

Dementia-Friendly Transportation Services: A Scoping Review

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Abstract

Background and Objectives: Transportation is an important component of dementia-friendly communities. People living with dementia have the right to access transportation services to keep their mobility in their community, which is essential for independence, well-being, and quality of life. This scoping review maps the literature on dementia-friendly transportation services and explores their characteristics to inform future development and research.

Research Design and Methods: Empirical quantitative and qualitative studies in English or French that informed on transportation services for people living with dementia in the community were searched in 15 databases. Two authors independently screened records and charted relevant characteristics from selected publications. Important findings were summarized with a narrative synthesis approach.

Results: Thirty-five studies informed on important dimensions of transportation services in urban and/or rural context: availability, accessibility, acceptability, adaptability, and affordability. Important insights were identified: the importance of staff training and attitude, and the challenges of availability of affordable services in the rural context. Emerging policy and program intervention areas include the need for access to quiet areas in transit hubs, training to use mass public transit and mobility management.

Discussion and Implications: The literature on dementia-friendly transportation services is important in the expansion and maintenance of mobility for people living with dementia in the community. The scope of the existing scientific literature remains limited. Although several studies indicated a clear need for better access to dementia-friendly transportation services, the best practices still need to be demonstrated in the scientific literature.

Keywords: Accessibility, Alzheimer, Communities, Mobility, Transit

Background and Objectives

Dementia is a broad term referring to loss of cognitive functioning and is manifested through decline in thinking, memory, language, and mood. It is one of the major causes of disability and dependency (Battistin & Cagnin, 2010; Lussier & Massoud, 2022; World Health Organization [WHO], 2022). However, most individuals living with dementia experience mild symptoms for many years and continue to live, play, and work in the community. More than 55 million people are living with dementia worldwide (WHO, 2022). Evidence from Canada, America, Sweden, and Australia shows that about 70% of older adults living with dementia live in the community (Alzheimer's Association, 2023; Alzheimer's Australia Inc., 2014; Canadian Institute for Health Information, 2018; Lepore et al., 2017; Odzakovic et al., 2019), with or without family (one fourth to one third live alone; Alzheimer's Association, 2023; Clare et al., 2020; Miranda-Castillo et al., 2010). In fact, Alzheimer's disease, a contributing cause in 60%–70% of dementia diagnoses, is a progressive disease. A preclinical stage precedes the mild cognitive impairment

stage that leads to mild dementia, with symptoms only starting to interfere with some everyday activities. Later, moderate and severe stages affect more important everyday activities and help is needed. Older adults aged 65 and older live an average of 4–8 years, while some can live for 20 years after the diagnosis (Alzheimer's Association, 2023). In their community, people living with dementia can stay involved meaningfully. Mobility in the neighborhood environment is essential for engagement in social, community, and civic life (Gaber, Nygård, Kottorp, et al., 2020; Sen & Prybutok, 2021; Vanderbur & Silverstein, 2006). However, dementia brings challenges to older adults in driving, which may affect their ability to travel in the community (Silverstein et al., 2015). Drivers may experience poor or decreased judgment, which affects them to safely judge when to merge with other traffic or decide the gaps between vehicles to make a turn (Rapoport et al., 2020). Many older adults and people living with dementia stop driving, and access to places and community participation becomes highly dependent on others (Li et al., 2021; Liddle et al., 2013). Alternative transportation

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options should be available, as there are unmet needs in this area highlighted by a recent realist review of qualitative literature of neighborhoods and dementia (Li et al., 2021). In that review, although transportation was an important theme, alternatives to driving and characteristics of dementia-friendly transportation were not described. Mobility allows independence and well-being while preserving dignity and quality of life (Vanderbur & Silverstein, 2006).

Much attention was given to create dementia-friendly communities in recent years (Gan et al., 2021; Li et al., 2021; WHO, 2017), with 2021–2030 being the healthy aging decade (see [Supplementary Material](#)). This decade is the occasion to do things differently, for all countries to connect and use enabling tools and platforms to involve stakeholders in building strong politics (legislation, frameworks, national programs) to strengthen healthy aging (WHO, 2023a, 2023b). Dementia-friendly communities allow people living with dementia to optimize their health and social participation to enhance their quality of life. Transportation is one important dimension of dementia-friendly communities and of age-friendly cities guide framework (WHO, 2007), but less focus was given to that topic. Learning from the coronavirus disease 2019 pandemic includes that older adults are a community with distinct needs (Lim & Bowman, 2022). Although some recent reviews were published on transportation services for older adults in general (Hansmann et al., 2023; Lin & Cui, 2021; Loos et al., 2020; Shrestha et al., 2017), this review focuses on people living with dementia, who are living with an invisible disability and specific needs. A report by the [National Centre on Senior Transportation](#) (2018) in the United States described the unique needs for older adults with dementia in public transportation that may need extra assistance. For example, they may be at risk of becoming disoriented and overwhelmed in environments with multiple distractions, getting off the bus at the wrong stop, and having difficulty remembering how to signal a stop. The present review of dementia-friendly transportation contributes to the recent conversations on dementia in the social sciences field around improving the quality of life and well-being of people living with dementia and supporting activities for them (Lim & Bowman, 2022).

The purpose of this scoping review is to (a) map the literature on dementia-friendly transportation services, including their availability, accessibility, acceptability, adaptability, and affordability, (b) explore the use and needs of dementia-friendly transportation services among people living with dementia in the community, and (c) identify key characteristics of effective dementia-friendly transportation services to inform future development and research agenda. Our research questions are: What is known about transportation services for people living with dementia in the community? What types and sources of evidence are commonly employed to study dementia-friendly transportation services? What are the gaps in the research? The review contributes to practical recommendations and ways forward for research in the dementia-friendly transportation field (Lim et al., 2022).

Research Design and Methods

A scoping review methodology was appropriate to summarize the existing literature on dementia-friendly transportation services, identify key characteristics, identify knowledge gaps, and provide guidance for future research (Paul et al., 2021).

Literature reviews are helpful to provide an overview of a field and prevent duplicative efforts in future research (Lim et al., 2022). We followed the guidelines for scoping reviews from Peters et al. (2017). We also used the preferred reporting items for systematic reviews and meta-analyses (PRISMA) extension for scoping reviews when writing the article (Tricco et al., 2018). The goal was to provide a broad overview based on both qualitative and quantitative research. This review was exploratory and used a descriptive approach (Kraus et al., 2022). It examined methodologies and findings to provide a holistic summary of existing empirical literature on dementia-friendly transportation (Kraus et al., 2022). The following keyword strategy was used: (Dementia OR Alzheimer) AND (transport* or transit) AND (community OR neighborhood OR neighbourhood). A unique research strategy in EBSCOhost included simultaneously 12 databases that focused on health sciences, social and behavioral sciences, psychology, and gerontology (see [Figure 1](#)). Web of Science and TRID: the TRIS and ITRD database OPEN ACCESS, an urban science database, were searched with the same strategy. Databases were searched from their inception (see [Supplementary Material](#)) to June 13, 2022. We did not use any limits in the research. Relevant references from included articles were also manually searched. The protocol was not preregistered. Inclusion criteria included (1) empirical research, written in English or French (2), that informs on transportation services specific (3) for people living with dementia in the community (4). Reasons of exclusion included some methods that were not empirical (e.g., review), focus (e.g., driving cessation without discussion on transportation services), and population (e.g., only older people, without addressing specific needs of people living with dementia).

The first and third authors were responsible for the selection process that was conducted using Covidence online software developed by Cochrane. First, the first author imported all articles in one folder ($n = 1,086$). Covidence detected most of the duplicates and they were removed. The first author also manually removed other duplicates, with 650 remaining articles. The first screening used titles and abstracts to screen individual studies (proportionate agreement 87.6%). At this step in Covidence, 584 records were excluded (reasons of exclusion cannot be added in Covidence at this step). If there was any doubt that a research paper could have any relevant result for the review, it was included for the next step, the full-text revision ($n = 66$). Conflicts were discussed between the

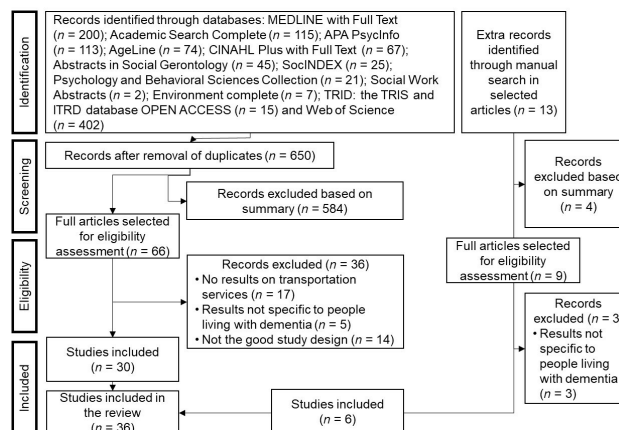


Figure 1. Systematic search and selection processes (PRISMA).

first and third authors. If needed, the second author was consulted to help resolve any disagreement. The second step for the article screening was based on full articles (proportionate agreement 72.0%). Similarly, the first and third authors independently screened all full articles, chose the reason for exclusions, and discussed conflictual decisions. If needed, the second author was involved. Finally, for the data-charting process, the first and third authors independently extracted data from selected articles using Covidence. Choice of answer questions or open questions were available for extracting the title, year of publication, country of recruitment, type of methodology, characteristics of the studied population, context (urban or rural), the main topic of individual articles, and years of data collection. Empirical results on transportation services were also extracted. Excel spreadsheets were used for more detailed results inclusion. The critical appraisal of individual sources of evidence was not relevant in that study as the goal was to have a scope of what exists in the scientific literature. A narrative synthesis was appropriate to summarize important findings (Popay et al., 2006).

To comprehensively investigate the research questions, three conceptual frameworks within the field of service access were used to synthesize the results. They informed data extraction and helped shape the thematic analysis; however, without limiting authors to extract relevant information that could not be included in one dimension of access described in these models. Having three conceptual frameworks allowed authors to extract information beyond the dimensions of access described in one of these models. All frameworks were complementary and helpful to organize the content from this scoping review. They were iteratively reviewed to understand the findings of this review. First, the “5 A’s of Senior Friendly Transportation” is a well-known model and commonly used in dementia-friendly initiatives (Kerschner, 2021a, 2021b). It includes five dimensions. Availability refers to the existence of transportation services. Accessibility means that the transportation service can be easily reached and used. Acceptability means that the transportation service reaches the standards of quality expected from the users in terms of cleanliness, safety, and user-friendliness. Affordability refers to fees that are affordable, similar to those incurred when driving one’s own vehicle. Adaptability refers to transportation that can be modified to accommodate the specific needs of individuals, such as those who use wheelchairs.

Another important model was the “User perspective on accessible public transport,” which emphasizes a travel chain perspective (Risser et al., 2015). In this model, every step involved in using public transport is broken down into individual components, including planning the trip, getting to the bus stop or terminal, buying a ticket, entering the vehicle, exiting the vehicle, and arriving at the destination (Risser et al., 2015). Each of these steps is essential for ensuring safety and comfort during travel. In that model, access is a result of the complex interaction between personal factors and contextual factors. This vision of access to services is shared in a third model by Levesque et al. (2013), who propose that access is the result of an interaction between dimensions of accessibility of the service (approachability, acceptability, availability and accommodation, affordability, and appropriateness) and five corresponding abilities of the person (ability to perceive, to seek, to reach, to pay, and to engage). In sum, the characteristics of both the users, including the person living with dementia and their caregivers, and services themselves,

interact with the need for transportation services to allow the actual access to the service.

Results

Description of Included Studies

We found 35 studies in 36 publications that included at least one result on transportation services for people living with dementia (see Table 1). Their characteristics were analyzed and are described in Table 2. A wide range of methodologies were used, with quantitative methods being the most common, followed by qualitative methods and mixed-methods studies. The studies were published between 1993 and 2022, with more than half being after 2017, illustrating the recent development of dementia-friendly communities. Studies were conducted most frequently in North America, followed by Europe, Asia, and Australia. The main topics addressed were health and social services, transportation services, dementia-friendly communities, driving cessation, out-of-home activities, and use of technologies.

Different dimensions of transportation services were studied: need of services, use of services, availability, accessibility, quality, and affordability. Different groups and stakeholders were interviewed on the subject: people living with dementia, caregivers or family, community organizations, municipalities, service providers, and healthcare or social care professionals. Approximately half of the studies included multiple groups of participants, whereas the other half focused on one group only. Overall, the perspective of people living with dementia was the more often included (two thirds of the studies), followed by the perspective of caregivers (less than half). Next, a few studies interviewed actors representing community organizations, municipalities, transportation service providers, and healthcare or social care professionals. Other groups were also interviewed (older adults living without dementia, people living with another disability than dementia, staff from transportation services organizations, people from the public, commissioners, “key informants” not defined). Interestingly, some dimensions were more often studied from the point of view of users, whereas others were studied from the point of view of organizations. Municipalities, transportation service providers, and other community organizations were in proportion more often than other stakeholders questioned on the availability of services (see Supplementary Material). On the other hand, people living with dementia were in proportion more often questioned on their needs, their use of services, and the quality of services.

Transportation services need to be studied within their context. One of the most important aspects of the context is the urbanity continuum. Overall, 13 studies surveyed participants from urban areas and five from rural areas. On the other hand, nine studies included both urban and rural areas in a way that the urban–rural context could be compared, whereas five studies included both urban and rural areas, but with aggregated results. Some more information on individual context is available in Table 1.

Transportation Services

Although a majority of the reviewed literature did not formally define transportation services or define what dimension of services was studied, a few definitions of relevant concepts were noted. In Pedlar and Biegel (1999), transportation services are referred to as community-based services provided

Table 1. Summary of Studies on Dementia-Friendly Transportation

Author(s), year and country of publication	Type of study; data collection methods; year of data collection when available	Participants; more precise location when available; participation rate when available	Focus of the study; dimension(s) of transportation; rural and/or urban	Key findings and recommendations if applicable
1. Arai et al., 2011, Japan and Mizuno et al., 2010, Japan Same study in two publications	Quantitative study; cross-sectional; data collection in 2008	Municipal governments ($N = 1,027$; nationwide survey of all municipal governments); participation rate of 56.8%	Transportation services; availability; urban and rural with results stratified by the size of the municipality Transportation services; availability and others; challenges for implementation; urban and rural with results stratified by the size of the municipality	<ul style="list-style-type: none"> Insufficient mobility support measures for people living with dementia in municipalities (only 11.7%; $n = 120$) with measures like special support services or reduced taxi fares). No significant differences in support measures implementation (from 9% to 13.2%) in municipalities of various sizes (large cities, small cities, large towns and villages, small towns and villages). Insufficient mobility measures for people living with dementia (11.7% of municipalities). Difficulties or problems to implementing supportive mobility measures for people living with dementia ($n = 160$): defining the people in need (25.0%); allocating financial resources (18.8%); requiring the presence of family members or other supporters (15.6%); unavailability of public transportation (9.4%); providing extra support measures specifically for older residents with dementia (8.8%); meeting the specific needs associated with dementia (6.9%).
2. Biegel et al., 1993, the United States	Quantitative study; cross-sectional	Caregivers of people living with mild to moderate Alzheimer's disease in the community ($N = 171$) in Pittsburgh and Cleveland, urban, midwestern, industrial-based communities; participation rate of 70.1%	Health and social services; use of services; urban	<ul style="list-style-type: none"> Compared to other out-of-home services, transportation services (primarily intended for persons living with dementia) were the most often used among out-of-home service users (45.8%) and among all users (both in- and out-of-home services; 22.4%).
3. Chen et al., 2020, Taiwan	Qualitative study; grounded theory, semistructured interviews and observation notes; data collection in 2015	Person living with dementia symptoms ($n = 4$), their family members ($n = 3$), and key persons ($n = 10$) in the Atayal community in northern Taiwan	Dementia-friendly communities; accessibility; rural	<ul style="list-style-type: none"> People living with dementia faced environmental barriers to access transportation services: danger of walking on hilly and steep roads, a long way to get to the bus station. It affected access to healthcare and general mobility to get outside the community.
4. Chung, 2006, Hong Kong	Quantitative study; cross-sectional; data collection in 2002	Community-dwelling older adults living with dementia ($N = 197$); participation rate of 49.6%	Health and social services; care needs assessment; need of services; urban	<ul style="list-style-type: none"> About 70% of the participants had "met" needs in transportation, support mainly from their family carers.

Table 1. Continued

Author(s), year and country of publication	Type of study; data collection methods; year of data collection when available	Participants; more precise location when available; participation rate when available	Focus of the study; dimension(s) of transportation; rural and/or urban	Key findings and recommendations if applicable
5. Crampton & Eley, 2013, United Kingdom	Project development and evaluation; data collection in 2011–2012	Various stakeholders including providers, commissioners, voluntary and community organizations, people living with dementia, and family carers (n = nonavailable)	Dementia-friendly communities; availability, accessibility, and quality; urban and suburban	<ul style="list-style-type: none"> • Poor transport links with few facilities in some suburban residential area and outside the city center. • Interpretation of the timetables, numbers, and color coding of buses is difficult. • Some elements reported in the cornerstones of dementia-friendly communities can be applied to dementia-friendly transportation services: <ul style="list-style-type: none"> ◦ Places: welcomeness (human scale, environmental quality, clean, calm), clarity, and familiarity. ◦ Resources: freedom to access and use based on budgets and specialized support. ◦ People: aware of dementia and its meaning; not stigmatizing; empathetic and understanding; encouraging, supportive, with a focus on what people living with dementia can do. • There was a strong consensus among participants that people encountered, including staff, was the most significant determinant of having a positive experience in the community. • Recommendation: participants suggested that sectors working with the public, for example, transport, would benefit from training on dementia to better understand what people living with dementia need.
6. Dobbs et al., 2010, Canada	Organizational report, quantitative study; cross-sectional, face-to-face or phone interviews; data collection in 2010	Service providers from organizations providing alternate transportation to older adults in Alberta (N = 197)	Transportation services; quality; rural and urban with results stratified	<ul style="list-style-type: none"> • Most of the results of the study were about describing services for all elders. The following were specific for people living with dementia: <ul style="list-style-type: none"> ◦ Door-through-door services are provided by 48% of organizations (56% in urban locations and 43% in rural locations). ◦ 10% provided volunteer or paid drivers training on aging issues (34% in urban locations and 12% in rural locations). ◦ 40% provided escorted services (44% for urban locations and 37% for rural locations). Older adults who are vulnerable, for example, people living with dementia, need this service the most. • Driving cessation directly affected participation in activities, for example, attending exercise classes, going to the library and church, visiting friends, and shopping. • Bus routes were difficult for a participant.
7. Dobbs, 2020, Canada	Book chapter, program development, and evaluation	People living with dementia participating to Driving Cessation Support Groups at the University of Alberta (n = nonavailable)	Driving cessation; need of services; urban or rural not reported	

Table 1. Continued

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8. Epps et al., 2018 , United States	Qualitative study; culturally informed community health assessment, formal semistructured interviews and informal interviews, concurrent iterative analysis of photographs, media clip-pings, observation notes, and journaling	Key community leaders and informants: community leaders ($n = 7$), citizens ($n = 4$), service providers ($n = 9$), and caregivers of people living with dementia ($n = 4$)	Aging in place for people living with dementia and their families from the African American community; availability and accessibility; urban	<ul style="list-style-type: none"> • Study context: community in Atlanta, with major public transportation service for older adults of 55 years old and older who could perform tasks independently, and also with volunteer services or from churches to transport older adults. • A study theme "Transportation Difficulties" was defined as travel constraints that interfere with someone's capability to get from one place to another one. Categories under the theme: <ul style="list-style-type: none"> ◦ The lack of sidewalks, and insufficient transportation. ◦ The lack of transportation services was a barrier. Some services were only available for people with physical handicap but not for people living with dementia. ◦ Quality and availability of sidewalks affected the use of public transportation. • Most public bus stops were not age-friendly—no seating or cover from the elements. • At inclusion, 74.3% of participants ($n = 26$) were using transportation services. • A decrease in participation over time for users of the transportation center, from 68.8% ($n = 11$) at the start to 50% in Year 1 ($n = 8$) to 37.5% in Year 2 ($n = 6$). • Explored differences in social participation among older people with and without dementia. The decrease between past and present frequentation of transportation centers seemed higher for people living with dementia than people without dementia (no statistical test reported). • Some participants living with dementia needed help to travel or support with travel arrangements; for example, some would not go without accompany or would get lost. • Access to face-to-face services was transport-dependent. Visits to services became geographically difficult with expensive taxi fares. • Finding the right bus and following the timetable independently is challenging for people living with dementia. • 21.0% of dyad used formal services of transportation services monthly (the proportion varied from 6.8% to 37.4% depending on where the participants came from).
9. Gaber et al., 2021 , Sweden	Quantitative study; longitudinal observational study, semistructured interviews; data collection in 2015–2017	People living with mild to moderate dementia ($N = 35$ at inclusion; Year 1: 26; Year 2: 16; Year 3: 9); study in Stockholm area	Out-of-home activities and use of technologies; use of services; urban	
10. Gaber, Nygård, Brorsson, et al., 2020 , United Kingdom	Convergent mixed-methods approach for the full study; data collection in 2017	People living with dementia ($n = 64$) and older people with no known cognitive impairment ($n = 64$), from five research sites in London, Cumbria, Greater Manchester regions	Out-of-home activities and use of technologies; use of services; urban and rural with results aggregated	
11. Giebel et al., 2021 , United Kingdom	Qualitative study; semistructured interviews; data collection in 2020	Unpaid carers ($n = 42$) and people living with dementia ($n = 8$), predominantly from across the Northwest Coast of England, and across the United Kingdom via organizations	Health and social services; need of services and accessibility; urban and rural with results aggregated	
12. Harrow et al., 2004 , the United States	Quantitative study; cross-sectional; data collection in 1995	Caregiver and care recipient living with Alzheimer's disease dyad ($N = 1,207$), from a trial study in Birmingham, Boston, Memphis, Miami, Palo Alto, and Philadelphia	Other: cost of community-based caregiving for Alzheimer's disease; use of services; urban	

Table 1. Continued

Author(s), year and country of publication	Type of study; data collection methods; year of data collection when available	Participants; more precise location when available; participation rate when available	Focus of the study; dimension(s) of transportation; rural and/or urban	Key findings and recommendations if applicable
13. Innes et al., 2005, Scotland	Qualitative study; semistructured interviews and focus group (3); data collection in 2003	People living with dementia ($n = 15$) and carers ($n = 16$); and further carers of people living with dementia ($n = 14$) only for the focus groups	Health and social services; availability; rural	<ul style="list-style-type: none"> Study context: participants came from rural areas defined as settlements having fewer than 3,000 people and with drive times over 30 min from a town having more than 10,000 people. Definition of gaps in services available: "At its simplest, a gap is a service that was requested or desired by a participant but was not available to them. [...] Availability may be influenced by the absence of a particular service or by the lack of individual workers available to provide the service." (p. 357) Transport was the most frequent gap mentioned in the study; 17 carers faced difficulties due to a lack of adequate transport, for example, long driving distances and costs of fuel. Lack of available transport provision through service providers. A study theme on barriers to leisure participation: "accessibility of transport" illustrated the challenges of accessing alternative transportation once a person no longer drove. <ul style="list-style-type: none"> Restricted and seasonal transportation services in rural area. Concerns about the length and duration of bus travel experiences. Large rail interchanges were challenging for many participants, for example, short time between connection, physically challenging platforms with stairs. Freedom bus passes (free) for older people were appreciated, described as a "life saver."
14. Innes et al., 2016, United Kingdom	Qualitative study; exploratory, focus group; data collection in 2012	People living with dementia ($n = 16$), carers ($n = 19$), and older people without dementia ($n = 13$), from Dorset County area (coastal towns, market towns, and rural areas)	Dementia-friendly communities with a focus on leisure; availability, accessibility, and affordability; urban and rural	<ul style="list-style-type: none"> Utilization of public transportation was challenging for people living with dementia: 41.4% of participants were unable to travel on public transportation even when assisted. The results in the other levels of the question on the Lawton scale were not reported (mode of transportation; travels independently on public transportation or drives own cars; arranges own travel via taxi but does not otherwise use public transportation; travels on public transportation when assisted or accompanied by another; travel limited to taxi or automobile with the assistance of another). Concerns about options of transportation after driving cessation, described as unmet needs. Family members and health professionals described unaccompanied trips on public transportation and risky pedestrian behaviors as high-risk activities related to alternative transportation. According to them, learning new skills for people living with dementia was difficult.
15. Lechowski et al., 2007, France; methodology in Gillette-Guyonnet et al., 2003	Quantitative study; cohort study but cross-sectional for results reported; data collection in 2000–2002	Community-dwelling women, mild to moderate Alzheimer's disease (Mini-Mental State Examination scores between 10 and 26), who have a caregiver, from the French research program on Alzheimer's disease and its management (REAL cohort; $N = 471$)	Patterns of loss of ability to perform instrumental activities of daily living; use of services; urban or rural not specified	<ul style="list-style-type: none"> Utilization of public transportation was challenging for people living with dementia: 41.4% of participants were unable to travel on public transportation even when assisted. The results in the other levels of the question on the Lawton scale were not reported (mode of transportation; travels independently on public transportation or drives own cars; arranges own travel via taxi but does not otherwise use public transportation; travels on public transportation when assisted or accompanied by another; travel limited to taxi or automobile with the assistance of another). Concerns about options of transportation after driving cessation, described as unmet needs. Family members and health professionals described unaccompanied trips on public transportation and risky pedestrian behaviors as high-risk activities related to alternative transportation. According to them, learning new skills for people living with dementia was difficult.
16. Liddle et al., 2013, Australia	Qualitative study, phenomenological, semistructured interviews, in Queensland	Retired drivers with dementia ($n = 4$), family members that are caregivers ($n = 11$), and health professionals ($n = 15$)	Driving cessation; needs of services and other: users' characteristics; urban ($n = 24$) and regional or rural ($n = 6$)	<ul style="list-style-type: none"> Utilization of public transportation was challenging for people living with dementia: 41.4% of participants were unable to travel on public transportation even when assisted. The results in the other levels of the question on the Lawton scale were not reported (mode of transportation; travels independently on public transportation or drives own cars; arranges own travel via taxi but does not otherwise use public transportation; travels on public transportation when assisted or accompanied by another; travel limited to taxi or automobile with the assistance of another). Concerns about options of transportation after driving cessation, described as unmet needs. Family members and health professionals described unaccompanied trips on public transportation and risky pedestrian behaviors as high-risk activities related to alternative transportation. According to them, learning new skills for people living with dementia was difficult.

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Author(s), year and country of publication	Type of study; data collection methods; year of data collection when available	Participants; more precise location when available; participation rate when available	Focus of the study; dimension(s) of transportation; rural and/or urban	Key findings and recommendations if applicable
17. Liu et al., 2021, Taiwan	Quantitative study; cross-sectional; data collection in 2017–2018	People living with dementia ($n = 60$), family caregivers ($n = 140$), service providers ($n = 200$), and members of the public ($n = 200$), in two districts of Taipei, Zhongzheng, and Wanhua	Dementia-friendly communities; quality; urban	<ul style="list-style-type: none"> Four groups were surveyed about the perception of the community dementia friendliness and its different domains, including transportation: people living with dementia (good 39 [65.0%]; fair 16 [26.7%]; poor 5 [8.3%]), family caregivers (good 23 [17.2%]; fair 102 [76.1%]; poor 9 [6.7%]), service providers (good 52 [26.0%]; fair 130 [65.0%]; poor 18 [9.0%]), and members of the public (good 67 [35.3%]; fair 120 [63.2%]; poor 3 [1.6%]). Public toilets were crucial for people living with dementia and their caregivers to be confident in using public transportation services. Different characteristics of toilets in public transportation services (including airports, bus stations, railway stations, and motorway service stations) were highlighted in this study. Difficult toilet access: <ul style="list-style-type: none"> Toilets not available, for example, locked or out of order without directions to available ones. Toilets hard to find, for example, poor signage that was too high up, too small, or unclear; staff members not always helpful to find toilets. Change machines in toilets were complex and unclear to use, positioned too high for a wheelchair user to reach. Ease of use: <ul style="list-style-type: none"> Good lighting was considered very important. Confusing buttons, for example, uncertain about whether a door was locked, prompted anxiety. Universal and unique needs: <ul style="list-style-type: none"> People living with dementia had unique needs due to cognitive challenges and other problems related to aging such as poor hearing, weaker muscles, and poor eyesight. For example, difficulties understanding the use of modern toilet equipment like hands-free taps, reflective surfaces, and the noise level of flushes and hand driers could be alarming; patterned, or speckled floors and poor color contrasts would affect differentiating aspects of space and contents. A transportation service provided access to social participation in the community, for example, free bus services for older adults and car booking through the community car scheme. The scheme was described as a great resource and cost five times less than a taxi. However, availability of services differed on public holidays when volunteers were not available. Lack of public transport made it difficult to visit nature farther from home. Participants appreciated the flexibility of transportation services. Friends of the participant helped plan the transport and planning took some time. Transport was noted as the main thing to be improved in rural areas.
18. Mathews et al., 2022, published online in 2021, Scotland	Qualitative coproduction design; photovoice; data collection in 2018	People living with dementia and people with different forms of cognitive and physical impairment and the carers of young people with profound and multiple learning disabilities ($n = 13$)	Quality of toilets in relation to travels; quality; urban and rural	
19. McAdam, 2020, Scotland	Book chapter, life story	Person living with dementia ($n = 1$)	Experiences of living with dementia; availability; rural	

Table 1. Continued

Author(s), year and country of publication	Type of study; data collection methods; year of data collection when available	Participants; more precise location when available; participation rate when available	Focus of the study; dimension(s) of transportation; rural and/or urban	Key findings and recommendations if applicable
20. Mizuno et al., 2011, Japan	Editorial research article; cross-sectional study; data collection in 2010	Municipalities in Japan ($N = 1,067$), participation rate of 61.0%	Transportation services; availability, affordability, and others: requirements for projects; urban and rural aggregated	<ul style="list-style-type: none"> 56.2% of municipalities ($n = 600$) had available transportation services for elders, accessible to people living with dementia. Requirements for implementing transportation services projects for people living with dementia: sufficient financial resources (58.0%, $n = 619$); ability to implement support measures for older residents without limiting it to those living with dementia (52.3%, $n = 558$) and the willingness to cooperate with businesses and individuals (43.0%, $n = 459$). 55.7% ($n = 39$) of participants commented that transportation services to healthcare were unavailable in most communities, while some (38.6%, $n = 27$) commented services were offered at least weekly; for example, transportation was not available on weekends and nights. The accessibility of available public transportation to dementia care services for older adult was rated on average 2.9 ($SD\ 1.5$) out of 5, while the accessibility of available subsidized/free transportation to services for older adults was given on average 2.0 ($SD\ 1.3$) out of 5 (1 = no, not at all and 5 = yes, to a very great extent).
21. Morgan et al., 2015, Canada	Quantitative study; cross-sectional; data collection in 2013	Home care assessors ($N = 71$), rural Saskatchewan	Health and social services; availability and accessibility; rural	<ul style="list-style-type: none"> Navigating airport processes and designs, in particular security and immigration procedures, was the biggest challenge for people living with dementia and their travel companions. Features created confusion: poor signage, blurred boundaries between retail and travel spaces. Recommendation: Little was done to modify built environments to promote accessibility for people with cognitive impairments. Access to physical spaces allows people living with dementia to participate in social activities and facilitate social inclusion, for example, enhancing transport hubs' accessibility like airports.
22. O'Reilly et al., 2017, Australia	Mixed-method study; online cross-sectional survey, qualitative telephone interview, and observation with the Dementia-Friendly Communities Environmental Assessment Tool	People living with dementia ($n = 7$); travel companions of people living with dementia ($n = 41$); flight crew ($n = 21$) and security staff ($n = 13$)	Transportation services; quality; urban	<ul style="list-style-type: none"> The role of transportation was a differential reason for limiting participation to going out for enjoyment among older people with probable dementia (23.15%) compared to people with no dementia (4.73%; $p < .01$). There was no difference between the group of people with possible dementia compared to each other groups. The role of transportation was not significantly different between groups as a reason for limiting participation to visiting friends or family, for attending religious services, and for attending clubs or classes.
23. Parisi et al., 2017, the United States	Quantitative study; cross-sectional; data collection in 2010	People aged 65 and more classified as having no dementia ($n = 5,264$), possible dementia ($n = 893$), or probable dementia ($n = 518$). The participants were part of the National Health and Aging Trends Study, a nationally representative sample of Medicare beneficiaries	Activities preferences and transportation limitations; need of services; urban and rural aggregated	<ul style="list-style-type: none"> The role of transportation was a differential reason for limiting participation to going out for enjoyment among older people with probable dementia (23.15%) compared to people with no dementia (4.73%; $p < .01$). There was no difference between the group of people with possible dementia compared to each other groups. The role of transportation was not significantly different between groups as a reason for limiting participation to visiting friends or family, for attending religious services, and for attending clubs or classes.

Table 1. Continued

Author(s), year and country of publication	Type of study; data collection methods; year of data collection when available	Participants; more precise location when available; participation rate when available	Focus of the study; dimension(s) of transportation; rural and/or urban	Key findings and recommendations if applicable
24. Pedlar & Biegel, 1999, Canada	Quantitative study, cross-sectional, Southern Ontario	Wives of community-dwelling husband living with dementia ($N = 82$), including subjects recruited from Veterans Affairs ($n = 53$), from a memory clinic ($n = 23$) and from a support group for people living with Alzheimer and their caregiver ($n = 6$), participation rate of 86%	Other: impact of caregivers' attitudes on the use of community services; use of transportation services and other: caregiver's attitude; urban	<ul style="list-style-type: none"> Transportation services are one type of community service described in the study. Community services are provided by a community agency or by a paid helper in the 4 weeks prior to the interview. Community agencies can be both governmental and nongovernmental. 43% of respondents ($n = 35$) used transportation services in the 4 weeks before the interview. Caregivers' attitudes did not explain the use of transportation services. Attitudes were favorable or unfavorable feelings toward the use of community services. Attitudes studied were favorable caregiver attitudes toward family responsibility, favorable attitudes or perceptions of service quality and services.
25. Peterson et al., 2022, the United States	Mixed-methods research, cross-sectional and descriptive-interpretative, web survey with open questions, data collection in 2019	People living with dementia ($n = 48$) and travel companions ($n = 176$)	Transportation services; quality; urban (airports)	<p>Quantitative results</p> <ul style="list-style-type: none"> The environment in airports matters for people living with dementia; 21.0% of people living with dementia and 23.6% of travel companions identified as being able to understand announcements and signs as one top issue. Other air travel concerns reported by more than 10% of participants (people living with dementia and travel companions) were anxiety, getting lost or separated from their travel companion, and a need for quiet space. <p>Qualitative results</p> <ul style="list-style-type: none"> The airport staff could help with good air travel experience, for example, being able to recognize unique identifiers for people in need for assistance. Training on how to interact with people living with dementia was suggested by participants. Having a designed security line for people needing assistance available for people living with dementia was positive as it offered a less stressful security screening experience. This service was not well-known among participants. For airport navigation, loudspeaker announcements were hard to understand and caused frustration and stress. Announcements were suggested to be in text form. Signage in the airport should be easier to follow with user-friendly maps and services available online. Physical spaces should be more accommodating with easy access to quiet spaces for people living with dementia to avoid overstimulation at the airport. Family restrooms were not consistently available but were very important for many participants. Recommendation: A travel companion suggested having a badge of certain colors on boarding passes could facilitate recognition of people living with dementia and caregivers, similar to the Hidden Disabilities Sunflower wearables used in the United States.

Table 1. Continued

Author(s), year and country of publication	Type of study; data collection methods; year of data collection when available	Participants; more precise location when available; participation rate when available	Focus of the study; dimension(s) of transportation; rural and/or urban	Key findings and recommendations if applicable
26. Reifler et al., 1997, the United States	Quantitative study; cross-sectional; data collection in 1988–1992	Adult day centers ($N = 16$), in California, Georgia, Hawaii (2), Massachusetts, Missouri, New York (2), North Carolina (3), Utah, and Wisconsin (4)	Other: adult day centers financial performance; availability and affordability; urban and rural aggregated	<ul style="list-style-type: none"> Most of the day centers (81.3%, $n = 13$) offered transportation services to their participants. Provision of transportation services for participants to the day center was associated with better finances (i.e., higher earnings-to-cost ratio; $p = .0724$). Agencies commented on the availability of transportation services within 50 miles of patients with memory loss: 37% very available, 55% somewhat available, 5% not available, and 3% didn't know; there was no significant difference on responses on the availability of services by urban versus nonurban respondents.
27. Shope et al., 1993, the United States	Quantitative study; cross-sectional	Responding agencies ($N = 219$) included community mental health centers (26%), district and local health departments (20%), councils on aging (12%), community action agencies (10%), Area Agencies on Aging (8%), Alzheimer's Association chapters (6%), and other community programs (18%). Ninety-one of the agencies (42%) were from urban areas, in Michigan; participation rate of 89.8%	Health and social services; availability; urban and rural stratified	<ul style="list-style-type: none"> Regarding the services and resources that were most needed to help people living with dementia and their caregivers, transportation was mentioned by 23 agencies (11%). 21 agencies (10%) identified "distance/no transportation" as current and foreseeable problems providing information and referral services to people living with dementia and their caregivers. Nonurban respondents were significantly more likely than urban respondents to mention the problem of "distance/no transportation" ($p < .05$).

Table 1. Continued

Author(s), year and country of publication	Type of study; data collection methods; year of data collection when available	Participants; more precise location when available; participation rate when available	Focus of the study; dimension(s) of transportation; rural and/or urban	Key findings and recommendations if applicable
28. Silverstein & Turk, 2016, the United States	Qualitative study; semistructured interviews; data collection in 2012	National experts on older adult transportation in the United States ($N = 32$), including public officials or lead agency staff ($n = 13$), transportation providers from rural and urban settings ($n = 13$), and transportation and aging researchers ($n = 6$)	Transportation services; availability, accessibility, quality, and affordability; urban and rural experts represented	<ul style="list-style-type: none"> Challenges related to the eligibility of people living with dementia for paratransit services; some participants estimated that current paratransit served more individuals with physical than cognitive impairments. Some people became too frail to use paratransit services before they tried to access them. Participants considered the current paratransit services not configured for people living with dementia, for example, requiring a high cognitive demand for setting schedules and reserving services. Paratransit services were less available in suburban and rural areas. Financial issues were limiting paratransit services in rural areas. The mobility management, which offered coordination and service to support customers to access a service given their needs, was useful because the older population had heterogeneous needs. It helped reduce many barriers to access, for example, people not able to get to the transit, unable to identify their own needs because of cognitive limitations, who felt stigma or were afraid to use services, who had limited family support, could not afford services, and were unaware of available services. All participants agreed that the curb-to-curb model was not enough to answer all the needs of people living with dementia in the community and to be patient-centered. A lack of travel training for retiring drivers living with dementia was noted by participants. Participants agreed that the staff and volunteers did not have the right amount of educational training to be able to provide safe, effective, and affordable care during their services. There was a lack of alternative transportation particularly in rural areas, which posed a challenge to people living with dementia and family carers when considering to stop driving. Some people living with dementia feared to become isolated when they lost their driving licenses. A minority of rural communities offered subsidized transportation services for people with disabilities such as dementia. People would continue driving if there were no family support. Recommendation: Participants urged collaboration of policymakers, clinicians, and community leaders to develop alternative options of affordable transportation for retired drivers with dementia.
29. Stasiulis et al., 2020, Canada	Qualitative study; semistructured interviews	Alzheimer Society staff in their work of supporting people living with dementia and family carers ($N = 15$)	Driving cessation; availability; rural	

Table 1. Continued

Author(s), year and country of publication	Type of study; data collection methods; year of data collection when available	Participants; more precise location when available; participation rate when available	Focus of the study; dimension(s) of transportation; rural and/or urban	Key findings and recommendations if applicable
30. Steiner et al., 2020, Australia	Qualitative study; in-depth semistructured interviews and a community forum; data collection in 2017–2018	General practitioners ($n = 20$), seniors and community/local government area representatives ($n = 53$), and community health workers ($n = 25$), from South Western Sydney	Health and social services; need of services; urban and rural	<ul style="list-style-type: none"> Transportation access was an important barrier to access memory clinics. Access to public transportation services was limited in the rural area. There was a need for more dementia-specialized services that supported people living with dementia, including community transport.
31. Sun et al., 2022, China	Quantitative study; cross-sectional; data collection in 2018	Family caregivers of people living with dementia at home ($N = 170$), in Ningbo and Shanghai, two cities of eastern China, participation rate 87.6%	Health and social services; use of services and need of services; urban	<ul style="list-style-type: none"> 67.1% ($n = 114$) of caregivers reported a need for transportation services (58.2% working caregivers and 72.8% nonworking caregivers). 51.8% ($n = 88$) of respondents reported using transportation services.
32. Sun et al., 2008, the United States	Quantitative study; cross-sectional	Family caregivers of people living with the Alzheimer's disease ($N = 720$), including 295 African Americans and 425 Caucasian from the REACH I site in Birmingham, Memphis, Philadelphia, and Boston	Health and social services; use of services; urban	<ul style="list-style-type: none"> Gender differences in the use of transportation services by caregivers: Female caregivers used formal services more (21.6%) than male caregivers (12.7%; $p = .01$). However, the relation between gender and transportation use disappeared with the inclusion of the variable frequency of religious service attendance and other control variables (caregiver age, income, education, race, and relationship to the care recipient; $\beta = 0.66$, $SE = 0.27$, $p < .05$ becomes $\beta = 0.03$, $SE = 0.33$, $p > .05$).
33. Thälén et al., 2022, Canada, Sweden, Switzerland, and the United Kingdom	Quantitative study; cross-sectional study; data collection in 2015–2017	People with mild-stage dementia living in Canada ($N = 29$), Sweden ($N = 35$), Switzerland ($N = 35$), and the United Kingdom ($N = 64$)	Out-of-home participation; use of services; urban	<ul style="list-style-type: none"> Public transportation service was granted for 31.0% ($n = 9$) of participants in Canada, 74.3% ($n = 26$) in Sweden, 11.4% ($n = 4$) in Switzerland (nonavailable for the United Kingdom). Sweden had a significantly higher rate of granted public transportation service than expected, whereas Switzerland had a significantly lower rate. The Stockholm area had extensive public transportation, for example, trains, tram, and buses. Many of these transportation means had adaptations for people with mobility challenges. People living with dementia could apply and be granted free passages on all public transport.
34. Wallcook, 2022, Sweden, the United Kingdom, and the United States	Thesis; mixed-methods research, cross-sectional study and a case study with semistructured interviews; data collection started in 2015	Older adults ($N = 315$), including people living with dementia ($n = 99$), from Stockholm region in Sweden, from five National Health Service sites including two in rural Cumbria and three in urban London and Greater Manchester, in the United Kingdom, and in Chicago suburb in the United States	Technologies in the life of older adults with or without dementia; accessibility; urban and rural	<ul style="list-style-type: none"> Technologies in public transportation services could be barriers or facilitators to participation for people living with and without dementia. Proving face-to-face services was important to mitigate digital exclusion to participation and affected the technological challenges.

Table 1. Continued

Author(s), year and country of publication	Type of study; data collection methods; year of data collection when available	Participants; more precise location when available; participation rate when available	Focus of the study; dimension(s) of transportation; rural and/or urban	Key findings and recommendations if applicable
35. Wu et al., 2019, Taiwan	Qualitative study; qualitative content analysis approach; semistructured interviews; data collection in 2016	People living with dementia ($n = 16$) and family caregivers ($n = 20$), in Taipei	Dementia-friendly communities; accessibility and quality; urban	<ul style="list-style-type: none"> This study identified similar dementia-friendly communities' indicators for Taiwan than those of other countries, including dementia-friendly transportation. One fifth of participants identified transportation as something important for dementia-friendly communities. The indicator of "dementia-friendly transportation" included the convenience of public transportation, friendliness of bus drivers and staff to people living with dementia, and the presence of easy-to-find and recognize signs for bus stations. Several caregivers experienced inconvenience when they used buses for handicapped people, for example, the service was often not available if they booked the bus too late, some bus drivers were not patient enough, and some metro signs were not clear.

Notes: SD = standard deviation; SE = standard error.

by a community agency, governmental or not, or by a paid helper. In Arai et al. (2011), transportation services were defined as mobility support specifically for older adults living with dementia (e.g., special transport services or reduced taxi fares). Other studies seemed to define transportation services as any alternative transportation services to private automobiles. In a few studies, only a particular type of transportation service was studied: airplanes and airports (O'Reilly et al., 2017; Peterson et al., 2022), transportation services as part of a day care center (Reifler et al., 1997), and paratransit services (transit other than mass public transit; Dobbs et al., 2010).

The issue of specific planning and design features for a dementia-friendly transportation service was not clearly addressed in the literature. In Biegel et al. (1993), transportation services studied needed to be primarily intended for persons living with dementia but were not defined in any further detail. Three papers on transportation services at a municipal level in Japan found that municipalities were already concerned about having transportation services available for all older people and preferred to manage services adaptable to different needs including for people living with dementia (Arai et al., 2011; Mizuno et al., 2010, 2011). In the discussion of Mizuno et al. (2011), the authors concluded that the "results clearly indicate that it is important to develop systems as part of existing projects that people living with dementia can use. This will require enhancing the knowledge and skills of businesses and individuals involved with the existing support projects to meet the specific needs associated with dementia" (p. 2389).

Needs and Unmet Needs of Transportation Services

Seven studies presented results on the need for transportation services for people living with dementia. Three were quantitative studies that provided estimates of the proportion of community-dwelling people living with dementia that needed transportation services. However, there was no systematic method to understand the prevalence of the needs. A few studies asked the community members if there was a need for a service, whereas others asked if there was an unmet need. In China, the needs of transportation services were reported by 67.1% of all family caregivers of people living with dementia at home, including 58.2% of working caregivers and 72.8% of nonworking caregivers in 2018 (Sun et al., 2022). In Hong Kong, 30.0% of community-dwelling older adults living with dementia had unmet needs in terms of transportation (Chung, 2006). In the United States, in 2010, 23.15% of older people with probable dementia reported transportation as a reason for limiting participation to going out for enjoyment (Parisi et al., 2017). This proportion (23.15%) was higher than that for cognitively healthy people (4.73%). Those results illustrate the need for transportation services for a high proportion of people living with dementia.

Four qualitative studies explored the need for transportation services among people living with dementia (Dobbs, 2020; Giebel et al., 2021; Liddle et al., 2013; Steiner et al., 2020). A few participants clearly illustrated unmet transportation needs following driving cessation, as illustrated by these excerpts, "the biggest thing that I am unable to do since losing my license is getting to and from my exercise classes and [I've] been unable to get to the library" (Dobbs, 2020, p. 69); "[I] no longer go shopping, or to church or to visit friends. All parts of my life are affected because I am not able to drive" (Dobbs, 2020, p. 69). Exploring met and unmet

Table 2. Description of Characteristics of the 35 Studies Included in the Review

Study characteristics	<i>n</i> (%)
Type of evidence source	
Primary research article	29 (82.9)
Books chapter	2 (5.7)
Editorial research article	1 (2.9)
Conference paper	1 (2.9)
Thesis	1 (2.9)
Organizational report	1 (2.9)
Methodology used	
Quantitative	16 (45.7)
Qualitative	11 (31.4)
Mixed methods	4 (11.4)
Others	4 (11.4)
Year of publication	
1991–1995	2 (5.7)
1996–2000	1 (2.9)
2001–2005	2 (5.7)
2006–2010	5 (14.3)
2011–2015	5 (14.3)
2016–2020	12 (34.3)
2021–2022	8 (22.9)
Country where studies were conducted	
North America	14 (40.0)
United States	9 (25.7)
Canada	5 (14.3)
Asia	7 (20.0)
Taiwan	3 (8.6)
China and Hong Kong	2 (5.7)
Japan	2 (5.7)
Europe	9 (25.7)
United Kingdom	4 (11.4)
Scotland	3 (8.6)
France	1 (2.9)
Sweden	1 (2.9)
Australia	3 (8.6)
Multiple countries (Sweden, the United Kingdom, and the United States, and Sweden, the United Kingdom, Switzerland, and Canada)	2 (5.7)
Main topics	
Health and social services	8 (22.9)
Transportation services	7 (20.0)
Dementia-friendly communities	5 (14.3)
Out-of-home activities and/or use of technologies	4 (11.4)
Driving cessation	3 (8.6)
Others	8 (22.9)
Dimensions of transportation services studied	
Needs of services	7 (20.0)
Use of services	8 (22.9)
Availability	13 (37.1)
Accessibility	9 (25.7)
Quality	8 (22.9)
Affordability	5 (14.3)

Table 2. Continued

Study characteristics	<i>n</i> (%)
Number of groups of actors studied	
More than one group	19 (54.3)
One group only	16 (45.7)
Population studied	
People living with dementia	23 (65.7)
Caregivers or family	16 (45.7)
Community organizations	6 (17.1)
Municipalities	5 (14.3)
Transportation service providers	4 (11.4)
Health or social care professionals	3 (8.6)
Context of the study	
Urban only	13 (37.1)
Rural only	5 (14.3)
Urban and suburban	1 (2.9)
Urban and rural segregated	9 (25.7)
Urban and rural integrated	5 (14.3)
Information not available	2 (5.7)

needs for community service is a first step before identifying ways to improve mobility.

Use of Transportation Services

In one multicentric, multimethod study conducted between 2015 and 2017, public transportation service was granted for 33% of participants with mild-stage dementia in Canada, 74% in Sweden, and 11% in Switzerland (Thalén et al., 2022). Sweden had a significantly higher rate of granted public transportation service than the others, whereas Switzerland had a significantly lower rate ($p < .001$, with post-hoc tests with Bonferroni correction). Eight papers explored the actual use of transportation services in communities. Most of those results were quantitative and cross-sectional. Caregivers and/or people living with dementia reported using transportation services in different proportions across regions, countries, gender, and time: 22.4% use (United States, Biegel et al., 1993), 21.0% monthly use, 6.8%–37.4% across regions (United States, 1995, Harrow et al., 2004), 21.6% use for female caregivers compared to 12.7% of male caregivers (United States, Sun et al., 2008), 42.7% last 4 weeks use by wives of community-dwelling care recipients with dementia (Canada, Pedlar & Biegel, 1999), 51.8% use (China, 2018, Sun et al., 2022), 68.8% use in Sweden at inclusion, with the frequentation decreasing to 50.0% in Year 1 follow-up and 37.5% in Year 2 (Gaber et al., 2021). Reasons for using services or not using services were not explored.

In France, in 2000, 41.4% of participants with mild to moderately severe Alzheimer's disease in the community were unable to travel on public transportation even when assisted (Lechowski et al., 2007). In the United Kingdom, one study explored differences in social participation and found that participants with dementia showed a more notable decrease between past and present frequentation of transportation centers (–14 of 64 participants) than participants without dementia (–11 of 64 participants; Gaber, Nygård, Brorsson, et al., 2020).

Availability

According to the “5 A’s of Senior Friendly Transportation,” availability means that the transportation service exists (Kerschner, 2021a). One of the included qualitative studies provided a definition: “At its simplest, a gap is a service that was requested or desired by a participant but was not available to them. [...] Availability may be influenced by the absence of a particular service or by the lack of individual workers available to provide the service” (Innes et al., 2005, p. 357). One important aspect of availability of services is to compare regions with each other, depending on their size and their rurality. A total of 11 studies included results on availability, five quantitative and six qualitative. Most were interviewing stakeholders that are responsible for the delivery of transportation services in the community, such as municipalities (4), transportation service providers (3), and community organizations representatives (5).

All quantitative studies informing on availability used different types of questions and points of view. In Japan, the proportion of municipalities with mobility support measures specifically for older residents with dementia was 11.7% ($n = 120$; Arai et al., 2011; Mizuno et al., 2010). There was no significant difference based on the size of the municipality. Later, the same study team sent a similar survey and availability for projects offering mobility support to older residents that people living with dementia can also use was 56.2% ($n = 600$; Mizuno et al., 2011). In rural Saskatchewan, in Canada, transportation services to healthcare reported in 2013 were unavailable in 55.7% of communities, whereas they were offered at least weekly in 38.6% of rural communities in Saskatchewan (Morgan et al., 2015). In the United States, between 1988 and 1992, most of the adult day centers offered transportation services to their participants: 81.3% ($n = 13$; Reifler et al., 1997). In Michigan, United States, responding agencies reported on the availability of transportation services within 50 miles for patients with memory loss: 37% said they were very available, 55% somewhat available, 5% not available, and 3% didn’t know (Shope et al., 1993). There was no significant difference reported on the availability of transportation services, according to urban versus nonurban respondents in that study (Shope et al., 1993).

On the other end, six qualitative studies were informative about the lack of transportation services for people living with dementia in urban communities (Epps et al., 2018; Silverstein & Turk, 2016) and particularly in suburban and rural areas (Crampton & Eley, 2013; Innes et al., 2005, 2016; Silverstein & Turk, 2016; Stasiulis et al., 2020). “We have very little, if any, alternative driving solutions in rural areas. [...] And, if there isn’t a family member living close by, who can take time off work, it just becomes really difficult to get around” (Stasiulis et al., 2020, p. 1266). Availability of paratransit services for people living with dementia was also a concern because they were often not considered in the eligibility criteria: “No one really knew for sure who was served by existing paratransit but assumed that it was individuals with more physical disabilities than cognitive impairments. [...] To be honest, I’m not sure if someone with dementia would qualify” (Silverstein & Turk, 2016, p. 388). Finally, a life story was informative about how availability of multiple options for transportation services in a rural area can give a person with mild dementia access to social participation while allowing to age in the place of her choice:

There is one bus an hour and this gives me some flexibility to attend different activities, including yoga, mindfulness, tai chi, my walking group, choir and my iPad class. My friend and supporter at the iPad class helps me plan my transport each week. He suggested that each Monday I book transport through the community car scheme, so I get the bus to the class (the bus is free for older people living in Scotland) and get the community car back. It’s a great resource and costs about five times less than a taxi would. (McAdam, 2020, pp. 281–282)

Generally, the perception of availability of specific services for people living with dementia was low in many populations across the world, particularly in rural areas. In some communities, transportation services associated with specific services such as day care centers seemed a possible way to provide access to those services.

Accessibility

Accessibility is defined by the extent of reachability and usability of existing transportation services (Kerschner, 2021a). Nine studies found important elements related to the accessibility of transportation services for people living with dementia. Qualitative studies were more informative about how to make transportation services accessible to people living with dementia and their caregiver (Chen et al., 2020; Crampton & Eley, 2013; Epps et al., 2018; Giebel et al., 2021; Innes et al., 2016; Silverstein & Turk, 2016; S. Wu et al., 2019). The perspectives of people living with dementia and their caregivers were explored in several studies. One challenge for accessing the transit bus was the duration (if over an hour) of bus journeys (Chen et al., 2020; Innes et al., 2016). Also, the neighborhood built environment to reach a bus stop was important for many participants, including steep streets, lack of sidewalks, and seating unprotected from the elements at the bus stop (Chen et al., 2020; Epps et al., 2018). Several participants noted that the bus timetables, with their numbers and color codes for buses, were hard to interpret for people living with dementia (Crampton & Eley, 2013; Giebel et al., 2021). Signs for bus stops/stations needed to be easily found and recognized (Wu et al., 2019). Also, the overall travel experience was important. Large rail interchanges and multiple interchanges were challenging to navigate with a very short time for changing trains (Epps et al., 2018; Innes et al., 2016). Physical access to platforms could also be challenging when some participants had mobility issues and could not take the stairs (Innes et al., 2016). A participant used the Internet to plan the best route: “I look online and see where the train’s going and where it stops. And at Wolverhampton ... you just wait on the same platform which is lovely” (Innes et al., 2016, p. 1654). Finally, in a multicentric study interested in technologies in the life of older adults, technologies related to public transportation services could be barriers or facilitators to participation for people living with and without dementia (Wallcook, 2022). Face-to-face services were helpful to mitigate digital exclusion and facilitate participation in everyday life for many participants (Wallcook, 2022).

A study in the United States interviewed experts on transportation services and accessibility was one of the main topics (Silverstein & Turk, 2016). Providers of transportation services faced challenges related to mobility management. Mobility management could help to reduce many barriers to access because it could provide a service centered on the

person's specific needs. It is useful because the older population has heterogeneous needs. Providing this personalized assistance could help with the challenges that people living with dementia can experience: having difficulty self-identifying their needs, feeling stigmatized, fear of trying a service, being unaware of existing services, not being able to afford one service, and not being able to get to the transit (Silverstein & Turk, 2016). Finally, one quantitative study was informative about accessibility. In rural Saskatchewan, Canada, 2013, home care assessors rated the accessibility of available public transportation for people living with dementia on average 2.9 (standard deviation [SD] 1.5) out of 5. They rated the accessibility of available subsidized/free transportation to services for older adults on average 2.0 (SD 1.3) out of 5 (Morgan et al., 2015). Scores under 3 were considered low accessibility.

Quality: Adaptability and Acceptability

The quality of services is also important for users to appreciate them and continue to access them. The "5 A's of Senior Friendly Transportation" includes two dimensions that are important for overall quality: acceptability and adaptability (Kerschner, 2021a). Acceptability means that the transportation service reaches the standards of quality expected from the users in terms of cleanliness, safety, and user-friendliness whereas adaptability refers to transportation that can be modified to meet special needs.

Quality of transportation services and alternative transportation services

Eight studies included insights about the quality of transportation services. In Taiwan, in 2017, global perceived quality of transportation services was surveyed and 65.0% of people living with dementia perceived them good, 26.7% fair, and 8.3% poor, compared to 17.2% of family caregivers that perceived them good, 76.1% fair, and 6.7% poor (Liu et al., 2021). Among service providers, 26.0% perceived transportation services as good, 65.0% fair, and 9.0% poor compared to among the public, 35.3% who perceived them as good, 63.2% fair, and 1.6% poor.

Adaptability of paratransit service (transportation services other than fixed route's public transit offered to the general population) was discussed in two studies. In the United States, experts of transportation services interviewed questioned the adaptability of paratransit services for people living with dementia (Silverstein & Turk, 2016). Paratransit services need someone to consult the schedule and call to make a reservation, and in general, their use requires a high cognitive demand (Silverstein & Turk, 2016). In Dobbs et al. (2010), service providers from Alberta were surveyed on alternative transportation services that are considered more adaptable to the needs of different groups, in particular people living with dementia: 56% of urban alternative transportation service providers offered door-through-door service compared to 43% in rural areas. Overall, 40% offered escorted services, 44% in urban settings compared to 37% in rural settings (Dobbs et al., 2010).

Quality of services provided by transportation staff and training

The quality of interactions with staff was highlighted as very important in several studies: the staff attitude needed to be friendly, nondiscriminatory, not stigmatizing, empathetic and understanding, encouraging, and supportive, and staff needed

to be aware of dementia and its meaning and should focus on what people living with dementia can do (Crampton & Eley, 2013; Peterson et al., 2022; S. Wu et al., 2019). "There was a strong consensus amongst the people living with dementia [...] that, although environmental and other factors were important, the most significant determinant of whether a community is dementia-friendly or not is how helpful, welcoming and understanding are the people encountered in everyday life" (Crampton & Eley, 2013, p. 54). One identified strategy related to improving the acceptability of services was to train staff, drivers, and volunteers on the needs of people living with dementia (Crampton & Eley, 2013; Peterson et al., 2022; Silverstein & Turk, 2016). For example, airport staff could be trained to recognize unique identifiers that would signal the need for assistance from an individual, such as the Hidden Disabilities Sunflower wearables (Peterson et al., 2022). In Alberta, Canada, volunteer and/or paid drivers from alternative transportation services were more trained in urban settings compared to rural settings: 32% received training on mental health issues and 34% on aging issues compared to 14% and 12% (Dobbs et al., 2010).

Quality of transport hubs' environment and toilets

The environment of travel hubs also mattered for people living with dementia (Peterson et al., 2022). Particularly, being able to understand announcements and signs was a top issue for people living with dementia and their travel companions: 21.0% of people living with dementia and 23.6% of the travel companions identified this as an issue (Peterson et al., 2022). In fact, loudspeaker announcements were often a source of frustration and anxiety because they were difficult to understand. Some participants suggested having the text available in a written form as well. Another travel hub concern reported by more than 10% of interviewees was the need for a quiet space (Peterson et al., 2022). The need for easily accessible quiet spaces was highlighted as people living with dementia need to avoid overstimulating spaces (Peterson et al., 2022). Transportation hubs needed to be easy to navigate: processes and designs could be better designed in airports with better signage and clearer boundaries between retail and travel spaces (Australia, O'Reilly et al., 2017 and United States, Peterson et al., 2022). Maps and services could be more user-friendly as signage was difficult to follow and inconsistent (Peterson et al., 2022).

Accessible toilets at transportation hubs were very important for the acceptability of services (Crampton & Eley, 2013; Mathews et al., 2022; Peterson et al., 2022). In Scotland, in 2018, an innovative qualitative study investigated the case of access to toilets while traveling and using public transportation services (Mathews et al., 2022). For older people living with dementia, access to public toilets was an imperative to using a service. Many aspects of toilets were important, such as the clarity of signs and symbols (Mathews et al., 2022). Their ease of use was important, including design such as confusing buttons, color contrast, lighting and reflections and emergency cords. Access to family restrooms was important for caregivers to help their care receiver if not the same sex (Peterson et al., 2022).

Affordability

According to the 5A's model, affordability for transportation services means that fees are affordable, more or less the same as if the person was driving their own vehicle (Kerschner,

2021a). Affordability for the client is related to financial viability for the organization providing the service, as they are interrelated. In fact, three studies were concerned about organizational finances.

Municipalities in Japan listed sufficient financial resources as the most important requirement for offering transportation support to people living with dementia (Mizuno et al., 2011). In another study, numerous national experts on older adult transportation considered that financial issues threatened to ruin paratransit services (Silverstein & Turk, 2016). In the United States, providing transportation services for participants to the day center seemed associated with better finances (i.e., higher earnings-to-cost ratio; $p = .0724$; Reifler et al., 1997). Finally, in the United Kingdom in 2012, a qualitative study found that the free “freedom bus pass” was improving affordability of public transportation for some participants (Innes et al., 2016).

Discussion and Implications

A Growing Amount of Research in the Area

This scoping review aimed at mapping the scientific literature on the need and use of dementia-friendly transportation services and on their availability, accessibility, acceptability, affordability, and adaptability. Results from 35 studies were synthesized. There was a gap between the need and the use of services. Transportation services were needed by over 20% of participants living with dementia in multiple studies, up to 70% in some studies. Actual use of services was around 20%–30% in many studies. Availability of transportation services was an important topic and an important challenge for all communities, and particularly for rural communities. Rural organizations faced challenges in sustaining services with the budget available.

Although there have been more studies in the field, there is a lack of definitions and descriptions of the public transportation services and dementia-friendly transportation in local communities. As the transportation systems are diverse in many countries, contextual information concerning local transportation systems can facilitate the understanding of aspects investigated in the articles. Not many reviewed articles explicitly stated the specific needs of people living with dementia in terms of transportation. However, some articles mentioned challenges faced by participants with dementia, such as having a short time during connections at rail interchanges (Innes et al., 2016) and having difficulty interpreting bus timetables and numbers (Crampton & Eley, 2013; Giebel et al., 2021).

The importance of human interactions within services for people living with dementia was highlighted by several studies through the perspectives of people with lived experiences and other key informants (Crampton & Eley, 2013; Peterson et al., 2022; S. Wu et al., 2019). Well-trained staff made a difference by providing assistance in wayfinding, using technology, and in general, by being patient, kind, and nonstigmatizing; such support could reduce anxiety and significantly improve the travel experience for people living with dementia.

Differences Between Availability, Need, and Use

This review showed differences between availability of services in the community, the perceived need for public transportation services, and the actual use of services. In fact, a service that is available will not necessarily be used. For

example, some people living with dementia can walk to the destination or have a caregiver who is able to drive and may not need the public service. The better a service is in terms of accessibility, quality, and affordability, the more a service will be used by the targeted population. The adequacy between service and the needs of a person can also change in time, better illustrated by longitudinal studies. Only one longitudinal study found a decrease in the use of transportation services by people living with dementia in time (Gaber et al., 2021). Having a mixed-method project to explore the reasons for this decrease would have been interesting. Next, one study explored both needs and use of services. Although 67.1% needed services, only 52% reported using services (Sun et al., 2022). The reasons to explain this gap were not explored. Finally, exploring this gap should include the dimension of destinations: life-sustaining, life-maintaining, and life-enriching destinations may influence how transportation services are answering needs (Kerschner & Silverstein, 2018).

Rural and Urban Areas

The papers reviewed showed the importance of context to study transportation services for people living with dementia. The challenges that municipalities, transit organizations, and people with lived experiences faced were distinctive in the natural and built environments for urban and rural spaces. For example, urban transportation systems may be well developed and available, but there were challenges in the large interchanges for people living with dementia (Innes et al., 2016); rural spaces may have more individualized transportation, but the service availability was inconsistent and required higher cost (Silverstein & Turk, 2016). In urban areas, access to a larger public transportation system such as rail and bus systems could be surveyed (Thalén et al., 2022). In rural areas, paratransit and door-to-door services by volunteers and paid drivers were generally described (Dobbs et al., 2010). Many qualitative studies were clear about a perceived lack of access to transportation in rural and suburban areas (Crampton & Eley, 2013; Innes et al., 2005, 2016; Silverstein & Turk, 2016; Stasiulis et al., 2020). Few studies included holistic program evaluation (Dobbs, 2020). No study compared the effectiveness or discussing improvements of coordination and efficiency of transportation services programs.

Implications

Dementia-friendly transportation is a priority of this decade (Gaber, Nygård, Kottorp, et al., 2020; WHO, 2007). It is essential that policymakers and community leaders work together with community members to improve dementia-friendly transportation. Although municipalities are taking initiatives to improve the built environment and promote accessibility for people with physical disability, relatively little has been undertaken to address the needs of people with cognitive impairments (O'Reilly et al., 2017). People living with dementia need to be actively engaged in planning and designing services in a participatory decision-making process. Community-based research can be used to develop relevant transportation services that are not only essential to access health and social services, but also to stay active in the community. General public transportation services need to be adaptable to allow their use, whereas some paratransit services with escorts or door-to-door options are complimentary. This adaptability can only be understood involving the concerned population.

Travel training for people living with dementia on effective use of public transportation needs to be better understood. People living with cognitive impairments should always be informed about how to use public transport, regardless of the perception of their level of functioning (Risser et al., 2015). Exploring how people living with dementia can help design programs and be involved in transit group training would be interesting. For example, a pilot study found that group training for transit for older adults without cognitive impairments was increasing their use of the bus (Stepaniuk et al., 2008). Some training ideas for people living with dementia need to be studied, such as explaining the use of technology, providing in-person orientation sessions in public locations that are easily accessible and in dementia support groups in the community, and holding online webinars.

Also, developing a supportive built environment and improving the walkability in the neighborhood to access public transportation hubs or bus stops were important. Improving signage for wayfinding and literacy of navigation tools for public transportation were also identified as areas for improvement.

Finally, the idea of mobility management, that is, having a person responsible for analyzing one's needs of transportation services and facilitating the search and use of services, also needed to be further explored. A few interesting ideas for transportation hubs were to improve the availability of quiet spaces and the use of a system of subtle identification of people with hidden disabilities.

Future Research

More practical insights might be drawn from an in-depth exploration of dementia-friendly transportation and the perspectives of people with lived experiences. In this review, there was no research project studying the full continuum of access in one community: quantitative data on perceived availability by users, availability described and quantified by providers, perceived need of services and actual use described by the person living with dementia, followed by qualitative exploration of barriers to access including accessibility, quality, and affordability. Future mixed-method research projects could address this gap and better inform program development. Noteworthy examples in rural communities could be cases studied for others to adapt in their communities.

Financial concerns and affordability should also be further investigated. There is a lack of exploration of the effectiveness aspect of developing dementia-friendly transportation services. Exploring solutions regarding effective coordination of dementia-friendly transportation can help illustrate the return on investment from improving mobility that allows individuals to stay active in their community. Finally, with the emerging development of technology, there would be opportunities for incorporating innovations in dementia-friendly transportation. Future research can explore the design and implementation of technology-incorporated dementia-friendly transportation services and options. Technology can make services more convenient, accessible, can improve security, and reduce costs if they are well integrated.

Limitations

This scoping review had a few limitations. To minimize selection bias, our inclusion criteria were broad. We did not exclude any article that seemed relevant based on the language. We included more than 10 databases from different

fields of research and did not limit the year of publication. The quality of individual studies was not assessed as the objective was to map the existing literature and methods. Hence, we did not consider the representativeness of the sample when reporting on quantitative data, nor did we consider the attrition bias. It is possible that a better portrait of the use of transportation services by people living with dementia could be available in non-peer-reviewed publications. Internal reports of organizations were not systematically researched and may contain relevant information. A future review on the gray literature in this area could help understand dementia-friendly transportation services as part of municipal initiatives. Another limitation of this study is the scope of the topic selected. The focus was specifically for people living with dementia. However, universal design could be helpful to explore in future research.

Conclusion

This review reflected the growing literature on dementia-friendly transportation and the diverse use of methods in addressing research questions in this area. Most articles reviewed showed the needs of dementia-friendly transportation in the community and the lack of availability of these services in rural areas. Moreover, well-trained staff and volunteers and the engagement of people with diverse needs in transportation planning are key to improving accessibility, affordability, and quality of services. Future research can focus on in-depth exploration of these initiatives from the perspectives of people living with dementia and more case studies of initiatives in the rural communities. Improvement in the transportation system for people with hidden disabilities is essential to their engagement in community life. People living with dementia can stay active in their community and keep a quality of life if their needs are addressed, such as improving their mobility.

Supplementary Material

Supplementary data are available at *The Gerontologist* online.

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Conflict of Interest

None.

Data Availability

We acknowledge that our data are available upon request to other researchers for replication purposes and that the scoping review was not preregistered.

Author Contributions

Stéphanie Lanthier-Labonté (Conceptualization [lead], Data curation [lead], Formal analysis [lead], Investigation [lead], Methodology [lead], Project administration [lead], Resources [equal], Software [equal], Writing—original draft [lead], Writing—review & editing [lead]), Habib Chaudhury (Conceptualization [supporting], Formal analysis [supporting],

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