

Associations between neighborhood built environment and social health among older adults in Harbin, China

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Abstract

Amid rapid urbanization and renewal, community social spaces are being restructured, posing adaptation challenges for the elderly due to physical aging and entrenched beliefs. The decline in social functions and participation exacerbates their social and health risks. It has been shown that community space, as the most frequently used spatial vehicle in the daily lives of older people, has an active intervention value for the physical and mental health of older people, yet fewer studies have discussed the relationship between the built environment and the social health of older residents. The study begins with the social dimension of health and attempts to proactively intervene in the social health crisis of old age from the perspective of the community environment. Combined with the rootedness theory, it reveals the role of the community built environment on the social health of the elderly, and proposes a theoretical model of 'environment-interaction-social health'.

Keywords

Built Environment, Social Health, The Elderly, Impact Relationship, Community, Theoretical Model

1. Introduction

China is one of the most rapidly ageing countries in the world. At the end of 2023, the proportion of older persons aged 65 and above will reach 217 million, accounting for 15.4 percent of the total population. (Wang, 2024). According to the relevant international standards, a moderately ageing society has been entered. However, to date, society has yet to form a relatively comprehensive understanding of the problems and challenges posed by an ageing population and develop mature coping strategies. The elderly population has greater health vulnerability, with a sharp increase in the prevalence of chronic diseases and a significantly higher risk of multiple organ ageing, declining immunity and disability and dementia. In

addition, retirement brings with it the loss of social roles, and the large population movements caused by urban construction and stock renewal destroy native social networks, leaving older people with fewer and fewer 'networks of acquaintances', and a growing sense of isolation and a crisis of social health. Healthy ageing is a common choice of the international community, which requires all subjects to work together for a high quality of ageing in health, dignity, socialisation, sociability, self-fulfilment and access to security to achieve the best results(Wang, 2023)。

Under the long-lasting influence of the family planning policy, the size of families in China has become increasingly small.(Ma, 2023). The average household size in China (mainland) in 2020 will be only 2.62 persons. At present, the elderly often choose to live separately from their younger generation, and the number of 'empty-nest' families is increasing. The role of the family in supporting the elderly has greatly diminished, while the demand for community support has increased significantly. At the same time, the combination of diminishing contact with members of the social network and declining physical and cognitive functioning has led to a reduction in the scope of travelling among older persons. The community becomes the main place for daily activities. In addition to health care coverage, the built environment of the community plays a key role in influencing their daily behaviours and health. A large number of studies have focused on the relationship between the community environment and the impact of physical and mental health of older adults, but more research findings are still needed to examine healthy communities from a social dimension.

2. Literature review

Social health is the same concept as social well-being, which is defined by the World Health Organisation (WHO) as one of the three dimensions of human health, along with physical health and mental health. In 1951, the American sociologist Parson first introduced the concept of social health, which refers to 'the state of the individual in his or her dealings with others and interactions with the social environment' (Parsons, 1951). This requires individuals to have good social adaptability and harmonious social relationships; otherwise, they will not be able to communicate and co-operate smoothly in society, resulting in tensions in interpersonal relationships, which in turn will have an impact on their physical and mental health. In recent years, the fields of sociology, psychology, medicine and behaviour have provided a multidimensional interpretation of social health. A range of concepts such as 'social adaptation, social support, social networks, social participation, social functioning, social integration, social identity, social cohesion, meaningful social contact' have emerged. Actually, social health in a broader sense encompasses both cohesion , mutual trust and support at the collective level, as well as healthy social relationships and interactional behaviours at the individual level. Also, the formation of good social support among individuals will help to promote collective self-identity , providing more possibilities for group social health. (Lin et al., 2016; Dong et al., 2023). This study focuses on the elderly population, that is, the social health at the individual level, which mainly includes two dimensions of individual social function and social relationship (Hahn et al., 2010). It can be understood as the ability to adapt well to the environment, to have harmonious social network relationships and to have the ability to participate in social activities.

Social relations owned by residents are essentially a kind of social resources, which are directly related to their socio-economic status, personality characteristics and living environment. Social adaptability increases with age, and people aged 30-65 tend to have a high level of social health due to their strong adaptability to social participation, career and family life. After retirement, people quickly leave the workplace role, interpersonal activities are greatly reduced, social participation is reduced, and the level of social health tends to decline(Renne, 1974). The loss of social value and the loneliness that comes with shopfronts threaten the physical and mental health of the elderly population, and they need a flexible and

constantly evolving living environment to compensate for these changes. In 2003, Mary E. Northridge and others joined with scholars in the fields of urban planning and public health to summarise the social and environmental factors that influence health, forming a framework for influencing human health and well-being (Figure 1) (Northridge et al., 2003). Considering that the natural environment is a contextual factor that influences the health outcomes of all living things, including urban dwellers. Whereas the built environment (including the artificially created physical environment of buildings, transport systems and development space) is the prospective factor and an important intermediate level factor, and is considered to be the level most vulnerable to active policy intervention. So clarifying the relationship between the built environment and health outcomes is a necessary part of the solution.

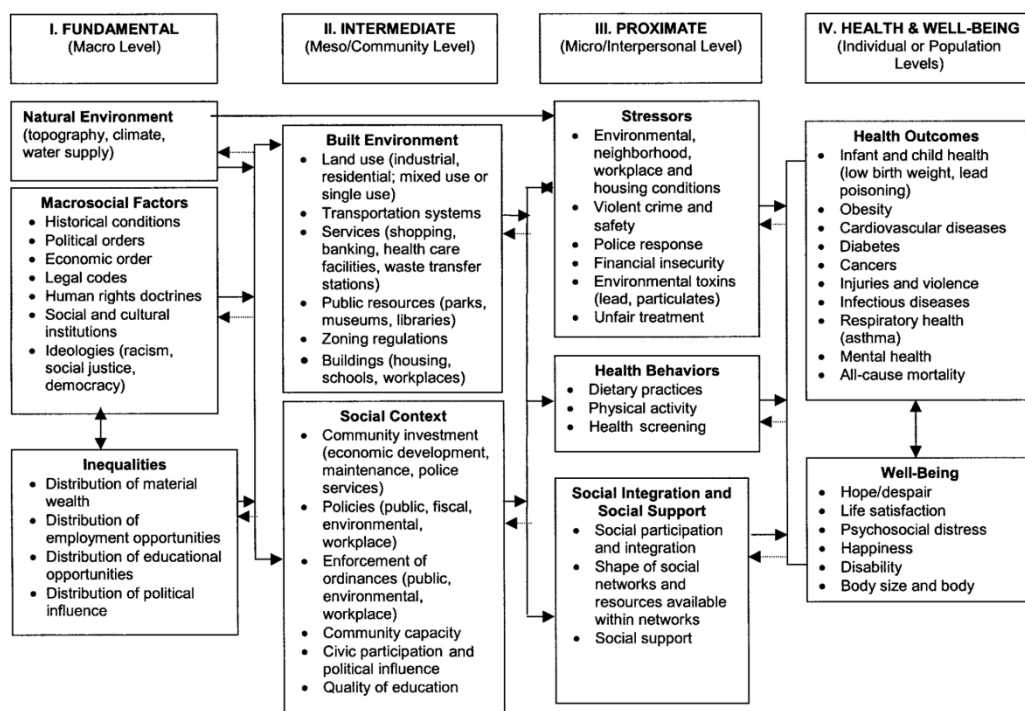


Figure 1 The Social and Environmental Determinants of Health Promotion. Source: Northridge et al., 2003

The community built environment is an important physical spatial vehicle for residents to carry out social activities, which affects the social health of individuals, and the Interactive behaviors generated in space are important influence ways. Residents' daily shallow social interactions and survival necessity behaviours take place mainly in the community and the surrounding places such as shops, supermarkets, food courts, roadside stalls, etc. The number, accessibility, diversity, walkability, and landscape environment of these types of places all have an impact on interaction behaviours and social support (Chen et al., 2020; Yang and Sui, 2021). Libraries, schools, community parks, community centres, etc. are necessary places in the community where collective behaviour takes place, which promotes social cohesion in the community and enhances a friendly atmosphere in the community (Cohen et al., 2008; Mazumdar et al., 2018). Due to the small activity radius of the elderly, a favourable community environment and supportive public resources are conducive to the promotion of physical and social activity among older residents and to the avoidance of social isolation (Levasseur et al., 2015). The built environment can also have an impact on the social health of residents by influencing their subjective perceptions. Perceived good spatial quality of recreational areas, satisfaction with the landscape environment, etc. will to some extent mobilise residents' willingness to travel and provide more opportunities for interpersonal exchanges (Yang and Sui, 2021). A favourable community atmosphere will provide residents with more emotional, informational and

instrumental support, thereby enhancing the sense of community and collective effectiveness. In addition, the equitable distribution of public resources in the community contributes to a more positive social environment, where good norms, order and social consensus are necessary to ensure the sustainability of collective behaviour and contribute to mutual trust and reciprocity among individuals and social groups and to the development of a climate of inclusiveness that fosters community cohesion (Brueckner and Largey, 2008; French et al., 2014).

At present, most of the research focuses on the relationship between the environment and the physical and mental health of the elderly, and the research on the relationship between the built environment and the social connection of the elderly residents is still in its infancy, and most of the research stays in the effect of the open space, public green space, etc. on the social interaction of the crowd, but the deeper mechanism of the role of the mechanism and the path of regulation has not yet been clarified. The reason for this is, on the one hand, the complexity of social health measurement standards and the fact that conceptual definitions and dimensions have not yet been harmonised. On the other hand, most of the studies lack a systematic collation of built environment indicators. Based on the above analyses, this study, on the basis of further clarifying the concept of social health of the elderly population, through in-depth research and analyses, adopts the theory of rootedness, clarifies the system of influencing elements of the built environment of the community, and finally puts forward the theoretical model of 'community environment - social health of the elderly'.

3. Research design

Because of the significant differences between China's socio-cultural background, urban construction methods, and community management modes and those of Western countries, the results related to foreign social health and its environmental influences cannot be fully applied to China's local communities. The study used the data collection method of semi-structured interviews to conduct in-depth interviews with elderly residents in the downtown area of Harbin. Using a combination of transcripts and audio-recorded interviews, based on the theoretical foundations of environmental-behavioural relationship theory, social interaction theory and established research foundations such as the relationship between the environment and social health. The four dimensions of respondents' basic information, perceived community environment, social interaction, and social health were used as entry points for information acquisition. And the three-stage translation and coding using the rootedness theory, to clarify the composition of the community environmental influence elements of the social health of the elderly in the downtown area of Harbin.

3.1. Survey design

Selection of in-depth interview sample areas: The Urban Statistical Yearbook and other relevant data indicate that the proportion of elderly residents in the Harbin metropolitan area will be 25.5 percent at the end of 2022. Considering the location, the built environment, the population base and the distribution of the elderly, the four central urban areas of Daowai, Doli, Xiangfang and Nangang (with the proportion of the elderly population at 30.5%, 28.9%, 26.0% and 23.4% respectively) were selected as the pre-study areas because of their representativeness. First-hand information on the research subjects was obtained through interviews with the residents and relevant workers involved in the region, as well as the collection of relevant policy documents, press releases and statistical yearbooks through the Internet. Based on the pre-survey, the interview sites were finally selected in parks, squares, community micro-activity spaces, green spaces, activity centres, shopping malls, fresh food supermarkets and other places in typical communities in the four urban areas.

Semi-Structured Interview Design: The study focused on the design of the interview outline in terms of four dimensions: respondents' basic information, perceived community environment, social interaction and social health. **Socio-economic Information:** This section mainly relates to the relevant socio-economic characteristics of the respondents and their families. **Perceived Community Environment:** This section includes respondents' perception and evaluation of the multi-dimensional community environment, and the respondents are asked to put forward the environmental factors that will affect the process of going out to communicate (on the way and at the destination), and finally the overall perception of the community environment and suggestions for optimization and improvement. **Social Interaction:** This section explores the law of outdoor interaction activities of the respondents, the characteristics and importance of interaction with different objects. **Social Health:** This dimension mainly includes self-evaluation of respondents' social function and social relationship. Social function includes participation in and satisfaction with social activities. Social relationships, including emotional support, instrumental support, informational support, and companionship.

Table 1. Interview Objectives and Content. Source: Author's own research

Interview Objective	Interview Content	
Socio-economic Information	Personal Attributes	Age, education level, pre-retirement occupation, economic income, health status, etc.
	Household and Community Attributes	Residential neighborhood, length of residence, living arrangements (family members), household responsibilities, etc.
Perceived Community Environment	Activity Venues	Most frequented social activity venues, variety and accessibility of venues, etc.
	Community Environment Spatial Quality	Walkability, housing conditions, public transportation facilities, public spaces, environmental safety and comfort, etc. Green spaces, sanitation, seating availability, accessibility facilities, etc.
Social Interaction	Types of Social Activities	Content and preferences, reasons for preferences, travel modes and needs, etc.
	Social Interaction and Perception	Modes, frequency, satisfaction, and importance of interactions with family, relatives or friends, neighbors, and service providers.
Social Health	Social Function	Participation in social activities (family events, recreational activities, interactions with friends, etc.) and satisfaction with social activities (household chores, helping friends, handling daily affairs, etc.).
	Social Relationship	Emotional support (trusted confidants, feeling valued, etc.), instrumental support (caregiving, accompanying to medical visits, errands, etc.), informational support (help with problem-solving, provision of important and useful advice, etc.), companionship (to enjoy entertainment and relaxation with, etc.).

Interviewer training: Conduct professional training for the interviewers to ensure that the core meaning of the interviewers remains unchanged during the interview process, and obtain sample data flexibly.

3.2. Methods

Grounded theory is one of the most scientific methodologies through the qualitative approach to theory building. Theories constructed through standardized and rigorous research procedures are firmly rooted in empirical data, and their research can be retroactively examined and even repeated to a considerable extent. Therefore, it is also considered to be the most suitable method for theoretical construction among

traditional sociological research methods(Jia and Tan, 2010). This study mainly draws on the coding construction logic of grounded theory, and uses the coding analysis to analyze the factors affecting the social health environment of the elderly.

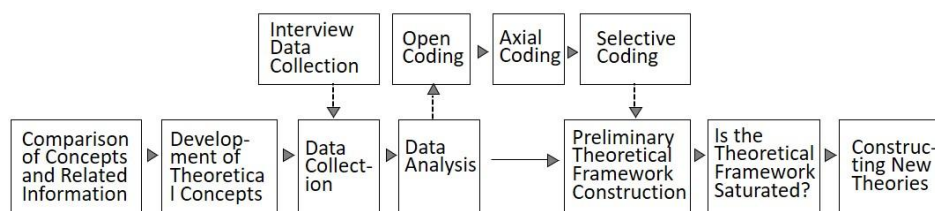


Figure 2 Analytical Approach Based on Grounded Theory Source: Author's own research

The textual information collected from the interviews was coded and analysed using NVivo11 to extract the core content, to further accurately interpret the connotation of social health of the elderly residents and its environmental impact elements, and to determine the relationship among them.(Figure 2).

3.3. Data collection

In-depth interviews were conducted in accordance with the principle of theoretical saturation, starting with the selection of a typical community in each of the four urban areas of the centre as a research unit, and the random sampling of research subjects within the unit. Then the sample data is coded and analyzed, and the next research unit is interviewed according to the analysis results, and the interview is stopped until there are no new concepts. Each interviewee was interviewed for 10-30 minutes. The researchers asked and interacted with the interviewees to different degrees according to their answers. The whole process was recorded with the consent of the interviewees.

4. Relationship between the neighborhood environment and elderly social health

Based on the above research ideas, the interview research was conducted from 18 December 2023 to 25 January 2024, and a total of 28 respondents were interviewed (Table 2). The total interview time was 7 hours and 46 minutes, with an average interview time of 16 minutes and 39 seconds per respondent. The entire audio file was transcribed into the corresponding textual material, resulting in a 106,000-word transcript.

Table 2. Demographic Information of Semi-Structured Interview Respondents. Source : Author's own research

No.	Gender	Age	District	Length of Residence (Years)	Living Arrangement	Recording Duration (min: sec)
F1	Female	81	Xiangfang	5	With grandchildren	17:36
F2	Female	84	Xiangfang	5	Alone	10:45
F3	Female	74	Xiangfang	4	Alone	19:13
F4	Female	83	Xiangfang	4	Alone	18:18
F5	Female	72	Xiangfang	15	Alone	13:31
F6	Female	71	Nangang	9	With spouse	17:39
F7	Female	80	Nangang	23	With children	12:20
F8	Female	76	Nangang	20	With children and grandchildren	11:38
F9	Female	68	Nangang	22	With spouse	21:52
F10	Female	69	Nangang	1	With spouse	15:51
F11	Female	67	Daoli	12	With spouse	10:42
F12	Female	72	Daoli	30	With spouse	13:21

No.	Gender	Age	District	Length of Residence (Years)	Living Arrangement	Recording Duration (min: sec)
F13	Female	72	Daoli	3	With Spouse and grandchildren	16:58
F14	Male	70	Xiangfang	3	With spouse	16:19
F15	Male	65	Nangang	6	With spouse, children, and grandchildren	13:07
F16	Male	85	Nangang	26	With Spouse and grandchildren	24:45
F17	Male	84	Nangang	9	Alone	21:49
F18	Male	76	Nangang	21	With spouse	24:00
F19	Male	66	Daowai	60	With spouse, children, and grandchildren	26:11
F20	Male	68	Daowai	16	With spouse	16:14
F21	Male	63	Daowai	20	With spouse	17:06
F22	Male	68	Daoli	11	With spouse	16:20
F23	Male	73	Daoli	3	With spouse	17:34
F24	Male	75	Daoli	20	With mother	13:44
F25	Male	65	Daoli	12	With spouse	11:48
F26	Male	79	Daoli	10	With spouse	16:14
F27	Male	61	Daoli	5	With spouse, children, and grandchildren	11:23
F28	Male	75	Daoli	10	With spouse	19:55

4.1. Open coding

Open coding encompasses conceptualization and preliminary categorization. It involves analyzing the collected data to identify key concepts and categories through textual analysis. By systematically examining and comparing the data, the content is categorized and named, revealing the underlying concepts to accurately reflect the material's essence. These abstracted concepts are then employed to present the data effectively.

Table 3. Examples of Open Coding Analysis(Only selected content is presented). Source : Author's own research

Original Interview Text (28 interview recordings)	Labeling a (1,091 labels)	Preliminary Conceptualization A (175 concepts)
I live by myself, but when my granddaughter comes back, I stay with her. (F1-1) My daughter lives close by, and my kids and granddaughter usually drop by two or three times a week. (F1-2) Sometimes, my daughter helps me with the cleaning. (F1-3) I chat a lot with my kids on WeChat; we mostly just message each other whenever something comes up. (F1-4)	a1 Living with granddaughter a2 Frequency of interaction with children a3 Children helping with household chores a4 Frequent online socializing	A1 Living Arrangement (a1...) A2 Intergenerational interaction (a2, a3...) A3 Online Socializing
In our neighborhood, we all go out for walks together regularly. Whether it's summer or winter, we like to stroll around the yard. (F1-5) We don't go to the park or the square because it's too far and the air isn't great there. It's way better here; the environment is nice, and it really keeps us healthy. (F1-6) In the winter, we don't go out much, but in the summer, we can walk further, like down to the ecological park where there's a place called Dai Xiu Lake Park. (F1-7) We usually just walk around close by. We hang out in the yard for about half an hour, not going too far, and we don't bother taking a car. (F1-8) We don't even use our senior cards; why would we need to take the bus? Everything we need is nearby, and that big supermarket is super close. (F1-9) At our age, why keep taking the bus? What if we trip or fall? It just doesn't make sense, right? (F1-10)	a5 Activities in the community yard a6 Community environment evaluation a7 Parks and squares a8 Generally enjoy walking a9 Commercial facilities and nearby neighborhoods a10 Concern for safety	A4 Outdoor Social Activity (a5, a7, a8, a9...) A5 Perception of Community Environment (a6) A6 Community Service Facilities (a7, a9...) A7 Preferences of Elderly Individuals (a10, ...)

Initially, a labeling approach was employed to abstract and extract interview data, summarizing the material sentence by sentence and assigning labels using Ax (1,091 instances in total). These labels were then categorized, named, and conceptually refined, resulting in preliminary conceptual coding represented by Ax (175 instances). Finally, through clustering and categorization, relationships among concepts were identified, leading to the formation of categories represented by AAx (26 instances). Examples of the open coding process are presented in Tables 3 and 4.

Table 4. Examples of Open Coding Categorization. Source: Author's own research

Category (AA)	Corresponding Concept (A)
Activity Facilities	Parks, squares, senior activity centers, community activity rooms, community canteens, senior universities, accessibility and diversity of facilities, etc.
Commercial Facilities	Morning and night markets, farmers' markets, restaurants, supermarkets, shopping malls, convenience stores, etc.
Service Facilities	Banks, senior universities, community clinics, hospitals, etc.
Public Transportation	Buses, subways
Walking Environment	Sidewalks, connectivity, parked vehicles, speed safety.
Spatial Quality	Landscape, fitness facilities, safety, environmental hygiene, benches, accessibility facilities, facility maintenance, satisfaction with outdoor spaces.
Housing Conditions	New /old neighborhoods, community demographic composition, length of residence, multi-story/high-rise neighborhoods.
Community Atmosphere	Familiarity/unfamiliarity among neighbors, mutual assistance, reciprocity, friendliness, alienation, stress
Living Arrangement	Living alone, with a spouse, with children, with grandchildren, with three generations.
Community Management	Property management, neighborhood renovation, gated management.
Intergenerational Interaction	Interaction with children/ grandchildren/ other relatives, family activities.
Like-minded Interaction	Former colleagues, walking buddies, sports partners/card friends, confidant, trusted individuals, old friends, mutual assistance, gatherings, interaction frequency, phone contacts, satisfaction with friendships.
Neighbor Interaction	Casual acquaintances, chance encounters, frequent chatting, traveling together, interaction frequency, familiarity among neighbors in older neighborhoods, satisfaction with neighbor relationships
Service Interaction	Shopping, vendors, banking services, business ownership, re-employment after retirement.
Other Outdoor Social Activities	Playing cards, mahjong, dancing, singing, swimming by the river, ball sport, photography, playing chess, watching the lively scene.
Ability to Participate	Engaging in social activities, leisure and entertainment, doing household chores, daily work, friend activities.
Satisfaction with Participation	Household skills, helping friends, managing daily affairs, entertainment.
Emotional Support	Confiding, trust, appreciation, comfort.
Instrumental Support	Care during illness, accompanying to medical appointments, helping with household chores, running errands.
Informational Support	Crisis advice, problem-solving, information needs, important matters.
Companionship	Enjoying entertainment/ relaxing together, companionship.
Daily Behavior Preferences	Enjoy walking, prefer strolling alone, online socializing/shopping, slow to accept new things, content mindset, emphasize customs and traditions.
Preference for Solitude	Enjoy being alone, prefer quiet, reading the news, reading poetry, strong self-confidence when living alone, not fond of visiting others.
Impact of Work Experience	Served in the countryside, historical background, worker, employee, community professor, campus experience, etc.
Personal Characteristics	Age, gender, profession before retirement, education, health.
Socioeconomic Characteristics	Monthly income, community, religious beliefs, etc.

4.2. Axial coding

Axial coding identifies core categories by examining the underlying relationships between various categories based on theoretical frameworks. This process establishes hierarchical relationships, summarizing core categories and their subcategories. In this study, the analysis of 26 categories revealed

six main categories: **Perceived built environment, Perceived social environment, Social interaction, Social health, Preferences of the elderly, and Individual and socioeconomic characteristics.** Table 5 presents these main categories along with their corresponding subcategories and specific meanings.

Table 5. Main Categories and the Corresponding Subcategories. Source: Author's own research

Main Categories (AAA)	Subcategories (AA)	Connotations
Perceived Built Environment	Activity Facilities	Subjective evaluation of recreational facilities frequently utilized in the community and surrounding areas.
	Commercial Facilities	Subjective evaluation of commercial establishments frequently utilized in the community and surrounding areas.
	Service Facilities	Subjective evaluation of other essential service facilities frequently utilized in the community and surrounding areas.
	Public Transportation	Subjective evaluation of daily public transportation usage.
	Walking Environment Spatial Quality	Subjective evaluation of environments involved in daily walking activities. Subjective evaluation of outdoor environments and public resource utilization within the community.
Perceived Social Environment	Housing Conditions	Subjective evaluation of current housing and residential community.
	Community Atmosphere	Subjective assessment of neighborly relations within the current living environment.
	Living Arrangement	Objective description of cohabiting family members.
	Community Management	Subjective evaluation of community operations and management.
Social Interaction	Intergenerational Interaction	Interaction behaviors with immediate and extended family members.
	Like-minded Interaction	Interaction behaviors with peers who share similar interests.
	Neighbor Interaction	Interaction behaviors among residents within the same community.
	Service Interaction	Interaction behaviors occurring during daily contact with service personnel.
	Other Outdoor Social Activities	Interaction behaviors for leisure and entertainment purposes.
Social Health	Ability to Participate	Perceived ability to engage in social activities.
	Satisfaction with Participation	Level of satisfaction regarding one's capability to participate in activities.
	Emotional Support	The experience of being valued and cared for.
	Instrumental Support	Assistance received in completing daily tasks.
	Informational Support Companionship	Access to useful advice and information. Having individuals to enjoy pleasant social activities with.
Preferences of the Elderly	Daily Behavior	Stable behavioral tendencies or preferences exhibited by elderly individuals in daily life.
	Preferences	
	Preference for Solitude	The tendency among certain elderly individuals to minimize external interactions.
Individual and Socioeconomic Characteristics	Impact of Work Experience	Influence of past life and work experiences on social relationships and behavioral preferences.
	Personal Characteristics	Self-awareness and evaluation of individual attributes.
	Socioeconomic Characteristics	Objective assessment of one's socioeconomic conditions.

4.3. Selective coding

Selective coding identifies core categories and their relational structures. Using theoretical foundations and empirical data, the researcher discerns core categories from primary categories, interpreting their logical relationships through an overarching "storyline." This storyline reflects the researcher's analysis of the data, clarifying the interconnections among the main categories. An in-depth analysis of the 26 categories and 6 main categories, along with a thorough review of the original text and field survey data, led to the development of a core model for the elderly: "Community Built Environment-Interactive Behavior-Social Health"(Figure 3).

Main Implications of the Model: The model highlights that the community built environment, encompassing both physical and social elements, shapes individuals' perceptions. Through various interactions—such as intergenerational, neighborly, and service-related—individuals engage with the objective built environment, influencing their perceptions and, in turn, affecting multiple dimensions of social health among the elderly. Socioeconomic characteristics and personal preferences also play a significant role, influencing all pathways based on individual attributes and life experiences. This variability is reflected in the diverse perspectives expressed by respondents during interviews.

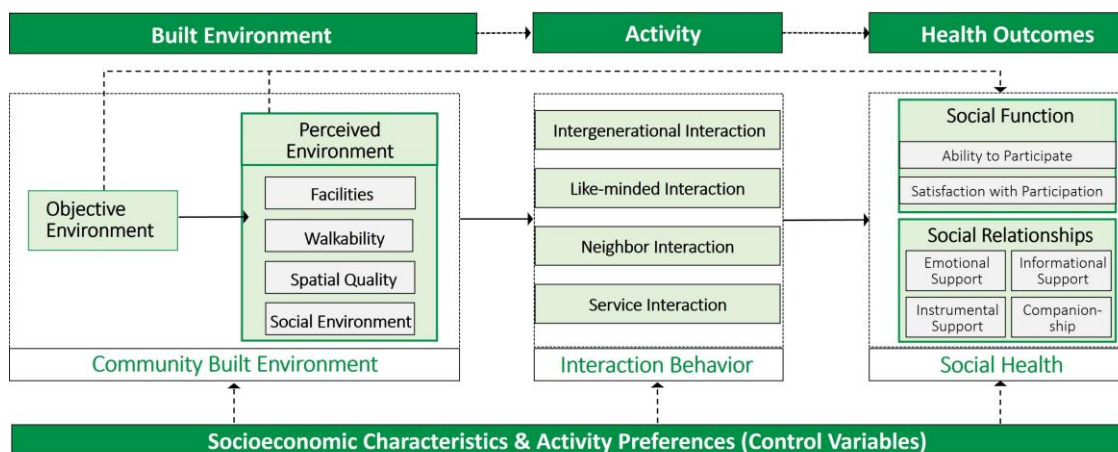


Figure3. Core Model of “Community Built Environment-Interactive Behavior-Social Health.”

Source: Author’s own research

4.4. Key findings

Based on the analysis and relevant theoretical insights, factors affecting the social health of elderly residents can be divided into two main categories: community built environment elements and social interaction factors.

Community facilities are the factors of the physical space. In summary, the use of high-frequency activity places for elderly residents is very obvious, and most communications occur in shopping scenes and leisure scenes. The top five most frequently used activity places in daily life are 1) morning and night markets, mobile vendors, and farmers' markets; 2) retail stores such as convenience stores/fruit and vegetable stores; 3) parks and squares; 4) community centers/senior activity centers; and 5) large shopping malls. The number, convenience, service, consumption and richness of these facilities are the main factors affecting the social interaction and social health of the elderly. The existence of these facilities will increase the opportunities for social interaction among elderly residents, and the attraction attached to the functional attributes of the facilities themselves will also encourage communication among residents. Through contact, a large amount of social support will be obtained, which will be beneficial to social health(Dong et al., 2023). At the same time, older residents like to patronise more familiar and safer activity venues, which have a stronger ‘stickiness’, and older people with the same behavioural preferences will form a relatively fixed ‘circle of interaction’, which will provide them with more opportunities for chatting and bonding.

In addition to the attraction of social places, **the community walking environment** is also an important factor affecting the physical space, which includes good destination accessibility and walkability. Previous studies have confirmed that there is a significant positive correlation between destination walkability and social cohesion(Jun and Hur, 2015; Moogoor et al., 2022). Similarly, this study found that more pedestrian-friendly, better-connected neighborhoods were more likely to increase neighborhood knowledge and

social engagement. This is especially true for the older population. Older people are more likely than younger people to travel on foot, tend to walk for exercise as their main leisure activity, and use walking spaces near their homes more frequently. As such, building age-friendly walking environments is an important part of enhancing the health of our society.

Spatial quality is also an important environmental factor. Landscape, safety and comfort, hygiene, and barrier-free design are all elements of the environment that are of particular concern to older residents in their leisure interactions. A higher quality community outdoor environment or neighborhood green space will enhance people's willingness to meet friends, enjoy fitness and recreation. Compared with ordinary people, the activity radius of the elderly is smaller, and the dependence on the community and surrounding environment and resources is stronger. For wheelchair users and people with mobility problems such as those with sequelae of cardiovascular disease, better accessibility in the community can provide opportunities for independent travel. Convenient, safe, comfortable, aesthetical, and enriched community built environments are important factors in encouraging inter-age and inter-generational interactions among older adults (Moogoor et al., 2022; Zhang and Yao, 2022).

The social environment elements are non-physical soft environmental elements. These mainly involve housing conditions, community atmosphere, living style, community management services and so on. In recent years, the housing reform and urban renewal have caused a large number of urban residents to move, which has a certain impact on the original geographical stability of social relations. Closed residential areas and apartment-style houses have reduced the opportunities for neighborhood communication to some extent. In this case, the abundance of amenities and activity options offered by urban communities creates opportunities for contact, thus easing neighborhood strangeness. A friendly community atmosphere and high quality management services will enhance residents' sense of community belonging and cohesion. Where and how older people live, such as whether they live with or near their children, will directly affect their social support and social networks.

Social interaction is an intermediate factor between community environment and social health outcomes. Whether people want emotional or instrumental social support, it is achieved through the act of interacting with others. In terms of deep interaction, older persons interact most frequently with family members, followed by familiar neighbors. The level of interaction with relatives and friends is mostly 1-3 times a year, mainly at parties. The average length and importance of interactions for most older people was ranked in order of family, relatives, friends and classmates. Shallow interactions, however, tended to be with pleasant neighbors, casual friends and service personnel. According to statistics, the interaction behavior of the elderly mostly stems from social needs with emotion and belonging. Different needs and preferences will stimulate different types of communications and correspond to different objects. Based on the existing research and analysis, we believe that the interaction of the elderly can be divided into four categories according to the objects of communication: **Like-minded Interaction** (leisure and entertainment, community participation and continuing education), **Intergenerational Interaction** with family, **Neighbor Interaction** (neighborhood pleasantries, chats, and mutual assistance), and **Service Interaction** with staff at the service place.

In addition to the above-mentioned core factors, there are still other factors affecting the social health of the elderly. Such as whether residents use online platforms for social, online communication frequency, adult children's economic status, religious beliefs, etc. Although these impact can hardly be ignored, the focus of this study is to explore the mechanism of the impact of community built environment on the social health of the elderly, so the factors with weak connection are not included in our model.

5. Conclusions

Starting from the social dimension of health, this study aims to improve the age friendliness and inclusiveness of the built environment in the community, explore the relevant influencing factors and clarify the paths. Primary data was collected in the form of in-depth interviews, coded using grounded theory methodology, and data was analysed using NVivo software. Six core categories were identified: perceived built environment, perceived social environment, social interaction, social health, elderly preferences, and individual and socioeconomic characteristics. Additionally, 26 subcategories were identified, including activity and commercial facilities, walkability, spatial quality, community atmosphere, and intergenerational interaction. These formed a comprehensive framework of factors influencing elderly social health within the community environment. This framework highlights critical environmental factors affecting elderly social health and offers targeted strategies for community planning and renewal that promote healthy aging. Although this study provides qualitative results, future research will explore quantitative analysis of environmental factor weights and their influence pathways.

Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work the authors used ChatGPT in order to improve language. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

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