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ORIGINAL ARTICLE

# How environments can promote active aging: results from a case study of two municipalities in Quebec, Canada

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## Abstract

**Objectives** To address global aging, a paradigm shift is needed from disease prevention and treatment towards active aging, i.e., optimizing opportunities for health, participation, and security as people age. Little is known about how age-friendly environments promote active aging. This study thus aimed to explore how (*through which mechanisms* and *in what contexts*) environments can promote active aging and, specifically, positive health, social participation, and health equity.

**Methods** Using a realist approach and semi-structured focus groups, a case study was used in two Quebec municipalities known for best fostering active aging. Data also included participants' logbooks, sociodemographic questionnaires, municipalities' sociodemographic profiles, and policy documents. A conceptual framework and thematic content analysis were carried out.

**Results** A total of 24 participants (9 older adults, 4 health professionals, 3 community-based actors, 5 municipal employees, and 3 elected officials) took part in 5 focus groups. Regarding contexts, both cases were midsize municipalities having an income and education level higher to Quebec's averages with supportive active aging policies. Two main themes explained how the environments promoted active aging: (1) by ensuring *proximity* through built (urban planning), social (network structures), services (variety and availability of local and outreach resources), and organizational (active listening to older adults' needs for active aging) environments; and (2) by fostering *transversality* through built (universal accessibility, intergenerational spaces), social (intergenerational opportunities for social participation), and political/organizational (unified and complementary policies) environments.

**Conclusion** To better promote active aging through age-friendly environments, practices should focus on fostering proximity and transversality, and act simultaneously on multiple environments.

## Résumé

**Objectifs** Pour faire face au vieillissement des populations, un changement de paradigme est requis allant de la prévention et du traitement de la maladie vers la promotion d'un vieillissement actif, c.-à.-d. l'optimisation des possibilités de bonne santé, de participation sociale et de sécurité pendant l'avancement de l'âge. Peu d'informations renseignent sur comment les environnements favorisent le vieillissement actif. Cette étude visait donc à explorer comment (*par quels mécanismes* et *dans quels contextes)* les environnements favorisent le vieillissement actif et, spécifiquement, la santé positive, la participation sociale et l'équité en santé des aînés.

**Méthodes** Selon une approche réaliste et des groupes de discussion semi-dirigés, une étude de cas multiples a été réalisée dans deux municipalités québécoises, reconnues pour favoriser un vieillissement actif. Les données incluaient aussi les journaux de bord et les questionnaires sociodémographiques des participants ainsi que les profils sociodémographiques des

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municipalités et leurs politiques municipales. Les données ont été traitées à l'aide d'un cadre conceptuel et d'une analyse de contenu thématique.

**Résultats** Un total de 24 participants (9 aînés âgés de 65 ans ou plus, 4 professionnels de la santé, 3 acteurs communautaires, 5 employés municipaux et 3 élus) ont pris part à un des cinq groupes de discussion. Concernant les éléments de contexte, les deux municipalités étaient de taille moyenne et présentaient des revenus et un niveau de scolarité supérieurs à la moyenne québécoise ainsi que des politiques municipales favorisant un vieillissement actif. Deux thèmes principaux expliquaient comment les environnements favorisaient le vieillissement actif : 1) en assurant la *proximité* des environnements bâti (aménagement urbain), social (structures des réseaux sociaux), des services (ressources locales et de proximité) et politique/organisationnel (écoute active des besoins des aînés pour un vieillissement actif); et 2) en favorisant la *transversalité* des environnements bâti (accessibilité universelle, espaces intergénérationnels), social (opportunités intergénérationnelles) et politique/organisationnel (politiques unifiées et complémentaires).

**Conclusion** Pour mieux promouvoir le vieillissement actif grâce à des environnements conviviaux aux aînés, les pratiques doivent privilégier la proximité et les approches transversales, en plus d'agir sur plusieurs environnements simultanément.

**Keywords** Active aging · Age-friendly environments · Age-friendly city · Health promotion · Case studies

**Mots-clés** Vieillissement actif · environnements amis des aînés · villes amies des aînés · promotion de la santé · étude de cas

## Introduction

Global population aging brings new challenges, especially in ensuring equitable access to health and social care (World Health Organization [WHO], 2015), including in Quebec (Canada), which is facing an inversion of its population age structure. As of July 2022, 20.9% of Quebecers were aged 65 or older compared to 15.6% who were under the age of 14 (Statistics Canada, 2023). Since this inversion increases economic and social demands on governments, a paradigm shift from disease treatment and prevention towards promoting active aging is needed. As active aging aims to optimize opportunities for health, participation, and security to enhance quality of life as people age (World Health Organization, 2002), this approach involves acting on social determinants of health, which facilitate health equity. Among determinants of active aging, positive health, social participation, and health equity are central. Positive health emphasizes the empowerment and proactivity of individuals in the management of their health to reduce risk factors for disease and to maximize protective factors (Lindström & Eriksson, 2010). Social participation refers to the person's involvement in social, economic, cultural, spiritual, or civic activities and their ability to remain an active contributor to their community (World Health Organization, 2007). This participation evolves according to available time, resources, societal context, and what is meaningful to individuals (Levasseur et al., 2022). Finally, health equity is the absence of unfair systems and policies that concentrate the risk of experiencing poorer overall health in certain groups of people (Public Health Agency of Canada, 2011). As aging results from the interactions between the individual and their environments (Lawton, 1982), actions to foster active aging should go beyond individual interventions and target environments to make them age-friendly, i.e., that build and maintain intrinsic capacity across the life course and enable greater functional ability in someone with a given level of capacity (World Health Organization, 2015). To foster active aging, the WHO Age-friendly Cities framework proposes acting on eight key components of the environment: (1) outdoor spaces and buildings, (2) transportation, (3) housing, (4) social participation, (5) respect and social inclusion, (6) civic participation and employment, (7) community supports and health services, and (8) communication and information (World Health Organization, 2007). These eight components target four dimensions of the environment (Fig. 1): (1) built, (2) social, (3) health and community services, and (4) political and organizational (Black & Hyer, 2019).

Age-friendly environments are complex to design, and should be contextualized to the local environment (Pawson et al., 2005; Pfadenhauer et al., 2017). To facilitate this contextualization, it is important to understand *how*, i.e., through which mechanisms, and *in what contexts* age-friendly environments and their components influence active aging. Such contexts represent a set of active and unique characteristics and circumstances that interact, influence, modify, or facilitate an embedded intervention (Pfadenhauer et al., 2017). A mechanism has been defined as the generative force, triggered in particular contexts, that leads to outcomes (Wong et al., 2013). Outcomes are the effects that result from the interaction between the contexts and mechanisms. Moreover, according to the realist approach (Wong et al., 2013), context, mechanisms, and outcomes can be linked in contexts-mechanisms-outcomes configurations (CMOCs), used as the conceptual framework (Fig. 2) developed for this study (McNeil-Gauthier et al., 2021 (oral presentation)). Positioning active

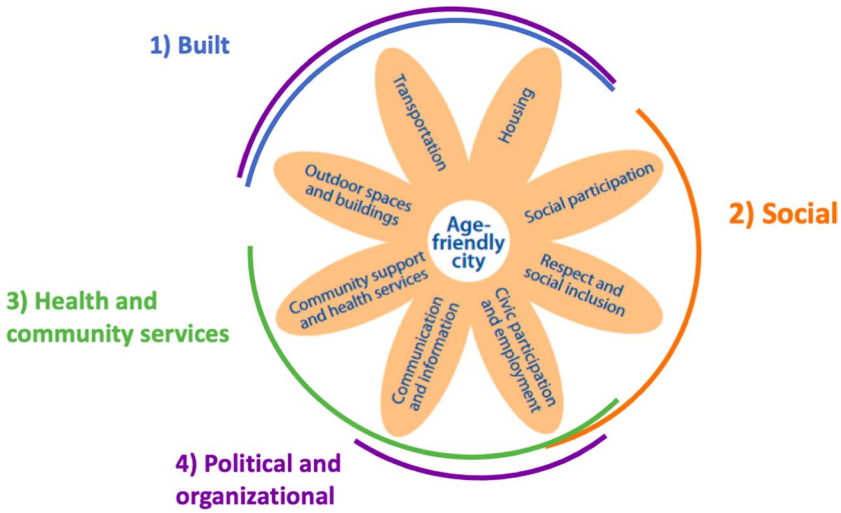


**Fig. 1** The four types of environments and key components of age-friendly cities. *Note.* Adapted from *Global age-friendly cities: A guide*, World Health Organization, Part 3. How the Guide was developed, p. 9, Copyright (2022)

aging as the interaction between contexts (macro), environments (meso), mechanisms (meso and micro), and individuals (micro; Fig. 2), this framework was informed by theories from multiple sources: (1) ecological models of aging and human development (e.g., Bronfenbrenner, 1994; Fougeyrollas et al., 2019; Lawton, 1982; Marsiske et al., 1995; Rowe & Kahn, 1997), (2) social connectivity and social networks (Berkman et al., 2000; Menec, 2017) as well as human behaviour frameworks (e.g., Becker, 1974; Green & Kreuter, 2005).

Few studies have explored *how* and *in what contexts* components of the environments foster active aging. Most research has focused on associations between positive health or social participation and components of the environments. Higher than average health, well-being, or walking behaviour have been found to be respectively associated with higher frequency of social participation and voluntary participation (Tomioka et al., 2017), age-friendliness of the environment (Nieboer & Cramm, 2018), and built environment features (Schmidt et al., 2019). Social participation has also been found to be associated with public space features offering opportunities for casual encounters (Schmidt et al., 2019). To our knowledge, no study has examined the associations between health equity in older adults and their environments, and few investigations on active aging have taken a holistic perspective of the environments, i.e., looking at multiple environments at the same time and considering their interinfluences and overlaps.

Conducted in the province of Quebec with five Eastern Townships communities, one study identified proximity of services and infrastructures, diversity of services and opportunities of social participation adapted to older adults' needs, as well as the diffusion of social participation opportunities through a wide variety of communication channels (Maclure et al., 2023) as the key mechanisms for promoting active aging. However, this study did not link contextual elements to mechanisms increasing positive health, social participation, or health equity. Another study was conducted with six communities aiming to make their environments more age-friendly in the United Kingdom, Canada, and the United States (USA; Jeste et al., 2016). Active listening to the needs of older adults and their involvement in the design and planning of age-friendly environments were key mechanisms promoting active aging in most communities. In one case (Johnson County, USA), multiple collaborations and partnerships between academia, public, and private sectors increased diversity and availability of services for older adults (Jeste et al., 2016). In another case in the USA (Washington), improved accessibility to a full range of services and quality of in-home care helped to create age-friendly environments (Jeste et al., 2016). While it focused more on general context and initiatives to increase the age-friendliness of environments and possibilities to age actively, this study did not identify or link mechanisms to contexts, an essential gap in knowledge for better environmental adaptation to context. To address this gap in knowledge, our study aimed to answer the following research question: "How can environments foster active aging?"; that is, *through which mechanisms* and *in what contexts* can environments and their components facilitate positive health, social participation, and health equity in older adults?

## Methods

### Design

Nested in a sequential mixed method research program (Levasseur et al., 2017), a multiple qualitative case study (Yin, 2003), applying a realist methodology (Pawson et al., 2005; Wong et al., 2013), was used with two cases (Saint-Bruno-de-Montarville, and Sainte-Julie, in Quebec). These two cases were selected based on the first phase of the research program targeting Canadian municipalities with respondents

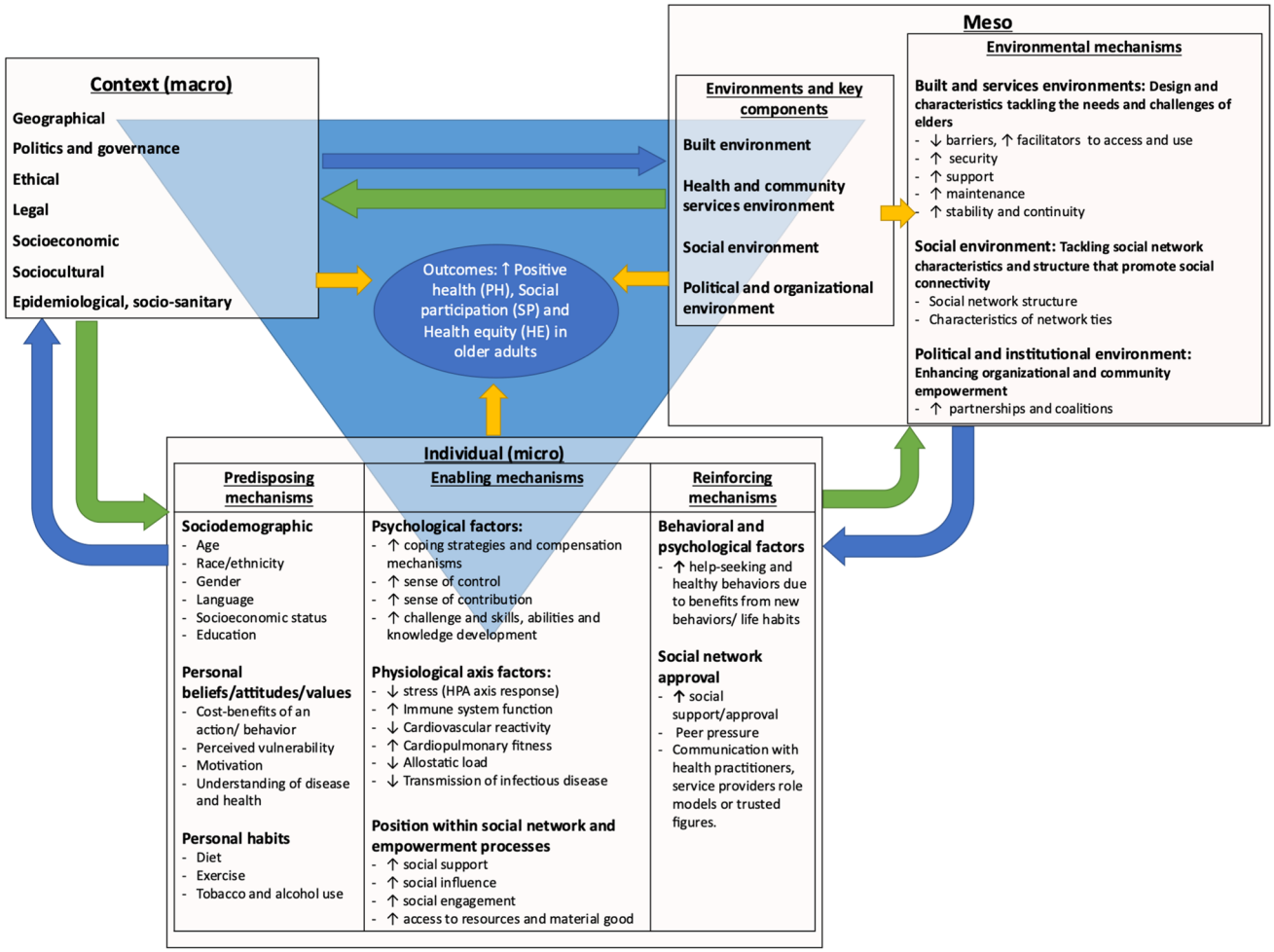


**Fig. 2** Ecological integrator model and contexts-mechanisms-outcomes configurations conceptualizing how components of the environments influence positive health, social participation, and health equity in older adults

having high positive health, social participation, and health equity, as documented by Levasseur and colleagues (2017). These three determinants, i.e., positive health, social participation, and health equity, were used in the present study to operationalize active aging. Although it is of interest to study how environments restrict active aging, it is also important to explore what happens in champion municipalities. Focusing on people's resources and capacity to create health rather than cause disease (Lindström & Eriksson, 2010), this salutogenic perspective helped to identify recurring factors promoting active aging and existing strengths on which to build to facilitate change (Coghlan et al., 2003). Due to the COVID-19 pandemic and logistic constraints, this study focuses on the two Quebec *Municipalités amies des aînés* (MADA, i.e., the Quebec adaptation of the WHO Age-friendly Cities framework (Garon et al., 2014) figuring among the top five (Levasseur et al., 2023).

Case studies are suitable for studying complex phenomena in their natural context (Patton, 2014); Yin's pragmatic approach uses practical tools and methods (Yin, 2003) (e.g., to find useful answers as to how the environments can foster active aging). Finally, realist methodology focuses on the mechanisms and "how" the intervention succeeds rather than solely on its effects (Crosbie et al., 2019; Wong et al., 2013). By analyzing the interactions among the contexts (C), mechanisms (M), and outcomes (O; Wong et al., 2013), the realist approach aims to link these data to identify recurrent contexts-mechanisms-outcomes configurations (CMOCs). The study was approved by the Research Ethics Committee of the *Centre intégré universitaire de santé et de services sociaux de l'Estrie – Centre hospitalier universitaire de Sherbrooke* (2017–656-IUGS).

## Participants and methods

From June 2020 to March 2021, the student-researcher used multiple sources to generate data: focus groups (Yin, 2003), participants' sociodemographic questionnaires and

logbooks, and, to describe municipalities' contexts, a synthesis of their sociodemographic profiles and policies. The sociodemographic questionnaire included the usual questions to describe the participants, e.g., age, gender, and health satisfaction. Using an individual logbook, one week prior to the focus groups, each participant self-reflected on how the environments and their components can promote active aging. To ensure a common understanding of key concepts and research questions, these logbooks also included definitions of positive health, social participation, and health equity. Finally, the municipalities' sociodemographic profiles were based on documents from the *Institut de la statistique du Québec* (ISQ), the Montérégie Public Health Department, and the 2016 short and detailed census data of Statistics Canada.

For each case, the student-researcher recruited older adults, professionals, community-based actors, municipal employees, and elected officials using a snowball sampling strategy (Patton, 2014) which aimed to reach maximum variation (Patton, 2014). For older adults, participants had to be over 65 years of age, have resided in the municipality for at least 2 years, and not have a communication disorder preventing them from contributing to the discussion. To recruit participants, the student-researcher sent emails to municipal committees and consensus tables where older adults participate, i.e., consultation and partnership space between various actors and parties, for example, the citizen table or municipal policy table. With the support of community organizers, several non-governmental organizations assisting older adults (e.g., community volunteer centres) were also contacted and invited to distribute these emails. Finally, one seniors' residence in Sainte-Julie directly emailed older adults registered for their recreation list. Professionals, community-based actors, municipal employees, and elected officials working with or for older adults, e.g., offering direct services, on the MADA committee or involved in active aging policies, for at least 2 years were mainly recruited through phone calls and emails.

In total, five semi-structured in-depth focus groups were conducted in March 2021 with 24 participants, i.e., 9 older adults, 4 health professionals, 3 community-based actors, 5 municipal employees, and 3 elected officials. Specifically, at least one focus group for each type of participant (older adults vs. others) was conducted in both municipalities. In Saint-Bruno-de-Montarville, one focus group was with older adults ($n=4$) and an elected official ($n=1$; FGB1), who was also an older adult, and the other (FGB2) was with health professionals ($n=2$), community-based actors ($n=3$), and a municipal employee ($n=1$). Among the three focus groups in Sainte-Julie, one was with older adults ($n=4$; FGJ1); another (FGJ2) was with one recreation professional ($n=1$) and municipal employees ($n=2$); and the last (FGJ3) included a health professional ($n=1$), municipal employees ($n=2$), and elected officials ($n=2$). Older adults were intentionally separated from the other types of participants to avoid social desirability and authority bias. Sample size was predetermined to be at least 3 people per focus group of each type of participant (older adults vs. others; Hennink et al., 2019). This sample size facilitated in-depth exploration of how municipal environments and their components foster active aging in older adults, while allowing data saturation to be reached, i.e., the point in data collection and analysis when no new substantive information is acquired (Miles et al., 2019).

The student-researcher conducted the focus groups, which lasted 84 to 114 minutes and were digitally audio-recorded, through Zoom or Teams. The student-researcher adapted an interview guide from a previous study (Maclure et al., 2023) to the context of this study, after which it was reviewed by two content experts. Two versions of the guide were developed (Appendix 1), one for groups with older adults and the other for groups with other types of participants. The student-researcher adapted the guides based on the literature on active aging and pre-tested them in person with three groups (one with 6 older adults, a second with 3 health professionals, and a third with 4 municipal employees); and virtually with 5 older adults. These participants were selected based on the same inclusion criteria as those for the focus groups but were from different municipalities than the municipalities in the present study. The interview guides aimed to (1) identify which components of the environments promote active aging, and (2) understand how these components influence active aging.

Focus groups (Patton, 2014) were led in French by the student-researcher (moderator) who was supported by a member of the research team (assistant-moderator) responsible for taking notes and drawing a group diagram. This diagram aimed to visually support discussion, avoid enumerations, and extensively explore context, mechanisms, and their interinfluences in the form of a summary diagram as the focus groups progressed. At the end of each focus group, the assistant-moderator presented the diagram to verify whether it reflected the participants' perspectives. The student-researcher had led focus groups in clinical settings in the past, but not in a research context. The assistant-moderator had led multiple focus groups and had extensive experience in qualitative interviews and research. After each focus group, the student-researcher (moderator) and assistant-moderator participated in a debriefing session to help the student-researcher improve her interview skills. These sessions also enabled the student-researcher to reflect on the content of the focus groups and adjust the interview guides accordingly. Summary sheets were also completed to summarize the main themes of discussion and remarks about the focus group process. Throughout data generation, the student-researcher kept memos to record her thoughts and

important information about the research process. Professional editors and translators transcribed the entirety of the focus groups verbatim and translated them from French to English.

## Analysis

The student-researcher, who moderated the focus groups, also coded the verbatims in detail, i.e., using an inductive-deductive thematic content analysis (Patton, 2014) based on the conceptual framework of the present study (Fig. 2). This analysis involved a code dictionary including coding procedures, definitions of concepts according to the Age-friendly Cities framework's eight key components of the environments, and codes related to the context, mechanisms, and outcomes of this conceptual framework. Using the macro and meso parts of the conceptual framework, the student-researcher identified elements of context and components of the environment, mechanisms, and outcomes, then organized them into CMOCs and then inductively in themes. The student-researcher compared the CMOCs to highlight similarities and differences from one municipality to another and identify recurrent patterns (Fig. 3) and analyzed all data using NVivo12 software. Two other members of the research team co-coded at least one third of the verbatims and all points of disagreement were resolved through returning to the data and, if needed, discussion among the researchers. Due to time constraints, the material other than focus group verbatims, i.e., diagrams, participant logbooks, as well as the synthesis of municipal documents, underwent content and thematic analysis following the same codes used for the verbatims.

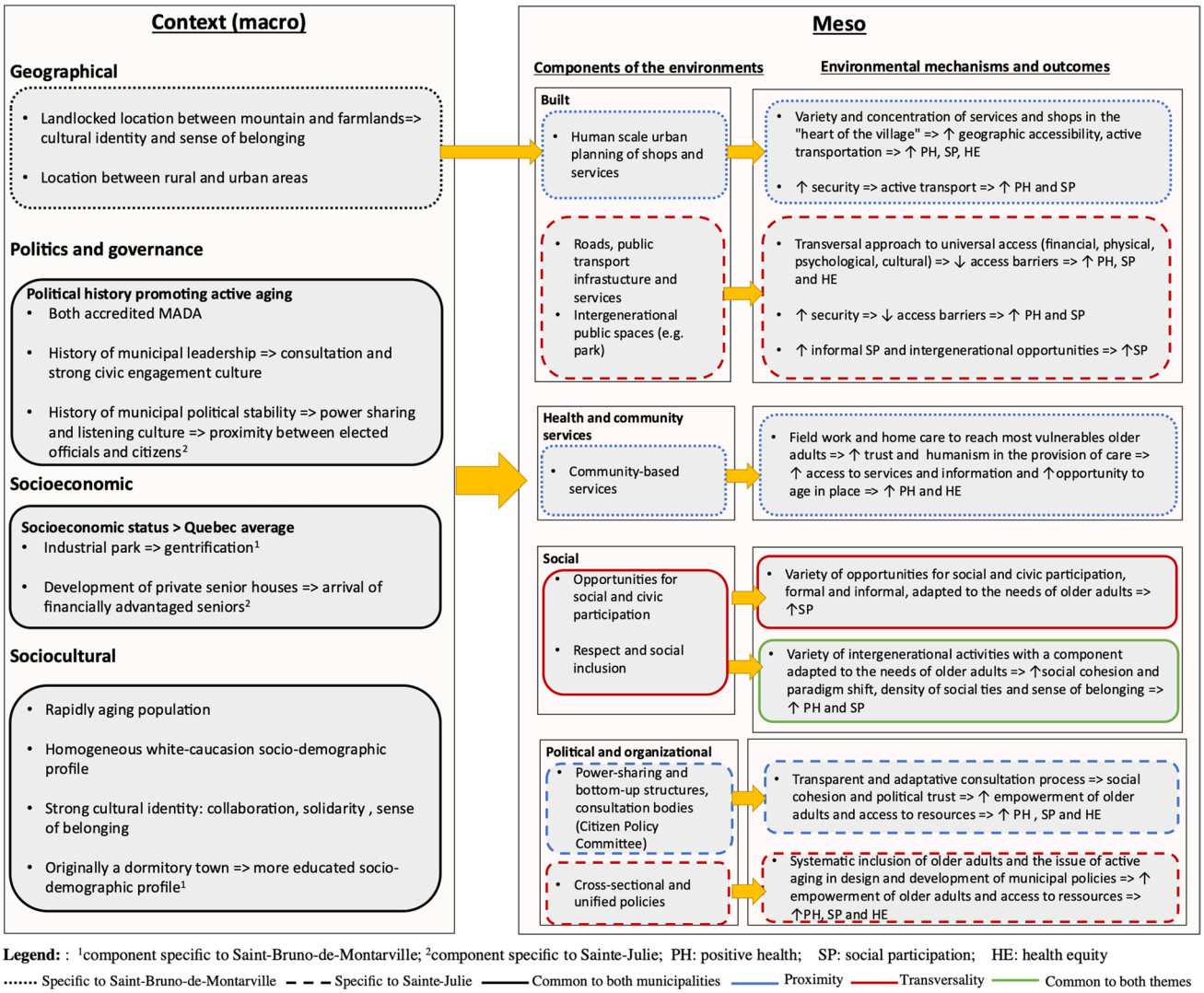


**Fig. 3** Context-mechanism-outcome configurations in Saint-Bruno-de-Montarville and Sainte-Julie explaining how components of the environments can promote positive health, social participation, and health equity in older adults

## Results

This section begins with a description of the sociodemographic profiles of participants and municipalities followed by a presentation of the two main themes, i.e., proximity and transversality, which answer the question "through which mechanisms and in what contexts can environments foster older adults' active aging?".

### Participants and municipalities

Aged 65 to 80, older participants were mainly women with at least post-secondary education (Table 1). Engaged in up to 20 h of volunteering per week (data not shown in Table 1), the majority were satisfied with their level of social participation and assessed their health as good or excellent. None were from a minority or Indigenous group and one older participant was born outside of Canada and not a native French speaker (Table 1). All older adults had lived in the municipality for at least 5 years and the majority for 15 or more. The other types of participants, i.e., health professionals, community-based actors, municipal employees, and elected officials, were also mainly women and performed various tasks, mainly in public organizations (Table 2). Most of them had held their position for at least 5 years, all were involved in various tasks related to older adults, and one fifth worked directly with them.

Politics and governance, sociocultural (aging population, homogenous Caucasian demographic profile, strong sense of belonging to the community; Fig. 3), and socioeconomic (income and education above Quebec's averages, and gentrification; Table 3 and Fig. 3) were the main macro contexts fostering active aging of older adults in both municipalities. Only the geographic context in Saint-Bruno-de-Montarville directly triggered proximity mechanisms (see next section). Other elements of context and their complex interactions influenced various mechanisms from a holistic perspective (Fig. 3). Due to the unique history regarding the politics and governance—i.e., Saint-Bruno-de-Montarville and Sainte-Julie were both accredited MADA in 2013, leading to the adoption of policies promoting active aging—decision-makers recognized the importance of active aging. This recognition led to a supportive political environment for age-friendly environments by making it a priority and funding related initiatives.

Sociocultural and socioeconomic contexts also predisposed health and participation in older adults. Specifically, both municipalities were midsize, located in the Montérégie semirural region, with an aging population mostly from a Caucasian ethnocultural background, and having income and education levels higher than Quebec's averages (Table 3). In Saint-Bruno-de-Montarville, the industrial park's development led to the arrival of professionals with greater incomes compared to other residents. In Sainte-Julie, building of several private senior houses—i.e., long-term housing, such as condominiums or apartments, offering various amenities and services depending on the level of autonomy of their residents and managed by private companies—attracted older adults in physical and financial health. Gentrification of both municipalities thus predisposed older adults to be in better health and more involved in the community, as explained by one municipal employee: "*People […] have an income and a level of education well-above Quebec's average […] that plays into [active aging], but that does not take away from the efforts that are made daily. This is a clientele that is used to doing activities.*" (FGS2).

The sociocultural context of both municipalities also promoted cohesion, a sense of belonging, and a cultural identity which in turn influence solidarity, collaboration, and civic engagement. In Saint-Bruno, the municipality's location was a key context element contributing to ensuring proximity with citizens and a tight-knitted community, contributing to residents' sense of belonging as reported by another municipal employee: "*[Because] it is landlocked [between the mountain and agricultural land], the geographic location ensures that it remains a small community.*" (FGB2). A strong political cohesion and stability also emerged as a specific context element to create a sense of belonging and citizen consultation culture in Sainte-Julie.

### Contexts-mechanisms-outcomes configurations

Through their specific contexts, both municipalities presented common (e.g., opportunities for social and civic participation, respect, and social inclusion) and distinctive (e.g., outdoor spaces and buildings, transportation, community support, and health services) environmental components that mainly promote positive health and social participation and, sometimes, health equity in older adults (Fig. 3). These salient components of the environments triggered one or two mechanisms promoting active aging, most often specific to one municipality. Emerging CMOCs were classified under two main themes: proximity and transversality. Common to both municipalities, components of the built and social environments particularly promoted positive health and social participation, and sometimes health equity. In Saint-Bruno-de-Montarville, the health and community services environment mainly facilitated health equity, while in Sainte-Julie, the organizational and political environment favoured better health equity.

### Mechanisms

#### Proximity

In this project, proximity referred to the state of "being near" in distance or time and to the geographical and physical conception of space. Proximity specifically translated into three mechanisms involving various environments and their

**Table 1** Characteristics of the older adults

| Characteristics | Saint-Bruno-de-Montarville ($n=5$) | Sainte-Julie ($n=4$) | Total ($n=9$) |
|---|---|---|---|
| Continuous variables | Md ($Q$) | Md ($Q$) | Md ($Q$) |
| Age (years) | 77.0 (10.0) | 69.5 (3.0) | 71.0 (9.0) |
| Years since retirement | 11.0 (5.75) | 7.0 (3.75) | 10.75 (7.5) |
| Hours of volunteering per week | 8.5 (7.5) | 10.0 (7.75) | 8.5 (11.0) |
| Categorical variables | *n* (%) | *n* (%) | *n* (%) |
| Gender (women) | 5 (100.0) | 2 (50.0) | 7 (77.8) |
| French as first language | 4 (80. 0) | 4 (100.0) | 8 (88.9) |
| Born in Canada | 4 (80. 0) | 4 (100.0) | 8 (88.9) |
| Years of residence in the municipality (≥ 15) | 4 (80.0) | 3 (75.0) | 7 (77.8) |
| Living situation | | | |
| With spouse | 3 (60.0) | 3 (75.0) | 6 (66.7) |
| Alone | 2 (40.0) | 1 (25.0) | 3 (33.3) |
| Type of dwelling | | | |
| Single detached house | 4 (80.0) | 2 (50.0) | 6 (66.7) |
| Intergenerational house | 0 (0.0) | 1 (25.0) | 1 (11.1) |
| Apartment in a building | 0 (0.0) | 1 (25.0) | 1 (11.1) |
| Condo in a building | 1 (20.0) | 0 (0.0) | 1 (11.1) |
| Education level (years of schooling) | | | |
| Secondary (high school) or equivalent (7–11) | 0 (0.0) | 1 (25.0) | 1 (11.1) |
| Post-secondary (college/professional certificate or diploma) (12–14) | 2 (40.0) | 1 (25.0) | 3 (33.3) |
| Graduate and postgraduate degree (master, doctoral post-doctoral degree) (> 17) | 3 (60.0) | 2 (50.0) | 5 (55.6) |
| Level of satisfaction with social participation | | | |
| Very satisfied | 3 (60.0) | 1 (25.0) | 4 (44.4) |
| Satisfied | 2 (40.0) | 2 (50.0) | 4 (44.4) |
| Very unsatisfied | 0 (0.0) | 1 (25.0) | 1 (11.1) |
| Total annual household income ($) | | | |
| $25,000–$40,000 | 1 (20.0) | 1 (25.0) | 2 (22.2) |
| > $40,000 | 4 (80.0) | 2 (50.0) | 6 (66.7) |
| Prefer not to say | 0 (0.0) | 1 (25.0) | 1 (11.1) |
| Level of satisfaction with income | | | |
| Very satisfied | 0 (0.0) | 2 (50.0) | 2 (22.2) |
| Satisfied | 4 (80.0) | 2 (50.0) | 6 (66.7) |
| Prefer not to answer | 1 (20.0) | 0 (0.0) | 1 (11.1) |
| Occupation (retired) | 5 (100.0) | 4 (100.0) | 9 (100.0) |
| Self-reported illnesses or chronic health conditions | | | |
| None | 2 (40.0) | 3 (75.0) | 5 (55.6) |
| ≥ 1 | 3 (60.0) | 1 (25.0) | 4 (44.4) |
| Depressed mood during discussion groups (No) | 5 (100.0) | 4 (100.0) | 9 (100.0) |
| Self-assessment of overall health | | | |
| Excellent | 1 (20.0) | 1 (25.0) | 2 (22.2) |
| Good | 4 (80.0) | 2 (50.0) | 6 (66.7) |
| Fair | 0 (0.0) | 1 (25.0) | 1 (11.1) |
| Assessment of the chances of achieving an optimal state of health in relation to members of society | | | |
| Very likely | 1 (20.0) | 2 (50.0) | 3 (33.3) |
| Likely | 3 (60.0) | 1 (25.0) | 4 (44.4) |
| Not very likely | 0 (0.0) | 1 (25.0) | 1 (11.1) |
| No response | 1 (20.0) | 0 (0.0) | 1 (11.1) |

Legend: *Md*, median; *Q*, interquartile interval

**Table 2** Characteristics of health professionals, community-based actors, municipal employees, and elected officials

| Characteristics | Saint-Bruno-de-Montarville ($n=6$) | Sainte-Julie ($n=9$) | Total ($n=15$) |
|---|---|---|---|
| Categorical variables | *n* (%) | *n* (%) | *n* (%) |
| Gender (women) | 6 (100.0) | 6 (66.7) | 12 (80.0) |
| Type of participants | | | |
| Health professionals | 2 (33.3) | 2 (22.2) | 4 (26.7) |
| Community-based actors | 3 (50.0) | 0 (0.0) | 3 (20.0) |
| Municipal employees | 1 (16.7) | 4 (44.4) | 5 (33.3) |
| Municipal elected officials | 0 (0.0) | 3 (33.3) | 3 (20.0) |
| Field of practice[a] | | | |
| Community-based organization | 2 (33.3) | 0 (0.0) | 2 (13.3) |
| Education | 1 (16.7) | 0 (0.0) | 1 (6.7) |
| Politics | 0 (0.0) | 3 (33.3) | 3 (20.0) |
| Leisure and recreation | 0 (0.0) | 2 (22.2) | 2 (13.3) |
| Communication | 0 (0.0) | 1 (11.1) | 1 (6.7) |
| Infrastructure and transportation | 0 (0.0) | 1 (11.1) | 1 (6.7) |
| Urban planning | 0 (0.0) | 1 (11.1) | 1 (6.7) |
| Health and social services | 2 (33.3) | 1 (11.1) | 3 (20.0) |
| Number of years in these positions (years) | | | |
| 2–4 | 3 (50.0) | 1 (11.1) | 4 (26.7) |
| 5 | 1 (16.7) | 0 (0.0) | 1 (6.7) |
| >5 to 14 | 0 (0.0) | 3 (33.3) | 3 (20.0) |
| 15 and over | 1 (16.7) | 4 (44.4) | 5 (33.3) |
| Prefer not to say | 1 (16.7) | 1 (11.1) | 2 (13.3) |
| Type of working environment | | | |
| Public | 1 (16.7) | 6 (66.7) | 7 (46.7) |
| Private | 2 (33.3) | 3 (33.3) | 5 (33.3) |
| Mixed | 3 (50.0) | 0 (0.0) | 3 (20.0) |
| Contributions related to older adults[a] | | | |
| Contractual engagement | 1 (16.7) | 0 (0.0) | 1 (11.1) |
| Administration, management or coordination | 2 (33.3) | 6 (66.7) | 8 (53.3) |
| Advisory committee, concertation table (e.g., MADA committee) | 6 (100.0) | 6 (66.7) | 12 (80.0) |
| Work directly with older adults (e.g., field work, health care) | 2 (33.3) | 1 (11.1) | 3 (20.0) |
| Education level (years of schooling) | | | |
| Secondary (high school) or equivalent (7–11) | 0 (0.0) | 1 (11.1) | 1 (6.7) |
| Post-secondary (college/professional certificate or diploma; 12–14) | 2 (33.3) | 0 (0.0) | 2 (13.3) |
| Bachelor's degree (15–16) | 2 (33.3) | 7 (77.8) | 9 (60.0) |
| Graduate and postgraduate degree (master, doctoral post-doctoral degree) (>17) | 2 (33.3) | 1 (11.1) | 3 (20.0) |
| Self-assessment of the degree of mastery of the concept of positive health | | | |
| Very good knowledge (i.e., expert) | 0 (0.0) | 3 (33.3) | 3 (20.0) |
| Good knowledge (i.e., competent) | 5 (83.3) | 3 (33.3) | 8 (53.3) |
| Basic knowledge (i.e., beginner to intermediate) | 1 (16.7) | 3 (33.3) | 4 (26.7) |
| Self-assessment of the degree of mastery of the concept of social participation | | | |
| Very good knowledge (i.e., experienced to expert) | 1 (16.7) | 2 (22.2) | 3 (20.0) |
| Good knowledge (i.e., competent) | 5 (83.3) | 4 (44.4) | 9 (60.0) |
| Basic knowledge (i.e., beginner to intermediate) | 0 (0.0) | 3 (33.3) | 3 (20.0) |
| Self-assessment of the degree of mastery of the concept of health equity | | | |
| Very good knowledge (i.e., experienced to expert) | 0 (0.0) | 1 (11.1) | 1 (6.7) |
| Good knowledge (i.e., competent) | 3 (50.0) | 5 (55.6) | 8 (53.3) |
| Basic knowledge (i.e., beginner to intermediate) | 3 (50.0) | 3 (33.3) | 6 (40.0) |

Legend: *Md*, median; *Q*, interquartile interval

[a]Multiple answers per participant are possible

**Table 3** Sociocultural and socioeconomic contexts of two cases

| | Saint-Bruno-de-Montarville | Sainte-Julie | Quebec |
|---|---|---|---|
| Categorical variables | *n* (%) | *n* (%) | *n* (%) |
| Population size 2019 | 26,865 | 30,095 | |
| Population aged 65 and over | | | |
| In 2009 | 4159 (16.3) | 2351 (7.9) | 1,170,047 (14.9) |
| In 2019 | 5917 (22.0) | 4951 (16.3) | 1,634,712 (19.3) |
| Growth rate (from 2009 to 2019) | (42.3) | (110.8) | (39.7) |
| Immigrants | (13.4) | (5.8) | (15.1) |
| Visible minority | (2.0) | (1.9) | (5.2) |
| Aboriginal identity | (0.6) | (0.7) | (1.5) |
| French-speaking[c] | (87.5) | (97.7) | (88.5) |
| Distribution by highest certificate, diploma, or degree[a,d] | | | |
| No certificate, diploma, or degree | (11.3) | (21.7) | (32.6) |
| Secondary (high) school diploma or equivalency certificate | (24.4) | (29.4) | (24.9) |
| Postsecondary and non-university certificate, diploma, or degree | (30.5) | (27.7) | (24.2) |
| University certificate, diploma, or degree | (33.7) | (21.3) | (18.2) |
| Employment rate[a] | (13.9) | (14.8) | (10.7) |
| Distribution by work category[a,e] | | | |
| Worked full year, full time | (18.7) | (23.8) | (24.6) |
| Worked part year and/or part time | (81.3) | (76.2) | (75.4) |
| Distribution by mode of transportation used to get to work[a,d] | | | |
| Car | (87.5) | (89.2) | (80.5) |
| Public transit | (4.8) | (3.2) | (8.5) |
| Active transportation (walk and bicycle) | (6.7) | (7.5) | (8.8) |
| Other | (0.0) | (0.0) | (2.2) |
| Proportion living below the after-tax low-income cut-off [a,d] | (4.6) | (4.2) | (6.6) |
| Proportion in low income according to the market basket measure[a,d] | (3.3) | (2.7) | (6.4) |
| Proportion beneficiary of the Guaranteed Income Supplement[a,d] | (14.7) | (20.6) | (39.0) |
| Distribution by type of housing [b,d] | | | |
| Private housing | (84.4) | (60.7) | (78.8) |
| Health care institutions (including private nursing homes) | (15.6) | (39.3) | (20.0) |
| Other | (0.0) | (0.0) | (1.2) |
| Proportion living alone in a private household[b,d] | (27.7) | (26.5) | (36.2) |
| Distribution by tenure of the accommodation[a,d] | | | |
| Owner | (89.9) | (84.4) | (69.9) |
| Renter | (10.1) | (15.7) | (30.1) |
| Distribution by type of residential construction[a,d] | | | |
| House | (75.5) | (71.6) | (58.4) |
| Duplex | (0.9) | (1.6) | (7.5) |
| Apartment building | (23.8) | (26.7) | (33.4) |
| Mobile house | (0.0) | (0.0) | (0.7) |
| Continuous variables | Md ($) | Md ($) | Md ($) |
| After-tax income[a,d] | 32,977 | 28,580 | 23,635 |

[a]Among the population aged 65 and over

[b]Among the population aged 75 and over

[c]First official language spoken

[d]Statistics Canada, 2016 census, data of 2016

[e]Statistics Canada, 2016 census, data of 2015

components: (1) urban planning of the built environment promoting a village centre and, as named by the participants, a "human scale" city, i.e., human-centered and livable size; (2) health and community services with variety and accessibility of community-based services and field workers to reach vulnerable older adults; (3) political and organizational components facilitating closeness between municipal employees or elected officials and older adults facilitating a shared power mechanism (Fig. 3). In Saint-Bruno, the built environment, promoting proximity between individuals and with services, led to increased positive health, social participation, and health equity. Indeed, the landlocked municipality between farmlands and the mountain (context) had favoured human scale urban planning, which fostered a tight social network and social participation. Human scale urban planning also enhanced the concentration of a variety of shops and services in the heart of the village, facilitating geographic accessibility and, therefore, promoting walking, active transportation, and thus positive health (Fig. 3), as mentioned by one older adult: "*Everything is concentrated in the village. From the city centre, you can easily walk in the Parc du Mont Saint-Bruno and go to local shops, like the two grocery stores, pharmacies, medical clinics, sports centres.*" (FGB1). Such geographic proximity has allowed older adults to feel safe while navigating their environments, and has helped them maintain their identities, and to age at home, which has promoted continuity of their contribution and roles and hence positive health and social participation: *"The sense of belonging is primarily due to the feeling of safety. […] the feeling of safety stems from nature and […] the neighbourhood.*" (FGB2).

Specifically in Saint-Bruno-de-Montarville, proximity also provided better accessibility to a variety of local community-based health and social services (Fig. 3), for example, a social field worker reaching older adults from all backgrounds, including those in vulnerable and isolated situations: "*It is really individual support to create this relationship of trust […] once you have formed the bond, you bring them to health organizations.*" (FGB2). This service was carried out in collaboration with community, health, and municipal services. A wide variety of accessible services adapted to different needs and profiles of older adults were salient mechanisms contributing to active aging in both municipalities: "*It is important, [to offer different services] to respond to different profiles of older adults.*" (FGJ2). These profiles were partially explained by one older citizen: "*I see at least three or four generations in what are called older adults […] someone aged 65 to 70 is not the same person [does not have the same needs for active aging] as someone aged 90 to 95.*" (FGB1). In sum, because participants mentioned them as a facilitator for positive health, social participation and health equity, these services fostered active aging (Appendix 1).

In Sainte-Julie, proximity between elected officials and citizens translated into a political and organizational shared power governance with both top-down and bottom-up mechanisms (Fig. 3), as mentioned by one older adult: "*Upstream, we know what is going on […] and, downstream, after one year or two years, [the citizens] see the result.*" (FGJ1). This sharing of power facilitated dynamic and iterative discussions to adapt the environment to meet active aging needs, as highlighted by another participant: "*Older adults tell us: We need benches when we walk, places to rest. […] We must plan for that […] question ourselves, otherwise it's not worth consulting [i.e., asking the population their opinions about public issues of importance].*" (FGJ3). This two-way and transparent consultation process strengthened the social fabric and trust in the municipal officials. Older adults felt recognized and observed concrete results emerging from the consultations, encouraging them to be even more engaged in the community.

### Transversality

Transversality was defined in this project as an integrated approach to the environments, i.e., considering their interinfluences and overlaps, involving intersectoral collaborations between professionals from all infrastructures offering services. Transversality was intertwined in mechanisms involving three components of the environments: (1) urban planning of the built environment promoting universal (i.e., for everyone) accessibility and intergenerational spaces; (2) social environment with a variety of intergenerational opportunities for social participation; (3) political and organizational components adopting complementary and unified municipal policies to systematically consider active aging, e.g., older adults' related needs (Fig. 3). In Sainte-Julie, built environment embraced a cross-cutting approach to rethink universal accessibility and public spaces. Facilitation of the use of public transportation was central to ensure accessibility to activities and services and, therefore, active aging. Sainte-Julie relied on accessibility beyond financial and physical (ergonomic and geographic) access by also reducing barriers related to fears and perceptions about one's own safety and promoting psychological and cultural accessibility, i.e., inclusive environments for individuals with various psychological abilities from all cultural backgrounds (Fig. 3). Sainte-Julie first adopted a policy for free public transit for older adults followed by low-floor buses, door-to-door bus driving services, and increased highway safety (e.g., crossings at intersections with protection for pedestrians). Finally, Sainte-Julie ensured psychological and cultural accessibility by offering "bus lessons" with ambassadors helping older adults use public transportation. These lessons contributed to a sense of safety and a positive perception of public transit: "*If [older adults] can no longer drive, they go through a grieving process, and […] we support them, reassure them [make them feel safe], and teach them how [to get around] again, in another way.*" (FGJ3).

Moreover, an intergenerational park, where people from all ages interacted in an informal setting, also contributed to

feeling safe while navigating the environments and helped increase social participation (Fig. 3): "*This park is intergenerational. We made the children's play area a little smaller to give more room for seniors' activities. We added [exercisers], shuffleboards, and swings. Many [users] are grandparents, so we kept the children's section.*" (FGJ2). Free exercise classes explaining how to use these exercisers were also offered. Saint-Bruno's safe environment enabled mechanisms such as maintenance of individuals' autonomy and functionality: "*We are not afraid to go walking even in the evening, [the environment] is really safe*." (FGB2). Security and maintenance were thus central functions when rethinking accessibility to the environments and their components, e.g., services, activities, and built infrastructures.

In Sainte-Julie, the social environment integrated intergenerational activities and a wide variety of cross-sectional opportunities for social participation adapted to different profiles of older adults (Fig. 3). Event programming truly adopted a transgenerational focus, which promoted the inclusion of older adults and a paradigm shift towards active aging: "*In all of our activities, there is always an adapted component so that older adults have as much fun as the [younger] families. It is really natural, from a whole family perspective, so that makes it gratifying for older adults to participate in these event*s." (FGJ2). In Saint-Bruno-de-Montarville, intergenerational events such as Neighbours' Day fostered social participation by including older adults: "*We can meet outside, share food, chat. We do races with children and all kinds of games. Each group of neighbours comes up with their own party*." (FGB1). Intergenerational events also enable proximity mechanisms. The two themes, proximity and transversality, are thus also interrelated. Saint-Bruno-de-Montarville also provided a wide variety of opportunities for social and civic participation across multiple fields, e.g., sporting activities, cultural events, volunteering, either formal (e.g., activities in a structured program or under a longer-term commitment), informal (e.g., activities in a flexible setting), or occasional participation.

In Sainte-Julie, the transversality of the political and organizational environments translated into both the conceptualization of aging and its operationalization within municipal policies (Fig. 3). More specifically, aging was approached from early childhood to old age, to create a city where you can be born, grow, work, and age. On the operational level, interdisciplinary collaborations led to a unified vision of aging across municipal policies: "*A lot of things were already being done to support [older adults], but we really wanted to make the Age-Friendly Municipality project a cross-cutting intervention*." (FGJ3). This unified vision was reflected by systematically considering active aging when developing municipal policies and including older adults among the stakeholders participating at the municipal advisory and decision-making committees: "*We have [older adults] who sit on our committees to [ensure that we] always listen to their needs*." (FGJ3).

## Discussion

This study aimed to explore *how* (through which mechanisms) and *in what context* municipalities' environments and their components can promote active aging by facilitating positive health, social participation, and health equity in older adults. Salient components of the environments of this study related to the WHO Age-friendly Cities framework for promoting active aging were outdoor spaces and buildings, transportation, community support and health services, opportunities for social and civic participation, and respect and social inclusion. We identified CMOCs and classified the results into two inductively generated main themes: proximity and transversality. Moreover, favourable income and education of the population as well as political and governance contexts predisposed older adults to be in better health and socially participate, which potentiated the action of components of the environment, i.e., amplified their positive influence on active aging. Another study among five Eastern Townships communities (Maclure et al., 2023) also reported that higher education levels facilitated older adults' positive health and social participation. Moreover, the advantaged sociodemographic and socioeconomic contexts, i.e., midsize semirural municipalities, the homogenous ethnocultural profile, i.e., Caucasian, wealthier socioeconomic profiles with higher education levels than Quebec's averages, might have contributed to enhanced social cohesion of residents of these municipalities. Other studies have observed that rural and smaller communities benefited from increased social participation (Hodgkin, 2012) and volunteering (Warburton & Winterton, 2017) among older adults. The results of this study support that a social context marked by a strong sense of community is important in facilitating proximity as a mechanism to increase empowerment and social participation of older adults.

This study highlighted the importance of proximity, which translated into a human scale urban planning of outdoor spaces and buildings favouring a tight-knit community and social networks. Community-based outreach services including healthcare and closeness with municipal officials promoting bottom-up power-sharing strategies to better meet the needs of older adults for active aging were also found to be important. In both municipalities, proximity went beyond objectives and geographical boundaries to include subjective and relational conceptualization of space. Conceptualized by participants as relational, i.e., social and subjective, and therefore fluid over time, proximity was defined by other authors as being related to socio-relational distances such as power dynamics between certain groups in society and ties in social networks (Cummins et al., 2007). This conceptualization of proximity is also coherent with social network (Berkman et al., 2000) and social connectivity (Menec, 2017) conceptual frameworks. Maclure and collaborators (2023) also identified that proximity of services and infrastructures is central in facilitating positive health and social participation of older adults. The results of the present study also corroborate

those of Jeste and colleagues (2016) where active listening by elected officials to the needs of older adults, and involvement of the latter in public policy planning, were key mechanisms for fostering active aging. For both municipalities, the top-down (active aging policies) and bottom-up (community and participatory power-sharing bodies) approaches helped to promote active aging among older adults, highlighting the importance of considering power dynamics, social network and social connectivity theories, defined as enhanced social cohesion and connections, in the development of enabling environments for active aging, as discussed by Menec (2017). Accordingly, social connectivity leads to individual and community empowerment that increases their social influence and ultimately results in better accessibility to resources and services for older adults (Menec, 2017).

In addition to an integrated approach in both municipalities, transversality was also reported by others as going beyond intersectoral approaches and translating into horizontal policy management (Peters & Pierre, 2006), social structures, and power dynamics (Lomnitz, 1982). These results are in line with ecological models of aging and human development (e.g., Bronfenbrenner, 1994; Lawton, 1982). Through intergenerational opportunities for social participation, respect and social inclusion, intergenerational public spaces, and consideration of how active aging can be fostered in all policies including urban planning, transportation, healthy habits, and citizen participation, the results of the present study have also shown that with transversality it is possible to systematically consider older adults' needs for active aging in the design and planning of environments. In addition to intervening on each of the eight components of the environments individually, this study supports that decision-makers could use the Age-friendly Cities framework in a holistic and comprehensive way (i.e., generally acting on multiple components of the environments at the same time and considering that their interinfluences can lead to outcomes) to better plan for active aging in their municipalities. Previous studies have also highlighted the presence of overlapping objectives addressed by initiatives not exclusively concerning older adults, e.g., family policies (Menec et al., 2015). Overlaps also happen between policies and components of the environments, e.g., multiple policies or interventions that tackle or act on the same component of the environments (Black & Hyer, 2019). These results stress the importance of creating partnerships among organizations and groups supporting older adults, as well as building on existing initiatives, resources, and strengths (Menec et al., 2015). The results of the present study also underline the importance of rethinking accessibility to the physical environment and services in a transversal way, including geographic, ergonomic, financial, and social accessibility and intergenerational opportunities. The physical environment can create informal intergenerational social interactions and encourage social participation and inclusion in older adults. These results were not previously identified in the literature.

### Strengths and limitations

To our knowledge, this study is the first to explore through which mechanisms and in what contexts the environments can foster older adults' active aging. The rigorous methodology involved in-depth exploration and triangulation of data sources including five focus groups with five types of participants (older citizens, health professionals, community-based actors, and municipal employees and elected officials) and documentation (participants' sociodemographic questionnaires and logbooks, diagrams from focus groups, municipalities' sociodemographic profiles and policies). The depth of the data collection and analyses made it possible to highlight points of divergence and convergence (Fig. 3) and ensured credibility. The interview guides, standardized process, recording, transcription, and co-coding of one third of the groups using an extraction grid ensured procedural accountability, i.e., reproducibility of the methodology (Patton, 2014).

This study has some limitations. Focus groups increased the risk of social desirability and authority bias, especially with participants in positions of power (e.g., mayor, municipal councillor, president of non-governmental organizations). To limit these potential biases, the interviewer mentioned that there was no right or wrong answer, and all opinions were welcomed. Participants could also communicate their opinion through their logbooks. Although repetition was found in the main elements of contexts, components of the environments, and mechanisms, including across types of participants and groups, saturation of data was not reached. Indeed, the methodological choice to have several types of participants from heterogenous backgrounds would have required a larger sample size to reach saturation, which was not possible due to time constraints and the COVID-19 context. Sampling for maximum variation however offered rich and diverse perspectives, better capturing the complexity of active aging. Although only one older adult reported that the use of technology hindered her participation in focus group discussion, the virtual format could have limited the recruitment of people who have limited access to internet or electronic devices. Finally, transferability of results remains limited to municipalities with similar contexts.

## Conclusion

This study aimed to explore *through which mechanisms* and *in what contexts* environments can promote active aging in two Quebec (Canada) municipalities. Politics and governance, and sociocultural or socioeconomic contexts predisposed older adults to active aging, i.e., greater positive health, social participation, and health equity, and helped trigger mechanisms involving all components of these environments. We identified proximity and transversality as important themes intertwined

within various environments and their components and mechanisms fostering active aging. The interactions between context elements and the environments and their components are important to trigger mechanisms leading to positive health, social participation, and health equity. To better promote active aging through environmental interventions, practices and policies should (1) foster *proximity* of built (urban planning), social (network structures), services (variety and availability of local and outreach resources), and organizational (active listening to older adults' needs for active aging) environments and (2) use a *transversal approach* to active aging and its operationalization through built (universal accessibility, intergenerational spaces), social (transgenerational opportunities for social participation), and political/organizational (unified and complementary policies) environments. Future research should explore cases of heterogenous backgrounds and contexts, with disadvantaged economic status or greater ethnocultural diversity. Finally, to fully understand how environments influence active aging, interactions between the context-macro level and mechanisms triggered at the environmental-meso level, and individual-micro level, should be further explored.

## Contributions to knowledge

What does this study add to existing knowledge?

- This study is the first to explore *how* and *in what context* environments can promote active aging in older adults by linking elements of context to mechanisms and outcomes through CMOCs. This was a complex exercise considering the overlap between contextual elements and mechanisms.
- Using a realist approach, the study identified key contexts, components of the environments, and mechanisms that promote active aging, i.e., positive health, social participation, and health equity in older adults.

What are the key implications for public health interventions, practice, or policy?

- To better promote active aging through age-friendly environments, practices should focus on:

    1) fostering *proximity* within built (accessibility, urban planning), health and community services (variety, availability, and outreach), social (network), or political and organizational (active listening to needs for active aging, bottom-up power mechanisms) environments;
    2) adopting a *transversal approach* through built (universal accessibility, intergenerational spaces), social (transgenerational opportunities for social participation), or political and organizational (unified and complementary policies) environments; and
    3) considering different *individual needs* for active aging and *profiles* of older adults in planning and designing services, e.g., health and community services, and opportunities for social participation.

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**Author contributions** A-LM-G drafted the manuscript. D-MM and ML helped draft and extensively revised the manuscript. All authors have approved the final manuscript and are willing to take responsibility for appropriate portions of the content.

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**Availability of data and material** Data will be available upon request to the corresponding author.

**Code availability** N/A.

## Declarations

**Ethics approval** This project has been approved by the CIUSSS de l'Estrie-CHUS Research Ethics Committee (# 2017–656).

**Consent to participate** Written informed consent was obtained from participants before data collection.

**Conflict of interest** The authors declare no competing interests.

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