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# Digital Health for Healthy Ageing and the Care Capacity Gap

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## Abstract

Objective: To examine the relationship between population ageing and care capacity and assess how digital health may address selected gaps in healthcare, long-term care and social support across India, Germany, the United States, Canada and the Netherlands.
Design: Comparative scoping review informed by the PRISMA-ScR reporting framework. We synthesised publicly accessible, peer-reviewed, authoritative demographic, health-system, policy, and digital-health sources published from January 2010 to August 2026 thematically.
Setting: Five contrasting national healthcare and social-care contexts: India, Germany, the United States, Canada and the Netherlands.
Results: The comparison indicates that ageing pressure and care capacity vary substantially across countries. The proportion of adults aged 65 years and above ranges from approximately 7% in India to more than 20% in Germany and the Netherlands. Health-system resources, long-term-care workforce and potential demographic support also differ considerably. Digital-health capabilities—including telehealth, electronic health records, patient portals, remote monitoring and digital information exchange—can address selected barriers involving geographic access, continuity, monitoring, coordination and caregiver involvement. However, availability does not guarantee benefit; digital literacy, affordability, connectivity, usability, trust and sustained engagement influence outcomes.
Conclusions: Healthy ageing requires a systems approach that combines formal healthcare, long-term care, financial and social protection, family support and community resources. Digital health should function as an enabling layer rather than a substitute for human-centred care. The proposed human-centred framework, comprising access, capability, adoption, sustained use and healthy-ageing benefit, provides a structured basis for assessing whether digital-health investment translates into meaningful benefits for older adults.

**Keywords:** healthy ageing; population ageing; digital health; care capacity; long-term care; telehealth

## 1. Introduction

Population ageing is one of the most significant demographic transformations affecting health and social-care systems worldwide. Longer life expectancy creates opportunities for

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individuals and societies, but may also extend the period during which people require support for chronic disease, multimorbidity, functional limitations and declining independence. [1,2] The policy challenge is therefore shifting from simply extending life to ensuring that additional years are lived with health, dignity, independence and quality of life.

The implications extend beyond healthcare delivery. Older adults may require coordinated preventive, primary, rehabilitative, long-term, palliative and social care. Families and communities remain important sources of practical, emotional and social support, while governments are responsible for health, social protection and care infrastructure. [1,2] However, geographical separation, changing household structures, employment demands, economic insecurity and increasing numbers of older adults living alone may constrain informal support.

This creates an ageing–care capacity gap between what ageing populations need, what families and communities can provide, and what formal healthcare and social-support systems can sustainably deliver. Digital health, including telehealth, electronic health records, patient portals, remote monitoring and mobile health, may address selected components of this gap.[3-6] However, digital availability does not necessarily result in adoption, sustained use or improved outcomes. Technology also cannot replace professional care, physical assistance, emotional support or human connection.

This review compares India, Germany, the United States, Canada and the Netherlands and examines how digital health can function as an enabling bridge within wider healthy-ageing systems. This review contributes a comparative, systems-level perspective by linking demographic ageing pressure and care capacity with digital-health capability and proposing a human-centred framework for assessing how digital health can support, rather than substitute for, formal and informal care.

## 2. Objectives and Review Questions

This review examines how increasing longevity and population ageing are changing healthcare and social-support needs and whether formal and informal care systems can respond adequately across India, Germany, the United States, Canada and the Netherlands.

The review seeks to: (1) compare demographic ageing with healthcare, long-term-care, economic and family-support capacity; (2) identify gaps between the needs of older adults and available formal and informal support; (3) examine how digital health can address gaps in access, continuity, monitoring, coordination, self-management and caregiver support; and (4) assess the conditions required for digital health to support healthy, independent and dignified ageing while complementing professional care, family relationships and social connection.

The review questions were:

1. What is the relationship between ageing-related needs and care capacity?
2. Where are the principal care-support gaps?
3. How can digital health address selected gaps?

4. What conditions are required for sustained healthy-ageing benefits?

## 3. Methods

### 3.1 Review Design

A comparative scoping review was undertaken to map evidence concerning population ageing, healthcare and social-support capacity, and the potential contribution of digital health to healthy ageing across five countries. The review was informed by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) framework to support transparent reporting of evidence identification, screening, eligibility and synthesis.[7]

### 3.2 Information Sources and Search Strategy

The search was constructed and documented on 16 September 2026 using a publication cutoff of 31 August 2026. The bibliographic component used PubMed/MEDLINE as the principal peer-reviewed literature source. Targeted searches of authoritative institutional sources were undertaken through the websites of the World Health Organization (WHO), United Nations Department of Economic and Social Affairs (UN DESA), Organisation for Economic Co-operation and Development (OECD), World Bank and relevant national health authorities. The search period for published evidence was January 2010 through 31 August 2026.

The core PubMed/MEDLINE concepts were combined as follows:

("older adults" OR elderly OR "older people" OR seniors OR ageing OR aging) AND ("digital health" OR telehealth OR telemedicine OR eHealth OR mHealth OR "electronic health record*" OR "patient portal*" OR "remote monitoring") AND ("healthy ageing" OR "healthy aging" OR independence OR "quality of life" OR "long-term care" OR caregiving OR "social support")

Country-specific searches added India, Germany, the United States, Canada and the Netherlands where required to identify country-relevant evidence. Additional targeted searches were used for demographic indicators, healthcare workforce, hospital capacity, long-term-care workforce, national digital-health infrastructure, patient portals, virtual care and caregiver/proxy access. Search concepts and source types were selected to reflect the review questions rather than to estimate a pooled intervention effect.

### 3.3 Eligibility and Selection

Eligible evidence included peer-reviewed original studies, systematic and scoping reviews, comparative studies, demographic reports, health-system reports, government publications and authoritative policy or digital-health documentation that addressed at least one review question and was relevant to one or more of the five countries. Sources were excluded when they did not concern older adults or ageing-related needs; did not address healthcare, social care, caregiving or digital health; were unrelated to the five-country comparison or the broader conceptual questions; lacked sufficient information to support interpretation of the relevant indicator or intervention; or consisted of non-authoritative general web content.

Titles and abstracts were screened for relevance, followed by full-text assessment of potentially eligible sources. Authoritative institutional sources were assessed separately for relevance and authority when used to obtain demographic, health-system or national digital-health indicators. The final retained evidence set was then audited for duplication, relevance, source authority and consistency with the review questions.

### 3.4 Country Selection Rationale

The five countries were selected purposively to provide contrasting demographic, health-system, long-term-care and digital-health contexts rather than to constitute a statistically representative sample. India was selected as a large lower-middle-income country with a rapidly expanding older population and substantial geographic and socioeconomic variation. Germany represents a highly aged European population with comparatively extensive health and long-term-care resources. The United States provides a contrasting high-income system with high health expenditure and a different financing and service-delivery structure. Canada was selected as a high-income country with publicly financed healthcare and substantial geographic variation in access and service delivery. The Netherlands provides a further European comparator with relatively high long-term-care workforce capacity and established digital-health and health-data exchange infrastructure. Together, the five countries provide variation in ageing intensity, demographic support, healthcare resources, long-term-care capacity and digital-health maturity, allowing examination of whether the potential role of digital health differs across contrasting care-system environments.

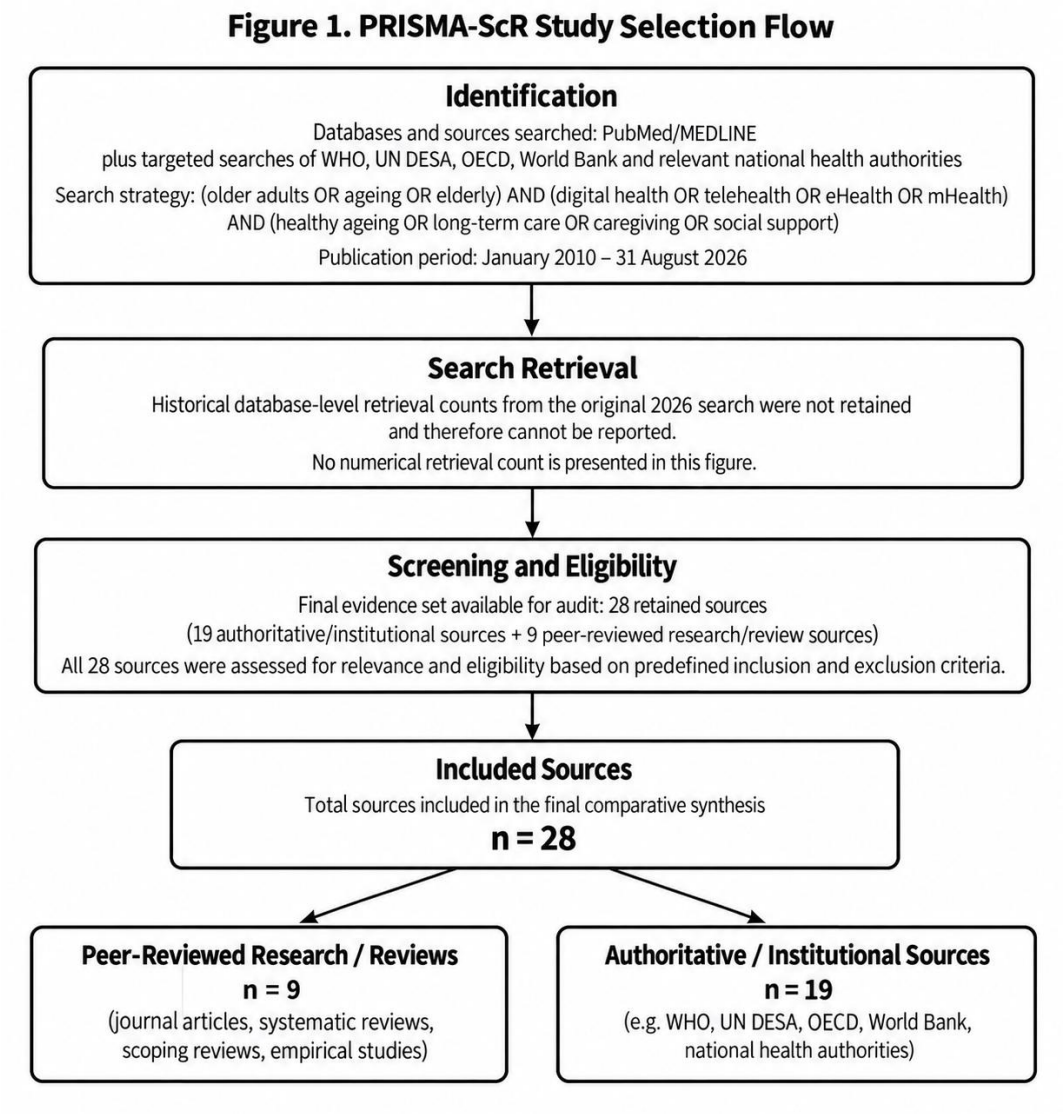
### 3.5 Data Extraction and Synthesis

Evidence was organised into five analytical domains: demographic ageing, healthcare capacity, economic/social-support capacity, family and caregiving support, and digital-health capability. Data were extracted according to country, indicator or intervention, source year, relevance to older adults and contribution to the review questions. Digital-health evidence was assessed according to its potential contribution to access, continuity, monitoring, coordination, self-management and caregiver support.

Findings were synthesised narratively and comparatively rather than through quantitative meta-analysis because of substantial heterogeneity in study designs, indicators, health-system structures, digital-health interventions and reporting years.

### 3.6 Search and Selection Audit

The known evidence set contains 28 retained sources: 19 authoritative or institutional sources and 9 peer-reviewed research or review sources. All 28 retained sources were assessed against the **predefined eligibility criteria** and remained eligible ; no duplicate records were identified within this final 28-source evidence set, and no source was excluded at the final audit stage. The evidence-selection process is presented in Figure 1. The figure explicitly distinguishes recoverable final evidence counts from unrecoverable historical database-level retrieval counts.




### 3.7 Ethics Statement

Ethics clearance was not required because this review used publicly available published literature and publicly available demographic, health-system and digital-health data and did not involve human participants or identifiable personal data.

## 4. The Ageing–Care Capacity Gap

Population ageing increases demand not only for medical treatment but for a continuum of preventive, primary, rehabilitative, long-term, palliative and social care. Longer survival may increase the duration of chronic disease, multimorbidity, functional limitation and potential care dependency. [1,2]

For this review, older adults or seniors are defined as persons aged 65 years and above. Potential Intergenerational Support is defined as the population aged 20–64 years relative to the population aged 65 years and above: Potential Intergenerational Support Ratio = population aged 20–64 ÷ population aged 65+. This ratio is a demographic proxy rather than a measure of

actual caregivers; employment, geographical proximity, family structure, health, financial circumstances and cultural expectations influence actual caregiving capacity.[5]

**Table 1. Demographic and Health-System Capacity Across Five Countries**

| Indicator | India | Germany | United States | Canada | Netherlands | Source/reference year |
|---|---|---|---|---|---|---|
| Total population (million) | 1,444.4 | 83.5 | 340.1 | 41.3 | 18.0 | UN WPP 2024 (2024) |
| Life expectancy – male (years) | 70.5 | 78.2 | 75.8 | 79.5 | 80.5 | UN WPP 2024 (2023) |
| Life expectancy – female (years) | 73.6 | 83.0 | 81.1 | 84.0 | 83.4 | UN WPP 2024 (2023) |
| Population aged 65+ (%) | 7.1 | 23.2 | 17.9 | 19.8 | 20.5 | UN WPP 2024 (2024) |
| Population aged 65+ (million) | 103.7 | 19.4 | 61.0 | 8.2 | 3.7 | UN WPP 2024 (2024) |
| Male share of 65+ (%) | ~47.6 | ~44.4 | ~45.9 | ~45.3 | ~46.6 | Author calculation from UN WPP 2024 (2024) |
| Female share of 65+ (%) | ~52.4 | ~55.6 | ~54.1 | ~54.7 | ~53.4 | Author calculation from UN WPP 2024 (2024) |
| Potential Intergenerational Support Ratio | ~8.3 | ~2.5 | ~3.2 | ~3.0 | ~2.9 | Author calculation from UN WPP 2024 (2024) |
| Physicians /1,000 | 0.7 | 4.7 | 2.7 | 2.7 | 3.9 | OECD HAG 2024 India (2020); OECD HAG 2025 others (2023) |
| Nurses /1,000 | 1.7 | 12.2 | 12.4 | 10.0 | 11.1 | OECD HAG 2024 India (2020); OECD HAG 2025 others (2023) |
| Hospital beds /1,000 | 1.6 | 7.7 | 2.8 | 2.5 | 2.3 | OECD HAG 2024 India (2021); OECD |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | HAG 2025 others (2023) |
| Health expenditure (% GDP) | NR | 12.3 | 17.2 | 11.3 | 10.0 | OECD HAG 2025 (2024) |
| Long-term-care workers per 100 aged 65+ | NR | 5.5 | 4.1 | 3.7 | 8.3 | OECD HAG 2025 (2023) |

Note: Potential Intergenerational Support Ratio = population aged 20–64 ÷ population aged 65+. Sex shares and the ratio are author calculations from age-specific population data. Demographic indicators are derived from UN World Population Prospects 2024. OECD health-system indicators use the latest year specified in the source: India uses Health at a Glance: Asia/Pacific 2024; the other four countries use Health at a Glance 2025. Reference years therefore differ by indicator and country and should not be interpreted as observations from a single common year. NR = not reported or not available in the selected comparable source.

Table 1 demonstrates substantial differences in population ageing, longevity and selected health-system resources across the five countries, although health-system indicators are not identical in the reference year across all countries. India has the largest absolute older population but a substantially lower proportion of its population aged 65+ than the four high-income comparators. Germany, Canada, the Netherlands and the United States have considerably higher ageing intensity and lower potential demographic support capacity.

Healthcare capacity should not be assessed solely through hospitals, doctors or nurses. For ageing populations, primary care, rehabilitation, home-based care, long-term care, palliative care, care coordination and financial protection are also important. [1,2] The ageing–care capacity gap is consequently multidimensional and provides the rationale for examining digital health as an enabling bridge.

## 5. Digital Health as a Bridge

Digital health encompasses technologies used to support health information, healthcare delivery, prevention, communication and self-management, including telehealth, electronic health records, patient portals, remote monitoring and mobile health.

The five countries have developed different digital-health architectures. India has established national digital-health infrastructure through ABDM and eSanjeevani.[14,15] Germany has developed national digital infrastructure centred on the electronic patient record and e-prescription.[16] In the United States, 65% of individuals reported accessing an online medical record or patient portal in 2024 and 51% reported proxy or caregiver access.[17] Canada has developed virtual-care and interoperability initiatives supported by Canada Health Infoway.[18] The Netherlands provides a useful comparator through the MedMij framework for secure exchange of health data between residents and care providers.[19]

**Table 2. Digital-Health Capabilities and Potential Contributions to Healthy Ageing**

| Capability | India | Germany | United States | Canada | Netherlands | Contribution to Healthy Ageing |
|---|---|---|---|---|---|---|
| Telehealth | e-Sanjeevani | National digitalisation strategy / virtual care | Established telehealth | Provincial virtual care | Telehealth/telemonitoring | Access; reduced travel |
| EHR / digital records | ABDM / ABHA | ePA | Extensive EHR adoption | EMRs and digital exchange | Digital exchange | Continuity; coordination |
| Patient portals / PHR | ABHA / PHR | ePA access | Provider portals | Provincial access | Personal health environments | Participation; access to information |
| Remote monitoring | Developing | Established use | Established use | Virtual-care programmes | Selected pathways | Home monitoring; earlier contact |
| Digital coordination | ABDM | ePA / telematics | EHR interoperability / APIs | Interoperability initiatives | MedMij | Reduced fragmentation |
| E-prescriptions | Digital services | National e-prescription | Established | Digital prescribing | Digital exchange | Medication continuity |
| Digital self-management | PHR / digital services | ePA / apps | Portals/apps | Patient services | Personal health environments | Participation; independence |
| Caregiver/proxy access | Consent-based information sharing | Secure access | 51% proxy access reported | Developing / authorised sharing | Caregiver involvement | Caregiver support; continuity |

Note: Country-level digital-health capabilities are based on official national sources [14-19]. Evidence concerning effectiveness, adoption barriers and implementation outcomes is supported by the peer-reviewed reviews and studies cited in the text.

Table 2 maps these capabilities against selected ageing-related care gaps. Evidence from reviews indicates that telehealth can be feasible and acceptable for older adults and may support chronic-disease management and access, although technology difficulty and limitations of virtual examination remain important constraints.[24,25] Remote monitoring can support observation of physiological and activity-related parameters outside conventional facilities, while digital records, patient portals and information exchange can support continuity and coordination.[17-19,26] Recent trial evidence also indicates improvements in quality of life and mental-health outcomes in selected older adults with chronic disease.[27]

However, availability does not equal benefit. Older adults may encounter barriers related to affordability, connectivity, digital and health literacy, accessibility, usability, privacy and trust.[20-22,28] Evidence from rural and underserved populations further identifies broadband access and digital literacy as recurring implementation barriers, even where interventions improve clinical, behavioural or psychosocial outcomes.[28] Digital technologies also cannot provide physical assistance, emotional companionship or professional judgement. Digital health should consequently be understood as an enabling layer within the wider ageing-care ecosystem rather than as a substitute for care capacity.

## 6. Human-Centred Framework for Digital Healthy Ageing

The comparative synthesis indicates that digital availability alone is insufficient to produce meaningful benefits for older adults. A technology may be available but remain unused because of limited skills, affordability constraints, inadequate connectivity, lack of trust or poor usability. [20-22]

A human-centred framework is therefore proposed as a conceptual synthesis derived from the comparative evidence, comprising five components: access, capability, adoption, sustained use and healthy-ageing benefit.

Access requires appropriate digital-health services, devices, connectivity and supporting infrastructure. Capability includes digital and health literacy, confidence and accessibility support; evidence indicates substantial variation in digital literacy among older adults.[20,21] Adoption is influenced by perceived usefulness, ease of use, trust, privacy, cultural acceptability and confidence, with recent evidence identifying usefulness and usability as important determinants of digital-health acceptance.[22] Sustained use requires reliability, relevance and integration with existing care arrangements; recent evidence shows that patient-portal use among older adults is increasing but continued engagement remains variable.[23] Recent meta-analytic evidence indicates that selected digital-health interventions can improve quality of life and mental-health outcomes in older adults with chronic disease, although heterogeneity remains.[27]

Human connection operates as a cross-cutting principle. Digital health can facilitate communication between older adults, professionals, families and caregivers, but cannot replace physical assistance, emotional support, professional judgement or meaningful social relationships.

## 7. Management and Policy Implications

The ageing–care capacity gap requires coordinated action across healthcare systems, governments, families and communities. Governments should plan for longevity rather than ageing alone, incorporating demographic projections into healthcare, social-care, pension and long-term-care planning.[1,2] Investment should extend beyond hospitals to primary care, home-based care, rehabilitation, palliative care and community support. Digital-health strategies should prioritise interoperable infrastructure, affordable connectivity, accessibility, privacy and digital-literacy support. Financial protection and pension arrangements should also be considered within this wider care-capacity context.[8]

Healthcare and aged-care organisations should move towards integrated, person-centred and continuity-oriented care. Digital tools can support virtual consultations, electronic records, remote monitoring, medication management and communication across providers. Performance should be assessed according to improvements in access, continuity, self-management, independence and quality of life rather than adoption alone.

Informal caregivers should be recognised as part of the ageing-care ecosystem. Digital platforms can support remote communication, appointment coordination, information sharing and monitoring when geographical distance limits physical caregiving. Digital-health developers should apply older-adult-centred design principles, including simplicity, accessibility, affordability, privacy, security and interoperability.[22]

The central management implication is that digital health should not be implemented as a stand-alone technology programme. Its effectiveness depends on healthcare capacity, long-term care, financial protection, family support and community resources.

## 8. Discussion

The review indicates that healthy ageing is increasingly a health-system and societal capacity challenge. The five-country comparison demonstrates that demographic pressure and care capacity do not change uniformly. The number and proportion of older adults, potential demographic support, healthcare resources and long-term-care capacity vary substantially across the countries.

The first important finding is that healthcare capacity is multidimensional. Table 1 demonstrates why hospital infrastructure or health expenditure alone cannot represent ageing-care capacity. Germany has high physician, nursing and hospital-bed capacity, while the Netherlands has particularly high long-term-care workforce availability.[10,13] The United States combines very high health expenditure with comparatively low hospital-bed density.[11]

The second finding is that formal and informal care are interconnected. Where formal services are constrained, families may absorb greater responsibility; however, geographical separation, changing household structures and competing employment and caregiving responsibilities may limit this capacity. The Potential Intergenerational Support Ratio is therefore useful as a demographic indicator but should not be interpreted as actual caregiver availability.[5]

The third finding is that digital health can address selected components of the care-capacity gap. Table 2 demonstrates established or developing capabilities in telehealth, electronic records, patient access, remote monitoring and digital coordination across all five countries.[14-19]

The fourth finding is that digital-health benefit depends on a progression from access to capability, adoption and sustained use. Evidence concerning digital literacy, technology acceptance and patient-portal engagement supports this interpretation.[20-23] Evidence from rural and underserved populations indicates that implementation barriers can persist even when digital interventions demonstrate clinical or psychosocial benefits.[28] Availability or utilisation alone is therefore insufficient as a measure of digital-health success; recent evidence of improved quality of life and mental health supports assessment at the level of meaningful benefit.[27]

An important contribution of this review is to distinguish between digital-health capacity and care capacity. A country may possess extensive digital infrastructure, electronic records, telehealth platforms and remote-monitoring capabilities while still experiencing substantial shortages of nurses, long-term-care workers, community services or family caregiving capacity. Conversely, a system with more limited digital infrastructure may retain strong interpersonal and community support that compensates for some technological limitations. Digital transformation should therefore be evaluated as part of a broader care ecosystem rather than as an independent measure of health-system preparedness.

The comparison also suggests that the pathway from technology availability to healthy-ageing benefit is not linear. Access is a necessary starting point, but access without capability may produce non-use; capability without perceived usefulness may not result in adoption; adoption without reliability, relevance and social support may not result in sustained use; and sustained use does not automatically establish improved health or wellbeing. This progression provides a useful analytical distinction between implementation success and meaningful outcome. It also explains why digital-health programmes can demonstrate technical reach while continuing to leave some older adults underserved.

The role of informal and relational support is particularly important within this pathway. Family members, caregivers, healthcare professionals and community networks can help older adults obtain devices, develop confidence, navigate platforms and interpret health information. They may also provide the motivation and reassurance required for continued engagement. This has implications for digital-health design: systems should not assume that the individual older adult is an isolated technology user. Consent-based caregiver or proxy functions, accessible interfaces, assisted digital services and opportunities for human contact can make digital care more compatible with the realities of ageing.

The findings further indicate that rurality should not be treated simply as a geographic variable. Rural and underserved populations may experience overlapping constraints involving broadband infrastructure, affordability, digital literacy, transport, availability of health professionals and social isolation. Digital health can reduce travel and improve access to selected services, but it cannot eliminate these structural inequalities by itself. A human-centred

implementation strategy therefore requires investment in connectivity and capability alongside local service capacity. In settings where digital infrastructure is expanding rapidly, policy should avoid creating a two-tier system in which digitally confident older adults receive greater continuity and choice while others remain dependent on fragmented or less accessible services.

These observations extend the interpretation of healthy ageing beyond technology adoption. The ultimate question is whether digital health contributes to functional ability, independence, continuity of care, wellbeing and dignity while preserving meaningful human relationships. The proposed framework therefore positions human connection as an essential condition across access, capability, adoption and sustained use rather than as a separate outcome. This perspective offers a practical basis for future empirical research: studies can examine not only whether older adults use a technology, but also who supports that use, whether engagement is sustained, what care functions are strengthened, and whether measurable benefits accrue to the older person, caregivers and the wider care system.

The principal strength is the integration of demographic, healthcare, economic, family/social-support and digital-health perspectives within a single comparative framework. Limitations include differences in definitions, reporting years and data availability; heterogeneous evidence concerning family caregiving and long-term-care capacity; reliance on publicly accessible evidence; rapidly evolving digital-health technologies; and the use of a demographic proxy rather than a direct measure of caregiver availability.

Future research should test the proposed human-centred framework empirically and examine whether improvements in digital access and capability translate into sustained use, better continuity of care, reduced caregiver burden, greater independence and improved quality of life.

## 9. Conclusion

Population ageing and increasing longevity are creating increasingly complex demands for healthcare, long-term care and social support. The central challenge is not simply that more people are living to older ages, but that ageing-related needs may increase faster than the capacity of healthcare systems, governments, families and communities to respond.

The five-country comparison demonstrates that care capacity is multidimensional and cannot be inferred from demographic structure, healthcare expenditure or hospital infrastructure alone. Digital health can serve as an important bridge by extending access, strengthening continuity, supporting monitoring and self-management, and connecting older adults with professionals and caregivers.

Healthy ageing therefore requires a human-centred systems approach in which digital health complements, not replaces, professional healthcare, family support and community connection. The proposed human-centred framework, comprising access, capability, adoption, sustained use and healthy-ageing benefit, provides a basis for evaluating whether digital-health investment translates into meaningful improvements in access, continuity, independence and quality of life for older adults.

**Declaration of Conflicting Interests**

The Author declares that there is no conflict of interest.

**AI Use Disclosure**

Generative AI tools were used as assistive tools during manuscript preparation for language refinement, editing, organisational support and document formatting. AI tools were not used as a substitute for the author's scholarly judgement or responsibility for the study design, interpretation of evidence, conclusions or final manuscript. The author independently reviewed and verified the cited evidence, references and numerical data and takes full responsibility for the accuracy, integrity and originality of the work.

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