Neighborhood effects for aging in place: A transdisciplinary framework toward health-promoting settings

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The premise of promoting ageing in place is that neighborhoods can enhance or protect older adults' health. But progress toward health-promoting settings has been slow in practice given limited understanding of causal pathways to facilitate targeted interventions in the built and social environment of neighborhoods. This paper compares the effects of neighborhood built and social environment on older adults' physical and psychosocial health by reviewing relevant articles from three interdisciplinary databases. With reference to an Urban Space Framework, fifty-one relevant articles were analyzed in four categories, each of which compares the significance of two pairs of relationships in the environment and health nexus. Whereas neighborhood social environment has more significant relationship with older adults' psychosocial health, the findings for neighborhood built environment are mixed. A resultant transdisciplinary framework links the urban design of neighborhoods to older adults' health via neighborhood social environment and older adults' psychosocial health, given fulfillment of macro level health prerequisites. The paper concludes with a discussion on the utility of the framework to facilitate research on micro level causal pathways from neighborhood built environment to older adults' health.

Keywords: neighborhood effects; older adults' health; integrative review; social environment; built environment

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Introduction

A key premise for ageing in place instead of in institutions or in alternative housing options assumes that one's home neighborhood can be salubrious or health-giving (Scharlach, 2017). Improved sanitation and medical advances had led to longer life expectancy in many cities. Where birth rates are lowered and net inward migration of working population is reduced, cities are facing increased ratio of seniors to working population, necessitating more financially sustainable approaches to provide adequate care to older adults who require care. One way is to encourage older adults to age in place and promote right-sited care so that institutional care remains available for those who need it. As ageing in place gain increasing acceptance amongst policy makers, its capability to enhance older adults' health becomes more crucial.

Yet, in efforts to promote ageing in place, governments have focused on improving care delivery models such as the Integrated Neighborhood Approach in Rotterdam, the Netherlands; less attention is given to how the physical environment of the neighborhood can protect or enhance older adults' health. Is intervening in a neighborhood's built environment as viable an approach as intervening in the social and service environment of the neighborhood? To address this knowledge gap, this paper conducts an integrative review of journal articles that allow one to compare the effects of neighborhood built environment vs. neighborhood social environment on older adults' health. The effects of each of these aspects of neighborhood environment on older adults' physical vs. psychosocial health is also compared.

Social determinants of health and transdisciplinarity

There is no broad consensus on how the spectrum of neighborhood environment variables should be tackled when analyzing their effects on older adults' health (Galster, 2011). Research on the built environment and health is often traced to Dahlgren and Whitehead (1991). Dahlgren and Whitehead (1991) identified general socioeconomic, cultural, and environmental conditions as amongst the social determinants of health, echoing the prerequisites of health identified in the Ottawa Charter for Health Promotion, namely "peace, shelter, education, food, income, a stable ecosystem, sustainable resources, social justice and equity" (World Health Organization, 1986). Without basic provisions of the above, the neighborhood is likely to affect older adult's

health differently than had the basic needs be met. Dahlgren and Whitehead (1991) further added to the list living and working conditions, and social and community networks, i.e., both physical and social aspect of the built environment (Health Canada, 1999; Rao, Prasad, Adshead, & Tissera, 2007; Srinivasan, O'Fallon, & Dearry, 2003) defined as "all buildings, spaces and products that are created or modified by people" (Health Canada, 1997, p. 12). Finally, Dahlgren and Whitehead (1991) also identified individual lifestyle factors, age, sex and constitutional factors as social determinants of health, which should be accounted for when measuring the effects of living in the neighborhood on older adults' health. While comprehensive, such broad-ranging framework, does little to guide research focused on a specific scale.

However, an overview of existing literature suggests a focus on the micro level pathways is needed and helpful to advance existing knowledge. The study of neighborhood features that promote health equity or equigenic neighborhood features (Mitchell, Richardson, Shortt, & Pearce, 2015) outlines two generations of area effects research, namely (1) research using census data which proved spatial inequities of health, and (2) research using more sophisticated and purpose-built measures to explore possible pathways that can explain the area effects (Diez Roux, & Mair, 2010). Despite the intention to "create supportive environments" (World Health Organization, 1986), health promotion at the micro level had not moved beyond health promotion *in* settings, i.e., educational public health events at neighborhoods and workplaces, to create health-promot*ing* settings that *in themselves* facilitate the enhancement of health besides public health events (Frohlich, 2013; Masuda, Poland, & Baxter, 2010); neighborhood effects research had largely focused on tackling self-selection issues (van Ham, et al., 2011) and neighborhood poverty (Small & Feldman, 2011). Specific causal pathways linking area characteristics to individuals' health remain needed and have been as helpful for the next step of formulating experimental or exploratory urban interventions (Andersen, 2013; Diez Roux, 2001; Diez Roux, & Mair, 2010; Frohlich, 2013; Hawe, & Shiell, 2000; Macintyre, Ellaway, & Cummins, 2002; Riva, Gauvin, & Barnett, 2007; Zubrick, 2007). Focusing on micro level pathways help understand more direct health effects on the individuals (Jones, & Moon, 1993; Riva, et al., 2007). Urban health interventions targeted at these micro level pathways might have effects at larger geographical scales, providing leads for further research. In this view, an inversion of area effects from a focus on the macro level to a focus on the micro level possibly expedites creating health-promoting settings.

At the same time, the definition of health has been reconsidered especially in view of ageing populations (Jadad, & O'Grady, 2008; Huber, Knottnerus, Green, van der Horst, Jadad, Leonard, …, & Smid, 2011). Larson (1999) discussed four models of health, namely the medical model, the holistic model, the wellness model, and the environmental model. The World Health Organization (WHO) has defined health as "a state of complete physical, mental and social well-being," which is the holistic model of health, "and not merely *the absence of disease or infirmity,*" which, in italics, is the medical model (World Health Organization, 2006). The medical model of health is helpful for preventing and diagnosing diseases but provides less guidance on how to be healthier, crucial for health promotion. The holistic model acknowledges the dimensions of health relevant to health promotion but suffers imprecision as it leaves "well-being" undefined. Recognizing these limitations, the wellness model of health extends the holistic model and defines health as "optimal personal fitness for full, fruitful creative living" (Goldsmith, 1972, p. 213); this model of health has attracted increased research interest in recent years. On the other hand, the environmental model accounts for how one's environment may hinder functioning and views health as the "ability to overcome the difficulties of living which result from a change in the environment" (Canguilhem, 1978, pp. 162-163) or, simply, "the ability to adapt to one's environment" (What is health, 2009, p. 781). Combining the wellness model and the environmental model, health can tentatively be defined as "the ability to adapt to one's environment" (What is health, 2009, p. 781) so as to have "optimal personal fitness for full, fruitful creative living" (Goldsmith, 1972, p. 213) as desired by the individual. This definition likely resembles older adults' definition of health when rating and discussing factors affecting their own health, more than WHO's definition of health given the inevitability of some diseases for many and the possible irrelevance of some dimensions of well-being at various stages (Huber, et al., 2011). A focus on micro level causal pathways with a broadened definition of health potentially advances the creation of health-promoting settings for older adults.

In addition to the need for clear, scale-relevant, interactive hypothesis, accounting for self-selection (van Ham, et al., 2011), neighborhood effects research may benefit from transdisciplinary research involving urban design and public health sectors (Albrecht, Freeman, & Higginbotham, 1998; Barton, Grant, & Guise, 2010; Ciesielski, Aldrich, Marsit, Hiatt, & Williams, 2016; McBride, Barker, Pollack, & Kemper, 2013). This is because widespread creation of health-promoting settings at existing

neighborhoods may require well-synthesized knowledge outputs from various perspectives ranging from urban design, social sciences and public health, each of which are accustomed to different knowledge production conventions. In order to "synthesize and extend discipline-specific perspectives, theories, methods, and translational strategies to yield innovative solutions" (Stokols, Hall, & Vogel, 2013, p.6), a framework that is reasonably familiar and useful to all three disciplines is required.

This article constructed a transdisciplinary framework relating neighborhood environment to older adults' health by differentiating between built and social aspects of neighborhood environment with reference to an Urban Space Framework. The framework was created to guide improvements at urban spaces in high-density contexts (Cho, Trivic, & Nasution, 2015). It identifies 94 criteria to guide improvements in hardware (e.g., physical accessibility), software (e.g., affordances for social activities), and "orgware" (e.g., space use policies) of urban spaces based on a synthesis of urban design discourses on what makes good urban spaces, and has been used to analyze and compare more than 50 urban spaces (Cho, Heng, & Trivic, 2016). Based on this framework, neighborhood environment variables can be categorized as neighborhood built environment, defined as neighborhood characteristics reasonably within direct influence of urban designers, or neighborhood social environment, defined as all constructs pertinent for discussion at the neighborhood level that is reasonably beyond direct influence of urban designers, and are often more dependent on the residents in the neighborhood than the urban space factors. For example, vandalism and safety from crime would be categorized as variables of neighborhood social environment, whereas general maintenance and traffic safety would be categorized as variables of neighborhood built environment. Such structuring of transdisciplinary knowledge on neighborhood effects potentially helps to faciltate knowledge production and application across various neighborhood settings.

Research question

Given that various health variables can be categorized as physical health or psychosocial health, and that neighborhood environment variables can be categorized as neighborhood built environment or neighborhood social environment, it may be worthwhile to understand the relative significance of the relationships in the nexus between neighborhood environment and health to help estimate the effects of living in a

neighborhood on older adults' health. Does the neighborhood built environment affect older adults' physical health more than it affects older adults' psychosocial health? Conversely, are older adults' psychosocial health more likely to be affected by neighborhood social environment than by neighborhood built environment? Of all four pairs in the nexus between neighborhood environment and health, i.e., built environment-physical health, social environment-psychosocial health, built environment-psychosocial health, and social environment-physical health, which pair has the strongest relationship for whom under what circumstances? Answers to these questions help generate community development and urban design interventions that have more targeted public health outcomes.

Methods

To answer the above questions on the relative significance of the relationships in the nexus between neighborhood environment and older adults' health, this article conducted an integrative review of relevant research articles in three interdisciplinary databases, namely ProQuest Social Science, Scopus, and Web of Science. Sensitive combinations of search terms were used to identify journal articles in English that involve the "neighborhood" in both its "physical" and "social" aspects, "health," "well-being," or "wellness" in both its "physical" and "mental," "psychological," "emotional," or "affect" aspects, and "older person," "older adults," "elder," or "senior." To ensure that the research articles yielded were focused on the neighborhood, articles that do not contain "neighborhood" or "built environment" in the title were excluded. With reference to the prerequisites of health in the Ottawa Charter for Health Promotion (World Health Organization, 1986), articles that contain "deprivation," "disadvantage," "slum," "squatter," "violence," "crime," "disaster," "heat death," "earthquake," or "hurricane" in the title were also removed. In addition, articles that contain "substance," "alcohol," "smoking," "sex*," "suicide," "birth," in the title were removed as the abovementioned tentative definition of health from the environmental-wellness model emphasized health as an ability, which excluded health behaviors (e.g., how often an older adult engages, as opposed to is capable of engaging, in physical activity) as categorically separate.

Based on the titles, abstracts, and full texts, articles found were selected for analysis by (1) excluding articles focused on rural or deprived neighborhoods only, (2) excluding articles that do not allow comparison of relationships between neighborhood

built or social environment and physical or psychosocial health, and (3) including only articles with results for a sample population aged 50 and above, or a sample population with an average age of 60 and above. Remaining articles were categorized into the following four categories, namely articles that allow the comparison of the effects of (1) neighborhood built environment vs. neighborhood social environment on older adults' *physical* health, (2) neighborhood built environment vs. neighborhood social environment on older adults' *psychosocial* health, (3) neighborhood *built* environment on older adults' physical health vs. psychosocial health, and (4) neighborhood *social* environment on older adults' physical health vs. psychosocial health. The sample population, sampling methods, setting and study design of each article are summarized per prevailing recommendations (Levasseur, Généreux, Desroches, Carrier, Lacasse, Chabot, …, & Vanasse, 2016). Neighborhood environment variables, health variables, and their relationships were extracted from final models of each article where relevant. Analyses of articles in categories 1 and 2 addressed the question: Do neighborhood built environment and neighborhood social environment affect health differently? Articles in categories 3 and 4 addressed the question: Does neighborhood environment affect physical health as much as it affects psychosocial health?

For each article, the significances of various environment-health relationships were compared. Category 1 compared the relationship between a built environment variable and a physical health variable with the relationship between a social environment variable and the same physical health variable. Category 2 did the same for psychosocial health variables. Where possible, comparable variables were pit against each other. For example, a health variable's relationship with traffic safety, a built environment variable, was compared with its relationship with crime safety, a social environment variable; and similarly, an environment variable's relationship with physical health-related quality of life (HRQOL) was compared with mental HRQOL. Where there was more than one comparison per article, one of the compared categories "win" by simple majority. To "win" is to have more relationships of greater significance with the fixed category. The fixed categories for Appendices 1, 2, 3, and 4 are physical health, psychosocial health, neighborhood built environment, and neighborhood social environment respectively.

Findings

A total of 436 articles in English were found. After removing duplicates, 385 unique articles remain. Of these, 120 were retained for full text review based on their titles and abstracts. Fifty-one relevant articles were analyzed. See Figure 1. Seven articles were simultaneously categorized into all four categories 1, 2, 3, and 4; each of the remaining 44 articles were categorized into one of the four categories. There were 29, 19, 10 and 13 articles in categories 1, 2, 3, and 4, respectively summarized in Appendices 1, 2, 3, and 4. Of the 51 articles analyzed, 30 were set in North America; 11 in Europe; seven in Asia, two in Australia; and one in South America. Eleven articles reported longitudinal analysis, whereas 40 articles reported cross-sectional analysis. The research reported in 36 articles employed random sampling methods; 13 employed purposive sampling methods; and two employed other sampling methods. The sizes of the study populations were spread widely. Twelve articles involved 48-499 relevant respondents; fourteen involved 500-999 respondents; seventeen articles involved 1000-4999 respondents; and eight involved 5000-937857 respondents. Studies involving a variety of age ranges were included. Eighteen articles reported findings from older adults as young as 65 years; fourteen from older adults as young as 55 years; two specifically from older adults aged 75 and above; and seventeen from wider age ranges.

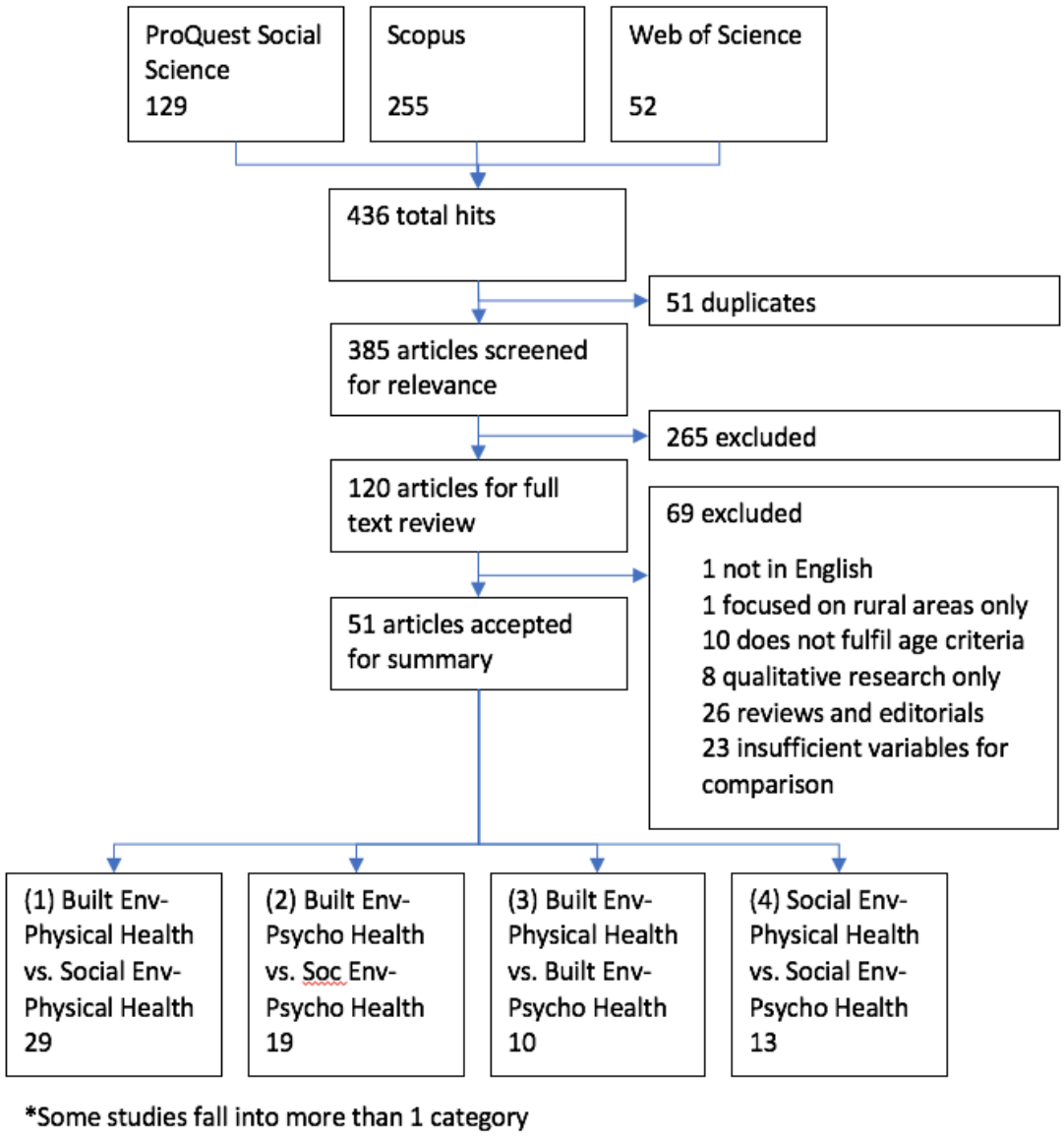

Fig 1: Flow chart of articles selection and categorization.

Common physical health variables included self-rated health, physical HRQOL, physical functioning, and body mass index. Cognitive functioning was categorized together with physical health variables as some decline in both physical health and cognitive health are natural processes of ageing (Brunner, 2005; Harada, Natelson Love, & Triebel, 2013; Jeste, Wolkowitz, & Palmer, 2011). Common psychosocial health variables included depressive symptoms, mental HRQOL, loneliness, and anxiety. Common neighborhood built environment variables included walkability, aesthetics, trash, access to services, and park. Common neighborhood social environment variables included safety, cohesion, percentage of seniors, and percentage below poverty within census tract. Besides data for census tracts, neighborhood environment variables mostly

measured the perceptions of the sampled population; some efforts were made to reduce same-source bias by including data sources apart from the sampled population or by aggregating data within a predetermined area.

Results

Overall, there are considerable uncertainties in the relative significance of pairs in the nexus between neighborhood environment and older adults' health. Nonetheless, analysis of articles in Appendix 1 suggests that physical health is more associated with built aspects than social aspects of the neighborhood environment. Thirteen out of 29 articles supported this notion; six opposed; and ten were neutral. Conversely, analysis of articles in Appendix 2 clearly indicates that psychosocial health is more associated with neighborhood social environment than neighborhood built environment. Twelve out of 19 articles supported this notion; three opposed; and four were neutral. Together, the above findings suggest that different aspects of older adults' health are primarily affected by specific aspects of the neighborhood environment. Hence, neighborhood built environment and neighborhood social environment affect older adults' health differently. But does neighborhood built environment affect older adults' psychosocial health as much as it affects their physical health? And does neighborhood social environment affect older adults' physical health as much as it affects their mental health?

Appendix 3 suggests that neighborhood built environment is almost as closely related to older adults' physical health as it is to their psychosocial health. Of 10 relevant articles, five articles suggested more significant associations between neighborhood built environment and older adults' physical health, which yield a slim margin give that three articles suggested relationship between built environment and older adults' psychosocial health. On other hand, Appendix 4 suggests that neighborhood social environment affects older adults' psychosocial health more than it affects their physical health. Of 13 articles, six suggested more significant relationships between social environment and psychosocial health, which is three times as many as the two articles that suggested more significant relationships between neighborhood social environment and older adults' physical health.

Given peace, income and other prerequisites of health (World Health Organization, 1986) and apart from one's social participation and health behaviors, the above results suggest neighborhood environment affects older adults' health primarily

via its social aspects; and neighborhood social environment in turn affects older adults' health primarily by affecting their psychosocial health. These can be summarized with the following transdisciplinary framework. In Figure 2, the neighborhood built and social environment are presented as separate but overlapping areas in recognition of the plethora of disciplines addressing the neighborhood environment, from architecture to environmental psychology and community development. Older adults' health outcome is presented as a single endpoint given that the effects of the neighborhood built environment on older adults' physical health vs. their psychosocial health is uncertain. Compared to neighborhood area (i.e., built and social environment), the overlap between meso level social factors (i.e., social environment and psychosocial health) and health outcome is greater to reflect consistently stronger relationship between neighborhood social environment and psychosocial health outcomes. Bidirectional arrows are drawn between neighborhood built and social environment, and between older adults' physical and psychosocial health by virtue of the potentially inseparable cross-effects of these entities. Dashed lines show the "pure effects" between neighborhood built environment and older adults health, if any, apart from physical activity and social participation. With reference to this framework, the neighborhood social environment is theorized to mediate between the neighborhood built environment and older adults' physical health via psychosocial health, at the micro level given general fulfillment of health prerequisites, including the absence of stark socioeconomic deprivation, general quality housing, and minimal ambient environmental pollution, while holding constant density and culture etc.

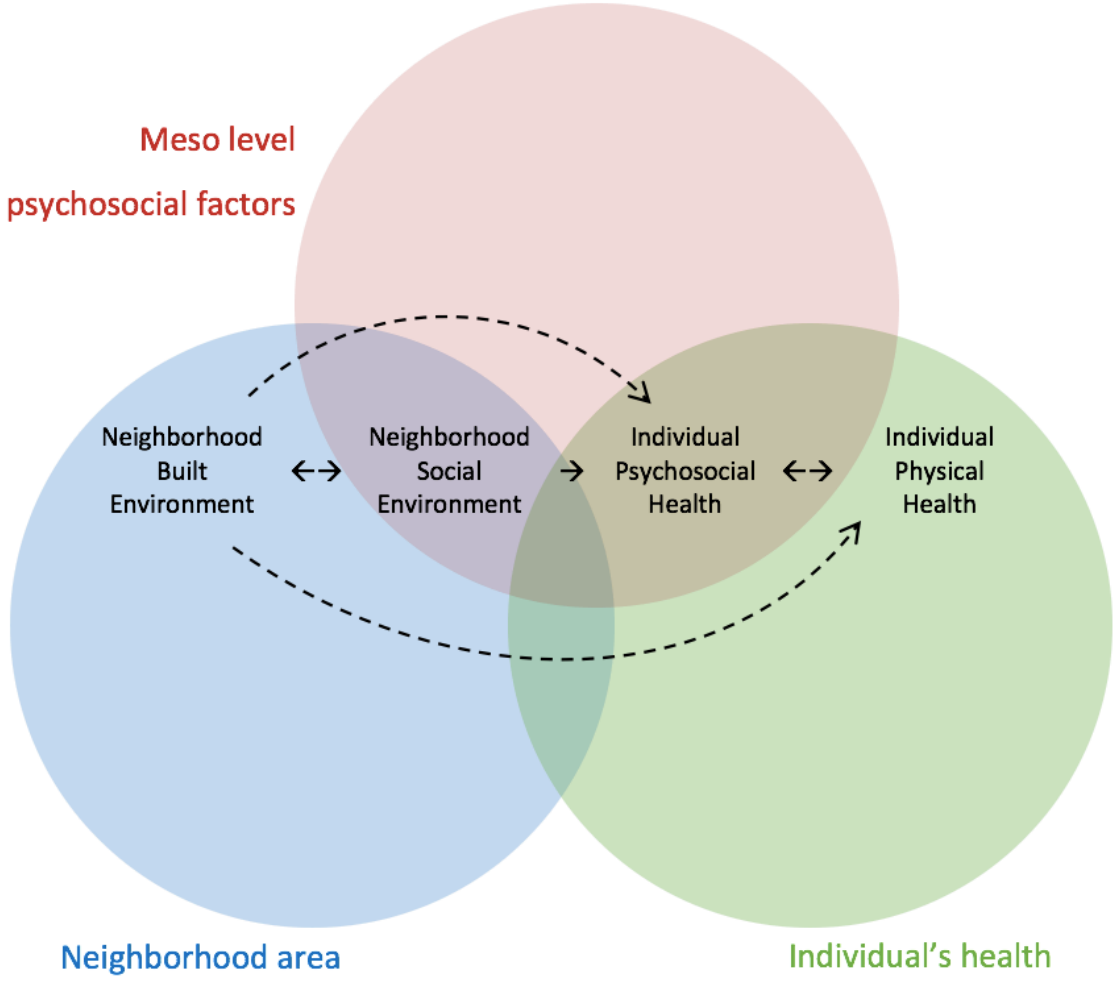

Fig 2: A tentative framework linking urban design and older adults' health at the micro level given general fulfillment of health prerequisites and assuming no drastic changes in macro level social structure and older adults' health behaviors, and no sample population moving between neighborhoods during the study period.

Discussion

This article sought to explicate the relationships between neighborhood built and social environment with older adults' physical and psychosocial health. The resultant framework helps facilitate transdisciplinary empirical research at the micro level to identify ways to intervene in the built environment that potentially enhances older adults' health. At the same time, it draws attention to meso level psychosocial factors (Martikainen, Bartley, & Lahelma, 2002) which helps structure the studies of neighborhood effects on older adults' health, given general fulfillment of health prerequisites (World Health Organization, 1986).

This review excluded articles focused primarily on rural settings and neighborhood deprivation which makes the findings less applicable to some neighborhood. Qualitative research was also excluded given the primary purpose to compare relative strengths of relationships between neighborhood environment and health, while noting that researchers of area effects consistently call for quantitative analysis to be augmented with qualitative inputs to "shed light on how persons relate to and interact with varying spatial contexts" (Diez Roux, & Mair, 2010, p. 134; Zubrick, 2007). Given reconsiderations to the definitions of health, qualitative empirical research may be especially helpful to provide insights on older adults' conceptualization of their health and how it interacts with their neighborhood built and social environment. Although three interdisciplinary databases were searched given the question, some relevant research articles from other databases may have been excluded. At the same time, there may be research with nonsignificant results that were not published. Most of the articles reviewed were from North American and European settings. It is possible that the resultant framework may differ had there been more research from other settings, especially given that cultural differences and built density affect the nature of a neighborhoods' social environment (Bramley & Power, 2009; Chan, 1999; Fitzpatrick, & LaGory, 2011; Fukuyama, 1995; Johns & Ha, 1999).

Some articles reported neighborhood environment variables (e.g., neighborhood problems) which consisted items of both neighborhood built environment and social environment. These variables were excluded unless they clearly fell into one of the two categories. The need to separate neighborhood environment variables into mutually exclusive categories of neighborhood social environment and built environment excluded some research articles. Was the division of neighborhood environment variables into two categories an oversimplification? Some simplification can be helpful for creating a heuristic framework to facilitate health-promoting urban design interventions; using the Urban Space Framework (Cho, Trivic, & Nasution, 2015) to distinguish between neighborhood built environment and social environment helped ascertain the possible health effects of urban design interventions in neighborhoods as older adults age in place. The resultant framework is a first step to identify mediated and unmediated health effects of neighborhood built environment variables in relation to neighborhood social environment variables. These mediated and direct pathways help in designing more targeted interventions in neighborhoods, and provide a basis for complementary, holistic interventions that transcends disciplinary boundaries.

As most articles reviewed analyzed cross-sectional instead of longitudinal data, the causal direction between neighborhood environment and older adults' health in the framework was assumed. Longitudinal research on structural aspects of neighborhood social environment showed that persons with poor health are likely to move into neighborhoods that have lower proportion of persons with high income, tertiary education, and high prestige jobs (Jokela, 2014), indicating that further research on the health effects of structural social environment variables or of neighborhood composition are unlikely to yield ways to promote older adults' health. That said, focusing on nonstructural neighborhood social environment and built environment remain viable ways to advance health-promoting settings. The general hypothesis that neighborhoods may affect older adults' health remains (Jokela, 2014a), and so do longitudinal data, experimental methods, and methods to account for self-selection (Oakes, Andrade, Biyoow, & Cowan, 2015). These methodological challenges do not negate the possibility of taking sure steps to improving older adults' living environment especially when many are likely to age in place.

Finally, this article assumed that existing neighborhoods can be improved via urban design to facilitate ageing in place. This does not deny that ageing in place is at times undesirable (Golant, 2008). While modifying urban spaces can possibly make existing neighborhoods more salubrious to older adults' health, the extent to which interventions are feasible is likely dependent on the existing built conditions. For example, space constraints may not allow both of a new homecare facility and an existing well-loved community garden. In this unfortunate hypothetical scenario, participatory approaches consulting the older adults will likely yield different results than more technocratic interventions (Cho, Nasution, Lee, & Mascarenhas, 2017; Macmillan, & Townsend, 2006). Equal attention should be given to indoor home environment particularly for older adults who are much less mobile. At the same time, more mobile older adults may not limit their life space to the neighborhood. The transdisciplinary framework in this paper is less applicable for identifying health effects of areas beyond one's residential neighborhoods.

Conclusion

Whether built environment interventions in the neighborhood can enhance older adults' health remains an area for systematic exploration especially in urban contexts where

various health prerequisites are met. This integrative review shows that the intersections between density, culture, and geographical locations are not well covered by existing research. As cities undergo demographic transition, researchers have called for neighborhoods need to be re-conceptualized to integrate health and social care needs (Barton, Grant, & Guise, 2010; Biggs, & Carr, 2016; Buffel, Philipson, & Scharf, 2012; Cho, & Trivic, 2013; Diez Roux, & Mair, 2010; Howe, 2012; Rao, et al., 2007; Stock, & Ellaway, 2013). Studies on the interaction between neighborhood built environment and social environment and their effects on health can benefit from clearer heuristic frameworks that allow intervention and further research to confirm or reject their usefulness. Iterative processes of interventions and research are likely necessary if a majority of the older adults in urban areas are to age in their neighborhoods with better health.

Whereas research on macro level area effects are more difficult to implement especially in dense cities and existing neighborhoods, micro level area effects are potentially more easily translated into action at existing neighborhoods. This integrative review has resulted in a tentative transdisciplinary framework that is potentially helpful for researchers interested in the intersections of existing scientific knowledge on the neighborhood, and for whom details of the lived micro level realities, both social and physical, matter. Further advances in architecture and planning can play important indirect role in promoting population health (Diez Roux & Mair, 2010; Hall, Vogel, Stipelman, Stokols, Morgan, & Gehlert, 2012; McBride, et al., 2013; Stokols, et al, 2013), and is of significance especially in urban agglomerations which has undergone the epidemiologic transition (McKweon, 2009; Omran, 2005).

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Appendix 1. Comparing effects of neighborhood built environment vs. neighborhood social environment on *physical* health

S/N	Study	Participants (**N** sample size) (**A** age range)	Sampling method	Setting	Study design	Neighborhood built environment variables (*objective measures or some efforts to reduce same-source bias/ **composite of both) (^dichotomized) ([1] within time or distance buffer from home or neighborhood centroid)	Neighborhood social environment variables (*objective measures or some efforts to eliminate same-source bias / **composite of both) (^dichotomized) ([1] within time or distance buffer from home or neighborhood centroid)	Relationship & significance (**0** no significant relationship / **+** direct relationship / **-** inverse relationship) (*p≤0.05 / **p≤0.01 / ***p≤0.001)		Physical health outcomes (*objective measures or some efforts to eliminate same-source bias/ **composite of both) (^dichotomized)	Comments
								Built environ-ment	**Social environ-ment**		
1	La Gory, et al. (1985)	N=1185; A=60+	Stratified random sampling	Albany-Schenectady-Troy, New York, United States	Cross-sectional	Maintenance	Safety	+*	+*	Physical functioning (Shanas)	See also other appendices
2	Smith, & Sylvestre (2008)	N=137 A=55+	Purposive: retirees who had moved to senior citizen apartment within a year of the survey	senior citizen apartment in Winnipeg, Manitoba, Canada	Longitudinal (2 annual time points)	Access to grocery store^	Safety^	+**	0	Self-rated health^	See also other appendices
3	Martin, et al. (2010)	N=696; A=23-94 (Average age=60)	Purposive: persons with arthritis who visit a primary care network	Area within 1 mile from one's home in 2006 North Carolina, United States	Cross-sectional	Aesthetics	Cohesion	0	0	Physical HRQOL (SF-12v2)	See also other appendices
								+	+	Physical functioning (HAQ reversed)	
4	Parra, et al. (2010)	N=1863; A=60+	Stratified random sampling	50 neighborhoods in 2007 Bogota, Colombia as delimited by expert	Cross-sectional	Traffic safety^	Open space safety^	**+*** **	0	Physical HRQOL (SF-8)	See also other appendices
								+* **	+**	Self-rated health^	
5	Tomey, et al. (2013)	N=5959; A=46-84	Random	Baltimore, Chicago, Forsyth County, Los Angeles, New York City, and St Paul, United States. Neighborhood defined as area within 1mile buffer from one's	Cross-sectional	Walkability	Sociability	-***	+***	Physical HRQOL (SF-12v2)	See also other appendices

				home							
6	Byles, et al. (2014)	N=202 A=75-79	Random	7 local government areas in Sydney, Australia	Cross-sectional	Access to services^ (shops, transport etc.)	Safety^ (children, at night)	+*	+*	General health (SF-36)	See also other appendices
								+*	+*	Physical functioning (SF-36)	
								0	0	Physical functioning (LLFDI)	
								0	0	Body mass index	
7	Eibich, et al. (2016)	N=1305; A=20-87 (Average age=60)	Random	2012-2013 Berlin metropolitan area, Germany	Cross-sectional	Pollution^	Noise^	-*	0	Physical HRQOL (SF-12)	See also other appendices
								0	0	Self-rated health^	
								0	0	Morbidity**	
8	Krause (1996)	N=1103 A=65+	Random	1992-1993 United States	Cross-sectional	Deterioration* (yard and sidewalks, buildings etc.)	Friendship strain (often expect too much, disapproving etc.)	+*** (non-linear)	+***	Self-rated health	
9	Balfour, & Kaplan (2002)	N=1135; A=55+	Random	1994 Alameda County, California, United States	Longitudinal (2 annual time points in 1994 and 1995)	Lighting^	Crime^	+*	+*	Loss of physical function	Nonsignificant exposure variables not shown here are heavy traffic, public transport access and trash problems.
10	Bowling, et al. (2006)	N=999; A=65+	Random	Local areas in 2001 Britain, UK defined as area within 15-20 minutes' walk or drive from one's home	Cross-sectional	Quality of facilities	Neighborliness	+**	+	Physical functioning	Nonsignificant neighborhood variables not shown here include safety and political engagement.
								+***	+**	Self-rated health	
11	Subramanian, et al. (2006)	N=1926; A=67-99	Random	28 census tracts in 1985 New Haven, United States	Cross-sectional	Number of churches, synagogues, etc. per capita*^	% seniors*	-*	+*	Self-rated health^	Nonsignificant neighborhood variables not shown here are % annual income > USD75000, and % African American.
						Number of beauty parlors, cafes, etc. per capita*^	Residential stability*	0	+*		
						Number of hospitals, pharmacies, etc. per capita*^	% below poverty*	0	-*		
						Number of liquor outlets, fast food outlets, etc. per capita*^	Neighborhood median income*	0	0		
12	Wen, et al. (2006)	N=229;	Stratified random	Census tracts in	Cross-sectional	Aesthetics	% below	+**	0	Self-rated	

		A=50-67	sampling	Cook County, United States		(housing, parks, etc.)	poverty, % high school graduates, and % college-educated*			health^	
						Local services (access to public transport, shops, etc.)	Cohesion and efficacy (friendliness, safety, etc.)	0	0		
13	Beard, et al. (2009)	N=937857 A=65+	Random	2138 census tracts in 2000/2005 New York, United States	Cross-sectional	Land use mix*	Residential stability*	0	-**	Physical disability	
						Trash and litter*	Crime*	0	-**		
						Heavy traffic*	Socioeconomic status*	0	-**		
						Intersections street trees and access to bus stop*	% foreign born*	-**	-**		
14	Aspinall, et al. (2010)	N=237 A=60-97	Random	Urban and rural Britain, UK	Cross-sectional	Facilities at local park (café, toilet, etc.)	Nuisance at local park (vandalism, dog fouling, etc.)	+**	0	Mobility^	Nonsignificant neighborhood variables not shown here include pavement, seats, maintenance, things to watch, water feature, and public transport.
						Trees along route to local park	Nuisance at local park	+*	0		
15	Clarke, et al. (2012)	N=949; A=50+	Random	Census tracts in 2000 Chicago, United States	Cross-sectional	Recreational centres*	% seniors*	0	-**	Cognitive function (memory, orientation, etc.) (Telephone Interview for Cognitive Status)	Nonsignificant neighborhood variables not shown here include socioeconomic disadvantage, park area, and disorder.
						Libraries, churches, schools, community centres*	% affluence*	+***	0		
16	Moore, et al. (2013)	N=1503; A=45-84 (Average age=60)	Random	2005-2007 Baltimore, Chicago, Forsyth County, Los Angeles, New York City, and St Paul, United States.	Longitudinal (4 time points from 2000 to 2007	Aesthetics*[1]	Socioeconomic status* of census tract	0	-**	Body mass index*	Nonsignificant home neighborhood variables not shown here are healthy food, walkability, and safety. Results for workplace neighborhood variables not shown here.
						Recreational facilities*[1]	Cohesion*[1]	-**	0		
17	Kershaw, et al.	N=3940;	Random	2004 Baltimore,	Longitudinal (5	Walkability etc.*^	Safety and	+**/+*	+**/0	Cardiovascular	Results are for

	(2014)	A=45-84		Chicago, Forsyth County, Los Angeles, New York City, and St Paul, United States.	time points from 2000 to 2011)		cohesion etc.*^			disease^	ethnic African Americans/ Whites respectively. Nonsignificant results for Hispanics are not shown here.
18	Michael, et al. (2014)	N=2003; A=66+	Random	Portland, Oregon, United States	Longitudinal (7 time points from 1986 to 2002)	Walkability	Socioeconomic status	0	-**	Body mass index*	
						Green space	Socioeconomic status	0	-**		
19	Christine, et al. (2015)	N=5124 A=45-84 (Average age=61)	Random	Census tracts in 2003-2012 Baltimore, Chicago, Forsyth County, Los Angeles, New York City, and St Paul, United States.	Longitudinal (5 time points from 2000 to 2012)	Healthy food options*[1]	Cohesion*[1]	-*	0	Type 2 Diabetes Mellitus*^	Nonsignificant neighborhood variables not shown here are markets and indoor exercise facilities.
						Walkability*[1]	Safety*[1]	-*	0		
20	Samuel, et al. (2015)	N=6874; A=65+	Random	United States	Cross-sectional	Street disorder* (litter, buildings, etc.)	Cohesion	-*	+*	Lower extremity function* (Short Physical Performance Battery)	
								0	0	Grip strength*	
								0	+*	Lung function* (peak expiratory flow)	
21	Smalls, et al. (2015)	N=615; A=18+ (Average age=61)	Purposive: eligible patients with type 2 diabetes mellitus from two medical centers	Urban southeastern United States	Cross-sectional	Aesthetics	Violence	0	+*	Low-density lipoprotein cholesterol level*	Nonsignificant variables not shown here include systolic blood pressure, neighborhood safety, crime, recreational facilities, and healthy food options.
						Walkability	Cohesion	0	-*	Hemoglobin A1c*	
22	Wong, et al. (2015)	N=801; A=50+	Convenience sampling at parks, housing estates, markets etc.	Sha Tin and Tuen Mun, Hong Kong, China	Cross-sectional	Outdoor spaces and facilities	Information and communication inclusivity	+*	+*	Self-rated health	Nonsignificant neighborhood variables not shown here include transport, community support and health services, and civic participation and
						Avenues for social participation	Respect and inclusion norms	+*	0		

											employment norms.
23	Inoue, et al. (2016)	N=3810; A=65+	Random	20 primary school districts in 2010 Chita peninsula, Aichi prefecture, Japan	Cross-sectional	Access to exercise facilities	Helpfulness, trust, and attachment	-*/0	0	Cardiovascular risk*	Results are for men/women respectively. Nonsignificant neighborhood variables not shown here are shops selling fruits and vegetables, and walkability.
						Traffic safety	Helpfulness, trust, and attachment	+**/0	0		
24	Timmermans, et al. (2016)	N=303; A=71-80	Random	2008 Hetfordshire, UK	Cross-sectional	Parks, seats, public transport and facilities	Cohesion	0	0	Clinical osteoarthritis in knees and/or hip^	
25	Wing, et al. (2016)	N=5950; A=45-84 (Average age=62)	Random	Baltimore, Chicago, Forsyth County, Los Angeles, New York City, and St Paul, United States.	Longitudinal (5 time points from 2000 to 2011)	Healthy food options*[1]	Cohesion and safety*[1]	-	0	Coronary artery calcium* (Agatston)	Nonsignificant neighborhood variables not shown here are recreational facilities, supermarkets and walkability.
26	Ailshire, et al. (2017)	N=779; A=55-98	Random	United States	Cross-sectional	Maintenance of streets and buildings	Disadvantage*	0	0	Cognitive function* (Short Portable Mental Status Questionnaire)	
						Maintenance of streets and buildings x fine particulate matter air pollution (interaction term)	Affluence*	-*	+*		
27	Mathis, et al. (2017)	N=1698; A=65+	Random	Census tracts in 2010 Flint, Michigan, United States	Cross-sectional	Park*^	Crime*	-*	0	Body mass index	
28	Orban, et al. (2017)	N=4480; A=45-75 (Average age=60)	Random	Mülheim, Bochum, and Essen, Germany	Cross-sectional	Green* in 100m buffer (Normalized Difference Vegetation Index)	Safety	+*	+*	Self-rated health	
						Green* in 1000m buffer (NVDI)	Helpfulness and trust	0	+*		
29	Wong, et al. (2017)	N=688; A=60+	Purposive: quota sampling	Sha Tin and Tai Po, 2015 Hong Kong, China	Cross-sectional	Transport	Civic participation and employment norms	+*	0	Self-rated health	Nonsignificant neighborhood variables not shown here
						Outdoor spaces	Respect and	+*	+*		

						and facilities	inclusion norms				include avenues for social participation, community support and health services.
						Green cover*[1]	Information and communication inclusivity	+*	0		
29	**Total**				Longitudinal only	**13/29** 4/7	**6/29** 1/7	**21** 6	**13** 3		

S/N – Identity number.
Shaded boxes – More significant correlation. Different colors are used to facilitate counting.

Appendix 2. Comparing effects of neighborhood built environment vs. neighborhood social environment on *psychosocial* health

S/N	Study	Participants (**N** sample size) (**A** age range)	Sampling method	Setting	Study design	Neighborhood built environment variables (*objective measures or some efforts to reduce same-source bias/ **composite of both) (^dichotomized)	Neighborhood social environment variables (*objective measures or some efforts to eliminate same-source bias / **composite of both) (^dichotomized)	Relationship & significance (**0** no significant relationship / **+** direct relationship / **-** inverse relationship) (*p≤0.05 / **p≤0.01 / ***p≤0.001)		Psychosocial health outcomes (*objective measures or some efforts to eliminate same-source bias/ **composite of both) (^dichotomized)	Comments
								Built environ-ment	**Social environ-ment**		
1	La Gory, et al. (1985)	N=1185; A=60+	Stratified random sampling	Albany-Schenectady-Troy, New York, United States	Cross-sectional	Maintenance	Safety	+*	+*	Mastery (Pearlin & Schooler)	
2	Smith, & Sylvestre (2008)	N=137 A=55+	Purposive: retirees who had moved to senior citizen apartment within a year of the survey	senior citizen apartment in Winnipeg, Manitoba, Canada	Longitudinal (2 annual time points)	Access to grocery store^	Safety^	0	-***	Depression (CES-D)	See also other appendices
								0	-**	Morale (PGC)	
								0	0	Esteem (Bachman-Rosenberg)	
3	Martin, et al. (2010)	N=696; A=23-94 (Average age=60)	Purposive – persons with arthritis who visit a primary care network	Area within 1 mile from one's home in 2006 North Carolina, United States	Cross-sectional	Aesthetics	Cohesion	+*	+	Mental HRQOL (SF-12v2)	See also other appendices
								0	-*	Depression^ (CES-D)	
4	Parra, et al. (2010)	N=1863; A=60+	Stratified random sampling	50 neighborhoods in 2007 Bogota, Colombia as delimited by	Cross-sectional	Traffic safety^	Open space safety^	+**	**+***	Mental HRQOL (SF-8)	See also other appendices

				expert							
5	Tomey, et al. (2013)	N=5959; A=46-84	Random	Baltimore, Chicago, Forsyth County, Los Angeles, New York City, and St Paul, United States. Neighborhood defined as area within 1mile buffer from one's home	Cross-sectional	Walkability	Sociability	-**	**+***	Mental HRQOL (SF-12v2)	See also other appendices
6	Byles, et al. (2014)	N=202 A=75-79	Random	7 local government areas in Sydney, Australia	Cross-sectional	Access to services^ (shops, transport etc.)	Safety^ (children, at night)	0	+*	Mental health (SF-36)	See also other appendices
								+*	+*	Vitality (SF-36)	
						Traffic nuisance	Safety	+*	+*		
7	Eibich, et al. (2016)	N=1305; A=20-87 (Average age=60)	Random	2012-2013 Berlin metropolitan area, Germany	Cross-sectional	Pollution^	Noise^	0	**-***	Mental HRQOL (SF-12)	See also other appendices
30	Moorer, & Suurmeijer (2001)	N=723; A=66+	Random	22 neighborhoods in Groningen, Netherlands as delimited by the municipality.	Cross-sectional	Activities by the association for the wellbeing of the elderly*	Crime*	0	0	Loneliness (De Jong Gierveld)	Nonsignificant neighborhood variables not shown here is % seniors. Further analysis not conducted given low intraclass correlation.
31	Kubzansky, et al. (2005)	N=2109; A=65+	Stratified random sampling	28 census tracts in 1985 New Haven, Connecticut, United States	Cross-sectional	Number of beauty parlors, cafes, etc. per capita*^	% below poverty*	0	**+*	Depression (CES-D)	Nonsignificant neighborhood variables not shown here are % annual income > USD75000, % African American, residential stability, and number of liquor outlets, fast food outlets, etc. per capita^
						Number of hospitals, pharmacies, etc. per capita*^	% seniors*	0	**-*		
32	Echeverria, et al. (2008)	N=5943; A=45-84 (Average age=61)	Random	2000-2002 Baltimore, Chicago, Forsyth County, Los Angeles, New York City, and St	Cross-sectional	Neighborhood problems (Traffic, trash, etc.)	Cohesion	+***	-***	Depression (CES-D)	

				Paul, United States.							
33	Miles, et al. (2012)	N=1944; 40% A=65+	Purposive: community-dwelling persons who have difficulties with activities of daily living matched with those without by age, gender, ethnicity and area of residence.	Census tracts in Miami-Dade County, United States	Cross-sectional	Land use mix*	% seniors*	0	+***	Depression (CES-D)	
						Park area within quarter-mile buffer from census tract*	Disadvantage*	-**	+**		
						Housing density*	Residential stability* (% in same house for 5+ years)	-***	-**		
34	Cramm, et al. (2013)	N=772; A=70+	Stratified random sampling	72 neighborhoods in Lage Land/ Prinsenland, Lombardijen, Oude Westen, and Vreewijk Rotterdam, Netherlands	Cross-sectional	Lighting, transport and public facilities	Social capital (neighbors help, participate, etc.)	+*	+***	Wellbeing (SPF-IL) (affection, comfort, etc.)	Nonsignificant neighborhood variable not shown here is safety.
						Lighting, transport and public facilities	Cohesion (neighbor can advise, work together, etc.)	+*	+***		
35	Hernandez, et al. (2015)	N=570; A=60-90	Purposive: eligible Latinos recruited from 27 senior centers	Los Angeles, United States	Longitudinal (3 annual time points)	Traffic safety	Crime safety	0	-	Depression^ (GDS)	Nonsignificant neighborhood variables not shown here are walking/cycling facilities, and aesthetics.
36	Ivey, et al. (2015)	N=884; A=65+	Purposive: Recruited from 77 senior organizations located in areas of varying housing density	103 census tracts in Alameda County, Cook County, Allegheny County, and Wake and Durham Counties, United States	Cross-sectional	Traffic safety	Crime safety	-*	-*	Depression^ (CES-D)	
						Traffic safety	Neighbors would help another neighbor they do not know	-*	-**		
37	Mair, et al. (2015)	N=548; A=45-84 (Average age=62)	Random	New York City, United States	Longitudinal (2 time points from 2000 to 2007)	Aesthetic*	Cohesion*	0	+	Depression (CES-D)	Nonsignificant neighborhood variables not shown here include safety and violence.
38	Shiue (2015)	N=3542; A=80-95	Random	2007-2012 urban and rural Europe	Cross-sectional	Trash	Crime	0	+*	Wellbeing^ (WHO-5)	Results shown are for respondents aged 80-95. Nonsignificant neighborhood variables not

											shown here include traffic congestion.
39	Chen, et al. (2016)	N=400; Average age=80	Purposive: community dwelling adults of varying frailty recruited during free health screening.	4 low-income public rental housing estates in Hong Kong, China	Cross-sectional	Access to medical facilities	Named neighbor(s) who can help buy groceries, accompany to clinics^	-**	-*	Depression (GDS-15)	Nonsignificant neighborhood variables not shown here include access to recreational facilities, necessities, dining.
40	Liu, et al. (2016)	N=1225 A=60+	Random	Urban China	Cross-sectional	Leisure amenities	Voluntary associations	0	0	Depression (CES-D)	
						Leisure amenities x ADL limitations (interaction term)	Net Income per capita*	-***	0		
41	Stahl, et al. (2016)	N=1049 A=55+	Random	2014 Allegheny County, United States	Cross-sectional	Condition of buildings, walkability, etc.	Cohesion (help, trust etc.)	0	0	Depression (PHQ-8)	
						Condition of buildings, walkability, etc.	Cohesion x living alone (interaction term)	0	+*		
42	Zhang, and Zhang (2017)	N=720; A=50-90	Purposive selection of neighborhoods; sampling methods of older adults not reported.	11 urban neighborhoods in 2015 Cangzhou, Hejian, and Huanghua City, northern China.	Cross-sectional	Aesthetics and access to services	Sense of community	0	+***	Meaning in life (Krause) (value, goals, etc.)	
								0	+*	Positive affect (PANAS)	
								-***	0	Negative affect (PANAS)	
19	**Total**				Longitudinal only	**3/19** 0/3	**12/19** 3/3	**6** 0	**18** 4		

S/N – Identity number.
Shaded boxes – More significant correlation. Different colors are used to facilitate counting.

Appendix 3. Comparing effects of neighborhood *built* environment on physical health vs. psychosocial health

S/N	**Study**	**Participants** (**N** sample size) (**A** age range)	**Sampling method**	**Setting**	**Study design**	**Neighborhood built environment variables** (*objective measures or some efforts to reduce same-source bias/ **composite of both) (^dichotomized)	**Relationship & significance** (**0** no significant relationship / **+** direct relationship / **-** inverse relationship) (*p≤0.05 / **p≤0.01 /	**Physical health outcomes** (*objective measures or some efforts to eliminate same-source bias/ **composite of both) (^dichotomized)	**Psychosocial health outcomes** (*objective measures or some efforts to eliminate same-source bias/ **composite of both) (^dichotomized)	**Comments**

						([1] within time or distance buffer from home or neighborhood centroid)	***p≤0.001)				
							Physic-al health	**Psycho-social health**			
1	La Gory, et al. (1985)	N=1185; A=60+	Stratified random sampling	Albany-Schenectady-Troy, New York, United States	Cross-sectional	Maintenance	+*	+*	Physical functioning (Shanas)	Mastery (Pearlin & Schooler)	See also other appendices
2	Smith, & Sylvestre (2008)	N=137 A=55+	Purposive: retirees who had moved to senior citizen apartment within a year of the survey	senior citizen apartment in Winnipeg, Manitoba, Canada	Longitudinal (2 annual time points)	Access to grocery store^	+**	0	Self-rated health^	Depression (CES-D)	See also other appendices; nonsignificant neighborhood variables are not shown here.
3	Martin, et al. (2010)	N=696; A=23-94 (Average age=60)	Purposive: persons with arthritis who visit a primary care network	Area within 1 mile from one's home in 2006 North Carolina, United States	Cross-sectional	Aesthetics	0	+*	Physical HRQOL (SF-12v2)	Mental HRQOL (SF-12v2)	See also other appendices
						Walkability	0	0			
4	Parra, et al. (2010)	N=1863; A=60+	Stratified random sampling	50 neighborhoods in 2007 Bogota, Colombia as delimited by expert	Cross-sectional	Traffic safety^	+***	+**	Physical HRQOL (SF-8)	Mental HRQOL (SF-8)	See also other appendices
						Traffic noise^	-***	-**			
						Access to cycling network*^[1]	0	+			
						Park coverage*^[1]	0	0			
						Access to bus rapid transit stop*^[1]	0	0			
5	Tomey, et al. (2013)	N=5959; A=46-84	Random	Baltimore, Chicago, Forsyth County, Los Angeles, New York City, and St Paul, United States. Neighborhood defined as area within 1 mile buffer from one's home	Cross-sectional	Walkability	+***	-**	Physical HRQOL (SF-12v2)	Mental HRQOL (SF-12v2)	See also other appendices
6	Byles, et al. (2014)	N=202 A=75-79	Random	7 local government areas in Sydney, Australia	Cross-sectional	Access to services^ (shops, transport etc.)	+*	0	General health (SF-36)	Mental health (SF-36)	See also other appendices
							+*	+*	Physical functioning (SF-36)	Vitality (SF-36)	
7	Eibich, et al. (2016)	N=1305; A=20-87 (Average age=60)	Random	2012-2013 Berlin metropolitan area, Germany	Cross-sectional	Clinics^[1]	0	0	Physical HRQOL (SF-12)	Mental HRQOL (SF-12)	See also other appendices
						Shops^[1]	0	0			
						Public Transport^[1]	+**	+**			
						Pollution^	-*	0			

43	van Dijk, et al. (2016)	N=186; A=70+	Purposive: Frail community-dwelling participants and random match for gender and frailty	A neighborhood in 2011-2012 Rotterdam, Netherlands	Longitudinal quasi-experimental (3 half-yearly time points)	Integrated neighborhood approach (service intervention)	-**	0	Physical functioning (SF-20)	Mental health (SF-20)	
							0	-	General health (SF-20)	Wellbeing (SPF-IL) (affection, comfort, etc.)	
44	Chan, et al. (2017)	N=48; A=60+	Purposive: Socially isolated participants were randomly allocated into control and intervention groups	A district elderly community center in 2016 Hong Kong, China	Longitudinal quasi-experimental (3 quarterly time points)	Twice weekly tai chi qigong outdoor group exercise program (intervention)	+	0	Physical HRQOL (SF-12) at T1	Mental HRQOL (SF-12) at T1	Nonsignificant outcome variables not shown here are MHI-18 anxiety, depression, affect subscales and total score.
							0	-*	Physical HRQOL (SF-12) at T2	Loneliness (De Jong Gierveld) at T1	
							0	+*	Physical HRQOL (SF-12) at T2	Social support satisfaction (RSSQ) at T1	
							0	+	Physical HRQOL (SF-12) at T2	Behavior control (MHI-18) at T1	
							0	0	Physical HRQOL (SF-12) at T2	Esteem (Rosenberg) at T1	
45	Ruijsbroek, et al. (2017)	N=171; A=65+	Stratified random sampling	30 neighborhoods in Barcelona, Spain, delimited by census tracts.	Cross-sectional	Amount of greenery	+*	+**	Self-rated health	Mental health (MHI-5)	Analyses conducted for younger persons or in less dense cities are not shown here.
						Quality of greenery	+*	+**			
10	**Total**					Longitudinal only	**8** 3	**8** 4	**5/10** 1/3	**3/10** 1/3	

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Appendix 4. Comparing effects of neighborhood *social* environment on physical health vs. psychosocial health

S/N	**Study**	**Participants** (**N** sample size) (**A** age range)	**Sampling method**	**Setting**	**Study design**	**Neighborhood social environment variables** (*objective measures or some efforts to reduce same-source bias/ **composite of both) (^dichotomized)	**Relationship & significance** (**0** no significant relationship / **+** direct relationship / **-** inverse relationship) (*p≤0.05 / **p≤0.01 / ***p≤0.001)		**Physical health outcomes** (*objective measures or some efforts to eliminate same-source bias/ **composite of both) (^dichotomized)	**Psychosocial health outcomes** (*objective measures or some efforts to eliminate same-source bias/ **composite of both) (^dichotomized)	**Comments**
							Physic-al health	**Psycho-social health**			

1	La Gory, et al. (1985)	N=1185; A=60+	Stratified random sampling	Albany-Schenectady-Troy, New York, United States	Cross-sectional	Safety	+*	+*	Physical functioning (Shanas)	Mastery (Pearlin & Schooler)	See also other appendices
2	Smith, & Sylvestre (2008)	N=137 A=55+	Purposive: retirees who had moved to senior citizen apartment within a year of the survey	senior citizen apartment in Winnipeg, Manitoba, Canada	Longitudinal (2 annual time points)	Safety^	0	-***	Self-rated health^	Depression (CES-D)	See also other appendices
3	Martin, et al. (2010)	N=696; A=23-94 (Average age=60)	Purposive: persons with arthritis who visit a primary care network	Area within 1 mile from one's home in 2006 North Carolina, United States	Cross-sectional	Safety	0	0	Physical HRQOL (SF-12v2)	Mental HRQOL (SF-12v2)	See also other appendices
						Cohesion	0	+			
						% below poverty* in census tract	0	0			
4	Parra, et al. (2010)	N=1863; A=60+	Stratified random sampling	50 neighborhoods in 2007 Bogota, Colombia as delimited by expert	Cross-sectional	Open space safety^	0	+***	Physical HRQOL (SF-8)	Mental HRQOL (SF-8)	See also other appendices
5	Tomey, et al. (2013)	N=5959; A=46-84	Random	Baltimore, Chicago, Forsyth County, Los Angeles, New York City, and St Paul, United States. Neighborhood defined as area within 1mile buffer from one's home	Cross-sectional	Sociability	+***	+***	Physical HRQOL (SF-12v2)	Mental HRQOL (SF-12v2)	See also other appendices
6	Byles, et al. (2014)	N=202 A=75-79	Random	7 local government areas in Sydney, Australia	Cross-sectional	Safety^ (children, at night)	+*	+*	General health (SF-36)	Mental health (SF-36)	See also other appendices
							+*	+*	Physical functioning (SF-36)	Vitality (SF-36)	
							-	+*	Self-rated health	Depression	
7	Eibich, et al. (2016)	N=1305; A=20-87 (Average age=60)	Random	2012-2013 Berlin metropolitan area, Germany	Cross-sectional	Noise^	0	-***	Physical HRQOL (SF-12)	Mental HRQOL (SF-12)	See also other appendices
						Cohesion^	0	+**			
						Crime*	0	0			
						% children*	0	0			
						% seniors*	0	0			
						% welfare recipients*	-*	0			
46	Young, et al. (2004)	N=9171; A=73-78; Female only	Random	1999 Australia	Cross-sectional	Cohesion	+***	+***	Physical HRQOL (SF-36)	Mental HRQOL (SF-36)	
						Safety	+***	+***			
47	Deeg, & Thomése (2005)	N=352; A=55-85	Random: Community-dwelling persons	1993 Netherlands	Cross-sectional	Relative income^* (Neighborhood income as	+**	-*	Cognitive functioning (MMSE)	Depression (CES-D)	Analyses conducted for personal income

			with income above EUR1600			compared to personal income)	0	-*	Self-rated health	Loneliness (De Jong Gierveld)	effects are not shown here. Cognitive ability is re-categorized as biological health.
48	Brown, et al. (2009)	N=273; A=70+	Stratified random sampling	2002 East Little Havana, Miami, Florida, United States	Cross-sectional	Neighboring (supportive acts, noise, etc.) (Skjaeveland, Garling & Maeland)	+	0	Cognitive functioning*: Communication, time orientation, etc. (Loewenstein); memory (Fuld); and visual attention, motor sequencing, etc. (Color Trails)	Anxiety (Spielberger) and depressive affect (CES-D)	
49	Menec, et al. (2010)	N=77930; A=65+	Random	Neighborhoods in 2004 Winnipeg, Canada as defined by census tract	Cross-sectional	Neighborhood income*^ (Q5 richest quintile as compared to Q2 quintile)	-*	0	CHF*^: congestive heart failure	Depression*^	Health variables unrelated to neighborhood variables and are not shown here: arthritis, diabetes, hypertension, chronic obstructive pulmonary disease, and dementia.
							-*	0	IHD*^: ischemic heart disease		
							0	0	AMI*^: acute myocardial infraction		
							-*	0	Stroke*^		
						% seniors*	0	+*	CHF*^	Depression*^	
							+*	+*	IHD*^		
							0	+*	AMI*^		
							0	+*	Stroke*^		
50	Kwag, et al. (2011)	N=567; A=60-96	Purposive: Korean American community-dwelling older adults	233 census tracts in 2008 Tampa and Orlando, Florida, United States	Cross-sectional	% below poverty*	-*	0	Self-rated health	Depression (GDS-SF)	
						% seniors*	0	0			
						Ethnic diversity*	0	0			
51	Roh, et al. (2011)	N=420; A=60-98	Purposive: Korean American	2010 New York City metropolitan area, United States	Cross-sectional	% Korean	0	0	Self-rated health	Depression (CES-D)	
						Safety	0	-*			
						Cohesion	0	0			
13	**Total**						**7**	**11**	**2/13**	**6/13**	
						Longitudinal only	0	1	0/1	1/1	

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