

## Review Article

# Understanding the Barriers and Enablers to Using Outdoor Spaces in Nursing Homes: A Systematic Review

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## Abstract

**Background and Objectives:** Despite acknowledged benefits of residents in nursing homes spending time outdoors, little is known about factors related to their use of outdoor space. This systematic review summarizes reported barriers and enablers to nursing home residents' use of outdoor spaces.

**Research Design and Methods:** Multiple databases were searched to May 2018. Qualitative or mixed methods studies describing barriers/enablers to use of outdoor areas by residents of nursing homes (aged 65 years and older), as reported by residents, staff, or family members were included. Study quality rating, thematic analysis, and stratified analyses were performed and confidence in findings assessed using GRADE-CERQual.

**Results:** Twenty-four studies were included. Nineteen collected data from residents, 15 from staff/caregivers, 7 from families. Major themes and key findings concerned: design of the outdoor area (importance of garden greenery and built features), safety concerns and staffing issues, weather and seasons (appropriate shade and shelter), design of the main building (easy to open doors and nearby access points) and social activities.

**Conclusions and Implications:** Providing gardens with seasonal plants and interactive features, weather protected seating, manageable doors at accessible thresholds, planned social activities, and appropriate clothing are fundamental to facilitate nursing home residents' access to the outdoors. Cultural change at an organizational level, addressing perceptions of safety as a barrier is important. Incorporation of the recommendations in this review by architects, facility managers, and policy makers in the design and management of nursing homes, may increase use of outdoor areas and improve the quality of life of residents.

**Registration:** The protocol is registered in Prospero (CRD42018100249).

**Keywords:** Outdoors, Garden, Access, Facilitators

The health benefits of spending time outdoors for older people living in nursing homes have been widely reported. Going outdoors has been associated with improved mood, increased wellbeing and quality of life, better sleep, decreased agitation and disruptive behaviors, and reduced use of medica-

tions used to treat changed behaviors (Bossen, 2010; Calkins, Szmerekovsky, & Biddle, 2007; Chaudhury, Cooke, Cowie, & Razaghi, 2018; Clark, Mapes, Burt, & Preston, 2013; Connell, Sanford, & Lewis, 2007; Gonzalez & Kirkevold, 2014; Whear et al., 2014; White et al., 2018). Interaction

with green spaces and nature encourages sensory stimulation, which can have restorative effects on the mental wellbeing of older people (Bossen, 2010; Clark et al., 2013). Green spaces also provide opportunities for exercise, which may provide benefits for mental health (Clark et al., 2013), cognition, mood, mobility (Brett, Traynor, & Stapley, 2016), and physical function (Potter, Ellard, Rees, & Thorogood, 2011). Moreover, outdoor areas and green spaces can facilitate social interactions through providing a meeting place and the opportunity for interaction, thereby cultivating engagement and giving an enhanced sense of belonging (Clark et al., 2013).

Despite these benefits, there is a paucity of data on the access to and use of outdoor areas in nursing homes (Clark et al., 2013). Data on getting outdoors from 2,000 residents of 40 nursing homes showed that, of those who were physically able, 32% went outdoors less than once per month, and only 22% daily (Cutler & Kane, 2006). An Australian trial of a sunlight intervention found that residents of 51 nursing homes had low adherence to the intervention, indicating strong barriers to getting outdoors (Sambrook et al., 2012). Previously reported barriers to resident access and use of outdoor spaces include general design problems (e.g., inaccessible pathways; Cutler & Kane, 2006; Grant & Wineman, 2007; Whear et al., 2014). To address this, many government and institutional guidelines on the design of outdoor spaces in nursing homes have been produced (Alzheimer's Australia SA, Inc., 2010; Care Inspectorate, 2017; Cunningham, McIntosh, Thorne, & Gresham, 2015; Dementia Service Development Centre, 2012; Department of Transportation and Infrastructure, 2015; Fleming & Bennett, 2017; National Institute of Building Sciences, 2017). Such guidelines support regulatory requirements around physical design and outline practical strategies, such as adequate provision of shade and identification of tripping hazards, with some specifically aimed at supporting people living with dementia. However, only a few indicate clearly that their recommendations are based on studies evaluating the opinions of residents, family, and/or staff of residential care homes (Alzheimer's Australia SA, Inc., 2010; Alzheimer's Australia WA, 2013, 2018; Fleming & Bennett, 2015).

Little research exists specifically aimed at identifying which physical elements of the outdoor space impact on resident use in practice, and to the authors' knowledge, a systematic review including qualitative studies to explore perceived barriers and enablers to the use of outdoor areas in nursing homes has not been conducted. The aim of this systematic review was to address the following research question, "What are the barriers and enablers affecting nursing home residents' use of outdoor space, as perceived by residents, their family members, and staff?"

## Methods

This systematic review was conducted following the Enhancing Transparency of Reporting the Synthesis of Qualitative research (ENTREQ) framework (Tong,

Flemming, McInnes, Oliver, & Craig, 2012) and is reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA; Moher, Liberati, Tetzlaff, & Altman, 2009), and A Measurement Tool to Assess systematic Reviews 2 (AMSTAR 2) guidelines (Shea et al., 2017). The protocol is registered with PROSPERO—International prospective register of systematic reviews (CRD42018100249). No modifications were made.

## Search Strategy

Searches were conducted in JBI Database of Systematic Reviews and Implementation Reports, The Cochrane Database of Systematic Reviews, MEDLINE, EmCare, PsycINFO, CINAHL, Scopus, ProQuest and Ageline. Searches were limited to articles published in English from January 1990 until May 2018. Studies were limited to post-1990 as there were significant changes to the understanding of the impact of the built environment and physical design of nursing homes on individual functioning around this time period (Calkins, 2018). Relevant gray literature searches were conducted (Supplementary Material S1) and reference lists of included studies and systematic reviews checked. Database searches included text word terms and indexing for aged care facility(ies), nursing home, elderly, aged, outdoor, garden, built environment. The complete search strategies are reported in Supplementary Material S1.

## Eligibility Criteria

Studies which described barriers to and/or enablers of outdoor use (e.g., physical design features, staff availability) within the setting of a nursing home (residential care setting providing nursing care), hospice or palliative care setting and sought views and collected data from residents (mean age 65 years or older), family members, staff and carers, using qualitative, quantitative or mixed methods designs, were eligible for inclusion. We used the term "outdoor space" to refer to nursing homes' outside areas, described in studies using various terms including gardens, balconies, outdoor covered and uncovered areas, and green spaces. Studies which only described theoretical concepts, were conducted with people not in a nursing home setting, included only younger people, or which only reported views of policy makers, were excluded. Studies conducted in assisted living facilities that did not provide 24-hr nursing care were also excluded from the review.

## Study Selection

Titles and abstracts were independently screened for potential inclusion by two reviewers (M.E.L. van den Berg and M. Winsall), as were full-text articles of citations considered likely to meet the inclusion criteria. Any disagreements were resolved by discussion and consulting a third reviewer (S. M. Dyer) where necessary.

## Critical Appraisal Methods

All of the included studies were rated for quality independently by two reviewers (M.E.L. van den Berg and M. Winsall) using the Joanna Briggs Qualitative Assessment and Review Instrument (JBI-QARI; [The Joanna Briggs Institute, 2014](#)), with disagreements resolved through discussion and with a third reviewer if necessary. Studies which met the JBI-QARI criteria deemed critical by the authors (data analysis, interpretation of results, participant voices, and conclusions) and which obtained an overall score of eight or more on the JBI-QARI were judged high quality. Studies which met three of the critical criteria and/or obtained an overall score of between five and seven were judged medium quality. Studies which met two or less of the critical criteria and/or obtained an overall score of four or less were judged low quality. Studies were not excluded from the review based on quality.

## Data Extraction and Analysis

Data from included studies were extracted to a pro-forma. A second author extracted data independently from 20% of the included studies. Agreement on independent extraction was more than 80%, so the remainder were extracted by one author (M. Winsall), and checked for accuracy by a second (M.E.L. van den Berg; [Shea et al., 2017](#)). Data extracted included publication year and country, study aims and scope, study design and methods, setting, participant type, sample size, mean resident age, resident gender, and results and outcomes of significance to the review question. Relevant quantitative data, related to study design, were tabulated and summarized narratively. Identified evidence of significance to the review question was all qualitative in nature. Through thematic analysis, using NVivo 12, common themes emerging from the qualitative data were identified. Text data relevant to the research question were coded using an inductive approach, and similar concepts were grouped into subthemes. This was an iterative process whereby subsequent studies were coded into preexisting subthemes, and new subthemes were created as necessary. Subthemes were then grouped into broader overarching themes, and a second author reviewed the preliminary analysis to ensure key themes were captured appropriately. A stratified analysis was conducted to assess whether (a) the themes and subthemes differed according to the participants included in the primary study, that is, resident, family of resident, or staff (together referred to as “participants”), and (b) the themes and subthemes differed in those studies which only included residents with dementia.

The review authors assigned a level of credibility to each subtheme, based on whether or not the subtheme was accompanied by a direct quote of a participant, and how directly the quote/s related to the research question. The levels of credibility were rated as unequivocal, credible,

and unsupported (see [Table 1](#) footnotes; [The Joanna Briggs Institute, 2014](#)).

All data were summarized into six key findings, or “evidence statements,” and each was assessed for confidence based on methodological limitations, coherence, adequacy, and relevance using the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) Confidence in Evidence from Reviews of Qualitative research (CERQual) tool ([Lewin et al., 2018](#)). GRADE-CERQual allows for transparent assessment of review findings and classifies each finding/subtheme as being of either “high,” “moderate,” “low,” or “very low” confidence ([Lewin et al., 2018](#)).

## Results

### Literature Search

The searches identified 5,068 citations, with an additional 37 identified through gray literature and hand searches. Twenty-four studies were included for review ([Figure 1](#)).

### Study Characteristics

Characteristics of the included studies are detailed in [Supplementary Material S2](#). Twelve studies were qualitative (Studies 1, 2, 4, 5, 9, 10, 12, 15, 20, 21, 23, and 24) and 12 had a mixed-methods design (Studies 3, 6–8, 11, 13, 14, 16–19, and 22; see footnotes of [Table 1](#) for study identifying numbers). Nineteen studies collected data from residents (Studies 2, 3, 7–14, and 16–24), 15 from staff or caregivers (Studies 1, 4–8, 10, 12, 13, 15, and 20–24), and seven from family members of residents (Studies 2, 5, 7, 12, 13, 15, and 20). Sixteen studies used interview techniques (Studies 2–4, 7, 9, 10, 12–18, 20, 21, and 24), seven focus groups (Studies 1, 5, 10, 12, and 21–23), six written/online questionnaires/surveys (Studies 3, 6, 8, 13, 19, and 22), four observations (Studies 3, 11, 21, and 24), and three environmental audits/assessments (Studies 11, 17, and 22). The settings were described as nursing homes (Studies 1–3, 12, 16–19, and 23), long-term care facilities (Studies 4, 6, 14, 15, and 20), residential care facilities (Studies 5, 7, 11, 21, and 24), intermediate care homes (Studies 9 and 10), a multi-level care home (Study 13), a residential living home (Study 8), and a mix of independent and congregate housing (Study 22). Five of the studies were conducted in homes with specific dementia care units (Studies 4, 5, 8, 15, and 20). Three studies stated that all participating residents had a diagnosis of dementia (Studies 5, 7, and 15), eight either indicated that some participants had dementia, or did not use dementia as a reason for ineligibility (Studies 1, 2, 4, 6, 8, 12, 17, and 20), and five excluded those with major cognitive impairment (Studies 13, 18, 19, 22, and 24). Four studies specifically excluded participants with dementia (Studies 9, 10, 14, and 21).

**Table 1.** Individual Quotes and References Supporting Each Subtheme

Themes and subthemes	Quotes from participants in included studies	Studies in which subtheme is mentioned, N (%)	Studies reporting each subtheme by participant type	Credibility level <sup>a</sup>
Design of the outdoor area				
Garden greenery and features	<p>“I love to touch and talk to plants.” [Resident] (Raske, 2010)</p> <p>“In springtime you see when it buds, and then there are the first flowers.” [Resident] (Bengtsson &amp; Carlsson, 2013)</p> <p>“It was very important to her. To feel the flowers, to somehow come close.” [Resident] (Bengtsson &amp; Carlsson, 2005)</p> <p>“Like being outside with trees and birds—a country feel.” [Resident] (Durvasula et al., 2010)</p> <p>“... gardening is something that he can still do and enjoy very much.” [Family] (Raske, 2010)</p> <p>“Oh it’s very pleasant with the rabbits and the birds out there, very pleasant.” [Resident] (Potter et al., 2018)</p> <p>“Residents would sit out there on a summer afternoon and watch dozens of hummingbirds and butterflies. It was a treat. It was incredible.” [Staff] (Raske, 2010)</p> <p>“... it was pointed out that water is important for visual/sound reasons, but also for ‘playing with’ and ‘walking in.’”<sup>b</sup> (Senes, Fumagalli, Crippa, &amp; Bolchini, 2012)</p> <p>“residents like watching [the] pond, stream, and gold fish”<sup>b</sup> (Heath &amp; Gifford, 2001)</p>	<p>19 (79)</p> <p>Studies 1–4, 6, 7, 9, 12–21, 23, 24</p>	<p>Residents: Studies 2, 3, 9, 12–14, 16–21, 23, 24</p> <p>Staff: Studies 1, 4, 6, 7, 13, 15, 20, 23</p> <p>Family: Studies 2, 7, 12, 13, 20</p>	Credible
Pathways and surfaces	<p>“They got all these roads ... there’s not many footpaths.” [Resident] (Durvasula, Sambrook, &amp; Cameron, 2012)</p> <p>“...we kind of wondered whether a level ground would have been better, just grass. We’re kind of concerned that they’re walking over the bushes and might trip and fall.” [Staff] (Morgan &amp; Stewart, 1999)<sup>c</sup></p>	<p>14 (58)</p> <p>Studies 2–4, 6, 8, 10, 13, 15–19, 23, 24</p>	<p>Residents: Studies 2, 3, 8, 10, 13, 16–19, 23</p> <p>Staff: Studies 4, 6, 13, 15, 23, 24</p> <p>Family: Study 13</p>	Credible
Seating	<p>“(There are) chairs out there, but not as comfortable.” [Resident] (Durvasula et al., 2010)</p> <p>“There’s plenty of seats around. You can have a sit in the sun....” [Resident] (Durvasula et al., 2012)</p> <p>“My mother likes to sit outside, she sits out there a lot.” [Family] (Cioffi, Fleming, Wilkes, Sinfield, &amp; Le Miere, 2007)<sup>c</sup></p>	<p>10 (42)</p> <p>Studies 2, 3, 5, 6, 9, 10, 13, 16, 17, 20</p>	<p>Residents: Studies 2, 3, 9, 10, 13, 16, 17</p> <p>Staff: Studies 6, 13, 20</p> <p>Family: Studies 5, 13, 20</p>	Credible
Shade and shelter	<p>When asked to identify factors that would facilitate sun exposure/outdoor access, one resident responded: “Shelter from the sun and rain” (Durvasula et al., 2010)</p> <p>“There’s a nice terrace there. The sun comes in and there’s no breeze. Lovely.” [Resident] (Durvasula et al., 2012)</p>	<p>10 (42)</p> <p>Studies 1, 3–6, 9, 10, 13, 16, 20</p>	<p>Residents: Studies 3, 9, 10, 13, 16</p> <p>Staff: Studies 1, 4, 6, 13, 20</p> <p>Family: Studies 5, 13, 20</p>	Credible
Other structures	<p>“They’ve got it fixed so that you can go up to the beds and see the plants. That makes it handy.” [Resident] (Raske, 2010)</p> <p>“[Lighting in the evening] not enough”<sup>b</sup> (Heath &amp; Gifford, 2001)</p> <p>“One resident with impaired vision who walked with a stick said that she was very happy about the handrails on parts of her walks. She had difficulty maintaining her balance, and therefore height differences were a problem if she had no rail to hold on to.” (Bengtsson &amp; Carlsson, 2013)</p>	<p>11 (46)</p> <p>Studies 1, 2, 4, 6, 8, 12, 13, 15, 16, 20, 24</p>	<p>Residents: Studies 2, 8, 12, 13, 16, 20, 24</p> <p>Staff: Studies 1, 4, 6, 13, 15, 24</p> <p>Family: Study 13</p>	Credible

Table 1. Continued

Themes and subthemes	Quotes from participants in included studies	Studies in which subtheme is mentioned, N (%)	Studies reporting each subtheme by participant type	Credibility level <sup>a</sup>
Design of the main building				
Doors and thresholds	<p>“I don’t like it when the door is locked because sometimes I have to wait for a long time before someone can help me get out” [Resident] (Bengtsson &amp; Carlsson, 2013)</p> <p>“I don’t go out as much as I would like, because I can’t handle the doors.” [Resident] (Rodiek, Lee, &amp; Nejati, 2014)</p> <p>“It is hard to get through it. They need some that opens, you know, when you get to it.” [Resident] (Rodiek et al., 2014)</p> <p>“There is something that I think a lot of us talk about missing is the freedom to be outside. At present here, all of our doors are locked except that front one [...] I know we need the security but we need something to be done where, you know, we’re not locked in.” [Resident] (Rodiek et al., 2014)</p> <p>“a staff member reported that a resident said it was hard for him to reach the outdoors because ‘he thinks the doors will lock behind him and he will be stuck outside.’” [Staff] (Rodiek et al., 2014)</p> <p>“Going over the door frame on floor hard to cross over.” [Resident] (Rodiek et al., 2014)</p> <p>“...the doors are not compatible with walkers and wheelchairs...” “...because when you walk up to the screen door you have to back (up) and when you are in the walker, that is difficult to do.” [Resident] (Rodiek et al., 2014)</p>	11 (46) Studies 1, 2, 4, 6, 8, 10, 11, 17, 19, 22, 24	Residents: Studies 2, 8, 10, 17, 19, 22, 24 Staff: Studies 1, 4, 6, 11, 22, 24	Unequivocal
Proximity	<p>“I’ve got a door that leads off to the lawn. So I, it’s not too much trouble for me to go out and sit out.” [Resident] (Durvasula et al., 2012)</p> <p>“[In the former facility] I couldn’t go outside [I could] only walk through that long corridor. And when they asked me to move to this place I said: ‘yes, but I want a room downstairs. Not upstairs anymore’, yes, because the elevator was always broken.” [Resident] (Van Steenwinkel, Dierckx de Casterle, &amp; Heylighen, 2017)</p>	8 (33) Studies 1, 2, 4, 6, 8–10, 24	Residents: Studies 2, 8–10, 24 Staff: Studies 1, 4, 6, 24	Unequivocal
Staffing and resident safety				
Safety concerns and staffing issues	<p>When asked about factors that influence use of garden spaces, resident responded: “I don’t think they [facility staff] want us to go outside ... it just wouldn’t be safe...” This resident believed she could not go outdoors alone. (Reynolds &amp; Rowles, 2011)</p> <p>The design of a new dementia SCU enabled staff to easily observe residents while they were outdoors. One staff member commented: “Now they [residents] are in sight when they go in the garden we can see them.” (Cioffi et al., 2007)<sup>c</sup></p> <p>When asked what are the barriers to sun exposure/going outdoors, a resident responded: “Rely on others to go out (and) staff are too busy.” (Durvasula et al., 2010)</p> <p>When asked what are the facilitators to sun exposure/going outdoors, a resident responded: “Need help with mobility. It’s short staffed. I wish someone would push me outdoors.” (Durvasula et al., 2010)</p> <p>When asked what would encourage people to have more sun exposure/go outdoors, resident responded: “We don’t have any volunteer carers to take people for a walk.” (Durvasula et al., 2012)</p> <p>The design of a new SCU made it hard for staff to monitor residents outside due to the outdoor area not being visible from one indoor location. One staff member commented: “I do appreciate the fact that they allowed them the freedom to be able to go outside ... [but] it creates quite a havoc for us to be watching them when we don’t have the staff to do that.” (Morgan &amp; Stewart, 1999)<sup>c</sup></p>	14 (58) Studies 1, 2, 5–7, 9, 10, 14, 15, 17–19, 21, 24	Residents: Studies 2, 9, 10, 14, 17–19, 21 Staff: Studies 1, 5–7, 15, 24 Family: Study 2	Unequivocal

**Table 1.** Continued

Themes and subthemes	Quotes from participants in included studies	Studies in which subtheme is mentioned, N (%)	Studies reporting each subtheme by participant type	Credibility level <sup>a</sup>
Resident autonomy	<p>“The residents wanted to maintain their mobility and be in control of their situation to the extent possible. One woman living at C3 said “I would like to manage on my own”. She went for a small walk every day so that she would be less tired and to relieve her back pain.” [Resident] (Bengtsson &amp; Carlsson, 2013)</p> <p>After construction of a new enabling garden (designed to enhance access) at their nursing home, one staff member stated: “Some of the residents can come out here and come and go as they please. They have their freedom back.” (Raske, 2010)</p> <p>After construction of a new enabling garden at their nursing home, one resident stated “[The garden] offers a choice about things to do.” [Resident] (Raske, 2010)</p>	7 (29) Studies 1, 2, 9, 15, 20, 22, 24	Residents: Studies 2, 9, 20, 22, 24 Staff: Studies 1, 20	Credible
Social activities	<p>“The garden is great because everybody can gather there. You get to know the people visiting other residents. Contact with other people is important.” [Resident] (Bengtsson &amp; Carlsson, 2013)</p> <p>One staff explained that it was different to talk outside: “It is easier to say: What kind of a flower is that? [...] Somehow it is easier when you have something to focus the conversation on. That is more easy when outdoors.” (Bengtsson &amp; Carlsson, 2005)</p> <p>One family member stated, “Sometimes she talks and we have no idea what she is talking about. But if I can get her to talk about a plant or flower, I can understand what she is saying. At least we are communicating somehow.” (Raske, 2010)</p> <p>“When I come to visit, we walk out into the garden and he tells me what everything is.” [Family] (Raske, 2010)</p> <p>“...seeing activity beyond the facility provides a feeling that ... there’s a world beyond the walls!” [Resident] (Reynolds &amp; Rowles, 2011)</p> <p>“...few residents were able to articulate why seeing people coming and going, and watching the activity along the street was important to them. [One resident] said ‘I think that makes you feel more like life’.” (Reynolds &amp; Rowles, 2011)</p>	12 (50) Studies 1, 2, 6, 10–12, 16, 18, 20, 21, 23, 24	Residents: Studies 2, 10, 12, 16, 18, 20, 21, 23, 24 Staff: Studies 1, 6, 11, 12, 20, 23 Family: Studies 2, 12, 20	Credible
Weather and seasons				
Adverse weather conditions	<p>“Well, then I sit down depending on the weather, if I want sun or shade” [Resident] (Bengtsson &amp; Carlsson, 2013)</p> <p>“I don’t like being in the sun and being hot.” [Resident] (Durvasula et al., 2010)</p> <p>“Skin is dreadful ... don’t like sitting in the actual sun.” “As you get older, (your) skin is too thin.” [Resident] (Durvasula et al., 2012)</p> <p>“Glare from the sun, I like cool weather” [Resident] (Durvasula et al., 2010)</p> <p>“Bad weather I guess ... too cold, too hot” [Resident] would prevent him from going outside. (Reynolds &amp; Rowles, 2011)</p> <p>“No matter how nice it is or how much they see, if it is windy, then that’s it [...] They are totally occupied by being cold.” [Staff] (Bengtsson &amp; Carlsson, 2005)</p> <p>“If it’s 85 degrees outside they don’t tolerate, or the heat of the sun on them, the breeze the coolness on them.” [Staff] (Reynolds &amp; Rowles, 2011)</p> <p>“Look outside, you have the sun out there, but you can’t bring your mum out there because it’s always so hot, [...]” [Family] (Cioffi et al., 2007)<sup>c</sup></p>	13 (54) Studies 1–3, 5, 6, 8–10, 14, 18, 19, 21, 23	Residents: Studies 2, 3, 8–10, 14, 18, 19, 21, 23 Staff: Studies 1, 6, 8, 21, 23 Family: Studies 2, 5	Unequivocal

Table 1. Continued

Themes and subthemes	Quotes from participants in included studies	Studies in which subtheme is mentioned, N (%)	Studies reporting each subtheme by participant type	Credibility level <sup>a</sup>
Experiencing weather and seasons	<p>“The first thing in the morning, they ask: ‘What is the weather like?’ and ‘Are we having coffee outdoors or indoors?’” [Staff] (Bengtsson &amp; Carlsson, 2005)</p> <p>“It is the same for them as it is for us, when winter arrives you creep into your nest and when the sun comes you go back out again.” [Staff] (Bengtsson &amp; Carlsson, 2005)</p> <p>“The importance of being able to follow the weather and seasons in the outdoor environment was also noticed by the staff through residents’ comments such as: ‘Oh, the sun is shining!’ or ‘Oh, it’s pouring outside!’” (Bengtsson &amp; Carlsson, 2005)</p> <p>“And just being able to feel whether it’s warm or cold, or the wind tousling one’s hair and all that, I think it’s important” [Family] (Bengtsson &amp; Carlsson, 2013)</p> <p>“Liked fresh air and sunshine it has something that fills you with joy, it’s bright.” [Resident] (Durvasula et al., 2010)</p>	6 (25) Studies 1, 2, 9, 14, 18, 21	Residents: Studies 2, 9, 14, 18, 21 Staff: Study 1 Family: Study 2	Credible

Note: Study numbers: 1. Bengtsson and Carlsson (2005); 2. Bengtsson and Carlsson (2013); 3. Chao, Chai, and Juan (2014); 4. Chapman, Hazen, and Noell-Waggoner (2007); 5. Cioffi and colleagues (2007); 6. Cohen-Mansfield and Werner (1999); 7. Cox, Burns, and Savage (2004); 8. Dahlkvist, Nilsson, Skovdahl, and Engstrom (2014); 9. Durvasula and colleagues (2010); 10. Durvasula and colleagues (2012); 11. Durvasula and colleagues (2015); 12. Eijkelenboom, Verbeek, Felix, and van Hoof (2017); 13. Heath and Gifford (2001); 14. Kearney and Winterbottom (2005); 15. Morgan and Stewart (1999); 16. Oguz, Cakci, Sevimli, and Ozgur (2010); 17. Potter, Sheehan, Cain, Griffin, and Jennings (2018); 18. Rappe and Kivelä (2005); 19. Rappe, Kivelä, and Rita (2006); 20. Raske (2010); 21. Reynolds and Rowles (2011); 22. Rodiek and colleagues (2014); 23. Senes and colleagues (2012); 24. Van Steenwinkel and colleagues (2017).

<sup>a</sup>As defined in JBI, 2014: unequivocal—findings accompanied by an illustration that is beyond reasonable doubt and therefore not open to challenge; credible—findings accompanied by an illustration lacking clear association with it and therefore open to challenge; and unsupported—findings not supported by data (The Joanna Briggs Institute, 2014).

<sup>b</sup>Unclear whether comment was made by a resident, staff, or family member (e.g., because data collected during study were analyzed/collated all together).

<sup>c</sup>Quotation taken from study which only included residents with dementia.

## Quality Assessment

Details of study quality assessment are presented in [Supplementary Material S3](#). Fifteen studies were considered high quality (Studies 1, 2, 5, 7–12, 15, 17, 20–22, and 24), seven medium (Studies 3, 6, 13, 14, 16, 18, and 19), and two low (Studies 4 and 23). All but three studies (Studies 3, 4, and 23) showed congruity between the research methodology and interpretation of results, however few studies discussed the cultural beliefs and/or values of the authors or the influence of the researcher on the participants.

## Data Synthesis

Five main themes were identified describing barriers and enablers to the use of outdoor areas in nursing homes, including *design of the outdoor area* (92%, or 22 out of 24 studies mentioned this), *staffing and resident safety* (71%), *weather and seasons* (54%), *design of the main building* (50%), and *social activities* (50%; [Figure 2a](#)). Eleven subthemes were created, the most important of which were *garden greenery and features* (79%), *pathways and surfaces* (58%), *adverse weather conditions* (54%), and *safety concerns and staffing issues* (58%; [Figure 2b](#)). The themes and subthemes are discussed below, with example quotations presented in [Table](#)

1. The subthemes rated as “Unequivocal” credibility included *doors and thresholds*, *adverse weather conditions*, *proximity*, and *safety concerns and staffing issues* ([Table 1](#)).

## Design of the Outdoor Area

### Garden greenery and features

Participants from 19 (79%) studies mentioned the role that garden greenery, specifically plants, trees and flowers, as well as other features of interest, played in the use of outdoor spaces. Green areas enabled residents to engage in gardening, to touch, view, and smell plants and flowers, and to discuss the greenery with others (Bengtsson & Carlsson, 2005; Raske, 2010). Trees were viewed as important in providing shade, as well as giving residents a feeling of peace and of being in touch with nature (Heath & Gifford, 2001; Rappe et al., 2006). Residents enjoyed walking among trees and observing the foliage with the changing seasons (Bengtsson & Carlsson, 2005, 2013). Some participants mentioned the importance of seeing and interacting with fauna in outdoor spaces, such as watching and listening to birds, seeing butterflies in the garden, or petting animals (Bengtsson & Carlsson, 2013; Potter et al., 2018; Rappe & Kivelä, 2005). Water features

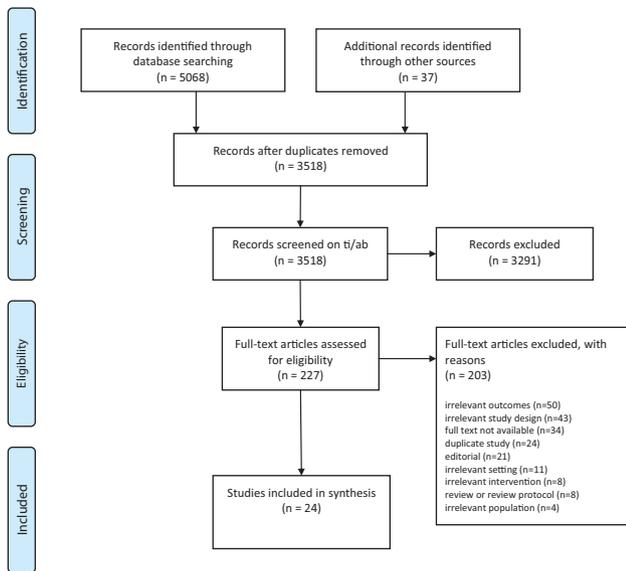


Figure 1. PRISMA flow diagram.

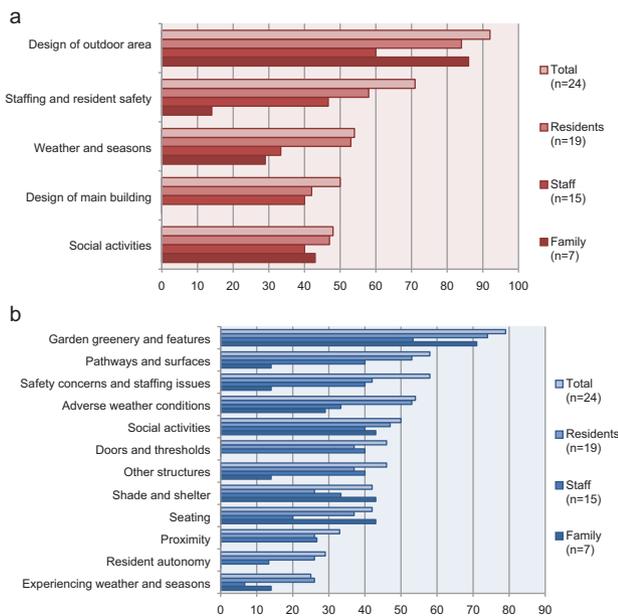


Figure 2. (a) Proportion of studies which reflected main themes, stratified by participant type. (b) Proportion of studies which reflected subthemes, stratified by participant type.

like ponds were also appreciated for their aesthetic appeal and calming effect (Bengtsson & Carlsson, 2005; Senes et al., 2012). Regular maintenance of green areas (e.g., mowing grass, keeping hedges trimmed) within the outdoor space was also viewed as important (Bengtsson & Carlsson, 2005; Chapman et al., 2007).

### Pathways and surfaces

In 14 (58%) studies, participants talked about the provision of adequate pathways and walking surfaces to enable safe navigation through outdoor spaces. Pathways which were

steep or sloping, were too narrow, had uneven surfaces, or which were difficult to get to from the main building, posed a hazard to residents (especially for those using wheelchairs or walkers), and restricted their use of outdoor areas (Morgan & Stewart, 1999; Rappe & Kivelä, 2005). Slipperiness of the terrain was also a concern to residents (Chao et al., 2014; Rappe & Kivelä, 2005). In some cases residents disliked having too many hard/concrete surfaces in the outdoor area, preferring green areas and more variability in pathway designs to prevent boredom (Oguz et al., 2010; Senes et al., 2012).

### Seating

Participants from 10 (42%) studies talked about seating and reported that sitting was one of the most frequent uses of outdoor spaces. Residents expressed the need for enough, easily accessible, seating facilities, that were comfortable and not too hard, and enabled enjoyment of the garden (e.g., in the sunshine or with a view; Chao et al., 2014; Durvasula et al., 2010; Heath & Gifford, 2001).

### Shade and shelter

In 10 (42%) studies, participants expressed the need for adequate outdoor structures designed to provide shade and shelter to residents in outdoor areas, such as gazebos, terraces, pergolas, or overhead rooftops, protecting residents from the sun, wind, and rain (Chao et al., 2014; Cioffi et al., 2007; Heath & Gifford, 2001), enabling the use of outdoor areas under different weather conditions.

### Other structures

Participants mentioned various other outdoor structures in 11 (44%) studies. Solid and adequate fencing around the outdoor area was viewed as a significant security aspect by staff (Bengtsson & Carlsson, 2005); however some residents expressed that it gave them a sense of enclosure (Van Steenwinkel et al., 2017). Locked gates were viewed as necessary for security, but as hindering residents' freedom when walking (or using a wheelchair) around the garden area (Eijkelenboom et al., 2017; Van Steenwinkel et al., 2017). Some participants talked about the advantage of raised garden beds, enabling residents to view plants and flowers more easily, especially for those in a wheelchair (Morgan & Stewart, 1999; Raske, 2010). The need for proper lighting in outdoor spaces, particularly in the evenings, was emphasized (Heath & Gifford, 2001; Oguz et al., 2010). The provision of handrails in outdoor walking areas to assist residents with mobility and balance was assessed as providing residents with a sense of security (Bengtsson & Carlsson, 2013), however in one study handrails were seen as dangerous with potential to cause accidents (Heath & Gifford, 2001).

### Staffing and Resident Safety

#### Safety concerns and staffing issues

A total of 14 (58%) studies mentioned issues and concerns around resident safety and staffing, with both staff and

residents themselves voicing concerns around residents venturing outdoors alone (Bengtsson & Carlsson, 2005; Potter et al., 2018; Reynolds & Rowles, 2011). Staff favored outdoor spaces which were completely visible from inside, hence allowing staff to keep an eye on residents when they were outdoors (Cioffi et al., 2007; Morgan & Stewart, 1999). Concerns related to staffing, hindering residents' use of outdoor spaces, included too few staff members at the home, and staff being too busy or not having enough time to take residents outside (Bengtsson & Carlsson, 2013; Durvasula et al., 2010, 2012).

### Resident autonomy

In seven (29%) studies, residents expressed the desire to manage on their own and to have the freedom to use the outdoor space as they chose (Raske, 2010; Van Steenwinkel et al., 2017). Some residents felt that they needed staff permission to go outside (Bengtsson & Carlsson, 2005; Potter et al., 2018; Reynolds & Rowles, 2011), while other participants discussed problems around wheelchair and walker use, specifically the general physical awkwardness of using such a device to get out and move about outdoors (Bengtsson & Carlsson, 2013). Outdoor spaces which were familiar or "homely" and easy and safe to navigate alone, enabled residents to access the space independently (Durvasula et al., 2010; Van Steenwinkel et al., 2017).

### Weather and Seasons

#### Adverse weather conditions

Thirteen (54%) studies reported adverse or unfavorable weather conditions as a reason for not going outside. Generally, outdoor spaces were used more in sunny and warm weather, and less in cold and windy weather. Rain, snow (mostly in studies carried out in European countries) and the potential for slipperiness were reported as barriers (Bengtsson & Carlsson, 2005; Rappe & Kivelä, 2005). Hot weather was also cited as preventing residents from getting outdoors, particularly in those studies carried out in temperate countries like Australia and parts of the United States, with some residents experiencing heat discomfort and a fear of getting sunburnt (Durvasula et al., 2010; Reynolds & Rowles, 2011). Residents appreciated outdoor spaces which received more sunlight in winter and at the same time provided shelter from wind and rain (Bengtsson & Carlsson, 2013; Chao et al., 2014).

#### Experiencing weather and seasons

Positive aspects of experiencing weather and seasons were discussed in six (25%) studies with fresh air and sunshine reported as one of the main reasons for going outdoors (Bengtsson & Carlsson, 2013; Durvasula et al., 2010). Residents valued being able to physically experience the weather and changing of seasons (Bengtsson & Carlsson, 2005).

### Design of the Main Building

#### Doors and thresholds

In 11 (46%) studies, participants mentioned that issues with doors, for example, too heavy or locked doors, were barriers to independent outdoor access (Bengtsson & Carlsson, 2013; Cohen-Mansfield & Werner, 1999; Rodiek et al., 2014). Residents mostly preferred automatic over manual doors, and some expressed a fear of being locked outside due to self-locking or alarmed doors (Rodiek et al., 2014). High doorframes or doorsteps were found hard to cross over, especially for those using a wheelchair or walker (Bengtsson & Carlsson, 2005; Rodiek et al., 2014).

#### Proximity

Proximity of the outdoor area to the main living area and residents' rooms was mentioned by participants from eight (33%) studies. Generally, the longer the distance between the garden access points and the residents' main living area, the less likely the residents were to approach and use the outdoor space (Bengtsson & Carlsson, 2013; Durvasula et al., 2012). Nonground floor resident rooms were seen as a barrier to outdoor access as residents needed to either navigate stairs or use an elevator, which not all residents are capable of doing on their own (Chapman et al., 2007; Van Steenwinkel et al., 2017).

### Social Activities

Participants from 12 (50%) studies viewed outdoor areas as gathering or meeting places, where they could socialize with other residents, friends, and family (Bengtsson & Carlsson, 2005; Oguz et al., 2010; Rappe & Kivelä, 2005). Both family members and staff mentioned that walks around the garden space were a good way to bond with residents, using different elements of the garden as topics of conversation (Bengtsson & Carlsson, 2013; Raske, 2010). Participants also discussed events and activities in garden spaces, including reading, walking, picnics, barbecues, and special events like parties (Bengtsson & Carlsson, 2005; Eijkelenboom et al., 2017). Residents valued being able to see beyond the garden boundaries to the surrounding neighborhood, which provided them with a sense of connection to life outside the home (Reynolds & Rowles, 2011; Van Steenwinkel et al., 2017).

### Stratified Analysis

#### Participant subgroups

*Design of the outdoor area* was more relevant to residents (84% of studies involving residents mentioned this) and family (86%) than to staff (60%), while *staffing and resident safety* was more relevant to residents (58%) and staff (47%) than to family (14%). Also, *weather and seasons* appeared to be most relevant to residents (53% vs 33% for staff and 29% for family). *Design of the main building* was

not mentioned by family participants; however only seven studies reported family views. The proportion of studies which mentioned each theme and subtheme, stratified by participant type, are shown in [Figures 2a](#) and [2b](#).

At subtheme level, four subthemes were particularly relevant to residents (i.e., studies involving residents mentioned them more often than studies involving staff or family): *pathways and surfaces*, *resident autonomy*, *adverse weather conditions*, and *experiencing weather and seasons*. The two subthemes of *shade and shelter* and *seating* seemed particularly relevant to family ([Figure 2b](#)).

### Dementia subgroup

In the three studies which solely included residents with dementia (Studies 5, 7, and 15), *design of the outdoor area*, *staffing and resident safety*, and *weather and seasons* were the most relevant themes, consistent with the main findings across all studies. However, *design of the main building* and *social activities*, were not mentioned at all in the three dementia studies. Staff and caregivers' preferences with regards to *design of the outdoor area*, were similar to those based on all included studies, including the importance of plants and flowers ([Cox et al., 2004](#)), adequate ground cover to prevent slipping ([Morgan & Stewart, 1999](#)), and provision of shade ([Cioffi et al., 2007](#)). However, at the subtheme level, *safety concerns and staffing issues* appeared more relevant in dementia studies when compared with the overall results ([Supplementary Figures 1a and 1b](#)). Within these studies, noteworthy comments from staff and caregivers concerned visual garden access and nursing home layout, allowing staff to observe and supervise residents while they were outside, as well as staff availability ([Cioffi et al., 2007](#); [Cox et al., 2004](#); [Morgan & Stewart, 1999](#)).

### Summary of Review Findings

A summary of the key findings and recommendations resulting from the review, along with GRADE-CERQual assessments, are presented in [Table 2](#). Full details of the GRADE-CERQual assessment process for each review finding can be found in [Supplementary Table S4](#).

### Discussion

This review aimed to systematically identify the barriers and enablers affecting nursing home residents' use of outdoor space, as perceived by residents, their family members, and staff. Design of the outdoor area was the most frequently mentioned main barrier or enabler across all included studies, particularly garden greenery and features, and pathways and surfaces, followed by concerns about staffing and safety, such as lack of visual accessibility.

Residents, their family members, and staff all felt that green elements such as plants, trees, and flowers, as well as "interactive features" like birds, butterflies, and water features were valuable characteristics and promoted use

of outdoor spaces through both active and passive use of the garden ([Gonzalez & Kirkevold, 2014](#)). Our findings suggest that gardens should be designed to maximize the opportunities for passive environmental interactions, for example, by planting a variety of flowering, colorful, aromatic plants which attract wildlife, as well as placing water features. Garden greenery has been reported to promote emotional well-being and is associated with feelings of being away and fascination, which in turn may promote better health ([Dahlkvist et al., 2016](#)). The observation of plants has been found to provide residents with a feeling of calm and a space for reflection, enhancing emotional regulation ([Rappe & Kivelä, 2005](#)). Due to their impact on resident well-being, plants and animals are being increasingly incorporated into nursing homes, in the Eden Alternative ([Bossen, 2010](#)), green care farms ([de Boer et al., 2017](#)), and green roof gardens ([Okubo, 2012](#)).

Built elements facilitating safe outdoor mobility were frequently discussed, mainly by residents and staff, including adequate pathways, appropriate lighting and handrails. Previous studies have indicated preferences for level gardens with glare-free and slip-resistant walkways, with handrails where appropriate ([Brawley, 2007](#)). Such safety elements are necessary to support residents with declining physical ability, and to minimize the risk of falls ([Brawley, 2007](#)). The placement of seating was viewed as an important factor influencing garden use. Preference was given to seating with views over the garden or close to garden features (e.g., plants, flowers, or a fountain), offering residents variety. The comfort of seating was also reported to influence garden use, in line with similar research which suggests that factors like the size, overall construction, safety, cleanliness and maintenance of garden furniture, and seating should be considered ([Brawley, 2007](#); [Grant & Wineman, 2007](#)). The comfort of seating was reported to influence garden use, in line with similar research which suggests that factors like the size, overall construction, safety, cleanliness and maintenance of garden furniture, and seating should be considered ([Brawley, 2007](#); [Grant & Wineman, 2007](#)). Furthermore, the placement of seating was viewed as an important factor influencing garden use. Preference was given to seating close to garden features (e.g., plants, flowers, or a fountain), and with views over the garden or beyond garden boundaries to the surrounding neighborhood. The finding that residents preferred such a view contrasts with existing design guidelines for nursing homes of residents with dementia, which recommend placing secure fencing around the garden and disguising such structures with plants or other features, in order to minimize resident anxiety and feelings of enclosure ([Alzheimer's Australia SA, Inc., 2010](#); [Fleming & Bennett, 2017](#)).

A key aspect to designing outdoor spaces for residents with dementia is to have spaces which are familiar, domestic, and "normal" which residents can readily access on their own ([Judd, 2012](#)). Many guidelines to support

**Table 2.** Summary of Review Findings and Recommendations

Summary of review finding	Number of studies contributing to review finding	CERQual quality of evidence	Recommendation
<p>1. <i>Doors, access points and building layout:</i> Heavy and locked doors and thresholds which were too high or difficult to cross were experienced as barriers to outdoor access. The location of access points to outdoor area/s is important. Doorways that were too far from the residents' rooms or the main living area, or on a different floor, were viewed as hindering access. Staff preferred a building layout where residents using the outdoor space were visible to staff from inside the building.</p>	14	High confidence	<ul style="list-style-type: none"> <li>• Doors which are access points to garden areas should be easy for residents to open by themselves, not be too heavy and should not self-lock. Automatic doors are preferred.</li> <li>• Thresholds should be low and easy to cross over for residents using mobility aids.</li> <li>• Windows providing views of the outdoor area from indoors should be maximized and spread throughout the building.</li> </ul>
<p>2. <i>Safety concerns and staffing issues:</i> Staff, family and residents expressed concerns about the safety of residents venturing outdoors alone. Nursing homes with too few staff members, and staff being too busy to take residents outside, are barriers to residents' use of outdoor spaces.</p>	13	High confidence	<ul style="list-style-type: none"> <li>• Conversations between staff, residents, family members, and nursing home management about the trade-off between the potential benefits and harms of residents venturing outdoors alone should be undertaken regularly.</li> </ul>
<p>3. <i>Connections with people and environment:</i> According to residents, staff, and family, outdoor spaces facilitated informal meetings between residents, provided a place to walk and talk with family, and facilitated other social activities (e.g., parties, picnics). Residents valued being able to see beyond the garden space to the surrounding neighborhood, providing a sense of connection to life outside the nursing home. Many residents valued getting out in the fresh air and sunshine, and experiencing different weather conditions and seasonal changes.</p>	14	High confidence	<ul style="list-style-type: none"> <li>• Social activities (e.g., afternoon tea) should be offered outdoors when possible.</li> <li>• The value of residents experiencing a range of weather conditions throughout the seasons should be considered by nursing home staff and management.</li> </ul>
<p>4. <i>Adverse weather conditions:</i> Residents, staff, and family reported adverse or unfavorable weather conditions as a main reason for residents not going outside. Outdoor spaces were used more in sunny and warm weather, and less in rain, cold, or windy weather (or snow in colder climates). Hot weather was also cited as preventing residents from getting outdoors, with some experiencing heat discomfort and a fear of getting sunburnt. Residents appreciated outdoor spaces which received more sunlight in winter and provided shelter from wind and rain, but that also provided shade in warm weather.</p>	13	High confidence	<ul style="list-style-type: none"> <li>• Ensure residents are appropriately dressed to be able to tolerate a wide range of weather conditions and have the opportunity to venture outside during different seasons.</li> <li>• Provide structures with shade and shelter from sun, wind, and rain.</li> </ul>
<p>5. <i>Garden greenery and features:</i> Residents, their family members, and staff reported that green elements, such as plants, trees, and flowers, along with garden features and fauna, such as birds, butterflies, and water features played an important role in their use of outdoor spaces. Reasons included the aesthetic appeal of greenery, resident enjoyment in gardening, walking among trees, interaction with fauna and water elements, the fragrance of flowers, and discussing the greenery with others.</p>	19	Moderate confidence <sup>a</sup>	<ul style="list-style-type: none"> <li>• Provide gardens with seasonal plants (including those that flower and which attract birds and butterflies), offer animals for interaction, and provide accessible and safe water features.</li> </ul>

Table 2. Continued

Summary of review finding	Number of studies contributing to review finding	CERQual quality of evidence	Recommendation
<p>6. <i>Built outdoor elements:</i> Residents, staff, and family expressed the importance of built features in the outdoor space, including: adequate pathways and ground surfaces to prevent slipperiness and to enable residents to walk around the garden, an adequate amount of comfortable seating placed in easily accessible areas, provision of shade and shelter (e.g., gazebos, overhead rooftops) for protection from weather conditions, fencing to ensure security without blocking views, raised garden beds for easier viewing of plants, sufficient outdoor lighting for evening garden use, and handrails.</p>	19	Moderate confidence <sup>a</sup>	<ul style="list-style-type: none"> <li>• Provide adequate seating, and level pathways with smooth terrain that will not become slippery.</li> <li>• Provide seating in accessible parts of the garden, which face areas of interest (some in shade, some in sun), and are comfortable to sit on.</li> <li>• Provide structures which provide shade and shelter from sun, wind, and rain, but which still allows a view of the garden.</li> <li>• Provide raised garden beds, lighting in garden space, and handrails along pathways.</li> </ul>

<sup>a</sup>Moderate concerns due to methodological limitations (lack of congruity between research and methodology and representation and analysis of data and interpretation of results/participants' voices not adequately represented/conclusions do not flow from data analysis and interpretation). Minor concerns about coherence.

requirements around the physical design of nursing homes for people with dementia have been developed, one example of which is the Dementia Enabling Environment Project (DEEP), which aims to translate evidence-based research on dementia enabling environments (including gardens) into practice through direct consultation with consumers (Alzheimer's Australia WA, 2018). Taking into account the views of residents, family members, and staff, our review provides clear underlying support for design principles described by the DEEP, including the consideration of ease of wayfinding, removing physical barriers in the garden, provision of formal activity programs, and sensory stimulation (Alzheimer's Australia WA, 2018).

Staffing and resident safety was the second most frequently talked about theme in studies including a mixed resident population as well as in those studies which solely included residents with dementia. Concerns about the safety of residents using outdoor spaces unsupervised were expressed by staff, family, and residents. Staff preferred a building layout where residents were visible to staff from inside the building when outdoors. Windows providing visibility of outdoor areas increase staff confidence in independent access to and use of the outdoor areas by residents. Rodiek and colleagues reported that residents of assisted living facilities, once having reached the outdoor space, felt fairly comfortable being "on their own" for a short time and that going out independently tended to foster feelings of autonomy (Rodiek, 2006). Although not clearly stated in the identified studies, it is likely that issues related to staffing will have greater impact on residents with greater mobility limitations, which is highly relevant for residents of nursing homes.

Although the participants in this review perceived independent use of outdoor space to be unsafe, it is unclear whether the actual falls risk outdoors is higher than the falls risk indoors. There is a lack of data informing the frequency of falls occurring outside in comparison to inside. A detailed study recording falls of all residents of 528 German nursing homes over a 1-year study period documented over 70,000 falls during 42,843 person-years (Rapp, Becker, Cameron, Konig, & Buchele, 2012). Forty-one percent of all falls occurred during transfers. Most falls (75%) occurred in the residents' rooms or bathrooms, 22% occurred in common areas, and 3% occurred outside. However, detection bias may be an issue for these findings. Although there was a higher risk of transfer to hospital from falls occurring outside, as the authors have stated, this may be due to an increased probability of recording serious falls outdoors (Buchele et al., 2014). Given lack of data on the true risk of falls outdoors, nursing home managers, staff, and family should discuss and consider the trade-off between the potential harms versus benefits of residents venturing outside, considering the principles of person-centered care (Crandall, White, Schuldheis, & Talerico, 2007) and dignity of risk (Hoffman & Field, 2002). Creating a care plan in consultation with residents, staff, and family will help to

deal with issues relating to risks and benefits, and should establish when residents may like to go outside and how this can be facilitated (Macintosh, 2012). Appropriate staff training and education, and increased awareness about the benefits of use of outdoor space and interaction with nature and other people, as well as residents' individual abilities, vulnerabilities, and goals, should support staff in person-centered planning. This involves the consideration of the outdoor space as part of the living area, and taking into account actual risks instead of perceived risks of residents, including those with dementia.

Adverse or unfavorable weather conditions as a barrier to getting outdoors was reported in most studies, in relation to resident discomfort due to cold or heat. Built features in the outdoor space were considered important in addressing this; including structures such as gazebos and overhead rooftops and seating options in both sunny and shaded areas. When considering design, comfort requirements of residents in different climates will vary, for example, in a cold northern climate letting in sunlight may be more important than blocking wind, whereas in a warmer southern climate, shade and breezes are essential (Pollock, Pollock, & McClenaghan, 2012). Residents are likely to remain inside when dressed inappropriately for the weather, therefore the authors of this review recommend providing appropriate clothing to tolerate weather conditions as necessary during all seasons.

Heavy and locked doors and difficult to manage doorsteps were experienced as barriers to outdoor access by residents and staff. Proximity of access points to outdoor spaces was found particularly relevant in studies including residents with dementia, and residents' preference was given to garden access points close to resident's rooms and main living areas. This is consistent with the study findings of Kearney and Winterbottom (2005), who recommended that multiple access points aid residents in overcoming mobility problems if needing to cover too long a distance to gain access to the outdoors.

As well as interaction with greenery, outdoor spaces reportedly facilitated informal meetings, allowing residents to engage more in social activities. Our review found that being in outdoor spaces provided a sense of connection to life outside the nursing home. Treating the outdoor space as a part of the home's living space, as well as organizing programmed activities outdoors, would create the opportunity to passively and actively use garden and outdoor spaces. There is currently little information on how much time residents of nursing homes spend outdoors, but residents are widely reported as having low vitamin D levels (Flicker et al., 2003). This may be the result of people in nursing homes having limited sun exposure, due to less outdoor activities than people living in their own homes (Okan, Okan, & Zincir, 2019). In a study conducted in 320 American nursing homes, 77% of nursing homes reported that in summer the outdoor areas were used every day, however only 23% reported use every day in winter

(Cohen-Mansfield & Werner, 1999). Other studies have reported residents using the gardens several times a week but not indicated what proportion of residents do this (Heath & Gifford, 2001; Oguz et al., 2010). Such data do not give an indication of the resident characteristics which get them outdoors, that is, if residents with mobility limitations have decreased use. Three of the included studies reported average duration of time spent outside for residents, ranging from 240 min per week (Rodiek et al., 2014) to 1–2 hr per day (Oguz et al., 2010), or mean 1.9 hr ( $SD = 2.6$ ) per week. Programmed social activities were perceived as a facilitator of garden use by all participants, particularly in studies including people living with dementia. Programmed outdoor activities such as morning teas can also encourage more frequent socialization and engage residents in more physical activity, in line with the recently established recommendations for physical activity (de Souto Barreto et al., 2016; World Health Organization, 2001).

Our review has a number of strengths and limitations. Only seven of the included studies reported views of family members, this may not be enough data to gain a broadly representative view of residents' family members. Most included studies were conducted in developed countries; therefore views of those in developing countries are underrepresented. However, there were very few concerns about study quality for adequacy and relevance, therefore themes were found to be mostly generalizable across different countries. Included studies were limited to those in the English language and, although an extensive search of gray literature was conducted (including in databases that capture nonmedical literature), it is possible that some eligible studies were not identified. In addition, although every effort was made to comprehensively extract the views and perspectives taken directly from study participants (through focusing on original quotes rather than author summaries), the methodologies and presentation of results in the included studies varied, and therefore our interpretation of the data was limited to what was provided in the published articles. This review is strengthened through the thorough search strategy and use of the GRADE-CERQual assessment, indicating moderate to high confidence in all of the key summary findings.

In summary, spending time outdoors has been shown to have benefits for residents of nursing homes in terms of mood, behavior, and well-being. Design of the outdoor space, especially greenery and features in the garden, as well as staff issues (mainly around safety concerns, visual accessibility, and staff availability) were found to be of most importance to residents, staff, and family, in enabling residents in nursing homes to use outdoor areas. Most of the identified reported barriers to the use of outdoor space are open to physical design interventions, and could be addressed in initial planning and design of facilities for which we have proposed a number of specific recommendations. There is a paucity of data informing the risk of falling outdoors in comparison to indoors. Barriers around staff

perceptions of risks to resident safety and adverse weather conditions could be more readily addressed through staff education and increased understanding of the risks versus potential benefits. Addressing such issues through culture change would enable residents to spend more time in outdoor spaces, thus facilitating social connections and interaction with nature, and potentially improving well-being. Incorporation of the recommendations in this review into the design and management of nursing homes by architects, facility managers, and policy makers may increase use of outdoor areas and improve the quality of life of nursing home residents.

## Supplementary Material

Supplementary data are available at *The Gerontologist* online.

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## Conflict of Interest

This study is supported by funding provided by the NHMRC Cognitive Decline Partnership Centre. This Partnership Centre includes three Australian not-for-profit residential aged care service providers. Although these industry partners did not provide funding to this study, they did provide input into research priority setting. M. Gresham is an employee of a residential aged care service provider.

## References

- Alzheimer's Australia SA, Inc. (2010). Gardens that care: Planning outdoor environments for people with dementia. Glenside, SA: Author. Retrieved January 29, 2019, from [https://www.enablingenvironments.com.au/uploads/5/0/4/5/50459523/gardens\\_that\\_care\\_planning\\_outdoor\\_environments\\_for\\_people\\_with\\_dementia.pdf](https://www.enablingenvironments.com.au/uploads/5/0/4/5/50459523/gardens_that_care_planning_outdoor_environments_for_people_with_dementia.pdf)
- Alzheimer's Australia WA. (2013). Dementia therapeutic garden audit tool. Osbourne Park, WA: Author. Retrieved January 29, 2019, from [https://www.enablingenvironments.com.au/uploads/5/0/4/5/50459523/dementia\\_therapeutic\\_garden\\_audit\\_tool\\_2013.pdf](https://www.enablingenvironments.com.au/uploads/5/0/4/5/50459523/dementia_therapeutic_garden_audit_tool_2013.pdf)
- Alzheimer's Australia WA. (2018). Dementia Enabling Environments Project (DEEP). Osbourne Park, WA: Author. Retrieved January 29, 2019, from <http://www.enablingenvironments.com.au/about.html>
- Bengtsson, A., & Carlsson, G. (2005). Outdoor environments at three nursing homes: Focus group interviews with staff. *Journal of Housing for the Elderly*, *19*, 49–69. doi:10.1300/J081v19n03\_04
- Bengtsson, A., & Carlsson, G. (2013). Outdoor environments at three nursing homes-qualitative interviews with residents and next of kin. *Urban For Urban Green*, *12*, 393–400. doi:10.1016/j.ufug.2013.03.008
- de Boer, B., Hamers, J. P., Zwakhalen, S. M., Tan, F. E., Beerens, H. C., & Verbeek, H. (2017). Green care farms as innovative nursing homes, promoting activities and social interaction for people with dementia. *Journal of the American Medical Directors Association*, *18*, 40–46. doi:10.1016/j.jamda.2016.10.013
- Bossen, A. (2010). The importance of getting back to nature for people with dementia. *Journal of Gerontological Nursing*, *36*, 17–22. doi:10.3928/00989134-20100111-01
- Brawley, E. C. (2007). Designing successful gardens and outdoor spaces for individuals with Alzheimer's disease. *Journal of Housing for the Elderly*, *21*, 265–283. doi:10.1300/J081v21n03\_14
- Brett, L., Traynor, V., & Stapley, P. (2016). Effects of physical exercise on health and well-being of individuals living with a dementia in nursing homes: A systematic review. *Journal of the American Medical Directors Association*, *17*, 104–116. doi:10.1016/j.jamda.2015.08.016
- Büchele, G., Becker, C., Cameron, I. D., König, H. H., Robinovitch, S., & Rapp, K. (2014). Predictors of serious consequences of falls in residential aged care: Analysis of more than 70,000 falls from residents of Bavarian nursing homes. *Journal of the American Medical Directors Association*, *15*, 559–563. doi:10.1016/j.jamda.2014.03.015
- Calkins, M. (2018). From research to application: Supportive and therapeutic environments for people living with dementia. *The Gerontologist*, *58*(Suppl. 1), S114–S128. doi:10.1093/geront/gnx146
- Calkins, M., Szmerkovsky, J. G., & Biddle, S. (2007). Effect of increased time spent outdoors on individuals with dementia residing in nursing homes. *Journal of Housing for the Elderly*, *21*, 211–228. doi:10.1300/J081v21n03\_11
- Care Inspectorate. (2017). Building better care homes for adults: Design, planning and construction considerations for new or converted care homes for adults. Dundee, Scotland: Care Inspectorate. Retrieved January 29, 2019, from <https://hub.careinspectorate.com/media/700631/building-better-care-homes-for-adults-2017.pdf>
- Chao, T. W., Chai, C. W., & Juan, Y. K. (2014). Landscape design for outdoor leisure spaces at nursing homes: A case study of Taiwan Suang-Lien Elderly Centre. *Journal of Food Agriculture and Environment*, *12*, 1036–1044.
- Chapman, N. J., Hazen, T., & Noell-Waggoner, E. (2007). Gardens for people with dementia: Increasing access to the natural environment for residents with Alzheimer's. *Journal of Housing for the Elderly*, *21*, 249–263. doi:10.1300/J081v21n03\_13
- Chaudhury, H., Cooke, H. A., Cowie, H., & Razaghi, L. (2018). The influence of the physical environment on residents with dementia

- in long-term care settings: A review of the empirical literature. *The Gerontologist*, 58, e325–e337. doi:10.1093/geront/gnw259
- Cioffi, J. M., Fleming, A., Wilkes, L., Sinfield, M., & Le Miere, J. (2007). The effect of environmental change on residents with dementia: The perceptions of relatives and staff. *Dementia*, 6, 215–231. doi:10.1177/1471301207080364
- Clark, P., Mapes, N., Burt, J., & Preston, S. (2013). Greening dementia: A literature review of the benefits and barriers facing individuals living with dementia in accessing the natural environment and local green space. Sheffield, UK: Natural England. Retrieved January 29, 2019 from <http://publications.naturalengland.org.uk/publication/6578292471627776>
- Cohen-Mansfield, J., & Werner, P. (1999). Outdoor wandering parks for persons with dementia: A survey of characteristics and use. *Alzheimer Disease and Associated Disorders*, 13, 109–117.
- Connell, B. R., Sanford, J. A., & Lewis, D. (2007). Therapeutic effects of an outdoor activity program on nursing home residents with dementia. *Journal of Housing for the Elderly*, 21, 194–209. doi:10.1300/J081v21n03\_10
- Cox, H., Burns, I., & Savage, S. (2004). Multisensory environments for leisure: Promoting well-being in nursing home residents with dementia. *Journal of Gerontological Nursing*, 30, 37–45.
- Crandall, L. G., White, D. L., Schuldheis, S., & Talerico, K. A. (2007). Initiating person-centered care practices in long-term care facilities. *Journal of Gerontological Nursing*, 33, 47–56.
- Cunningham, C., McIntosh, D., Thorne, S., & Gresham, M. (2015). *DesignSmart: The rating tool for environments that work for people with dementia*. Sydney, Australia: The Dementia Centre, HammondCare, University of Stirling.
- Cutler, I., & Kane, R. (2006). As great as all outdoors. *Journal of Housing for the Elderly*, 19, 29–48. doi:10.1300/J081v19n03\_03
- Dahlkvist, E., Nilsson, A., Skovdahl, K., & Engstrom, M. (2014). Is there a caring perspective in garden/patio design in elderly care? A description and a comparison of residents and staff members perceptions of these outdoor spaces. *Journal of Housing for the Elderly*, 28, 85–106. doi:10.1080/02763893.2013.858094
- Dahlkvist, E., Hartig, T., Nilsson, A., Högberg, H., Skovdahl, K., & Engström, M. (2016). Garden greenery and the health of older people in residential care facilities: A multi-level cross-sectional study. *Journal of Advanced Nursing*, 72, 2065–2076. doi:10.1111/jan.12968
- Dementia Service Development Centre. (2012). Design: The importance of getting outside. University of Stirling, Scotland, UK. Retrieved February 20, 2019, from <https://dementia.stir.ac.uk/design/virtual-environments/importance-design/importance-getting-outside>
- Department of Transportation and Infrastructure. (2015). DSD design standards for nursing homes version 3.0. New Brunswick, Buildings Division, Canada. Retrieved January 29, 2019, from <https://www2.gnb.ca/content/dam/gnb/Departments/sd-ds/pdf/NursingHomes/NursingHomeDesignStandards-e.pdf>
- Durvasula, S., Kok, C., Sambrook, P. N., Cumming, R. G., Lord, S. R., March, L. M.,...Cameron, I. D. (2010). Sunlight and health: Attitudes of older people living in intermediate care facilities in southern Australia. *Archives of Gerontology and Geriatrics*, 51, e94–e99. doi:10.1016/j.archger.2010.01.008
- Durvasula, S., Sambrook, P. N., & Cameron, I. D. (2012). Factors influencing adherence with therapeutic sunlight exposure in older people in intermediate care facilities. *Archives of Gerontology and Geriatrics*, 54, e234–e241. doi:10.1016/j.archger.2011.08.009
- Durvasula, S., Mason, R. S., Kok, C., Macara, M., Parmenter, T. R., & Cameron, I. D. (2015). Outdoor areas of Australian residential aged care facilities do not facilitate appropriate sun exposure. *Australian Health Review*, 39, 406–410. doi:10.1071/AH14035
- Eijkelenboom, A., Verbeek, H., Felix, E., & van Hoof, J. (2017). Architectural factors influencing the sense of home in nursing homes: An operationalization for practice. *Frontiers of Architectural Research*, 6, 111–122. doi:10.1016/j.foar.2017.02.004
- Fleming, R., & Bennett, K. (2015). Assessing the quality of environmental design of nursing homes for people with dementia: Development of a new tool. *Australasian Journal on Ageing*, 34, 191–194. doi:10.1111/ajag.12233
- Fleming, R., & Bennett, K. A. (2017). Applying the key principles in environments for people with dementia: Dementia Training Australia. Retrieved January 29, 2019, from <https://www.dta.com.au/resources/dementia-friendly-community-environmental-assessment-tool/>
- Flicker, L., Mead, K., MacInnis, R. J., Nowson, C., Scherer, S., Stein, M. S.,...Wark, J. D. (2003). Serum vitamin D and falls in older women in residential care in Australia. *Journal of the American Geriatrics Society*, 51, 1533–1538.
- Gonzalez, M. T., & Kirkevold, M. (2014). Benefits of sensory garden and horticultural activities in dementia care: A modified scoping review. *Journal of Clinical Nursing*, 23, 2698–2715. doi:10.1111/jocn.12388
- Grant, C. F., & Wineman, J. D. (2007). The garden-use model: An environmental tool for increasing the use of outdoor space by residents with dementia in long-term care facilities. *Journal of Housing for the Elderly*, 21, 89–115. doi:10.1300/J081v21n01\_06
- Heath, Y., & Gifford, R. (2001). Post-occupancy evaluation of therapeutic gardens in a multi-level care facility for the aged. *Activities and Aging*, 25, 21–43. doi:10.1300/J016v25n02\_02
- Hoffman, S., & Field, A. (2002). Preparing youth to exercise self-determination: Quality indicators of school environments that promote the acquisition of knowledge, skills, and beliefs related to self-determination. *Journal of Disability Policy Studies*, 13, 114–119. doi:10.1177\_10442073020130020701
- Judd, S. (2012). Being outside ‘down under’. In A. Pollock & M. Marshall (Eds.), *Designing outdoor spaces for people with dementia*. Greenwich, Australia: HammondCare Media.
- Kearney, A. R., & Winterbottom, D. (2005). Nearby nature and long-term care facility residents: Benefits and design recommendations. *Journal of Housing for the Elderly*, 19, 7–28. doi:10.1300/J081v19n03\_02
- Lewin, S., Booth, A., Glenton, C., Munthe-Kaas, H., Rashidian, A., Wainwright, M.,...Noyes, J. (2018). Applying GRADE-CERQual to qualitative evidence synthesis findings: Introduction to the series. *Implementation Science*, 13(Suppl. 1), 2. doi:10.1186/s13012-017-0688-3
- Macintosh, E. (2012). How relatives, friends and staff can facilitate being outside. In A. Pollock & M. Marshall (Eds.), *Designing outdoor spaces for people with dementia*. Greenwich, Australia: HammondCare.

- Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G.; PRISMA Group. (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *PLoS Medicine*, *6*, e1000097. doi:10.1371/journal.pmed.1000097
- Morgan, D. G., & Stewart, N. J. (1999). The physical environment of special care units: Needs of residents with dementia from the perspective of staff and family caregivers. *Qualitative Health Research*, *9*, 105–118. doi:10.1177/104973299129121721
- National Institute of Building Sciences. (2017). Design recommendations—Health care facilities: Nursing home. Retrieved February 13, 2019, from <http://www.wbdg.org/building-types/health-care-facilities/nursing-home>
- Oguz, D., Cakci, I., Sevimli, G., & Ozgur, D. (2010). Outdoor environment preferences in nursing homes: Case study of Ankara, Turkey. *Scientific Research and Essays*, *5*, 3987–3993.
- Okan, F., Okan, S., & Zincir, H. (2019). Effect of sunlight exposure on vitamin D status of individuals living in a nursing home and their own homes. *Journal of Clinical Densitometry*. doi:10.1016/j.jocd.2018.12.005.
- Okubo, Y. (2012). Case study 2: The gardens at Plaisir Villa Ichikawa. In A. Pollock & M. Marshall (Eds.), *Designing outdoor spaces for people with dementia*. Greenwich, Australia: HammondCare.
- Pollock, A., Pollock, R., & McClenaghan, C. (2012). Site and climate considerations. In A. Pollock & M. Marshall (Eds.), *Designing outdoor spaces for people with dementia*. Greenwich, Australia: HammondCare.
- Potter, R., Ellard, D., Rees, K., & Thorogood, M. (2011). A systematic review of the effects of physical activity on physical functioning, quality of life and depression in older people with dementia. *International Journal of Geriatric Psychiatry*, *26*, 1000–1011. doi:10.1002/gps.2641
- Potter, R., Sheehan, B., Cain, R., Griffin, J., & Jennings, P. A. (2018). The impact of the physical environment on depressive symptoms of older residents living in care homes: A mixed methods study. *The Gerontologist*, *58*, 438–447. doi:10.1093/geront/gnx041
- Rapp, K., Becker, C., Cameron, I. D., König, H. H., & Büchele, G. (2012). Epidemiology of falls in residential aged care: Analysis of more than 70,000 falls from residents of Bavarian nursing homes. *Journal of the American Medical Directors Association*, *13*, 187.e1–187.e6. doi:10.1016/j.jamda.2011.06.011
- Rappe, E., & Kivelä, S. L. (2005). Effects of garden visits on long-term care residents as related to depression. *HortTechnology*, *15*, 298–303. doi:10.21273/HORTTECH.15.2.0298
- Rappe, E., Kivelä, S. L., & Rita, H. (2006). Visiting outdoor green environments positively impacts self-rated health among older people in long-term care. *HortTechnology*, *16*, 55–59.
- Raske, M. (2010). Nursing home quality of life: Study of an enabling garden. *Journal of Gerontological Social Work*, *53*, 336–351. doi:10.1080/01634371003741482
- Reynolds, L., & Rowles, G. D. (2011). *The perceived value of nature and use of gardens by older adults living in residential care*. Ann Arbor, MI: ProQuest Dissertations Publishing.
- Rodiek, S. (2006). Resident perceptions of physical environment features that influence outdoor usage at assisted living facilities. *Journal of Housing for the Elderly*, *19*, 95–107. doi:10.1300/J081v19n03\_06
- Rodiek, S., Lee, C., & Nejati, A. (2014). You can't get there from here: Reaching the outdoors in senior housing. *Journal of Housing for the Elderly*, *28*, 63–84. doi:10.1080/02763893.2013.858093
- Sambrook, P. N., Cameron, I. D., Chen, J. S., Cumming, R. G., Durvasula, S., Herrmann, M.,...Simpson, J. M. (2012). Does increased sunlight exposure work as a strategy to improve vitamin D status in the elderly: A cluster randomised controlled trial. *Osteoporosis International*, *23*, 615–624. doi:10.1007/s00198-011-1590-5
- Senes, G., Fumagalli, N., Crippa, R., & Bolchini, F. (2012). Nursing homes: Engaging patients and staff in healing garden design through focus group interviews. *Neuropsychological Trends*, *12*, 135–146. doi:10.7358/neur-2012-012-sene
- Shea, B. J., Reeves, B. C., Wells, G., Thuku, M., Hamel, C., Moran, J.,...Henry, D. A. (2017). AMSTAR 2: A critical appraisal tool for systematic reviews that include randomised or non-randomised studies of healthcare interventions, or both. *BMJ (Clinical Research Ed.)*, *358*, j4008. doi:10.1136/bmj.j4008
- de Souto Barreto, P., Morley, J. E., Chodsko-Zajko, W., H Pitkala, K., Weening-Dijksterhuis, E., Rodriguez-Mañas, L.,...Rolland, Y.; International Association of Gerontology and Geriatrics – Global Aging Research Network (IAGG-GARN) and the IAGG European Region Clinical Section. (2016). Recommendations on physical activity and exercise for older adults living in long-term care facilities: A taskforce report. *Journal of the American Medical Directors Association*, *17*, 381–392. doi:10.1016/j.jamda.2016.01.021
- The Joanna Briggs Institute. (2014). Reviewer's manual: 2014 edition. The University of Adelaide, South Australia: Author. Retrieved January 29, 2019, from <http://joannabriggs.org/assets/docs/sumari/reviewersmanual-2014.pdf>
- Tong, A., Flemming, K., McInnes, E., Oliver, S., & Craig, J. (2012). Enhancing transparency in reporting the synthesis of qualitative research: ENTREQ. *BMC Medical Research Methodology*, *12*, 181. doi:10.1186/1471-2288-12-181
- Van Steenwinkel, I., Dierckx de Casterlé, B., & Heylighen, A. (2017). How architectural design affords experiences of freedom in residential care for older people. *Journal of Aging Studies*, *41*, 84–92. doi:10.1016/j.jaging.2017.05.001
- Whear, R., Coon, J. T., Bethel, A., Abbott, R., Stein, K., & Garside, R. (2014). What is the impact of using outdoor spaces such as gardens on the physical and mental well-being of those with dementia? A systematic review of quantitative and qualitative evidence. *Journal of the American Medical Directors Association*, *15*, 697–705. doi:10.1016/j.jamda.2014.05.013
- White, P. C., Wyatt, J., Chalfont, G., Bland, J. M., Neale, C., Trepel, D., & Graham, H. (2018). Exposure to nature gardens has time-dependent associations with mood improvements for people with mid- and late-stage dementia: Innovative practice. *Dementia (London, England)*, *17*, 627–634. doi:10.1177/1471301217723772
- World Health Organization. (2001). International classification of functioning, disability and health: ICF. Geneva: World Health Organization. Retrieved January 29, 2019, from <https://www.who.int/classifications/icf/en/>