The Nether-lands	Interview survey, 2 waves	Stratified random sample	What are the associations of loneliness with health, residential care, partner status, and network size over a seven-year period among adults born between 1908 and 1937?	Housing type (before vs. after entering residential care)
Domenech-Abella et al.	2020 a	Aged 50+	5,912	Finland, Poland, and Spain	Interview survey	National stratified multistage cluster sample	What are the associations of the perceived neighborhood built-environment with loneliness and depression among older European adults?	Usability of the neighborhood resources Hindrance of walkable environment

Author	Year	Pop-ulation	N	Place	Study Instrument [1]	Sampling	Research Question	Built Environmental Variables
Domenech-Abella et al.	2020 b	Aged 60+	869	Belgium	Interview survey	Random sample	What is the association between the perceived social and physical environment and mental health among older adults and what are the mediating effects of loneliness in this association?	Availability of basic services Ease to walk or bike (all perceived)
Ferreira-Alves et al.	2014	Aged 50+	1,174	Portugal	Interview survey	The sampling approach targeted people in different parts of Portugal, both urban and rural, and randomly sampled people in residential facilities, day care centers, etc.	What was the prevalence of loneliness reported in the Portuguese population over 50 years of age and can loneliness be predicted by socio-demographic, health-related or social characteristic of the sample other than age?	Types of housing (living at home vs. permanent care)
Finlay and Kobayashi	2018	Aged 55+	124	US	In-depth interviews, researcher observations, GIS mapping	Volunteers responded to flyers and advertisements placed in three diverse locations in the Minneapolis area	How do personal and neighborhood contexts influence social isolation and loneliness among older adults?	Qualitative analysis: Neighborhood resources Quantitative analysis: Sidewalks presence near home Residential location Residential density Street type
Gibney, Zhang, and Brennan	2020	Aged 55+	2,094	Ireland	Interview survey	A multi-stage random sample	What is the association between age-friendly urban environments and psychosocial wellbeing?	Overall perceived age-friendly environment

Author	Year	Pop-ulation	N	Place	Study Instrument [1]	Sampling	Research Question	Built Environmental Variables
Hagan	2020	Older	11	UK	In-depth interview	Convenience sample	How do older adults use community transport systems to not only facilitate important social tasks but also maintain friendships and other valued relationships?	Transport to door in rural areas
Henning-Smith, Moscovice and Kozhimannil	2019	Panel aged 62+ plus partners 38+ (Mean age=71)	2,439	US	Interview survey and supplemental mail-back questionnaire	Representative sample	What are the differences in social isolation by rurality among US older adults	Urban context (urban vs. micropolitan rural vs. noncore rural) (USDA rural-urban community area (RUCA) definition related to density patterns, commuting, and population)
Jeste et al.	2019	Aged 65+	104	US	Interview survey. Existing study used phone screening interview and mail/online questionnaire.	N= 104 residents recruited from a senior housing community in San Diego County compared with (N=119) from an existing random sample survey	What are the associations of sociodemographic and clinical factors with cognitive, physical, and mental health among independent living older adults in a continuing care senior housing community (CCSHC)?	Age-specific housing vs. living in the community
Kearns et al.	2015	General (incl. sub-group 65+)	4,302	UK	Interview survey	Stratified random sampling of adult householders in 15 communities in the City of Glasgow	Is loneliness associated with the residential environment, including housing and neighborhood factors?	Overall perceived quality of neighborhood Use of amenities within and outside the neighborhood Dwelling type: houses, other flats (<=4 stories), and high-rise flats (>4 stories)

Author	Year	Pop-ulation	N	Place	Study Instrument [1]	Sampling	Research Question	Built Environmental Variables
Kemperman et al.	2019	Aged 65+	182	The Nether-lands	Paper-and-pencil questionnaire distributed in person	Convenience sample. How the participants were identified is unclear.	What are the relationships of loneliness with social networks and living environments among older adults?	Satisfaction with amenities Distance to green areas and shops Urban density (urban, suburban, and rural)
Kowitt et al.	2020	Aged 45+ (mostly rural)	1,558	US	Interview survey	Probability-based sample of African Americans and White individuals aged 45 and above living in six towns in Johnston County, North Carolina	Are neighborhood characteristics associated with depressive symptoms? If so, what factors mediate these relationships?	Perceived neighborhood environment--resources for physical activity and walking, social cohesion, and safety
Lee and Tan	2019	Aged 65+	305	US	A drop-off and pick-up questionnaire	Random sample of homeowners receiving a tax exemption for those over 65 in two college towns in Texas	How did neighborhood walkability and third places affect older adults' social connectedness?	Third places Objective neighborhood walkability (Walk Score) Perceived neighborhood walkability
Maas et al.	2009	General (incl.sub-groups 46–65 and 66+)	10,089	The Nether-lands	Interview survey	Two-stage national random sample of (a) general practices and (b) of people using the general practices	Are social contacts an underlying mechanism behind the relationship between greenspace and health?	Percentage of green space around home (within 1 and 3 km radius) Urban context (5 levels from very strongly urban to non-urban)

Author	Year	Pop-ulation	N	Place	Study Instrument [1]	Sampling	Research Question	Built Environmental Variables
Matsuda et al.	2019	Aged 65+	31	Japan	Interview survey	Data from those who stopped driving was drawn from 306 participants recruited in five community clubs	What is the association between public transportation use and loneliness in urban older people who stop driving?	Perceived distance to a public transport stop
Menec et al.	2019	Aged 45+	48,330	Canada	Interview survey plus physical measures and biological samples	Participants randomly selected within age/sex strata from areas within 25 or 50 km of 10 data collections sites across Canada	What is the association of personal (e.g., sex, income) and geographic (rural/urban and sociodemographic) factors with social isolation and loneliness?	Urban context (urban core, secondary core, urban fringe, rural)
Nyqvist et al.	2017	Age 85+	1,034 (pooled)	Sweden	Interview survey	Random sample. Compared samples from 3 waves over 10 years.	What is the prevalence of loneliness among the oldest old in northern Sweden within a 10-year period, and the influence of sociodemographic, social and health characteristics on loneliness?	Housing type (institution vs. community)
Park, Kim, and Chung	2020	General (incl. sub-groups 45–65, and 65+)	1,017	Korea	Interview survey	Multistage quota sampling strategy based on age, gender, and geographical area	What are the group differences regarding age-friendly environments (AFE), loneliness, and depressive symptoms among younger, middle-aged, and older Korean adults? etc.	Perceived age-friendly environments

Author	Year	Pop-ulation	N	Place	Study Instrument [1]	Sampling	Research Question	Built Environmental Variables
Prieto-Flores et al.	2011b	Aged 60+	468	Spain	Interview survey	Two samples: a subsample of 234 older people living in communities from a nationally representative sample; 234 older people living in 14 nursing homes	Did sociodemographic and health factors contribute differentially to the explanation of loneliness in institutionalized and noninstitutionalized older adults? What was the influence of institutionalization on loneliness?	Housing type (institution vs. community)
Pun, Manjou-rides, and Suh	2019	Aged 57+	4,118	US	Interview survey, bio-measure collection, and supplemental mail-back questionnaire	Nationally representative sample	What is the association of roadway distance and urbanicity with mental health measures in a cohort of older Americans?	Degree of urbanization, measured distance to major roadway (air pollution)

Author	Year	Pop-ulation	N	Place	Study Instrument [1]	Sampling	Research Question	Built Environmental Variables
Rantakokko et al.	2014	Aged 75+	848	Finland	Interview survey	Random sample of target populations in two municipalities recruited via telephone	What were the associations between perceived environmental barriers to outdoor mobility and loneliness among community-dwelling older people?	Sum of perceived environmental barriers to outdoor mobility Barriers also examined separately, including street conditions; curbs; nearby hills; distances to services; lack of benches in winter; noise; traffic; dangerous crossroads; cyclists on walkways; snow and ice; insecurity due to other pedestrians; vehicles on walkways; poor lighting; lack of pedestrian zones
Savikko et al.	2005	Aged 75+	3,915	Finland	Mail questionnaire	Random sample in 6 selected municipalities of Finland	What was the prevalence and self-reported causes of loneliness among Finnish older population?	Housing type (own home vs. residential home) Urban context (rural areas, small city, and large city)
Scharf and de Jong Gierveld	2008	Aged 60+	501 (UK) and 3,508 (the Netherlands)	UK and the Nether-lands	Interview survey	The Netherlands sample was stratified according to sex and birth year in three regions. The UK data use a random sample survey conducted in nine electoral wards in socially deprived areas.	What are the neighborhood influences on loneliness, comparing UK and the Netherlands?	The Netherlands: Degree of urbanization Overall perceived quality of neighborhood England: Perceived quality of neighborhood

Author	Year	Pop-ulation	N	Place	Study Instrument [1]	Sampling	Research Question	Built Environmental Variables
Timmermans et al.	2020	Aged 63+	1,959	The Nether-lands	Two surveys: LASA: Interview survey + follow-up questionnaire CLOBE: Mail questionnaire	Both random samples	What are the associations of objectively measured social and physical neighborhood characteristics with loneliness?	Land use mix (10 land use categories within 1 km around home including built-up areas, industrial and commercial areas, urban green areas, sports and leisure facilities, agricultural land, and natural areas, etc.)
van Bilsen et al.	2008	Very old people at risk for institutionalization	317	The Nether-lands	Interview survey	All members of target populations were recruited by the caregivers in two regions of the Netherlands.	Do housing types (sheltered housing vs. independent housing in the community) matter for frail elderly people?	Age-specific housing vs. living in the community
van den Berg et al.	2016	General (incl. sub-groups 35–64, 65–75, 75+)	344	The Nether-lands	Drop-off pick-up questionnaire and two-day social interaction diary.	Distributed in neighborhoods with high percentages of seniors in several towns in Noord-Limburg.	What role do mobility and built environment play in loneliness when aging?	Satisfaction with facilities Distance to a daily shop, public green, and highway Type of dwelling (apartment vs. house) Residential density

Author	Year	Pop-ulation	N	Place	Study Instrument [1]	Sampling	Research Question	Built Environmental Variables
van den Berg et al.	2019	General (18–75, incl. sub-groups 46–65 and 65–75	3,948	Europe	Mail questionnaire (one city); interview survey (three cities).	In each of four cities, approx. 30 neighborhoods were purposefully selected for variation in access to green space and in socioeconomic status. A random sample of 30-35 persons was selected in each neighborhood.	Do physical activity, social cohesion, and loneliness mediate the association between time spent visiting green space and mental health?	Distance to green spaces
Victor and Pikhartova	2020	Aged 50+	4,663	UK	Interview survey; pen and paper questionnaire	Nationally representative sample	What was the relationship between loneliness among older people and three dimensions of the lived environment: geographical region, deprivation, and area classification (urban or rural)?	Urban context (urban vs. rural) (Office for National Statistics definition)

Author	Year	Pop-ulation	N	Place	Study Instrument [1]	Sampling	Research Question	Built Environmental Variables
Vitman Schorr and Khalaila	2018	Aged 65+	13,828	Europe	Interview survey	Different types of random samples by country	What are the moderated-mediation effects of perceived accessibility to the environment on quality of life in later life via two socio-spatial mediators (loneliness and connection to place) and two moderators (functional disability and marital status)?	Perceived accessibility to four daily services and sites
Wee et al.	2019	Aged 60+	528	Singa-pore	Interview survey	All target residents in two public housing precincts that included both rental and ownership units	What are the social and environmental factors that are associated with loneliness among elderly residents of public rental housing in Singapore?	Overall perception of neighborhood physical environment
Yu et al.	2017	Aged 60+	181	China (Hong Kong)	Interview survey	Age-stratified sample of volunteers in seven neighborhoods with a range of housing types was recruited using fliers in housing estates and community centers.	What are the associations between perceived neighborhood walkability and walking time, physical activity, well-being, and loneliness in older adults?	Perceived neighborhood walkability Also destinations within walking distance from home; hills; alternative routes; sidewalks; covered bridges; indoor air-conditioned places where people can walk; trees along the streets

1. If we use the term interview survey it means a highly structured interview done in person or over the phone unless we specify it was “qualitative” or “in-depth;” many are computer assisted. A questionnaire is delivered via other means e.g., mail, internet.