Original Article

Korean J Health Promot 2025;25(2):66-73
pISSN: 2234-2141 • eISSN: 2093-5676
https://doi.org/10.15384/kjhp.2025.00080

Korean Journal of Health Promotion
KJHP

Redefining Age-Friendly and Resilient Cities under Pandemic through Scorecard

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ABSTRACT

Background: The COVID-19 pandemic exposed older adults' vulnerability, underscoring the urgent need for comprehensive urban health strategies and resilient cities. Existing frameworks often lack specific tools for assessing pandemic policy effectiveness for aging populations.

Methods: This study introduces the Pandemic Policy Assessment Scorecard, a tool with 16 subjects and 40 evaluative statements across five dimensions: governance & finance, healthcare capacity, social support, urban environment, and information/communication technology. Developed drawing on World Health Organization and United Nations Office for Disaster Risk Reduction frameworks, these subjects were selected through literature review, expert consultation, and pilot studies, capturing both quantitative and qualitative dimensions of policy performance.

Results: The scorecard provides a systematic framework to assess pandemic-related policy effectiveness. Comparative analyses of pandemic responses in aging societies, such as Switzerland and Thailand, revealed variations in age-friendly policy initiatives, highlighting the necessity of targeted, evidence-based approaches to protect elderly populations during crises.

Conclusions: The scorecard offers a integrated framework that complements existing resilience tools by explicitly addressing elder-specific vulnerabilities. It equips policymakers with data-driven insights to strengthen interventions, ultimately advancing the development of age-friendly, resilient urban environments prepared for future health emergencies.

Keywords: Social determinants of health, Health services for the aged, Resilience, Civil defense, Pandemics

INTRODUCTION

On March 11, 2020, the World Health Organization (WHO) first characterized COVID-19 as a pandemic. Since then, nearly 7 million deaths have been officially reported worldwide, according to the WHO COVID-19 dashboard [1]. Regions and countries characterized by a higher prevalence of certain risk factors such as higher population density, older populations, more inbound and outbound tourism, and high levels of deprivation and poverty have been seen to be hit the hardest, overwhelming their national health systems.

The COVID-19 pandemic has forced governments globally to enact stringent public health measures such as social distancing, self-isolation, travel restrictions, and prolonged lockdowns to minimize the impact of the disease. While these actions aim to protect populations at high risk, they have inadvertently affect-

Received: May 28, 2025; **Revised:** June 14, 2025; **Accepted:** June 14, 2025
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ed overall well-being of them, including social, physical, and mental health. This is particularly true for senior citizens, who are at greater risk of infection and mortality and may struggle to adhere to social distancing due to their specific needs, i.e., the necessity for close physical interaction in elder care further complicates compliance with these measures.

The health of individuals is determined not just by healthcare systems but also by socio-economic conditions, security, and the environments in which people live, work, and age. The pandemic has exacerbated existing social and economic difficulties, disproportionately impacting vulnerable groups like the elderly. Addressing these challenges and improving resilience requires a holistic approach that goes beyond healthcare, incorporating multi-sectoral and multidisciplinary strategies. This comprehensive response is essential for reducing the pandemic's effects and promoting inclusive, healthy urban environments that address the needs of all citizens, particularly the most at-risk.

The study introduces the Pandemic Policy Assessment Scorecard, a comprehensive tool that enables governments and citizens to systematically evaluate pandemic-related policy effectiveness for older adults and other vulnerable groups. By capturing both quantitative and qualitative dimensions of policy performance, its main objective is to guide the development of evidence-based policies that address pandemic challenges and shape a resilient post-COVID "new normal," ensuring protection of daily life, care services, and social support both during and after the pandemic.

Comparative analyses of international pandemic responses in aging societies such as Switzerland and Thailand reveal variations in the effectiveness of age-friendly policy initiatives and measures, underscoring the necessity of targeted, evidence-based approaches as provided by the scorecard. By generating knowledge and evidence, this study supports the development of policies that foster age-friendly, resilient cities, helping communities better adapt to future health crises.

METHODS

Theoretical framework

In the context of a global pandemic, the urgency of building age-friendly and resilient cities has become increasingly evident. As urban populations age, cities must adapt to meet the unique needs of older adults, ensuring their safety, health, and well-being amidst health crises and beyond.

Drawing on WHO's "Global age-friendly cities" [2] framework and United Nations Office for Disaster Risk Reduction (UNDRR)'s "Disaster Resilience Scorecard for Cities" [3], the study team developed a scorecard framework that encompasses five critical dimensions (governance, healthcare, social support, urban environment, and information, communication & technology [ICT]). The inclusion of governance, social support, and technology aspects is strongly supported by literature from Lowe et al. [4] and Xiang et al. [5], validating the hypothesis that an integrative framework enhances long-term resilience and inclusivity for older adults. Each dimension is detailed with specific subjects/issues for assessment (Fig. 1).

The scorecard's indicators were selected through a three-phase process—literature review, consultations with experts in public health, epidemiology, urban planning, communication, disaster management, and pilot studies. Indicators were chosen based on relevance, measurability, and clarity, ensuring the scorecard's robustness. By systematically assessing elder-specific vulnerabilities and responses, it transcends generic resilience tools to provide targeted, data-driven guidance.

Illustrative application for governments and civil society

The Pandemic Policy Assessment Scorecard is flexibly designed for diverse stakeholders across various governance levels and organizational contexts, offering three primary implementation pathways.

Government-led implementation begins with establishing a multidisciplinary assessment team comprising representatives from public health, urban planning, social services, and aging affairs units. Local governments should first conduct a baseline assessment by systematically evaluating each of the 40 statements across the five dimensions, utilizing existing policy documents, service delivery data, and stakeholder consultations. The scoring process involves evidence-based evaluation where each statement based on documented policy measures, implementation status, and measurable outcomes. This assessment should be complemented by workshops with frontline service providers and older adult advocacy groups to ensure comprehensive evaluation of policy effectiveness from multiple perspectives.

Civil society-led assessment provides an alternative approach for non-governmental organizations (NGOs), community organizations, and advocacy groups to monitor government performance and identify service gaps. Civil society organizations can utilize the scorecard through community-based participatory evaluation, engaging older adults directly in assessing their ex-

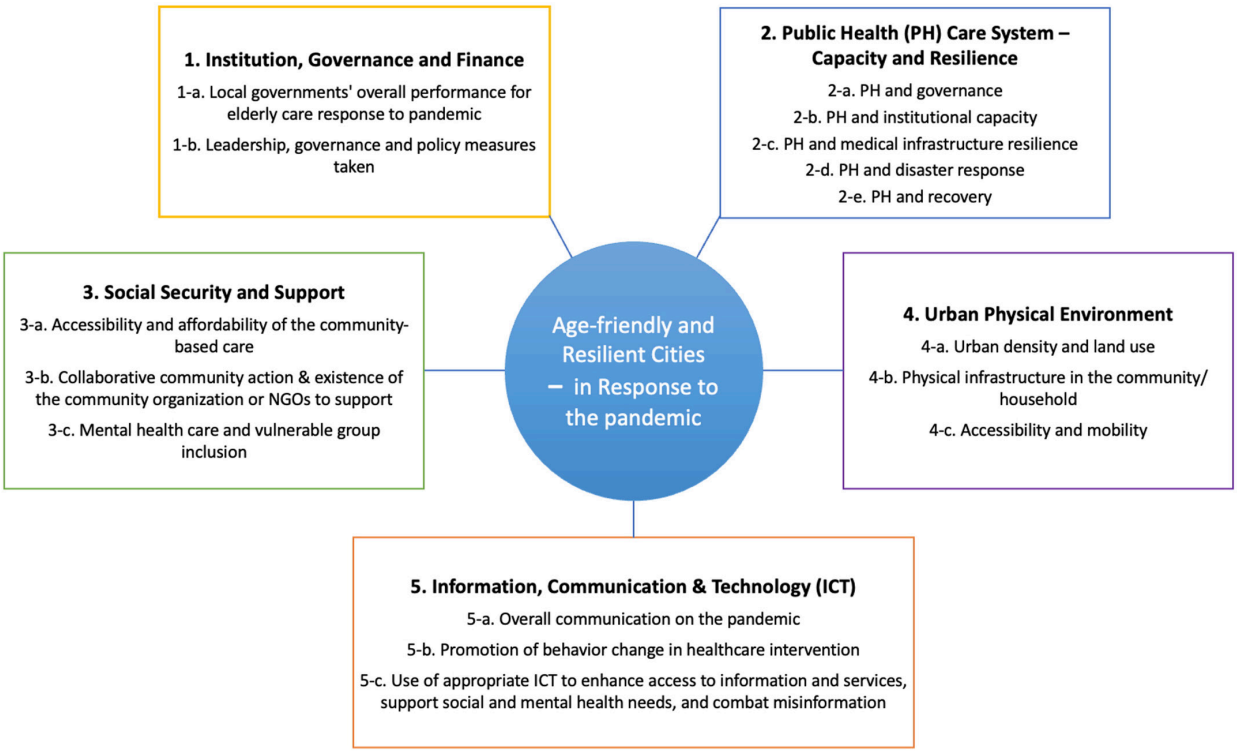

Fig. 1. Conceptual framework of age-friendly and resilient cities during a pandemic across five dimensions. NGOs, non-governmental organizations.

periences with pandemic-related policies and services. This bottom-up approach involves organizing focus groups, conducting surveys with elderly community members, and documenting service accessibility challenges. The resulting scores provide evidence-based advocacy tools for civil society to engage with local authorities, propose policy improvements, and monitor implementation progress over time.

Collaborative multi-stakeholder application represents the most comprehensive approach, bringing together government officials, civil society representatives, academic institutions, and older adults in joint assessment exercises. This methodology involves establishing assessment committees with balanced representation, conducting parallel evaluations by different stakeholder groups, and reconciling scores through structured dialogue sessions. Such collaborative approaches help strengthen accuracy and legitimacy of assessments, build consensus on priority areas for improvement as well as partnerships for policy implementation and monitoring.

Whichever application is chosen, the methodology emphasizes iterative application, with annual or biennial reassessments to track progress, identify emerging challenges, and adapt strategies based on changing urban contexts and evolving pandemic preparedness needs.

RESULTS

Scorecard for age-friendly and resilient cities

The Pandemic Policy Assessment Scorecard is detailed in Table 1, serves as a comprehensive tool for evaluating urban pandemic preparedness and response specifically for older adults and vulnerable groups. This scorecard is structured across five critical dimensions, encompassing 16 subjects and a total of 40 evaluative statements. Each statement can be quantitatively assessed on a four-point scale, ranging from 3 (indicating "completely agree/satisfied" with the policy's performance or implementation) down to 0 (signifying "completely disagree/unsatisfied"). This scoring mechanism allows for a nuanced assessment, capturing both the presence and perceived effectiveness of policies and interventions during health crises.

 https://doi.org/10.15384/kjhp.2025.00080

Table 1. Pandemic Policy Assessment Scorecard

Dimension & sub-dimension	Assessment statements
1. Institution, governance and finance	
1-a. Local governments' overall performance for older adults care in response to pandemic	i. Overall pandemic response and recovery to safeguard the older adults has been successful.
	ii. Data and reports are provided regularly and disaggregated to capture co-factors of risk among older adults, including age, sex, socio-economic and underlying health conditions.
1-b. Leadership, governance, and policy measures taken	i. The government is addressing the health and socio-economic impacts of containment measures, and contingency plans and strategies are in place for older adults at high risk.
	ii. Multidisciplinary, interagency, long-term governance arrangements are set up to ensure a coordinated response to manage the crisis.
	iii. The government is closely coordinating with the international/regional bodies and alliances in formulating its policy measures and actions.
2. Public health care system – capacity and resilience	
2-a. Public health and governance	i. A Pandemic Task Force team that includes public health and medical experts—relevant to the older population—is part of the coordination of the national response.
2-b. Public health and institutional capacity	i. Public health workforce has competencies (direct contact with governance), skills (management, scientific knowledge) and resources to plan and maintain public health systems and services, relevant to the older population.
	ii. Public health authorities systematically collect and maintain robust local epidemiological databases, which are regularly updated and freely accessible to stakeholders and researchers.
2-c. Public health and medical infrastructure resilience	i. There are sufficient qualified health workers and surge capacity of medical equipment to meet the evolving local needs in protecting older adults.
	ii. Older adults have uninterrupted access to basic and specialized health services through healthcare, social security, and insurance systems.
	iii. Specialized health services (i.e., nursing homes, home care services) for older adults are in coordination with local authorities and have the necessary resources and capacity to adapt to changing needs.
2-d. Public health and disaster response	i. An effective monitoring system is in place, providing access to free tests, rapid communication of results and isolation measures, and efficient contact tracing.
2-e. Public health and recovery	i. Health system is prepared to provide post-recovery care, with the necessary resources and infrastructure to follow up on patients' physical and mental health status and treat any long-term effects.
3. Social security and support	
3-a. Accessibility and affordability of community-based care	i. Primary care services and social services are coordinating and collaborating with each other throughout the pandemic.
	ii. Specialized helplines (telephone and digital) are provided and expanded to support the health and psychological needs of older adults.
	iii. Adequate access to food and nutritional needs is ensured, including provisions to address food security and malnutrition issues among older adults due to mobility restrictions, health vulnerabilities, loss of income, or rising costs.
	iv. Access to social services and social protection schemes is ensured for the most marginalized social groups, taking into account factors such as age, income, gender, ethnicity/race, and other contributors to higher vulnerability.
3-b. Collaborative community action and the role of community organizations or non-governmental organizations in support	i. Opportunities for social participation of older adults are maintained and expanded.
	ii. There was active support from voluntary and welfare organizations for addressing the needs of older adults.
	iii. Partnerships of local authorities and stakeholders to provide specialized services for older adults are expanded and strengthened.
3-c. Mental healthcare and vulnerable group inclusion	i. Mental health outreach services have been expanded to meet increased demand.
	ii. Appropriate measures have been taken to protect members of vulnerable groups at higher risk, including older adults living alone, in facilities, in poverty, or migrant populations.
	iii. Creative and innovative measures have been employed to maintain effective and meaningful social links with older adults, combining technology and community-based approaches to overcome digital disparities.
	iv. Relevant measures have been implemented to support older adults facing domestic abuse and violence at home or in the community.
4. Urban physical environment	
4-a. Urban density and land use	i. Urban policy, planning, and design support all ages, ensuring universal accessibility to spaces and facilities.
	ii. Pandemic containment measures and relief programs focus on specific geographic and economic areas, especially densely populated, low-income regions.
	iii. Sufficient green and recreational spaces are accessible and well-maintained nearby.
4-b. Physical infrastructure in the community/household	i. Sufficient public and affordable housing is appropriately equipped to meet sanitary standards for low-income families and older adults.
	ii. Community and housing facilities and services that promote social interaction and integration of older adults are accessible during the pandemic.
4-c. Accessibility and mobility	i. Mobility needs of older adults are accommodated, catering to diverse needs.
	ii. The community adopts a barrier-free and comfortable mobility and walking environment.

(Continued on the next page)

Table 1. Continued

Dimension & sub-dimension	Assessment statements
5. Information, communication & technology	
5-a. Overall communication on the pandemic	i. A crisis/health communication committee is in place with technical experts and relevant stakeholders, to guide and coordinate media and communication strategies and health promotion materials at national and local levels.
	ii. Government communications use trusted medical experts and professionals as information sources, providing up-to-date, evidence-based health information.
	iii. Multiple channels (television, newspapers, social media, posters, and community-based health workers) are used to ensure accessibility for all and cater to the needs of varied socio-economic and vulnerable groups.
	iv. Vulnerable populations are consulted to understand public perceptions, address concerns and misinformation, and inform communication campaigns.
5-b. Promotion of behavior change in healthcare intervention	i. The IEC (information, education, and communication) campaign promotes specific behaviors that older adults can adopt for disease prevention, ensuring positive health, well-being, and enhanced self-efficacy.
	ii. Community organizations and non-governmental organizations collaborate to amplify/disseminate IEC campaigns and promote changes in lifestyle and preventative behavior among older adults.
	iii. Communication campaigns appeal to collective action and enhance a sense of community and collective efficacy.
5-c. Use of appropriate information, communication & technology to enhance access to information and services, support social and mental health needs, and combat misinformation	i. Helplines provided by the government or community organizations connect older adults to emergency medical care, mental health resources, social support, and abuse reporting services.
	ii. Online and social media platforms are monitored for detecting trends in misinformation and disinformation, integrating ongoing IEC activities.

DISCUSSION

Policy recommendations

Based on the review of international public health guidance, pilot studies and stakeholder interviews on the domestic measures taken in Switzerland and Thailand during the COVID-19 pandemic, recommendations for governmental actions were formulated across five key dimensions to strengthen outbreak preparedness and response.

Institution, governance, and finance: with a focus on local governments and leadership

Effective institutions and governance are critical for formulating and enforcing age-friendly policies, enabling cities to meet the various needs of their aging populations, particularly during crises like pandemics. Incorporating disaggregated data is crucial, as it highlights risk co-factors among older adults, allowing for more tailored and effective policy responses. Additionally, securing sufficient finance is key to support public healthcare, social security systems, and required technological infrastructures for elderly care.

Integrating multidisciplinary and interagency governance institutions ensures a holistic approach for elderly care, facilitating the effective implementation of well-designed policies through collaborative efforts across sectors. This approach not only ensures uninterrupted care under social distancing and improved access to healthcare resources but also supports the long-term continuity of these initiatives.

During the COVID-19 pandemic, a number of countries, such as India, Sri Lanka, and Vietnam, implemented temporary increases in pensions or provided cash handouts to senior citizens as part of their social protection schemes in response to the pandemic [6]. Regarding cash handouts, it is critical that the application processes are thoughtfully designed. Reports from Thailand indicate that while applications were submitted online, the system posed accessibility challenges for many older residents.

By placing a high priority on elderly care within their policy measures and budgetary plans, local governments can also play a critical role in protecting health and well-being of older adults during pandemics, as a result, contributing significantly to the overall urban resilience.

Public healthcare system: capacity and resilience through various facets

Ensuring public health capacity and resilience means medical services encompassing preventive care, treatment, and recovery are readily accessible, thereby protecting the well-being of older adults. Effective and integrated governance is crucial for planning, funding, and implementing public health initiatives, particularly for pandemic preparedness and response. It facilitates resource allocation and policy enforcement, emphasizing the prioritization of elderly needs in the public health agenda. Including experts relevant to the elderly in a Pandemic Task Force in coordinating national and local responses enhances effectiveness and focuses on this vulnerable population in society.

 https://doi.org/10.15384/kjhp.2025.00080

The robustness of the public health system depends on its institutional capacity, which includes a workforce equipped with competence, skills, and resources for pandemic resilience and relevant to the older population. This involves training healthcare professionals in geriatric care, ensuring the availability of specialized facilities for the elderly, the system's surge capacity to scale up during health crises, and the maintenance of robust local epidemiological databases that are regularly updated and freely accessible to stakeholders and researchers.

Infrastructure resilience is another crucial element of maintaining healthcare delivery during emergencies. This not only includes the physical robustness of facilities but also necessitates sufficient number of qualified health workers and medical equipment to meet the evolving needs to protecting older adults. It is essential that they have uninterrupted access to both basic and specialized health services.

Furthermore, an effective monitoring system that offers access to free tests, quick communication of results, and effective contact tracing is crucial. This system should work in coordination with specialized health services for older adults, such as nursing homes and home care and local authorities to adapt to changing needs. Lastly, a health system prepared for post-recovery care, with necessary resources and infrastructure to monitor patients' physical and mental health status and treat any sequels, is a key component of a resilient health system for the older population.

Social security and support: enhancing community-based care, collaboration, and inclusion

To enhance the accessibility and affordability of community-based care during health crises, it is crucial to establish stronger collaboration between primary care services and social services. This means that older adults receive integrated care addressing both their medical and social needs. Additionally, governments should invest and expand specialized helplines (both conventional, such as telephone, and digital) to provide essential health and psychological support to older adults, tackling the impacts of isolation and health vulnerabilities.

Furthermore, access to social services and protection schemes should be expanded, with particular attention to marginalized groups based on age, income, gender, ethnicity, or other vulnerabilities. Tailored policies are necessary to address the unique challenges these groups face, ensuring equitable access to vital resources such as food. Governments should establish comprehensive mechanisms to provide continuous access to nutritional support, especially for those experiencing mobility restrictions, income loss, or health challenges. Studies from Switzerland have shown that older adults in community settings benefited significantly from structured social services and coordinated volunteer initiatives during the pandemic, which maintained their well-being by ensuring access to essential resources such as food, healthcare, and social interaction [7].

Collaboration between local authorities, community organizations, and NGOs must be strengthened to maintain and enhance opportunities for older adults' social participation. Voluntary organizations should continue to play an active role in providing support, while partnerships between local stakeholders should be expanded to offer specialized services, particularly in times of crisis. These collective efforts will be critical in fostering resilience among older adults and ensuring their well-being during future emergencies.

Mental health support became critically important during the COVID-19 pandemic, though limited empirical policy research exists. Governments should expand mental health outreach services, particularly for vulnerable groups like older adults living alone, those in poverty, and migrant populations. Tailored strategies combining innovative technologies and community-based approaches are needed to address digital disparities and maintain social connections. These efforts will enhance resilience and well-being in at-risk populations during future crises.

Urban physical environment: optimizing urban density, infrastructure, and accessibility

The design of urban spaces and infrastructure directly impacts the mobility, safety, and well-being of older residents. During a pandemic, the importance of such features is increased, as they contribute to the physical and mental health of the population, while also supporting social distancing and other health-related measures.

Strategic planning of urban density and land use is crucial for balancing the needs of the population with the availability of resources and services. Densely populated areas particularly need measures to avoid overcrowding while ensuring access to essential services in the low-resource areas. During and after the COVID-19 pandemic, cities around the world have announced an increasing number of green recovery initiatives, reclaiming public spaces for citizens [8]. Provisioning sufficient green spaces and recreational areas can improve the quality of life for older residents by providing safe opportunities for physical activity and social interaction.

In addition, the physical infrastructure of the community and individual households should be appropriately equipped to meet sanitary conditions for low-income families and accommodate the mobility challenges of older adults. Ensuring easy access for the elderly to essential services and facilities is another crucial element for their independence and well-being. This involves not just physical mobility through accessible public transportation and pedestrian-friendly street design but also the spatial arrangement of neighborhoods to keep essential services within reach.

Information, communication & technology: facilitating awareness, health interventions, and support

To improve communication efforts during health crises, governments should establish a crisis/health communication committee comprising relevant experts and stakeholders responsible for planning and coordinating media and communication strategies across national and local levels. Utilizing trusted medical experts and professionals as sources of information will ensure that public messaging is grounded in evidence-based, up-to-date health information, helping to build trust with the targeted audiences.

It is also essential that communication strategies leverage multiple channels, such as television, newspapers, social media, and community health workers, to reach diverse socio-economic and vulnerable groups. Additionally, vulnerable populations should be consulted to understand their perceptions, address concerns, and prevent the spread of misinformation. Tailoring messages to these groups will enhance the effectiveness of public health campaigns and ensure inclusivity. In Thailand, village health volunteers played a crucial role in disseminating COVID-19 information within vulnerable communities by leveraging community trust. Their pre-existing relationships allowed for rapid adaptation, ensuring critical health services reached at-risk populations [9].

To promote behavior change, governments must implement clear, tailored messaging through various formats (audio, video, visual) and channels suited to different pandemic stages. IEC (information, education, and communication) campaigns should emphasize specific behaviors that older adults can adopt to prevent disease and improve their health and well-being. Community organizations and NGOs can play a vital role in amplifying these messages, fostering lifestyle changes, and promoting preventive behaviors. Communication campaigns that emphasize collective action will strengthen community bonds and enhance collective efficacy.

Finally, the use of ICT should be strategically applied to meet the needs of older adults, with particular emphasis on enhancing their digital literacy to ensure access to services and combat misinformation. Governments can offer helplines and telemedicine services to address health and social needs while monitoring online platforms to identify and counter misinformation. These initiatives will help older adults remain connected, informed, and supported during future crises.

Conclusion

The Pandemic Policy Assessment Scorecard presents a unique, integrative framework, integrating governance, healthcare accessibility, social support mechanisms, urban design, and technology, to evaluate pandemic policies tailored to older adults. By explicitly addressing elder-specific vulnerabilities, it complements and extends existing resilience tools, equipping policymakers with data-driven insights to ensure that cities can evolve into safe, supportive, and vibrant places for people of all ages. The policy recommendations outlined above demonstrate how coordinated actions across these dimensions protected elderly populations during COVID-19 and offer a practical roadmap for municipalities to adopt proactive, innovative, and responsive strategies in future health crises.

Future studies should address gaps identified, including digital disparities among older adults, integration of mental health services, and equitable policy implementations across diverse vulnerable groups, further contributing to the ongoing dialogue on urban resilience during pandemics. The project team plans to conduct further pilot testing of the scorecard to support local governments in collaborative multi-stakeholder applications. Partnerships with regional and international organizations could enhance the tool's applicability and build institutional capacity for age-friendly pandemic preparedness. The outcomes will inform future refinements of the scorecard and contribute to the development of resilient, age-friendly cities.

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AUTHOR CONTRIBUTIONS

Dr. Sohee Minsun KIM had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. All authors reviewed this manuscript and agreed to individual contributions.

Conceptualization: SMK. Data curation: all authors. Formal analysis: all authors. Methodology: all authors. Supervision: all authors. Writing–original draft: SMK. Writing–review & editing: all authors.

CONFLICTS OF INTEREST

No existing or potential conflict of interest relevant to this article was reported.

FUNDING

This work was supported by the Swiss State Secretariat for Education, Research and Innovation (SERI), through ETH Zurich as the Leading House for the Bilateral Science and Technology Cooperation Programme with Asia (Project No. COV_15_062020).

DATA AVAILABILITY

The data presented in this study are available upon reasonable request from the corresponding author.

ACKNOWLEDGMENTS

The research team would like to express gratitude to the health and disaster management experts in the cities of Bern and Bangkok for their valuable insights and expertise, which greatly assisted the research.

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