# AGEING POPULATION RESEARCH: A BIBLIOMETRIC ANALYSIS

TING LI HAN

BACHELOR OF INTERNATIONAL BUSINESS (HONOURS)

UNIVERSITI TUNKU ABDUL RAHMAN

FACULTY OF ACCOUNTANCY AND MANAGEMENT
DEPARTMENT OF INTERNATIONAL BUSINESS

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BY

TING LI HAN

A final year project submitted in partial fulfilment of the requirement for the degree of

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(2) No portion of this FYP has been submitted in support of any application for any other degree or qualification of this or any other university, or other institutes of learning.

(3) Sole contribution has been made by me in completing the FYP.

(4) The word count of this research report is 9786.

| Name of Student: | Student ID: | Signature |
| --- | --- | --- |
| Ting Li Han | 2102869 |  |

Date: 16 May 2025

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## DEDICATION

***Family***

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“Friends make university a journey, not just a trek.”

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| | |
|---|---|
| AI | Artificial Intelligence |
| CAGR | Compound Annual Growth Rate |
| C/CP | Citations per Cited Paper |
| C/P | Citations per Paper |
| C/Y | Citations per Year |
| NCA | Number of Contributing Authors |
| NCP | Number of Cited Publications |
| SWB | Subjective Well-being |
| TC | Total Citations |
| TFR | Total Fertility Rate |
| TP | Total Publications |
| UK | United Kingdom |
| US | United States |
| VR | Virtual Reality |
| ML | Machine Learning |
| MCT | Multicomponent Training |

# ABSTRACT

The ageing population is a significant global issue driven by substantial demographic shifts, raising concerns about healthcare, socio-economic impacts, and the need for supportive technologies for older adults.

This study provides a bibliometric overview of research on population ageing which stands as a vital worldwide subject throughout the twenty-first century. It analyses publications from 1940 to 2025, focusing on publication trends, influential contributors, highly cited documents, key themes, and keyword evolution.

The bibliometric analysis covers 2,568 publications across 85 years through biblioMagika®, VOSviewer and Biblioshiny tools which create visual representations of co-occurrences and thematic maps and word clouds. The findings indicate an interdisciplinary approach, primarily driven by medicine, social sciences, and technology sectors. The number of published works about ageing population has shown continuous growth until it reached its peak in 2024 which demonstrates worldwide interest in this demographic trend.

The key themes include health and chronic diseases, cognitive health and technology integration, and socio-economic aspects. The analysis of co-occurrence and thematic mapping reveals that artificial intelligence and smart technology have become significant areas for elderly care development. However, gaps persist in research areas like artificial intelligence, health policy, pension systems, and palliative care.

This paper provides valuable insights for researchers, policymakers, and industry stakeholders by demonstrating the need for further interdisciplinary research and cross-national comparisons to effectively address global ageing challenges.

Keywords: ageing; ageing population; bibliometric analysis; elderly; older people

# CHAPTER 1: INTRODUCTION

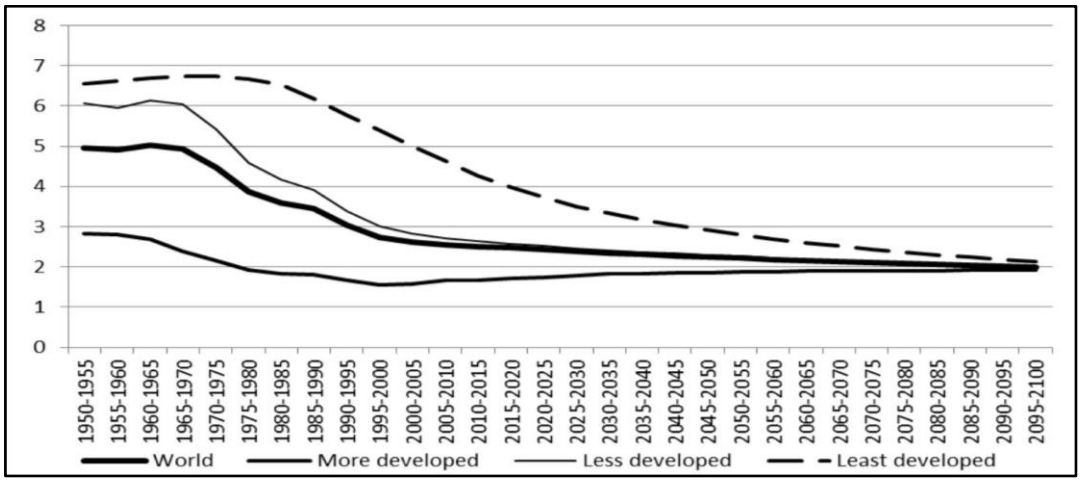
## 1.0 Introduction

Chapter 1 provides an overview of the study on the ageing population. It highlights the rising global trend of ageing populations and its implications. The problem statement underpins concerns about the effects of this trend on various aspects, such as economic and social factors. The research questions and objectives of this study are presented, highlighting the necessity of the research and explaining how bibliometric analysis is used to address these questions and objectives**.**

## 1.1 Background

The Total Fertility Rate (TFR) represents the average number of children that a woman would have at the end of their reproductive period (OECD, 2022). In 2022, the global fertility rate stands at 2.3 live births per woman, an obvious decrease as compared to 3.3 births in 1990 (United Nations, 2024). Figure 1.1 below shows historical and forecasted data having a significant trend in worldwide fertility rates. In 1950, the global fertility rate was approximately 5 children per woman. The birth rate decreased by half between 1950 and 2015 when it reached 2.5 children per woman and experts predict this number will decrease to approximately 2 children per woman by the end of the century. The fertility rates in developed nations fell below the replacement threshold of 2 children per woman during the year 1970. Since then, there has been a slight increase due to government incentives and higher fertility rates among immigrant families. On the other hand, the fertility rates in less developed regions have decreased from approximately 6 children per woman in 1950 to lower levels due to economic and social transformations. In the least developed countries, fertility rates initially increased to nearly 7 children per woman by 1975 before starting their downward trend.

Figure 1.1: Medium Fertility Projections



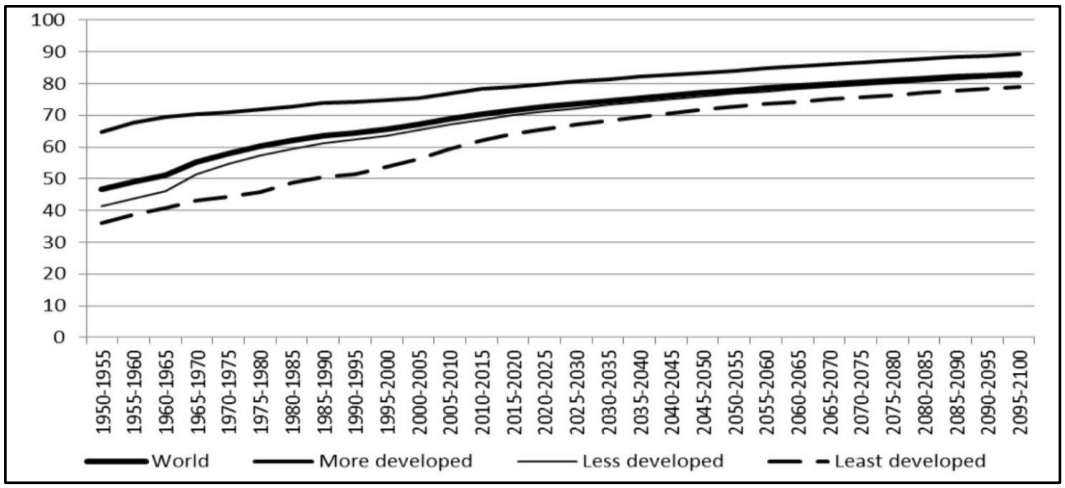

Source: World Population Prospects 2015 (United Nations, 2024)

The global average life expectancy in 1950 was 48 years, which has steadily increased over the years. By 2024, it will reach 73.3 years and is projected to rise further in the future. Projections indicate that this trend will continue, with people living longer in the future (United Nations, 2024). For example, individuals born in the past 10–20 years are expected to live an additional 7–8 years compared to their parents and 12-14 years more than their grandparents.

As shown in Figure 1.2, the top line shows the life expectancy of the richest nations, such as Europe and the US, at 65 years in 1950, while the least developed countries have an average life expectancy of only 36 years. Less developed countries started with an average life expectancy of 41 years in 1950, also showing consistent growth.

The life expectancy gap between wealthy and impoverished nations decreased to a 15-year difference. This indicates the improvements in healthcare and living conditions and standards in less developed regions. The worldwide life expectancy continues to rise positively as people are living longer across the world. However, the changing demographics from this trend affect both resource allocation and public social policies. The gap between rich and poor countries is a significant global trend.

Figure 1.2: Medium Life Expectancy (in years)

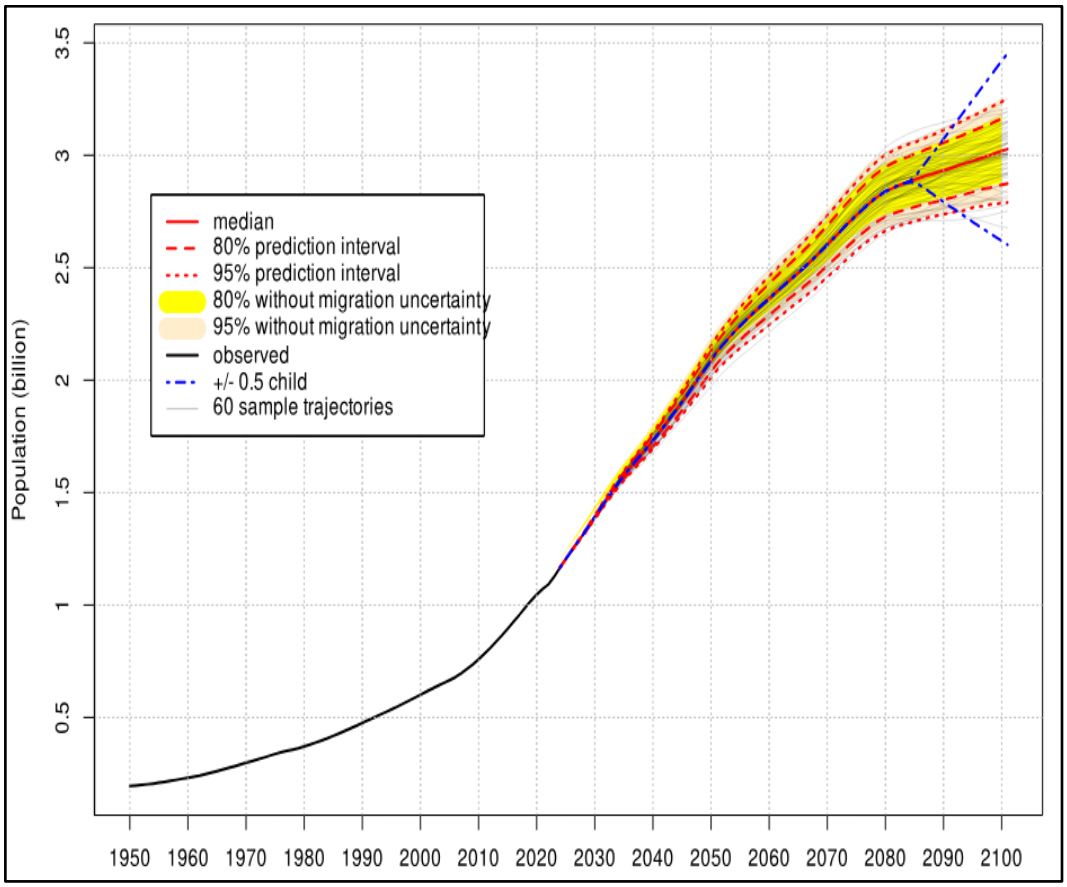



Source: World Population Prospects 2015 (United Nations, 2024)

Due to decreased fertility and increased life expectancy, ageing population is now a global demographic trend (Bloom & Zucker, 2023). The ageing population consists of two demographic changes: it shows an increase in the number of people aged 60 and above while simultaneously showing a decrease in the number and percentage of people aged 15 and below (Ismail et al., 2021). The United Nations (2024) predicts that the number of people aged 80 and above will surpass the number of infants under one year old, reaching a total of 265 million during the mid-2030s. As shown in Figure 1.3, by the late 2070s, the global population aged 65 and older is projected to reach 2.2 billion, which is more than the number of children under 18. Asia and Europe have the world's oldest populations, with people aged 65 and older. Specifically, Japan has the highest percentage at 28%, followed by Italy at 23%, and Finland, Portugal, and Greece are under 22% respectively (PRB, 2020).

According to United Nations (2024), the world is categorised into three regions: developed nations, such as Europe, the United States, Canada, Australia, New Zealand, and Japan; and less developed nations, such as most parts of Africa, most Asian countries other than Japan, most of Latin America, and the Caribbean; and the least developed nations, which include 49 impoverished countries.

Figure 1.3: World Population Aged 60+




Source: World Population Prospects 2024 (United Nations, 2024)

## 1.2 Problem Statements

Global ageing represents achievements in medical, economic, and social development; however, it is also alarming the nations and specialists on challenges that need immediate attention. The United Nations (2023) points out that fertility rates decrease while people live longer and healthier, thus increasing the number of older people in the population. Research indicates that 2050 will bring an equal number of people aged 65 and older to the number of children younger than 15 (Ataguba et al., 2021).

Global health systems are currently facing a growing burden from noncommunicable diseases, such as diabetes, cancer, and heart disease, which increase the financial burden and medical support. In addition, the changes on family structures due to global ageing have led to increasing reliance on long-term care mechanisms, such as assisted living and residential care, which are costly and require skilled health workers. The rising healthcare workforce demands will drive healthcare professional migration from poor nations to rich ones; thus, it creates difficulties in managing worldwide health resources.

Population ageing also brings impacts on labour markets, productivity, and global capital flows. Europe along with other countries that experience decreasing workforces may face GDP reduction unless they choose to welcome foreign workers or implement new methods to improve productivity. In other words, nations from less-developed countries may shift towards capital-intensive economies because developed countries provide better lifestyles through better resources for countries' economy support.

Population ageing creates economic difficulties for countries by putting pressure on their current work and retirement policies, especially in better-developed countries. In many developed countries, current pension systems and retirement age policies may not be enough to maintain future living standards. As life expectancy increases, people will need more retirement income for longer periods. The shift from defined benefit to defined contribution pension plans has also raised concerns about the adequacy of retirement income security for older people.

In summary, the increase of ageing population has affected social insurance, pension systems, family structures, labour supply, economic productivity, and public health (Bloom, 2020). The application of bibliometric analysis enables researchers to track knowledge patterns while revealing information gaps that direct future academic work. Such analysis will enable policymakers together with researchers to develop effective strategies to address the global implications of ageing population.

## 1.3 Research Questions

Based on the research background, the following research questions are formed.

1. What are the current states in the field of ageing population?
2. What are the publication trends in the field of ageing population?
3. What are the most productive contributors in ageing population research?
4. What are the most highly cited documents in the field of ageing population, and what are the key themes and topics that they address?
5. What are the key themes that emerge from co-occurrence analyses of author keywords in the literature on the ageing population?
6. What are the evolution of keywords in the ageing population research field?
7. What are the important keywords in the ageing population before and after the era COVID-19 pandemic?

## 1.4 Research Objective

Following the information on the research question, below are the research objectives.

1. To analyse the current states in the field of ageing population.
2. To identify the publication trends in the field of ageing population.
3. To explore the most productive contributors in ageing population research.
4. To analyse the most highly cited documents in the field of ageing population, and what are the key themes and topics that they address.
5. To investigate the key themes emerging from co-occurrence analyses of author keywords in the literature on the ageing population.
6. To analyse the evolution of keywords in the ageing population research field.
7. To examine the important keywords in the ageing population research before and after the COVID-19 pandemic.

## 1.5 Research Significance

The bibliometric analysis of the ageing population provides useful information for practitioners, academics, and policymakers.

Practitioners gain direction on resource allocation in healthcare, pension systems, and elderly-focused technologies. Healthcare providers benefit from this study because it predicts upcoming challenges through its identification of current research trends and essential topics. The study also emphasises the importance of cross-sector collaboration between healthcare professionals, government agencies, and private organisations to address global issues related to an ageing population.

For academics, the analysis offers an overview of how research on ageing populations has evolved, identifying influential studies and emerging topics. Researchers can use this analysis to unexplored areas of existing knowledge and develop new research objectives. The analysis highlights the need for interdisciplinary research, showcasing how fields like sociology, technology, economics, and medicine contribute to understanding ageing. It encourages scholars to adopt diverse perspectives and collaborate across disciplines to address the complexities of ageing societies.

For policymakers, the analysis underscores the need for reforms healthcare systems, pension policies, and long-term care to meet the demands of an ageing population. As demographic shifts increase, policymakers have to ensure that systems are in place to support older adults. Moreover, the research underlines the importance of modern technological innovations including assistive technologies, AI-driven health solutions and smart home systems in enhancing the quality of life and promoting independence for older adults.

In short, the bibliometric analysis is a valuable resource for practitioners, academics, and policymakers. It provides practical guidance for practitioners, identifies research gaps for academics, and advocates for policy reforms that support the elderly.

## 1.6 Chapter Layout

The rest of this paper is structured as follows:

### Chapter 1: Introduction

This chapter introduces the study by providing the background and context of the research on the ageing population. It outlines the research objectives, presents the research questions, and explains the significance of the study. It includes the chapter layout, which describes the structure and organisation of the dissertation and concludes with an overview of the topic to set the stage for the study.

### Chapter 2: Literature Review

This chapter reviews existing literature relevant to the research topic. It summarises significant studies and findings related to the ageing population, including its impact on the economy, labour markets, and social systems. The chapter also discusses the theoretical frameworks pertinent to the study and identifies gaps in the current literature that the research aims to address.

### Chapter 3: Methodology

This chapter details the research design and methodology employed in the study. It describes the overall approach and strategy, including the methods used for data collection and the procedures for data analysis. The chapter also explains the analytical tools and techniques applied, such as bibliometric software and visualisation tools.

### Chapter 4: Data Analysis

The data analysis results include data presentation through figures, and tables, followed by a detailed interpretation of the findings. This chapter focuses on analysing trends, patterns, and key insights derived from the bibliometric data on research related to the ageing population.

### Chapter 5: Discussion, Conclusion, and Future Directions

The final chapter provides a comprehensive discussion of the research findings in the context of existing literature and theoretical frameworks on the ageing population. It summarises the main conclusions drawn from the study and discusses their implications for the field. The chapter also suggests potential areas for future research and offers practical recommendations based on the research outcomes. This layout ensures a clear and structured presentation of the research, facilitating a thorough understanding of the study's aims, methods, results, and implications regarding the ageing population.

In conclusion, the chapter layout provides a systematic structure for this study. In chapter 1, it guides the reader through an introduction to the ageing population, helping them understand the background, objectives, and significance of the study. The literature review summarises significant studies and findings related to the ageing population, while the methodology details the research design, data collection, and analysis procedures. Lastly, the discussion and conclusion chapter show the findings on the research objective.

## 1.7 Chapter Summary

The first chapter served as an introduction to the research topic focused on the ageing population. The study background emphasised the growing trend of ageing populations worldwide and its implications. The problem statement acknowledges the ageing population trend's effects on key areas, including social insurance, pension systems, family structures, labour supply, economic productivity, and public health. The research questions and objectives were outlined to guide the study. The chapter concluded by emphasising the importance of this research in addressing the challenges posed by an ageing population. Chapter layouts outline the systematic structure of the study from Chapter 1 to Chapter 5.

# CHAPTER 2: LITERATURE REVIEW

## 2.0 Introduction

Chapter 2 provides an overview of bibliometric analysis techniques and their applications, along with a review of past studies on the bibliometric analysis of ageing populations. The section on bibliometric analysis and techniques explains the methodologies used to conduct literature reviews and evaluate research trends. The discussion on past studies highlights key findings and insights from previous bibliometric analyses related to ageing populations. This chapter offers a critical review of the main literature, providing a foundation for understanding the study's focus and context.

## 2.1 Bibliometric Analysis and Techniques

Bibliometrics, a term originally introduced by Pritchard (1969), refers to the application of mathematical and statistical methods to analyse and evaluate academic publications. Bibliometric analysis serves as a quantitative method for examining publication data to uncover patterns, trends, and relationships (Othman et al., 2022). By utilising metadata, it delivers a complete picture of research activities across specific academic domains (Milian et al., 2019).

In contrast, a systematic literature review requires manual data collection and synthesis of smaller datasets to answer specific research questions (Carrera-Rivera et al., 2022). However, the study results and reliability face potential harm from publication bias, insufficient data, and flaws in the included studies (Drucker et al., 2016). The combination of quantitative large-scale data analysis with qualitative methods in bibliometric analysis helps reduce research bias to deliver an expanded understanding of the topic.

Bibliometric analysis consists of two primary methods which include performance analysis and science mapping. Performance analysis describes the contributions of research, such as the most productive authors, institutions, journals, and countries in a particular field. In addition, science mapping together with thematic analysis functions to demonstrate how different research areas connect through their thematic relationships (Donthu et al., 2021).

The research employs bibliometric analysis through co-occurrence analysis, thematic mapping and word cloud analysis. Co-occurrence analysis shows how different ideas or topics are linked by creating a visual map of connections between words in the research (Godwin, 2016). The qualitative research method of thematic analysis reveals important themes in the data while word cloud analysis uses visual representation to show how often words appear in the text to identify major terms.

## 2.2 Previous Studies on Bibliometric Analysis of Ageing Populations

Over the years, research conducted on ageing populations has increased substantially because of worldwide rising interest in this field. As shown in Table 2.1, numerous previous studies on bibliometric analysis are related to the ageing population.

Nagarajan et al. (2017) researched economic growth by showing how the ageing population has become a central interest for economists. The authors observed two major developments in their study: empirical approaches became dominant while mathematical modelling decreased along with the predominantly negative impact of ageing on economic growth. The study noted a significant gap in research concerning developing countries.

Gu et al. (2019) provided an integrative perspective on healthy ageing, focusing on brain and muscle ageing, Alzheimer's disease, and frailty. They reviewed prevalent anti-ageing interventions, including calorie restriction, exercise, and pharmacological approaches, offering a comprehensive view of the field.

Fu et al. (2020) analysed social participation where the United States leading the research in this area. The research discussed ageing along with dementia and frailty as its main themes. The study underscored the importance of international collaboration in addressing issues like social participation, support, and loneliness among older adults.

Cao et al. (2021) investigated safety in home care settings while showing continuous growth of research in this field. The research suggested that further collaboration among countries, institutions, and scholars could enhance understanding and improve safety for older adults receiving home care.

Chen and Shin (2021) focused on accidental falls among older adults. They identified factors such as osteoporosis and dementia as key contributors to falls and stressed the need for tailored prevention programs. The study highlighted gaps in awareness and research, particularly in non-English literature.

Soytas (2021) analysed COVID-19 effects through a publication and citation-based analysis which revealed that the United States produced the highest number of papers and received the most citations. Research primarily focused on geriatrics and gerontology, with the *Journal of the American Geriatric Society* leading in publications and influence.

Huang et al. (2022) reviewed subjective well-being (SWB) among older adults, documenting significant research growth over two decades. The researchers studied Europe, North America, Asia, and Oceania to identify eight core research topics including ageing, health, successful ageing, and social support. The current research trends in the field focused on socioeconomic status, community and intervention studies.

Mahmood and Dhakal (2022) focused on the ageing population and society (APS), which highlights fragmented research in this domain. Their findings emphasised the dominance of developed countries, a lack of north-south collaboration, and a focus on ageing and health while neglecting social policy aspects.

Sabri et al. (2022) noted continuous growth in research on the ageing population from 2001 which demonstrates growing interest in this essential field.

Pereira-Payo et al. (2024) investigated multicomponent training (MCT) for older adults and documented exponential growth in publications. The research identified Spain as one of the main contributors to the field which focused on sarcopenia, quality of life, falls, and dual-task exercises. The study also identified the International Journal of Environmental Research and Public Health as one of the leading scientific journals that published most of these studies.

### 2.2.1 Identifying Gaps in Previous Research

The previous studies span various domains and research findings, providing valuable insights into the focus and evolution of the field. However, a critical evaluation of the current literature points to certain gaps in research, which offer opportunities for further exploration:

**1. Specificity of Data Sources:** Previous bibliometric analyses on ageing populations have relied on the Web of Science. This specificity may narrow down the focus of the analysis and reduce the ability to capture the full breadth and diversity of research. In this study, the Scopus database, which is well-known for its vast coverage of research articles across disciplines, will be used to give a more detailed and accurate overview of the ageing population.

**2. Lack of Thematic Scope:** Table 2.1 shows that the studies discussed focus on various sub-themes within the ageing population, including economic growth, social participation, subjective well-being (SWB), and

multicomponent training (MCT). However, there is a need to conduct a more general analysis of the ageing population, as the studies mentioned above give valuable insights into specific aspects of the issue. This research will adopt a combination of keywords, thereby providing a more representative picture of the ageing population field.

**3. Language Limitations:** Some of the prior studies, such as the work by Nagarajan et al. (2017), Gu et al. (2019) and Mahmood and Dhakal (2022), have been restricted to articles published exclusively in English. Although these studies provide valuable insights into the field of ageing population, they may not fully reflect the global scope of research on the ageing population. This study will cover articles from all over the world, without any language barrier, to provide a global outlook.

**4. Temporal Coverage of Literature:** The previous studies have been conducted over different periods. The different timeframes may lead to inconsistencies in how the evolution of the ageing population is understood. This study bridges that gap by providing a comprehensive literature review from 1940 to 2025, offering a detailed explanation of the field's development.

Table 2.1: Summary of Previous Studies

| Author & Year | Domain & Search Query | Objective of the Study | Total Document, Data Source & Coverage | Attributes Examined | Main Findings |
|---|---|---|---|---|---|
| Nagarajan et al. (2017) | Domain: Economic Growth<br><br>Search Keywords: “ageing population”, “aging population” and “demographic transition” | Identify the emergent topics; the 4 relative scientific importance of the main mechanisms; the main methodological approaches; and the main regions and countries | 144 documents from Scopus (1975-2013) | -Empirical methods | Highlighted the growing focus on aging in economics, with more studies on consumption, savings, and human capital. Found increased use of empirical methods, a decline in mathematical modelling, and a predominantly negative impact on growth. Noted limited research on developing countries. |
| Gu et al. (2019) | Domain: Healthy ageing<br><br>Search Keywords: “healthy”, “well”, “normal" “ageing”, “aging”, “elderly”, “aged”, “older”, “Old” | Explore the research network and trends in healthy ageing | 3303 documents from Web of Science (1998–2017) | -Co-citation analysis<br>-Co-occurrence of keywords analysis<br>-Research trends analysis | Provided an integrative view of healthy ageing research, with a focus on brain and muscle ageing, Alzheimer's disease, frailty, and prevalent anti-ageing interventions like calorie restriction, exercise, and drugs |
| Fu et al. (2020) | Domain: Social participation<br><br>Search Keywords: “social participation” and “old* people” | Explore the publication numbers, countries, institutions, journals, hot spots and emerging trends over the past 20 years | 7,029 documents from Web of Science (2000–2019) | -Co-authorship analysis<br>-Co-cited reference cluster analysis<br>-Co-occurrence of keywords analysis | Highlighted the U.S. leadership in social participation research for older adults, focusing on ageing, dementia, and frailty. Emphasised the need for international collaboration and noted key research areas like social participation, support, and loneliness. |
| Cao et al. (2021) | Domain: Safety in home care | Explore the development process, main contributors, | 2,631 documents from Web of Science (2009–2020) | -Co-occurrence analysis | Highlighted the research on home care safety for older adults is developing steadily, and this field may be understood to a greater |

| Author & Year | Domain & Search Query | Objective of the Study | Total Document, Data Source & Coverage | Attributes Examined | Main Findings |
|---|---|---|---|---|---|
| | Search Keywords: "home care", "patient safety", "elderly adult" | relationship structure, mainstream research topics | | | extent in the future. Countries, institutions and scholars need to cooperate more in this research field |
| Chen and Shin (2021) | Domain: Accidental Falls<br><br>Keywords: older adults; accidental falls; research hotspot; CiteSpace; knowledge domain visualisation | Explore the research network and trends, keywords in accidental falls ageing | 34,899 documents from Web of Science (2010–2020) | -Co-institution analysis<br>-Co-authorship analysis<br>-Co-occurrence of keywords analysis | Highlighted growing research on falls in older adults, with key factors like osteoporosis and dementia linked to falls. Emphasised the need for tailored prevention programs and noted gaps in awareness and research, especially in non-English literature. |
| Soytas (2021) | Domain: COVID-19<br><br>Search Keywords: "COVID-19" or "Novel Coronavirus" or "SARS-CoV-2" or "2019-nCoV" and "geriatrics" or "older adults" or "elderly" | Provide information about the quality and research areas of published studies on COVID-19 and older adults. | 784 documents from Web of Science (2019–2021) | -Affiliation analysis<br>-Co-authorship analysis<br>-Keyword analysis<br>-Publications analysis | Highlighted the most active and most cited country was the United States. The Journal of the American Geriatric Society had the largest number of publications and citations. The most researched and most cited areas were geriatrics-gerontology. |
| Huang et al. (2022) | Domain: Subjective well-being (SWB)<br><br>Search Query: TS = "subject* well-being" AND TI = ("old* person" OR "old* people" OR "old* population" OR "old* man" OR "old* woman" OR "old* adult" OR "late* life" OR "very old" OR "fourth age" OR "oldest-old" OR | Explore current developments and trends in the field of subjective well-being (SWB) of older adults at a macro level and identify research hotspots | 354 documents from Web of Science (2002–2021) | -Co-authorship analysis<br>-Co-cited reference cluster analysis<br>-Co-occurrence of keywords analysis | Highlighted the growth in research on the subjective well-being (SWB) of older adults over the past two decades, with key studies from Europe, North America, Asia, and Oceania. Identified eight main research topics, including ageing, health, successful ageing, and social support. Noted current research frontiers in socioeconomic status, community, and interventions. |

| Author & Year | Domain & Search Query | Objective of the Study | Total Document, Data Source & Coverage | Attributes Examined | Main Findings |
|---|---|---|---|---|---|
| | retirement OR elder* OR aging OR geriatric* OR senior*) | | | | |
| Mahmood and Dhakal (2022) | Domain: ageing population and society (APS)<br><br>Search Query: TITLE("ageing population" AND "society") | Examine APS literature to identify key topics, contributors, gaps, and provide insights for future research and policy | 566 documents from Scopus (2011–2020) | -Co-authorship analysis<br>-Co-occurrence of keywords analysis | Highlighted fragmented APS research, focused on ageing and health, neglected social policy, and revealed developed-country dominance with limited north-south collaboration |
| Sabri et al. (2022) | Domain: ageing population<br>Search Query: TITLE("ageing population") | Explore the development trends of research related to ageing populations | 3954 documents from Scopus (2001–2021) | -Affiliation analysis<br>-Citation analysis<br>-Keyword analysis<br>-Publications analysis<br>-Research trends analysis<br>-Source title analysis | Highlighted continuous growth in ageing population research since 2001 |
| Pereira-Payo et al. (2024) | Domain: Multicomponent training (MCT)<br><br>Keywords: multicomponent exercise; older adults; physical functional performance; scientometrics | Explore the number of publications; the journals, authors, and countries that stand out the most in this area; and the most common themes and used keywords | 485 documents from Web of Science (2001–2022) | -Co-authorship<br>-Co-occurrence of keywords analysis | Highlighted the exponential growth in publications on MCT in the aged population. Identified Spain as the leading contributor. Showcased core themes like sarcopenia, quality of life, falls, and dual-task exercises, with top journals including International Journal of Environmental Research and Public Health. |

Source: Collected by the author from Google Scholar

## 2.3 Chapter Summary

Chapter 2 commenced by introducing the use of bibliometric analysis in the scholarly context. It then outlines the metrics for using bibliometric analysis to examine the trends of publication on the ageing population.

# CHAPTER 3: METHODOLOGY

## 3.0 Introduction

The research methodology presented in Chapter 3 enables the study to fulfil the objectives defined in Chapter 1. This chapter explains the research methods together with data collection, analysis procedures, tools and techniques applied for data analysis and interpretation. This chapter delivers an extensive explanation of bibliometric analysis procedures.

## 3.1 Search Strategy

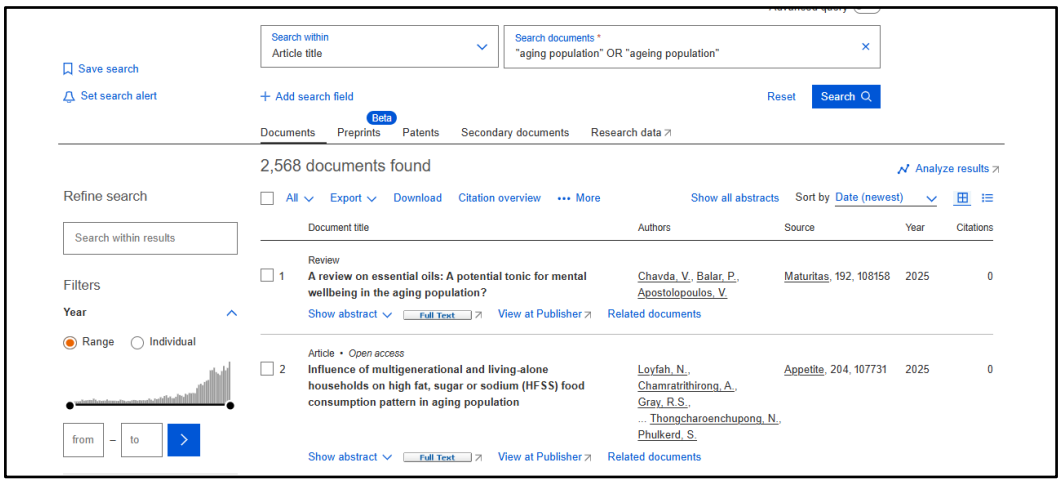
The literature search was conducted using the Scopus database. Scopus was chosen because it represents a reliable platform for accessing high-quality academic publications. As shown in Figure 3.2, the search query used was (TITLE("ageing population" OR "ageing population")). The search query limited results to article titles to guarantee that publications focused exclusively on the ageing population appeared in the results. This specific search has enhanced the relevance and accuracy of the dataset, avoiding the inclusion of papers where the ageing population was only a peripheral theme. The research included all Scopus publications about the ageing population which appeared between time frame of 1940 to 2024.

## 3.2 Data Collection

As shown in Figure 3.1, a total of 2,568 documents were collected from Scopus. The Scopus database was relied upon for its reputation as a reliable source of bibliometric data, which ensure the integrity of the collected dataset.

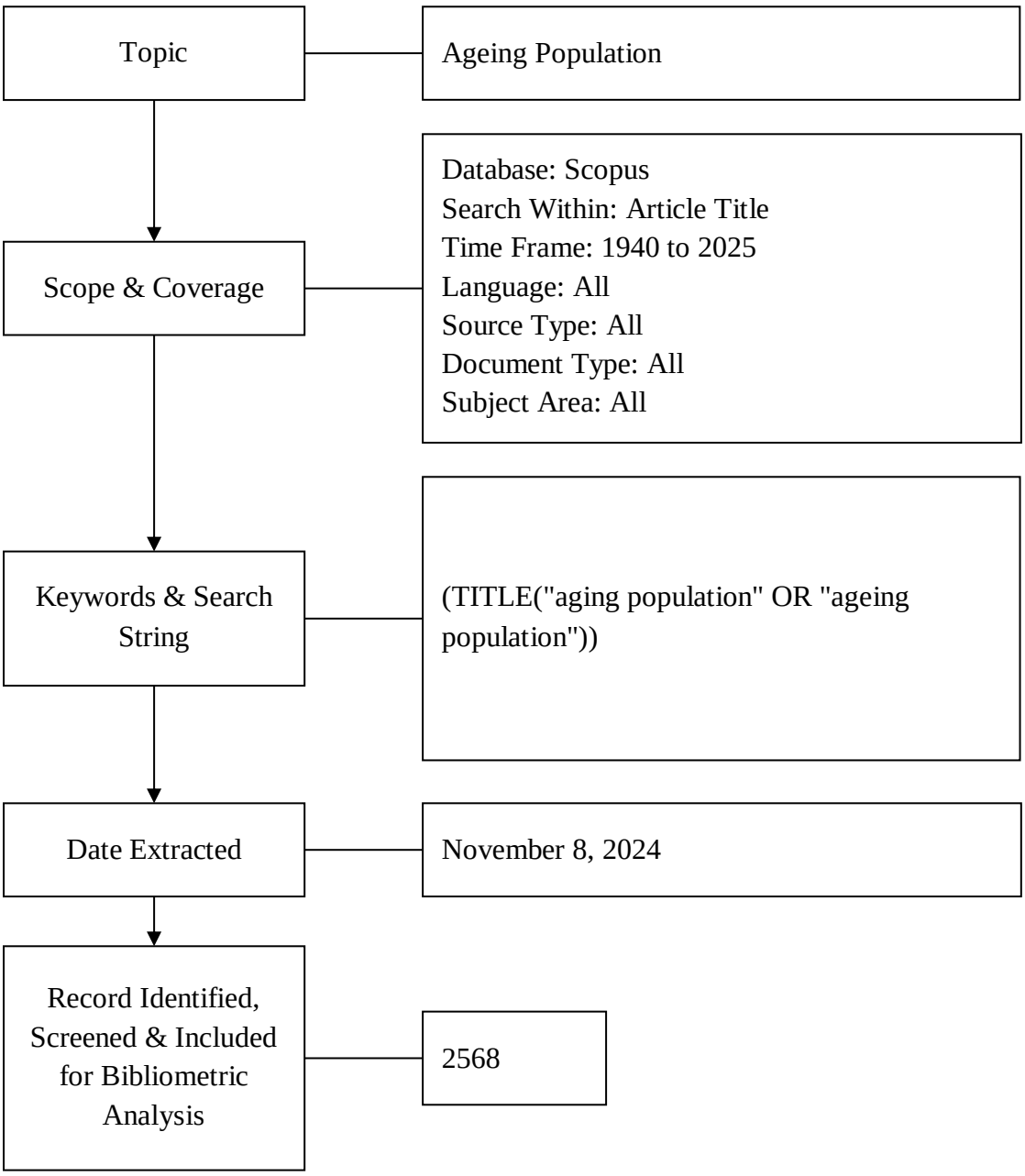
The main difficulty arose from verifying that all chosen papers matched the primary focus of the study. This was addressed by focusing on title-only, as described in the search strategy. The method enhanced data accuracy by concentrating the collected information on research about the ageing population as the core research area.

Figure 3.1: Data Collection from Scopus on November 8, 2024




Source: Generated by the author using Scopus

Figure 3.2: PRISMA Model




Source: Zakaria et al. (2021)

## 3.3 Data Cleaning and Harmonisation

Data cleaning and harmonisation are critical steps in bibliometric analysis to guarantee the accuracy and reliability of the results. The data cleaning and harmonisation process was conducted using OpenRefine and biblioMagika (Ahmi, 2024), tools designed for refining messy bibliographic information like author names, affiliations, and keywords.

The researcher started the cleaning process by downloading the Scopus data in csv file format. The missing data fields—such as authors' full names, affiliations, single names, and countries—were identified and completed using Bibliomagika® Split. To ensure consistency, author names and affiliations were harmonised both manually and with the support of OpenRefine. The cleaned standardised data was then transferred back to bibliomagika® for further processing. This included preparation for extended analyses, such as publications by authors, institutions, and countries.

## 3.4 Bibliometric Measures

The identified publications received assessment for their impact and relevance through multiple bibliometric measures. It includes the total publications, number of contributing authors, number of cited publications, total citations, citations per paper, citations per cited papers, citations per author, citations per year, h-index, g-index, and m-index. These metrics were utilised to offer a comprehensive evaluation of the scholarly output.

The author's keywords in the field were analysed through visualisation techniques which included co-occurrence network analysis, thematic mapping and word clouds. The visual representations revealed related topic clusters, research patterns and unexplored areas which pointed to new research directions.

## 3.5 Data Analysis

The analysis of data followed the research questions presented in the introduction. The collected data was carefully processed to identify research trends, patterns, and insights. The dataset received additional completeness through efforts to identify and fix all missing or inconsistent data points. Researcher used data matching techniques to fix discrepancies that appeared in author names and affiliations together with publication information. After cleaning the dataset, network analysis was performed to visualise connections between the keywords. These visualisations helped to identify key research themes, influential topics, and potential gaps. Statistical analysis was also used to examine keyword frequencies, publication trends, and institutional research contributions. All steps were connected to create a better understanding of research landscape and developments.

## 3.6 Tools

Several tools and software were used to carry out this bibliometric analysis. The initial data preparation and organisation occurred through Microsoft Excel before BiblioMagika helped to clean and standardise author, affiliation and country information. The biblioMagika®Split tool was used to detect and handle missing data, which provided strong analytical conditions. Next, the dataset received detailed cleaning and harmonisation through OpenRefine which efficiently addressed all inconsistencies (Ahmi, 2023). The analysis of bibliometric relationships together with network visualisation was accomplished through the use of VOSviewer (Van Eck & Waltman, 2014) and Biblioshiny (Aria & Cuccurullo, 2017). The use of these tools and techniques enabled a comprehensive analysis of the ageing population. The analysis achieved both accuracy and insight through the essential contribution of each tool.

## 3.7 Chapter Summary

This chapter explains a clear and organised approach to studying research on the ageing population. By using reliable databases, thorough data cleaning steps, and effective bibliometric tools, the study ensures that the results are accurate and meaningful. The analyses, such as keyword co-occurrence, and subject category analysis, provide a detailed view of key research trends and connections in the field. Tools like Bibliomagika®, OpenRefine, VOSviewer, and Biblioshiny were essential in improving the quality of the analysis and making the process more efficient. Overall, this methodology forms a reliable basis for understanding the research on the ageing population.

# CHAPTER 4: RESULTS & FINDINGS

## 4.0 Introduction

Chapter 4 presents a detailed evaluation of ageing population research landscape is conducted, focusing on the research questions (RQs) established in the introduction to provide an in-depth understanding into the field of ageing population.

## 4.1 Current State

To answer RQ1 (What are the current states in the field of ageing population?), the analysis focused on document types, source types, language, subject areas, and citation metrics.

The most common document types in ageing population publications were articles, making up 58.22% of the total, followed by reviews at 11.06%. Other document types, such as book chapters, conference papers, and editorials, each make up less than 8% of the total publications. The least common document types in terms of publication volume include letters, short surveys, books, erratums, data papers, and retracted documents (Table 4.1).

Table 4.2 shows the distribution of publications across five different source types. Journals represent the most prevalent source, comprising 82.79% of the total publications, followed by books at 8.57%. The least common document types are conference proceedings, book series and trade journals.

In terms of language, 95.33% of publications were published in English (Table 4.3), followed by French (1.13%) and German (1.05%). The other twenty-two languages collectively contributed less than 2.49% to the field, with each accounting for less than 1% of the total.

Table 4.4 presents the subject areas, which shows the multidisciplinary nature of the research. The highest proportion of publications was classified under the category of medicine (57.48%). This category includes various medical disciplines related to ageing, such as geriatrics, age-related diseases, and healthcare systems for the elderly. On the other hand, specialised fields such as "Biochemistry, Genetics and Molecular Biology" accounted for only 7.71% of the publications, which focused more on the molecular and genetic aspects of ageing.

Besides medicine, other significant subject areas that contribute to ageing population research include "Social Sciences" (18.89%), which deals with the social effects of an ageing population, including topics such as an ageing workforce, healthcare policies, and social services for the elderly. Other fields, including "Nursing" (9.46%) and "Engineering" (7.63%), also provide valuable contributions, pointing to the importance of caregiving and assistive technologies in ageing research.

The diversity of subject areas reflects that the field is broad and goes beyond medicine and biological sciences. It includes areas like computer science, economics, finance, business, management, psychology, and environmental science. Each of these fields has its own different insights into the ageing population.

From Table 4.5, the study used 2,568 publications, receiving a total of 1,806 citations in the last 85 years. The study shows that the average citation per year was 521.92 and citation per paper was 17.28, which shows that research in the ageing population is still relevant and continues to be a significant area of study. Furthermore, the average number of citations per author is 5.35, which means that, on average, the authors have more influential work that is recognised and built upon by other researchers in the field. The average of 3.23 authors per paper shows that the research was conducted in a collaborative manner, with multiple authors working on the study to provide different perspectives on the ageing populations.

The h-index of 92 indicates the high level of productivity and impact, while the g-index of 158 highlights the impact of the highly cited papers. These high values

demonstrate the significant contribution of ageing population research within the academic community.

This study of the types of documents, sources, languages, topics, and citation metrics in the ageing population field provides a comprehensive response to our first research question (RQ1). Our results present a diverse ageing population research landscape characterised by article and journal publication formats, English language usage, and multidisciplinary research involving medical, social sciences, nursing, and various other fields.

Table 4.1: Document Type

| Document Type | Total Publications | Percentage (%) |
|---|---|---|
| Article | 1495 | 58.22% |
| Review | 284 | 11.06% |
| Book Chapter | 203 | 7.90% |
| Conference Paper | 201 | 7.83% |
| Editorial | 156 | 6.07% |
| Note | 91 | 3.54% |
| Letter | 47 | 1.83% |
| Short Survey | 37 | 1.44% |
| Book | 36 | 1.40% |
| Erratum | 16 | 0.62% |
| Data Paper | 1 | 0.04% |
| Retracted | 1 | 0.04% |
| **Total** | **2568** | **100.00** |

Source: Generated by the author using biblioMagika® (Ahmi, 2024)

Table 4.2: Source Type

| Source Type | Total Publications | Percentage (%) |
|---|---|---|
| Journal | 2126 | 82.79% |
| Book | 220 | 8.57% |
| Conference Proceeding | 111 | 4.32% |
| Book Series | 85 | 3.31% |
| Trade Journal | 23 | 0.90% |
| Undefined | 3 | 0.12% |
| **Total** | **2568** | **100.00** |

Source: Generated by the author using biblioMagika® (Ahmi, 2024)

Table 4.3: Languages

| Language | Total Publications | Percentage (%) |
|---|---|---|
| English | 2448 | 95.33% |
| French | 29 | 1.13% |
| German | 27 | 1.05% |
| Spanish | 16 | 0.62% |
| Dutch | 15 | 0.58% |
| Chinese | 10 | 0.39% |
| Japanese | 9 | 0.35% |
| Italian | 8 | 0.31% |
| Polish | 5 | 0.19% |
| Russian | 4 | 0.16% |
| Czech | 3 | 0.12% |
| Finnish | 3 | 0.12% |
| Swedish | 3 | 0.12% |
| Danish | 2 | 0.08% |
| Portuguese | 2 | 0.08% |
| Greek | 1 | 0.04% |
| Hebrew | 1 | 0.04% |
| Hungarian | 1 | 0.04% |
| Indonesian | 1 | 0.04% |
| Moldavian | 1 | 0.04% |
| Moldovan | 1 | 0.04% |
| Persian | 1 | 0.04% |
| Romanian | 1 | 0.04% |
| Serbian | 1 | 0.04% |
| Slovenian | 1 | 0.04% |

**Note.** Twenty-six documents have been prepared in dual languages.

Source: Generated by the author using biblioMagika® (Ahmi, 2024)

Table 4.4: Subject Area

| Subject Area | Total Publications | Percentage (%) |
|---|---|---|
| Medicine | 1476 | 57.48% |
| Social Sciences | 485 | 18.89% |
| Nursing | 243 | 9.46% |
| Biochemistry, Genetics and Molecular B | 198 | 7.71% |
| Engineering | 196 | 7.63% |
| Computer Science | 171 | 6.66% |
| Economics, Econometrics and Finance | 154 | 6.00% |
| Business, Management and Accounting | 127 | 4.95% |
| Psychology | 116 | 4.52% |
| Environmental Science | 96 | 3.74% |
| Health Professions | 84 | 3.27% |
| Neuroscience | 63 | 2.45% |
| Pharmacology, Toxicology and Pharmac | 59 | 2.30% |
| Agricultural and Biological Sciences | 58 | 2.26% |
| Mathematics | 58 | 2.26% |
| Dentistry | 56 | 2.18% |
| Arts and Humanities | 55 | 2.14% |
| Multidisciplinary | 48 | 1.87% |
| Energy | 44 | 1.71% |
| Immunology and Microbiology | 34 | 1.32% |
| Decision Sciences | 29 | 1.13% |
| Materials Science | 29 | 1.13% |
| Earth and Planetary Sciences | 28 | 1.09% |
| Physics and Astronomy | 20 | 0.78% |
| Chemistry | 11 | 0.43% |
| Chemical Engineering | 10 | 0.39% |
| Veterinary | 4 | 0.16% |

Source: Generated by the author using biblioMagika® (Ahmi, 2024)

Table 4.5: Citation Metrics

| Main Information | Data |
|---|---|
| Publication Years | 1940 - 2025 |
| Total Publications | 2568 |
| Citable Year | 85 |
| Number of Cited Papers | 1806 |
| Citation per Paper | 17.28 |
| Citation per Year | 521.92 |
| Citation per Author | 5.35 |
| Author per Paper | 3.23 |
| h-index | 92 |
| g-index | 158 |

Source: Generated by the author using biblioMagika® (Ahmi, 2024)

## 4.2 Publication Trends

To answer RQ2 (What are the publication trends in the field of ageing population?), we analysed the total publication by year, number of contributing authors, and several measures of research impact, including the h-index, g-index, m-index, citations per publication, and citations per cited publication (Table 4.6 and Figure 4.1).

The publication of ageing population has shown a significant upward trend, peaking at 153 publications in 2024, with a **compound annual growth rate (CAGR)** of 6.17% from 1940 to 2024. This reflects the maturing of the field and the growing recognition of ageing as a global issue.

The **number of contributing authors (NCA)** has steadily increased, especially from the 2000s onwards. This trend indicates that more researchers from diverse fields are engaging with ageing-related topics.

The **h-index** and **g-index** values, which measure productivity and citation impact, have also increased, indicating growing influence in the field. Similarly, the rising **m-index** indicates researchers in this field are consistently producing influential work.

The average **citations per publication (C/P)** and **citations per cited publication (C/CP)** have fluctuated over the years, with a clear decrease in recent years. This trend could be due to changes in citation behaviour or changes in the quality and relevance of the published research.

Table 4.6: Publication by Year

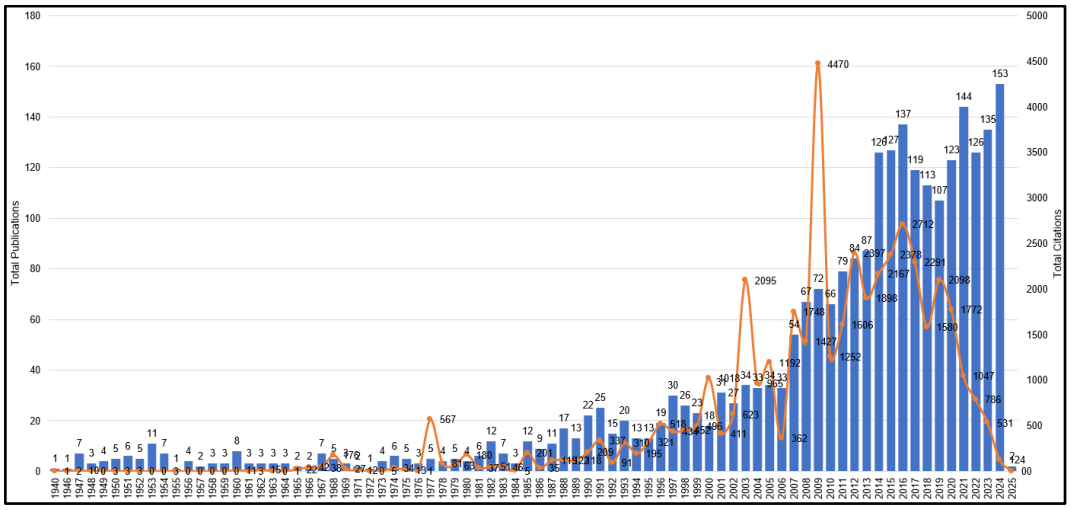
| Year | TP | NCA | NCP | TC | C/P | C/CP | *h* | *g* | *m* |
|---|---|---|---|---|---|---|---|---|---|
| 1940 | 1 | 1 | 1 | 1 | 1.00 | 1.00 | 1 | 1 | 0.012 |
| 1946 | 1 | 1 | 1 | 2 | 2.00 | 2.00 | 1 | 1 | 0.013 |
| 1947 | 7 | 7 | 5 | 10 | 1.43 | 2.00 | 2 | 2 | 0.025 |
| 1948 | 3 | 2 | 0 | 0 | 0.00 | 0.00 | 0 | 0 | 0.000 |
| 1949 | 4 | 4 | 1 | 3 | 0.75 | 3.00 | 1 | 1 | 0.013 |
| 1950 | 5 | 3 | 2 | 3 | 0.60 | 1.50 | 1 | 1 | 0.013 |
| 1951 | 6 | 5 | 2 | 3 | 0.50 | 1.50 | 1 | 1 | 0.013 |
| 1952 | 5 | 6 | 0 | 0 | 0.00 | 0.00 | 0 | 0 | 0.000 |
| 1953 | 11 | 9 | 0 | 0 | 0.00 | 0.00 | 0 | 0 | 0.000 |
| 1954 | 7 | 7 | 2 | 3 | 0.43 | 1.50 | 1 | 1 | 0.014 |
| 1955 | 1 | 1 | 0 | 0 | 0.00 | 0.00 | 0 | 0 | 0.000 |
| 1956 | 4 | 5 | 0 | 0 | 0.00 | 0.00 | 0 | 0 | 0.000 |
| 1957 | 2 | 2 | 0 | 0 | 0.00 | 0.00 | 0 | 0 | 0.000 |
| 1958 | 3 | 3 | 0 | 0 | 0.00 | 0.00 | 0 | 0 | 0.000 |
| 1959 | 3 | 3 | 0 | 0 | 0.00 | 0.00 | 0 | 0 | 0.000 |
| 1960 | 8 | 9 | 2 | 11 | 1.38 | 5.50 | 2 | 3 | 0.030 |
| 1961 | 3 | 3 | 1 | 3 | 1.00 | 3.00 | 1 | 1 | 0.015 |
| 1962 | 3 | 7 | 3 | 15 | 5.00 | 5.00 | 1 | 3 | 0.016 |
| 1963 | 3 | 3 | 0 | 0 | 0.00 | 0.00 | 0 | 0 | 0.000 |
| 1964 | 3 | 3 | 1 | 1 | 0.33 | 1.00 | 1 | 1 | 0.016 |
| 1965 | 2 | 4 | 1 | 22 | 11.00 | 22.00 | 1 | 2 | 0.016 |
| 1966 | 2 | 6 | 2 | 42 | 21.00 | 21.00 | 2 | 2 | 0.033 |
| 1967 | 7 | 10 | 4 | 38 | 5.43 | 9.50 | 3 | 6 | 0.051 |
| 1968 | 5 | 10 | 4 | 176 | 35.20 | 44.00 | 4 | 5 | 0.069 |
| 1969 | 3 | 6 | 2 | 27 | 9.00 | 13.50 | 2 | 3 | 0.035 |
| 1971 | 2 | 3 | 2 | 12 | 6.00 | 6.00 | 2 | 2 | 0.036 |
| 1972 | 1 | 1 | 0 | 0 | 0.00 | 0.00 | 0 | 0 | 0.000 |
| 1973 | 4 | 4 | 1 | 5 | 1.25 | 5.00 | 1 | 2 | 0.019 |
| 1974 | 6 | 15 | 2 | 34 | 5.67 | 17.00 | 1 | 5 | 0.019 |
| 1975 | 5 | 9 | 3 | 13 | 2.60 | 4.33 | 2 | 3 | 0.039 |
| 1976 | 3 | 7 | 1 | 1 | 0.33 | 1.00 | 1 | 1 | 0.020 |
| 1977 | 5 | 18 | 3 | 567 | 113.40 | 189.00 | 2 | 5 | 0.041 |
| 1978 | 4 | 3 | 2 | 81 | 20.25 | 40.50 | 1 | 4 | 0.021 |
| 1979 | 5 | 10 | 4 | 63 | 12.60 | 15.75 | 4 | 5 | 0.085 |
| 1980 | 4 | 13 | 3 | 180 | 45.00 | 60.00 | 3 | 4 | 0.065 |
| 1981 | 6 | 8 | 4 | 37 | 6.17 | 9.25 | 3 | 6 | 0.067 |
| 1982 | 12 | 24 | 7 | 51 | 4.25 | 7.29 | 4 | 7 | 0.091 |
| 1983 | 7 | 14 | 3 | 46 | 6.57 | 15.33 | 2 | 6 | 0.047 |
| 1984 | 3 | 4 | 3 | 5 | 1.67 | 1.67 | 2 | 2 | 0.048 |
| 1985 | 12 | 23 | 6 | 201 | 16.75 | 33.50 | 5 | 12 | 0.122 |
| 1986 | 9 | 13 | 6 | 35 | 3.89 | 5.83 | 3 | 5 | 0.075 |
| 1987 | 11 | 13 | 10 | 119 | 10.82 | 11.90 | 6 | 10 | 0.154 |
| 1988 | 17 | 22 | 9 | 122 | 7.18 | 13.56 | 4 | 11 | 0.105 |
| 1989 | 13 | 16 | 9 | 118 | 9.08 | 13.11 | 6 | 10 | 0.162 |
| 1990 | 22 | 43 | 15 | 209 | 9.50 | 13.93 | 8 | 14 | 0.222 |
| 1991 | 25 | 47 | 17 | 337 | 13.48 | 19.82 | 7 | 18 | 0.200 |
| 1992 | 15 | 19 | 9 | 91 | 6.07 | 10.11 | 6 | 9 | 0.176 |
| 1993 | 20 | 37 | 12 | 310 | 15.50 | 25.83 | 7 | 17 | 0.212 |
| 1994 | 13 | 27 | 10 | 195 | 15.00 | 19.50 | 6 | 13 | 0.188 |
| 1995 | 13 | 21 | 10 | 321 | 24.69 | 32.10 | 6 | 13 | 0.194 |
| 1996 | 19 | 41 | 12 | 518 | 27.26 | 43.17 | 8 | 19 | 0.267 |
| 1997 | 30 | 57 | 24 | 434 | 14.47 | 18.08 | 9 | 20 | 0.310 |
| 1998 | 26 | 58 | 17 | 452 | 17.38 | 26.59 | 9 | 21 | 0.321 |
| 1999 | 23 | 50 | 16 | 496 | 21.57 | 31.00 | 8 | 22 | 0.296 |
| 2000 | 18 | 31 | 15 | 1018 | 56.56 | 67.87 | 7 | 18 | 0.269 |
| 2001 | 31 | 64 | 20 | 411 | 13.26 | 20.55 | 9 | 20 | 0.360 |

| Year | TP | NCA | NCP | TC | C/P | C/CP | *h* | *g* | *m* |
|---|---|---|---|---|---|---|---|---|---|
| 2002 | 27 | 53 | 17 | 623 | 23.07 | 36.65 | 11 | 24 | 0.458 |
| 2003 | 34 | 95 | 25 | 2095 | 61.62 | 83.80 | 12 | 34 | 0.522 |
| 2004 | 33 | 70 | 24 | 965 | 29.24 | 40.21 | 11 | 31 | 0.500 |
| 2005 | 34 | 55 | 24 | 1192 | 35.06 | 49.67 | 12 | 34 | 0.571 |
| 2006 | 33 | 77 | 26 | 362 | 10.97 | 13.92 | 11 | 18 | 0.550 |
| 2007 | 54 | 142 | 42 | 1748 | 32.37 | 41.62 | 19 | 41 | 1.000 |
| 2008 | 67 | 163 | 44 | 1427 | 21.30 | 32.43 | 16 | 37 | 0.889 |
| 2009 | 72 | 192 | 56 | 4470 | 62.08 | 79.82 | 21 | 66 | 1.235 |
| 2010 | 66 | 182 | 53 | 1252 | 18.97 | 23.62 | 19 | 34 | 1.188 |
| 2011 | 79 | 218 | 60 | 1606 | 20.33 | 26.77 | 20 | 39 | 1.333 |
| 2012 | 84 | 267 | 67 | 2397 | 28.54 | 35.78 | 21 | 48 | 1.500 |
| 2013 | 87 | 251 | 70 | 1898 | 21.82 | 27.11 | 22 | 42 | 1.692 |
| 2014 | 126 | 327 | 82 | 2167 | 17.20 | 26.43 | 24 | 45 | 2.000 |
| 2015 | 127 | 403 | 96 | 2378 | 18.72 | 24.77 | 24 | 46 | 2.182 |
| 2016 | 137 | 649 | 108 | 2712 | 19.80 | 25.11 | 27 | 49 | 2.700 |
| 2017 | 119 | 375 | 96 | 2291 | 19.25 | 23.86 | 27 | 45 | 3.000 |
| 2018 | 113 | 462 | 86 | 1580 | 13.98 | 18.37 | 21 | 36 | 2.625 |
| 2019 | 107 | 517 | 91 | 2098 | 19.61 | 23.05 | 25 | 43 | 3.571 |
| 2020 | 123 | 501 | 104 | 1772 | 14.41 | 17.04 | 21 | 37 | 3.500 |
| 2021 | 144 | 563 | 107 | 1047 | 7.27 | 9.79 | 17 | 25 | 3.400 |
| 2022 | 126 | 532 | 100 | 786 | 6.24 | 7.86 | 14 | 22 | 3.500 |
| 2023 | 135 | 589 | 90 | 531 | 3.93 | 5.90 | 10 | 18 | 3.333 |
| 2024 | 153 | 764 | 49 | 124 | 0.81 | 2.53 | 5 | 7 | 2.500 |
| 2025 | 2 | 9 | 0 | 0 | 0.00 | 0.00 | 0 | 0 | 0.000 |
| Total | 2568 | 8291 | 1806 | 44363 | 17.28 | 24.56 | 92 | 158 | 1.070 |

Notes: TP=total number of publications; NCA=Number of contributing authors; NCP=number of cited publications; TC=total citations; C/P=average citations per publication; C/CP=average citations per cited publication; h=h-index; g=g-index; m=m-index.

Source: Generated by the author(s) using biblioMagika® (Ahmi, 2024)

Figure 4.1: Total Publications and Citations by Year




Source: Generated by the author using biblioMagika® (Ahmi, 2024)

## 4.3 Publication by Authors

To answer RQ3 (What are the most productive contributors in ageing population research?), the most influential authors, institutions, and countries are identified by analysing their contributions, citation counts, and overall impact on the field.

Table 4.7 list the most productive authors, ranked by their total **number of publications (TP)**, along with their affiliations, countries, and bibliometric parameters. Figure 4.2 illustrates the authors' publication trends over time.

Miguel Riella and Marcello Tonelli have 35 publications each, with 228 citations, showing consistent productivity. However, their **citation-per-publication rate (C/P)** of 6.51 suggests moderate impact. In contrast, Chatterji Somnath and Dong XinQi have fewer publications, with 7 and 8 respectively, have higher citation impact. This is because, Chatterji's work has received 441 citations, and Dong's 234, with C/P values of 63.00 and 29.25 respectively, indicating strong individual influence and impact to the field.

The h-index, g-index, and m-index provide further insight into the academic standing of these authors. Chatterji, with an **h-index** of 6 and a **g-index** of 7, shows a strong record of productive research that continues to be cited. The highest **m-index** values belong to Rodolfo Sardone and Fabio Castellana at 0.8. This indicates that they have managed to maintain a high level of productivity and impact relative to the length of their careers.

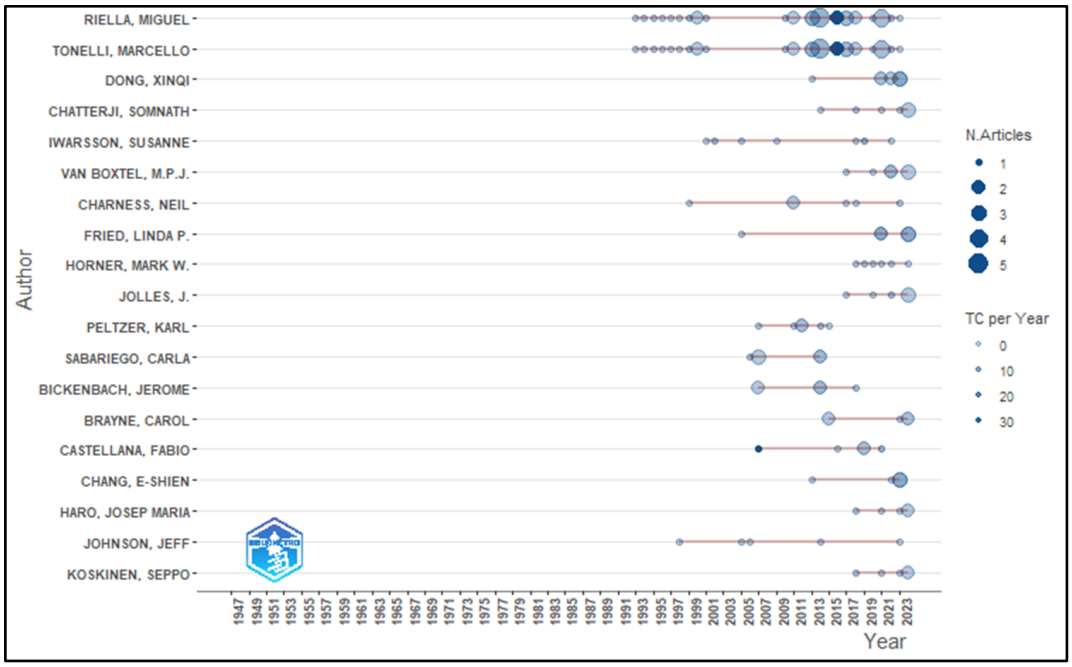
Table 4.7: Most Productive Authors

| Author's Name | Current Affiliation | Country | TP | NCP | TC | C/P | C/CP | h | g | m |
|---|---|---|---|---|---|---|---|---|---|---|
| Riella, Miguel | Catholic University of Parana | Brazil | 35 | 25 | 228 | 6.51 | 9.12 | 8 | 15 | 0.615 |
| Tonelli, Marcello | University of Alberta | Canada | 35 | 25 | 228 | 6.51 | 9.12 | 8 | 15 | 0.615 |
| Dong, XinQi | Rush University | United States | 8 | 8 | 234 | 29.25 | 29.25 | 7 | 8 | 0.467 |
| Chatterji, Somnath | World Health Organisation | Switzerland | 7 | 7 | 441 | 63.00 | 63.00 | 6 | 7 | 0.333 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Iwarsson, Susanne | Lund University | Sweden | 7 | 4 | 49 | 7.00 | 12.25 | 3 | 7 | 0.107 |
| Fried, Linda P. | Columbia University | United States | 6 | 5 | 929 | 154.83 | 185.80 | 5 | 6 | 0.167 |
| Charness, Neil | State University | United States | 6 | 5 | 52 | 8.67 | 10.40 | 3 | 6 | 0.200 |
| Sabariego, Carla | University of Lucerne | Switzerland | 6 | 2 | 4 | 0.67 | 2.00 | 2 | 2 | 0.667 |
| Horner, Mark W. | Florida State University | United States | 6 | 6 | 144 | 24.00 | 24.00 | 6 | 6 | 0.545 |
| Peltzer, Karl | Mahidol University | Thailand | 6 | 5 | 8 | 1.33 | 1.60 | 2 | 2 | 0.500 |
| Watson, Ronald Ross | University of Arizona | United States | 5 | 5 | 18 | 3.60 | 3.60 | 3 | 4 | 0.167 |
| Leonardi, Matilde | IRCCS | Italy | 5 | 5 | 271 | 54.20 | 54.20 | 5 | 5 | 0.385 |
| Pengpid, Supa | Mahidol University | Thailand | 5 | 5 | 8 | 1.60 | 1.60 | 2 | 2 | 0.500 |
| Ozguven, Eren Erman | FAMU-FSU | United States | 5 | 5 | 82 | 16.40 | 16.40 | 5 | 5 | 0.500 |
| Brayne, Carol | University of Cambridge | United Kingdom | 5 | 5 | 306 | 61.20 | 61.20 | 4 | 5 | 0.235 |
| Chang, E-Shien | Rush University | United States | 5 | 5 | 166 | 33.20 | 33.20 | 4 | 5 | 0.267 |
| Koskinen, Seppo | Finnish Institute for Health and Welfare | Finland | 5 | 5 | 271 | 54.20 | 54.20 | 5 | 5 | 0.385 |
| Castellana, Fabio | Hospital Saverio De Bellis | Italy | 5 | 4 | 48 | 9.60 | 12.00 | 4 | 5 | 0.800 |
| Tobiasz-Adamczyk, Beata | Jagiellonian University | Poland | 5 | 5 | 271 | 54.20 | 54.20 | 5 | 5 | 0.385 |
| Timmermans, Harry | Eindhoven University of Technology | Netherlands | 5 | 2 | 164 | 32.80 | 82.00 | 2 | 5 | 0.143 |
| Simon, Melissa | Northwestern University | United States | 5 | 5 | 166 | 33.20 | 33.20 | 4 | 5 | 0.267 |
| Johnson, Jeff | University of San Francisco | United States | 5 | 2 | 66 | 13.20 | 33.00 | 2 | 5 | 0.200 |
| Sardone, Rodolfo | Hospital Saverio De Bellis | Italy | 5 | 4 | 48 | 9.60 | 12.00 | 4 | 5 | 0.800 |
| Bickenbach, Jerome | Swiss Paraplegic Group | Switzerland | 5 | 3 | 13 | 2.60 | 4.33 | 2 | 3 | 0.333 |

Source: Generated by the author using biblioMagika® (Ahmi, 2024)

Figure 4.2: Author's Production over Time




Source: Generated by the author using Biblioshiny (Aria & Cuccurullo, 2017)

## 4.4 Publication by Institutions

Table 4.8 lists the most productive institutions with a minimum of 15 publications, ranked by **total publications (TP)**, along with their respective countries and bibliometric parameters.

The University of Alberta leads with 46 publications, followed by the University of California with 44, and the National Health Service with 40. However, while the University of Alberta leads in publications, its citation impact is lower than the University of California and National Health Service.

The University of Alberta has 376 citations and an average of 8.17 **C/P**. In contrast, the University of California leads with 2,412 citations and 54.82 C/P, while the National Health Service has 583 citations and 14.58 C/P, both showing greater citation impact. The **h-index** and **g-index** for these institutions further demonstrate their higher citation impact. The University of California has an h-index of 21 and a g-index of 44, while the National Health Service has an h-index of 12 and a g-index of 24. Both institutions surpass the University of Alberta, which has an h-index of 10 and a g-index of 19.

Despite lower TP, Johns Hopkins University and the National Institute on Aging have substantial citation impacts. Johns Hopkins University, with 20 publications, had a **C/P** of 80.05 and 88.94 **C/CP**. The National Institute on Aging, with 15 publications, stands out with 92.60 C/P and 106.85 C/CP, the highest in the dataset, which highlight its citation influence, surpassing both Johns Hopkins University and the University of Alberta.

Table 4.8: Most Productive Institutions

| Institution Name | Country | TP | NCA | NCP | TC | C/P | C/CP | *h* | *g* | *m* |
|---|---|---|---|---|---|---|---|---|---|---|
| University of Alberta | Canada | 46 | 62 | 31 | 376 | 8.17 | 12.13 | 10 | 19 | 0.435 |
| University of California | United States | 44 | 88 | 39 | 2412 | 54.82 | 61.85 | 21 | 44 | 0.553 |
| National Health Service | United Kingdom | 40 | 83 | 29 | 583 | 14.58 | 20.10 | 12 | 24 | 0.333 |
| Catholic University of Parana | Brazil | 32 | 35 | 23 | 225 | 7.03 | 9.78 | 8 | 15 | 0.615 |
| University College London | United Kingdom | 28 | 50 | 25 | 800 | 28.57 | 32.00 | 12 | 28 | 0.218 |
| Harvard University | United States | 26 | 64 | 23 | 991 | 38.12 | 43.09 | 13 | 26 | 0.371 |
| King's College London | United Kingdom | 21 | 39 | 18 | 867 | 41.29 | 48.17 | 9 | 21 | 0.375 |
| University of Toronto | Canada | 21 | 31 | 20 | 436 | 20.76 | 21.80 | 9 | 20 | 0.231 |
| University of Texas | United States | 20 | 30 | 16 | 178 | 8.90 | 11.13 | 8 | 13 | 0.178 |
| Johns Hopkins University | United States | 20 | 60 | 18 | 1601 | 80.05 | 88.94 | 10 | 20 | 0.154 |
| World Health Organisation | Japan | 18 | 34 | 15 | 707 | 39.28 | 47.13 | 10 | 18 | 0.556 |
| Florida State University | United States | 17 | 32 | 15 | 241 | 14.18 | 16.07 | 8 | 15 | 0.182 |
| University of Michigan | United States | 17 | 26 | 14 | 826 | 48.59 | 59.00 | 8 | 17 | 0.167 |
| University of North Carolina | United States | 16 | 25 | 15 | 113 | 7.06 | 7.53 | 5 | 10 | 0.069 |
| McGill University | Canada | 16 | 32 | 13 | 83 | 5.19 | 6.38 | 6 | 9 | 0.150 |
| University of Geneva | Switzerland | 16 | 31 | 14 | 1088 | 68.00 | 77.71 | 9 | 16 | 0.184 |
| University of Illinois | United States | 16 | 29 | 10 | 146 | 9.13 | 14.60 | 7 | 12 | 0.184 |
| Erasmus Medical Center | Netherlands | 15 | 71 | 15 | 589 | 39.27 | 39.27 | 12 | 15 | 0.364 |
| National Institute on Aging | United States | 15 | 28 | 13 | 1389 | 92.60 | 106.85 | 10 | 15 | 0.204 |
| Monash University | Australia | 15 | 37 | 15 | 372 | 24.80 | 24.80 | 9 | 15 | 0.529 |
| Columbia University | United States | 15 | 28 | 7 | 351 | 23.40 | 50.14 | 6 | 15 | 0.182 |

**Notes:** TP=total number of publications; NCA=number of contributing authors; NCP=number of cited publications; TC=total citations; C/P=average citations per publication; C/CP=average citations per cited publication; h=h-index; g=g-index; m=m-index.

Source: Generated by the author using biblioMagika® (Ahmi, 2024)

## 4.5 Publication by Countries

Table 4.9 and Figure 4.3 present the most productive countries with at least 30 publications on ageing population research.

The United States (US), United Kingdom (UK), and Canada lead in ageing population research with the highest publications and contributing authors, indicating strong research infrastructure and collaboration. The US outperforms the UK in all bibliometric measures, with a 27.69% higher **h-index**, 33.58% higher **g-index**, and 28.55% higher **m-index**. The UK surpasses Canada, with a 51.06% higher h-index, 50.55% higher g-index, and 16.84% higher m-index. The US, UK, and Canada are the top three most productive countries in this field.

Despite lower TP, Germany, Switzerland, and the Netherlands show high citation impact in ageing population research. In terms of **C/P**, Germany leads with 50.25, followed by Switzerland with 43.60, and the Netherlands with 35.04. For **C/CP**, Germany also leads with 67.27, followed by Switzerland with 52.54, and the Netherlands with 42.73. These findings demonstrate that citation impact is not solely determined by the volume of publications but also by the quality and influence of the research produced. The results suggest that academic impact, measured by citation rates, should be prioritised alongside publication volume.

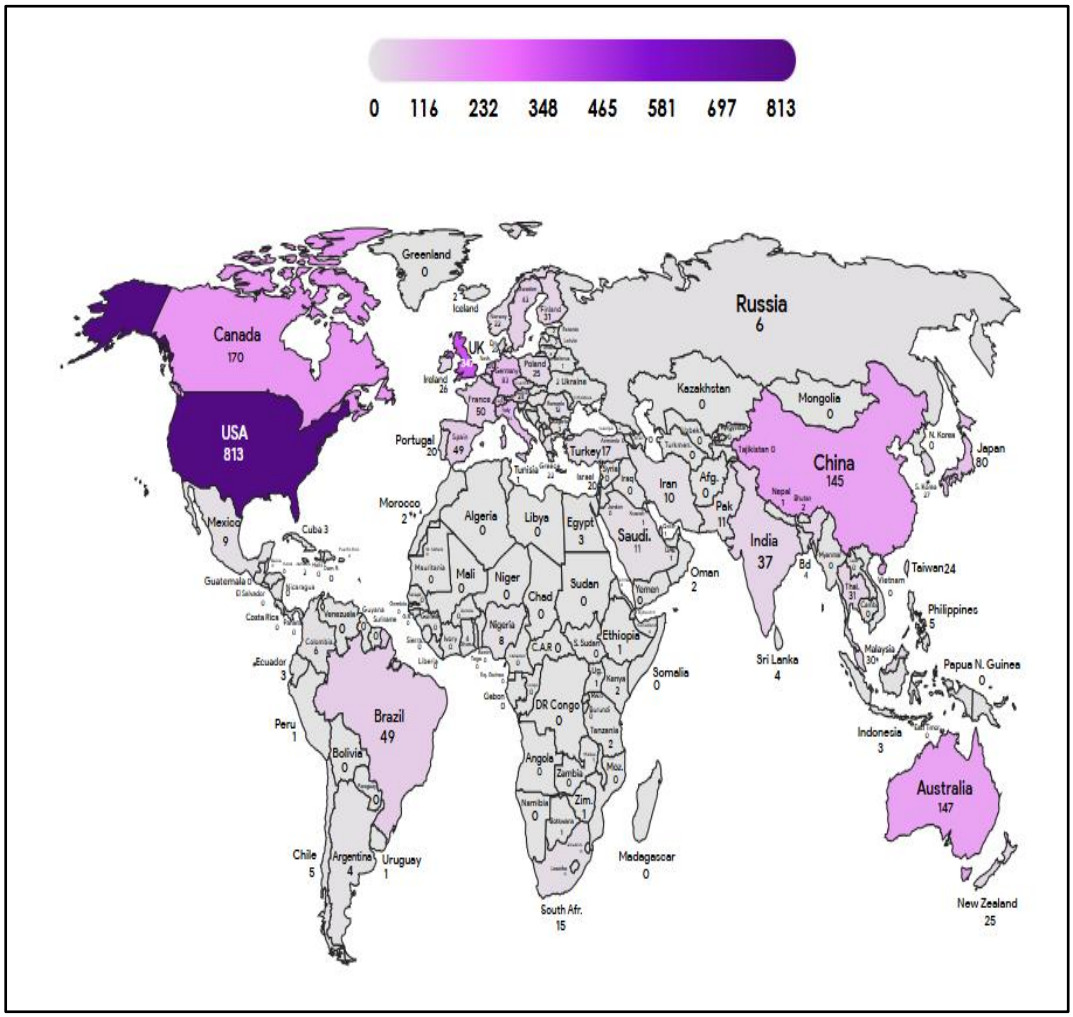
Table 4.9: Most Productive Countries

| **Country** | **TP** | **NCA** | **NCP** | **TC** | **C/P** | **C/CP** | ***h*** | ***g*** | ***m*** |
|---|---|---|---|---|---|---|---|---|---|
| United States | 813 | 2064 | 630 | 18837 | 23.17 | 29.90 | 65 | 137 | 0.823 |
| United Kingdom | 347 | 802 | 277 | 8328 | 24.00 | 30.06 | 47 | 91 | 0.588 |
| Canada | 170 | 390 | 123 | 2088 | 12.28 | 16.98 | 23 | 45 | 0.489 |
| Australia | 147 | 350 | 127 | 2582 | 17.56 | 20.33 | 27 | 50 | 0.643 |
| China | 145 | 542 | 98 | 1529 | 10.54 | 15.60 | 19 | 39 | 0.679 |
| Netherlands | 100 | 340 | 82 | 3504 | 35.04 | 42.73 | 30 | 59 | 0.612 |
| Italy | 83 | 321 | 70 | 2110 | 25.42 | 30.14 | 24 | 45 | 0.727 |
| Germany | 83 | 251 | 62 | 4171 | 50.25 | 67.27 | 20 | 64 | 0.333 |
| Japan | 80 | 295 | 64 | 1138 | 14.23 | 17.78 | 18 | 33 | 0.346 |
| France | 50 | 144 | 35 | 1127 | 22.54 | 32.20 | 15 | 33 | 0.417 |
| Brazil | 49 | 74 | 37 | 373 | 7.61 | 10.08 | 10 | 19 | 0.526 |
| Spain | 49 | 188 | 40 | 774 | 15.80 | 19.35 | 15 | 27 | 0.429 |
| Switzerland | 47 | 180 | 39 | 2049 | 43.60 | 52.54 | 21 | 45 | 0.350 |
| Sweden | 43 | 86 | 35 | 902 | 20.98 | 25.77 | 16 | 30 | 0.364 |
| Hong Kong | 37 | 86 | 27 | 944 | 25.51 | 34.96 | 14 | 30 | 0.636 |
| India | 37 | 106 | 22 | 128 | 3.46 | 5.82 | 6 | 11 | 0.300 |
| Singapore | 34 | 82 | 25 | 415 | 12.21 | 16.60 | 10 | 20 | 0.294 |
| Thailand | 31 | 89 | 22 | 219 | 7.06 | 9.95 | 8 | 14 | 0.348 |
| Finland | 31 | 69 | 26 | 627 | 20.23 | 24.12 | 12 | 25 | 0.293 |
| Malaysia | 30 | 79 | 18 | 308 | 10.27 | 17.11 | 7 | 17 | 0.259 |
| Belgium | 30 | 75 | 24 | 843 | 28.10 | 35.13 | 12 | 29 | 0.444 |

Notes: TP=total number of publications; NCA=number of contributing authors; NCP=number of cited publications; TC=total citations; C/P=average citations per publication; C/CP=average citations per cited publication; h=h-index; and g=g-index.

Source: Generated by the author using biblioMagika® (Ahmi, 2024)

Figure 4.3: Most Productive Countries




Source: Generated by the author using iipmaps.com

## 4.6 Highly Cited Documents

To answer RQ4 (What are the most highly cited documents in the field of ageing population, and what are the key themes and topics that they address?), Table 4.10 presents the top 20 most-cited articles that influenced the ageing population research field.

The paper by Christensen et al. (2009), leads with an impressive 2,719 citations and 169.94 **citations per year (C/Y)**, discusses the impact of increasing life expectancy in developed countries. It concludes that medical advances and work distribution can help people live longer without severe disability.

Angus et al. (2000), with 864 citations and 34.56 C/Y, focuses on the growing demand for critical care and pulmonary medicine specialists in the U.S. due to the ageing population.

Etzioni et al. (2003), with 707 citations and 32.14 C/Y, predicts a rise in surgeries due to the ageing population. It stresses the need for planning to meet increased demand for surgical care.

Aw et al. (2007) with 655 citations and 36.39 C/Y, explores immunosenescence, detailing how ageing weakens the immune system, making older adults more susceptible to infections and reducing vaccination efficacy.

Smit et al. (2015), with 848 citations and a notably high 64.60 C/Y addresses the challenges of caring for an ageing HIV-infected population at increased risk for age-related non-communicable diseases (NCDs). The paper highlights the need for specialised care, with the high C/Y indicating its continued relevance in ageing, HIV, and healthcare planning.

The top 5 highly cited articles in ageing population research address several key themes including disability prevention, healthcare workforce planning, immunosenescence, chronic disease management and specialised care. These

themes have significantly shaped the development of ageing population research, reflecting the primary challenges and strategies in addressing the healthcare needs of ageing populations.

Table 4.10: Top 20 Highly Cited Articles

| No. | Authors | Title | Source Title | Cites | Cites per Year |
|---|---|---|---|---|---|
| 1 | Christensen et al. (2009) | Ageing populations: the challenges ahead | The Lancet | 2719 | 169.94 |
| 2 | Angus et al. (2000) | Current and projected workforce requirements for care of the critically III and patients with pulmonary disease: Can we meet the requirements of an ageing population? | JAMA | 864 | 34.56 |
| 3 | Etzioni et al. (2003) | The Ageing Population and Its Impact on the Surgery Workforce | Annals of Surgery | 707 | 32.14 |
| 4 | Aw et al. (2007) | Immunosenescence: Emerging challenges for an ageing population | Immunology | 655 | 36.39 |
| 5 | Smit et al. (2015) | Future challenges for clinical care of an ageing population infected with HIV: A modelling study | The Lancet Infectious Diseases | 646 | 64.60 |
| 6 | Bell et al. (2012) | Epigenome-wide scans identify differentially methylated regions for age and age-related phenotypes in a healthy ageing population | PLoS Genetics | 550 | 42.31 |
| 7 | Gerstenblith et al. (1977) | Echocardiographic assessment of a normal adult ageing population | Circulation | 500 | 10.42 |
| 8 | Fried et al. (2004) | A Social Model for Health Promotion for an Ageing Population: Initial Evidence on the Experience Corps Model | Journal of Urban Health | 431 | 20.52 |
| 9 | Pollack (2005) | Intelligent technology for an ageing population: The use of AI to assist elders with cognitive impairment | AI Magazine | 421 | 21.05 |
| 10 | Dall et al. (2013) | The care span: An ageing population and growing disease burden will require a large and specialised health care workforce by 2025 | Health Affairs | 380 | 31.67 |
| 11 | Alsnih & Hensher (2003) | The mobility and accessibility expectations of seniors in an ageing population | Transportation Research Part A: Policy and Practice | 357 | 16.23 |
| 12 | Geda et al. (2006) | Prevalence of neuropsychiatric symptoms in mild cognitive impairment and normal cognitive ageing: Population-based study | Archives of General Psychiatry | 355 | 20.88 |
| 13 | Guralnik et al. (1996) | Disability as a public health outcome in the ageing population | Annual Review of Public Health | 351 | 12.10 |
| 14 | Stewart et al. (2003) | Heart failure and the ageing population: An increasing burden in the 21st century? | Heart | 314 | 14.27 |
| 15 | Kanasi et al. (2016) | The ageing population: demographics and the biology of ageing | Periodontology 2000 | 293 | 32.56 |
| 16 | Ancoli-Israel (2009) | Sleep and its disorders in ageing populations | Sleep Medicine | 274 | 17.13 |
| 17 | Feng et al. (2012) | China's rapidly ageing population creates policy challenges in shaping a viable long-term care system | Health Affairs | 272 | 20.92 |
| 18 | Colwill et al. (2008) | Trends: Will generalist physician supply meet demands of an increasing and ageing population? | Health Affairs | 271 | 15.94 |
| 19 | Teunissen et al. (2003) | Inflammation markers in relation to cognition in a healthy ageing population | Journal of Neuroimmunology | 258 | 11.73 |
| 20 | Liu et al. (1999) | Twenty-four-hour pattern of intraocular pressure in the ageing population | Investigative Ophthalmology and Visual Science | 257 | 9.88 |

Source: Generated by the author using biblioMagika® (Ahmi, 2024)

## 4.7 Co-occurrence Analysis

Co-occurrence refers to the simultaneous occurrence of two or more elements. Co-word networks are used to illustrate the conceptual structure by showing the relationships between different concepts (Aria & Cuccurullo, 2017). Co-occurrence analysis involves quantifying the frequency of matched data within a given collection unit (Buzydlowski, 2015).

### 4.7.1. Co-occurrence Network

To answer RQ5 (What are the key themes that emerge from co-occurrence analyses of author keywords in the literature on the ageing population?), Table 4.11 presents the research themes based on author keywords, and Figure 4.4 shows the co-occurrence network of the author's keywords. Keywords co-occurrence analysis in VOSviewer is a method used to explore relationships between research topics. The visualisation displays distinct colours for clusters of related keywords. This clustering algorithm groups keywords that frequently co-occur with one another, indicating shared thematic relevance. The colours scheme functions to distinguish different research themes or subfields which exist within the ageing populations subject area.

The size of each node represents how often a keyword appears, with larger nodes indicating more frequent keywords. The links between nodes represent the strength of their co-occurrence, with stronger links indicating more frequent connections.

This research employed specific parameters to discover important terms in ageing population studies. The full counting method recorded all keyword co-occurrences found in documents. A minimum occurrence threshold of five was set to filter in only the most frequent keywords which resulted in 150 selected terms from an initial pool of 3,692. A minimum cluster size of

18 was used to create meaningful clusters which resulted in five distinct thematic groups.

The author keywords with the highest occurrences and total link strengths within each cluster include *epidemiology, geriatrics, dementia, frailty, healthy ageing, quality of life, accessibility, demographics, ageing population* and *healthcare.*

Cluster 1 (Red), themed **health and chronic conditions**, deals with health care and clinical conditions affecting older populations. It includes keywords related to geriatric care, multimorbidity, chronic diseases, and the impact of ageing on health such as chronic kidney disease, falls, osteoporosis, polypharmacy, cognitive decline, and hearing loss.

Cluster 2 (Green), themed **cognitive health and technology**, focuses on cognitive health and the role of technology in enhancing the quality of life for older adults. It highlights concerns over dementia, frailty, and cognitive impairment in ageing populations. The cluster also emphasises the potential of technological innovations, such as artificial intelligence, smart homes, and mobile health devices, in supporting cognitive health and ageing in place.

Cluster 3 (Blue), themed **healthy ageing, chronic disease management**, and Prevention, focuses on maintaining the health and quality of life for older populations. It highlights chronic conditions like cardiovascular disease, diabetes, and obesity, with an emphasis on prevention, management, and risk factors. The cluster underscores the importance of exercise, rehabilitation, falls prevention, and screening for maintaining physical health

Cluster 4 (Yellow), themed **age-friendly design and accessibility**, emphasises the importance of design, accessibility, and inclusivity in creating environments that support elderly population.

Keywords such as gerontechnology, user experience and user-centered design highlights the need for age-friendly products and environments that address the physical and cognitive limitations of the elderly.

Cluster 5 (Purple), themed **demographics, policy, and economic impact**, highlights the demographic shifts and economic implications of an ageing society. It includes life expectancy, long-term care, pensions, and social security issues, with a strong focus on countries experiencing significant demographic changes, like China, Japan, and Singapore.

The co-occurrence analysis of research themes in ageing reveals key connections between health, lifestyle, societal issues, and technological advancements. However, gaps exist in areas such as health policy, pension systems, and palliative care, suggesting opportunities for future exploration.

The elderly care research is increasingly incorporating technological integration including AI, augmented reality and smart homes. Future studies could assess the effectiveness and accessibility of these technologies. The research on ageing shows geographical variations, with frequent references to countries such as China, Japan, and Singapore. These findings highlight the importance of cross-national comparative studies that explore demographic change, economic growth, social security and pension.

In summary, the analysis provides an extensive view of ageing research themes and points to areas that need further research. Future studies could include filling the gaps in health policy and palliative care research, the impact of technological advancements in elderly care, and cross-national comparative studies on ageing-related issues.

## Table 4.11: Research Themes based on Author Keywords

| Author's keyword | Cluster | Total link strength | Occurrences | Avg. pub. year | Theme |
|---|---|---|---|---|---|
| ageing | 1 (red) | 450 | 332 | 2015.9187 | Theme 1: Health and Chronic Conditions |
| epidemiology | | 60 | 36 | 2014.4167 | |
| geriatrics | | 64 | 35 | 2018.3714 | |
| health | | 57 | 23 | 2018.1304 | |
| cognition | | 45 | 21 | 2017.619 | |
| mortality | | 43 | 20 | 2010.25 | |
| covid-19 | | 21 | 18 | 2021.8333 | |
| aged | | 17 | 15 | 1998.0667 | |
| depression | | 18 | 15 | 2018.4667 | |
| age | | 15 | 14 | 2013.3571 | |
| hiv | | 22 | 13 | 2018.5385 | |
| assistive technology | | 18 | 12 | 2017 | |
| chronic kidney disease | | 16 | 11 | 2016.4545 | |
| multimorbidity | | 21 | 10 | 2016.7 | |
| mobility | | 12 | 9 | 2016.7778 | |
| hearing loss | | 14 | 8 | 2019.5 | |
| polypharmacy | | 24 | 8 | 2017.625 | |
| surgery | | 10 | 8 | 2015.625 | |
| elderly patients | | 9 | 7 | 2014.8571 | |
| falls | | 19 | 7 | 2018.4286 | |
| immunosenescence | | 11 | 7 | 2014.5714 | |
| primary care | | 11 | 7 | 2019.5714 | |
| tuberculosis | | 12 | 7 | 1999.8571 | |
| wearable technology | | 16 | 7 | 2017.2857 | |
| adherence | | 14 | 6 | 2019.5 | |
| antiretroviral therapy | | 9 | 6 | 2014.3333 | |
| housing | | 11 | 6 | 2012.1667 | |
| medication adherence | | 8 | 6 | 2017.1667 | |
| morbidity | | 14 | 6 | 2013.3333 | |
| old age | | 5 | 6 | 1993.8333 | |
| osteoporosis | | 6 | 6 | 2013.3333 | |
| outcomes | | 10 | 6 | 2014.1667 | |
| oxidative stress | | 8 | 6 | 2013.8333 | |

| | | | | | |
|---|---|---|---|---|---|
| senescence | | 19 | 6 | 2018.1667 | |
| telemedicine | | 11 | 6 | 2018.8333 | |
| adverse drug reactions | | 14 | 5 | 2014.2 | |
| aids | | 10 | 5 | 2015.4 | |
| care | | 7 | 5 | 1985 | |
| comorbidities | | 13 | 5 | 2017.4 | |
| gender | | 7 | 5 | 2014.6 | |
| health care expenditure | | 8 | 5 | 2016 | |
| health policy | | 10 | 5 | 2020.6 | |
| hospitalisation | | 5 | 5 | 2016.6 | |
| inflammaging | | 16 | 5 | 2019 | |
| lifestyle | | 9 | 5 | 2020.8 | |
| palliative care | | 8 | 5 | 2020.2 | |
| telehealth | | 11 | 5 | 2018.4 | |
| dementia | 2 (green) | 78 | 34 | 2016.4118 | Theme 2: Cognitive Health and Technology |
| frailty | | 69 | 34 | 2018.1765 | |
| cognitive impairment | | 38 | 18 | 2017.3889 | |
| alzheimer's disease | | 38 | 17 | 2017.1176 | |
| disability | | 31 | 16 | 2015.75 | |
| prevention | | 30 | 14 | 2013.7143 | |
| physical activity | | 28 | 13 | 2018.1538 | |
| oral health | | 29 | 12 | 2019.25 | |
| health promotion | | 31 | 11 | 2013.0909 | |
| nutrition | | 34 | 11 | 2018.6364 | |
| cognitive decline | | 20 | 9 | 2019.4444 | |
| cohort studies | | 23 | 8 | 2018.625 | |
| diet | | 19 | 8 | 2018.875 | |
| longitudinal study | | 14 | 8 | 2019.375 | |
| mental health | | 20 | 8 | 2017.75 | |
| public health | | 17 | 8 | 2018.375 | |
| ageing in place | | 13 | 7 | 2015.2857 | |
| cross-sectional study | | 7 | 7 | 2018.4286 | |
| machine learning | | 21 | 7 | 2022.1429 | |
| activities of daily living | | 15 | 6 | 2013.5 | |
| ambient assisted living | | 10 | 6 | 2018.1667 | |

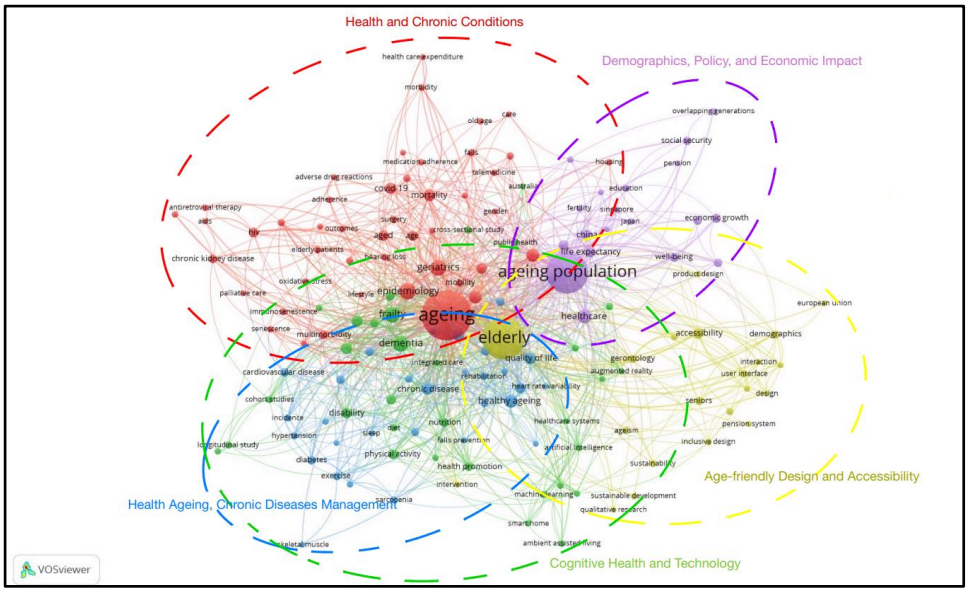
| | | | | | |
|---|---|---|---|---|---|
| artificial intelligence | | 29 | 6 | 2022.6667 | |
| internet of things | | 13 | 6 | 2021.5 | |
| mobile phone | | 16 | 6 | 2016.6667 | |
| mri | | 9 | 6 | 2019.8333 | |
| south africa | | 7 | 6 | 2022.6667 | |
| augmented reality | | 14 | 5 | 2019 | |
| australia | | 8 | 5 | 2013.4 | |
| healthcare systems | | 14 | 5 | 2021.4 | |
| integrated care | | 9 | 5 | 2020.2 | |
| smart home | | 13 | 5 | 2018.6 | |
| virtual reality | | 17 | 5 | 2022.6 | |
| healthy ageing | 3 (blue) | 45 | 23 | 2020.1739 | Theme 3: Healthy Ageing, Chronic Disease Management |
| quality of life | | 37 | 20 | 2016.9 | |
| chronic disease | | 44 | 18 | 2013.5556 | |
| population | | 37 | 18 | 2014.2778 | |
| demography | | 28 | 16 | 2008.75 | |
| technology | | 34 | 12 | 2016.9167 | |
| cardiovascular disease | | 24 | 11 | 2016.8182 | |
| diabetes | | 20 | 11 | 2015.3636 | |
| prevalence | | 26 | 11 | 2015.0909 | |
| health services | | 16 | 10 | 2016.1 | |
| risk factors | | 23 | 10 | 2015.1 | |
| elderly population | | 14 | 9 | 2016.5556 | |
| exercise | | 23 | 9 | 2018.5556 | |
| cancer | | 12 | 8 | 2015.375 | |
| hypertension | | 18 | 8 | 2019.125 | |
| rehabilitation | | 16 | 8 | 2014 | |
| screening | | 17 | 8 | 2016.25 | |
| incidence | | 17 | 7 | 2015.2857 | |
| sarcopenia | | 13 | 7 | 2018.2857 | |
| cognitive function | | 14 | 6 | 2018 | |
| obesity | | 12 | 6 | 2016.8333 | |
| primary health care | | 10 | 6 | 2022.8333 | |
| treatment | | 13 | 6 | 2017.3333 | |
| falls prevention | | 14 | 5 | 2018.8 | |

| | | | | | |
|---|---|---|---|---|---|
| health literacy | | 11 | 5 | 2017.6 | |
| heart rate variability | | 4 | 5 | 2015.2 | |
| population projections | | 8 | 5 | 2008.8 | |
| projection | | 7 | 5 | 2015 | |
| skeletal muscle | | 7 | 5 | 2018.2 | |
| sleep | | 15 | 5 | 2016.8 | |
| elderly | 4 (yellow) | 387 | 243 | 2016.6543 | Theme 4: Age-friendly Design and Accessibility |
| accessibility | | 44 | 15 | 2016.3333 | |
| demographics | | 25 | 9 | 2015.5556 | |
| gerontology | | 28 | 9 | 2016.2222 | |
| seniors | | 24 | 9 | 2016.5556 | |
| active ageing | | 7 | 8 | 2014.125 | |
| ageism | | 8 | 7 | 2020.1429 | |
| sustainability | | 12 | 7 | 2017.1429 | |
| user interface | | 29 | 7 | 2017 | |
| gerontechnology | | 15 | 6 | 2017.1667 | |
| inclusive design | | 7 | 6 | 2016.5 | |
| sustainable development | | 7 | 6 | 2014.8333 | |
| design | | 21 | 5 | 2016.6 | |
| european union | | 5 | 5 | 2017.6 | |
| interaction | | 18 | 5 | 2014.6 | |
| intervention | | 15 | 5 | 2015.4 | |
| pension system | | 4 | 5 | 2016.8 | |
| product design | | 11 | 5 | 2013.2 | |
| qualitative research | | 8 | 5 | 2018.8 | |
| user experience | | 22 | 5 | 2017.2 | |
| user-centered design | | 24 | 5 | 2015.6 | |
| ageing population | 5 (purple) | 216 | 238 | 2017.6176 | Theme 5: Demographics, Policy, and Economic Impact |
| healthcare | | 52 | 26 | 2016.9231 | |
| china | | 24 | 15 | 2020.5333 | |
| life expectancy | | 23 | 15 | 2015.5333 | |
| long-term care | | 22 | 14 | 2018.6429 | |
| economic growth | | 13 | 12 | 2017.6667 | |
| well-being | | 24 | 12 | 2019.0833 | |
| demographic change | | 14 | 11 | 2015.5455 | |

| | | | |
|---|---|---|---|
| policy | 27 | 11 | 2017.9091 |
| ageing society | 8 | 10 | 2019.3 |
| social security | 13 | 10 | 2012 |
| education | 10 | 7 | 2010.4286 |
| fertility | 6 | 6 | 2010.1667 |
| japan | 11 | 6 | 2018.8333 |
| overlapping generations | 5 | 6 | 2010.5 |
| wearable devices | 10 | 6 | 2018.5 |
| challenges | 11 | 5 | 2018.8 |
| demographic ageing | 8 | 5 | 2018.6 |
| pension | 7 | 5 | 2021.6 |
| singapore | 10 | 5 | 2016.4 |

Source: Generated by the author using VOSviewer (Van Eck & Waltman, 2014)

Figure 4.4: Co-occurrence Network of the Author's Keywords




Source: Generated by the author using VOSviewer (Van Eck & Waltman, 2014) (https://tinyurl.com/2xup5ga9)

### 4.7.2. Thematic Map Analysis

Table 4.12 and Figure 4.5 show a thematic map from Biblioshiny, illustrating topics based on centrality and density within quadrants. Centrality measures the degree of a cluster's connections with other clusters. Density measures the strength of the relationships between the words within the cluster (Callon et al., 1991). Rank Density represents the position of a cluster determined by its density score, whereas cluster frequency denotes the frequency of keyword occurrences within the cluster.

Clusters in the lower right quadrant are important for a research field but remain underdeveloped, representing transversal and general, basic themes (Ahmi, 2022). The blue cluster includes *ageing population, healthcare, mortality, COVID-19, demography, China, life expectancy,* and *economic growth*, while the green cluster covers *elderly, frailty, health, age, prevention,* and *physical activity*.

Clusters in the upper-left quadrant have a high impact but lower centrality, indicating their marginal importance to the field. These themes are highly specialised and peripheral in character (Ahmi, 2022). The clusters include terms of "quality of life, technology, well-being," "assistive technology" and "accessibility."

Clusters in the lower-left quadrant are both weakly developed and marginal. The clusters in this quadrant have low impact and low centrality, mainly representing either emerging or disappearing themes (Ahmi, 2022). The orange cluster, which includes terms such as *geriatrics, healthy ageing*, and *long-term care*, occupies a transitional space between the lower-left and lower-right quadrants, reflecting its evolving role in ageing research. Despite their foundational importance, these topics have become less emphasised in recent research as the focus has shifted more toward motor themes.

Clusters in the upper-right quadrant have both significant impact and high centrality. The clusters under this quadrant consider as well developed and important clusters within the research field (Ahmi, 2022). The red cluster, which includes terms like *ageing*, *epidemiology*, *dementia*, *cognition*, *cognitive impairment*, *chronic disease*, *population*, *Alzheimer's disease*, *disability*, *aged*, *depression*, *HIV*, and *oral health*, represents a highly integrated and well-established body of knowledge within the field of ageing research. However, the red cluster's positioning between the upper right and lower right quadrants means that although these themes are highly developed, they are still viewed as foundational in nature.

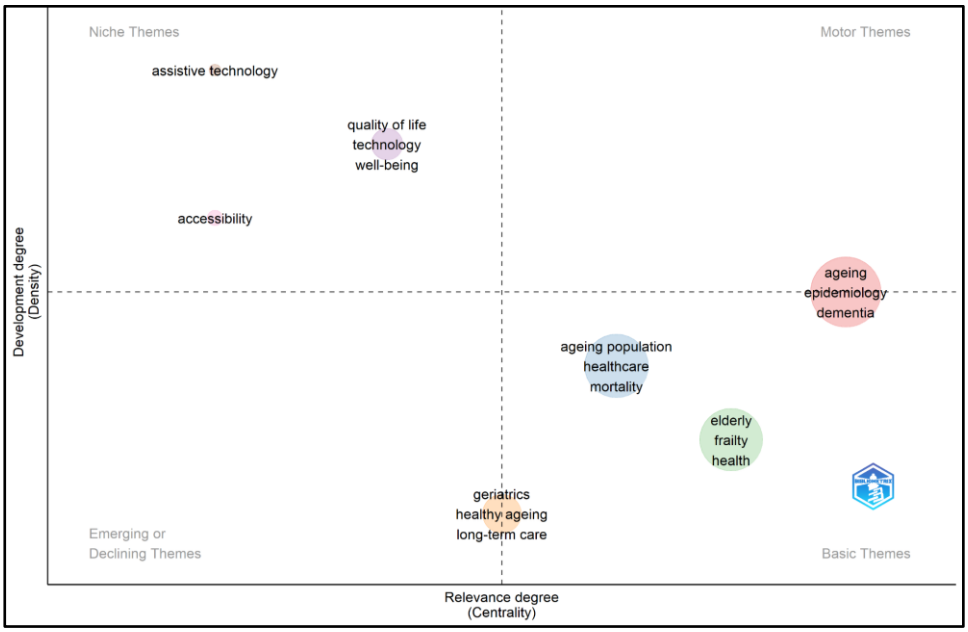
Table 4.12: Thematic Map of the Author's Keywords

| Keywords | Cluster | Co-occurrence | Betweenness Centrality | PageRank |
|---|---|---|---|---|
| ageing | 1 (red) | 332 | 5606.794 | 0.092908 |
| epidemiology | | 36 | 1472.824 | 0.013014 |
| dementia | | 34 | 652.8467 | 0.013476 |
| cognition | | 21 | 1003.858 | 0.010035 |
| cognitive impairment | | 18 | 561.2279 | 0.007225 |
| chronic disease | | 18 | 723.055 | 0.008435 |
| population | | 18 | 243.2644 | 0.006129 |
| alzheimer's disease | | 17 | 308.3266 | 0.007364 |
| disability | | 16 | 280.654 | 0.00585 |
| aged | | 15 | 209.4749 | 0.004279 |
| depression | | 15 | 587.3431 | 0.005365 |
| hiv | | 13 | 90.81006 | 0.004655 |
| oral health | | 12 | 110.0379 | 0.005419 |
| ageing population | 2 (blue) | 238 | 4537.9 | 0.046499 |
| healthcare | | 26 | 804.4573 | 0.010418 |
| mortality | | 20 | 684.224 | 0.009457 |
| covid-19 | | 18 | 556.0737 | 0.00703 |

| | | | | |
|---|---|---|---|---|
| demography | | 16 | 127.894 | 0.005762 |
| china | | 15 | 433.4606 | 0.005344 |
| life expectancy | | 15 | 391.7609 | 0.005459 |
| economic growth | | 12 | 143.5948 | 0.003503 |
| elderly | 3 (green) | 242 | 4440.132 | 0.078394 |
| frailty | | 34 | 1092.227 | 0.012632 |
| health | | 23 | 563.1476 | 0.010602 |
| age | | 14 | 135.594 | 0.003287 |
| prevention | | 14 | 321.2581 | 0.005593 |
| physical activity | | 13 | 227.0047 | 0.005313 |
| quality of life | 4 (purple) | 20 | 707.5126 | 0.007319 |
| technology | | 12 | 516.8794 | 0.00636 |
| well-being | | 12 | 116.3488 | 0.004919 |
| geriatrics | 5 (orange) | 35 | 839.5959 | 0.012497 |
| healthy ageing | | 22 | 909.1216 | 0.009094 |
| long-term care | | 14 | 139.9829 | 0.004518 |
| assistive technology | 6 (brown) | 12 | 140.3246 | 0.004065 |
| accessibility | 7 (pink) | 15 | 335.8334 | 0.00844 |

Source: Generated by the author using Biblioshiny (Aria & Cuccurullo, 2017)

Figure 4.5: Thematic Map of the Author's Keywords




Source: Generated by the author using Biblioshiny (Aria & Cuccurullo, 2017)

## 4.7.3. Evolution of Keywords

To answer RQ6 (What are the evolution of keywords in the ageing population research field?), Figure 4.6 presents the overlay visualisation of co-occurrence network.

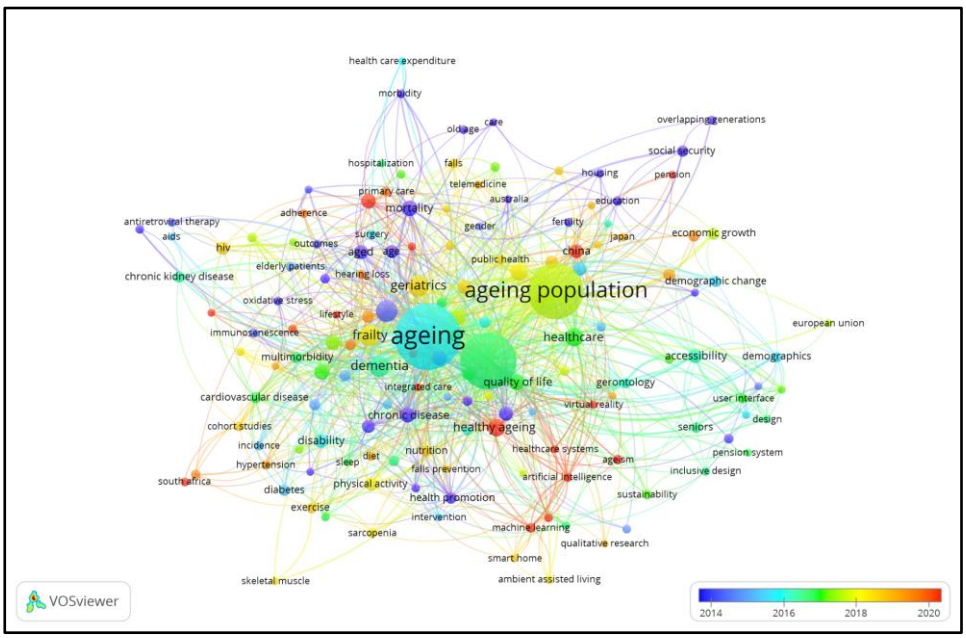
Research about ageing populations concentrated on health and social issues between 1990 and 2016. The keywords of *epidemiology, dementia, and disability* pointed to the concerns about chronic diseases and care needs. The expanding socio-economic problems of ageing populations became evident through discussions about *social security* and *pension system*. The elderly care technology integration became apparent through discussions about assistive technology and gerontechnology in the early stages.

During the period from 2016 to 2019, researchers concentrated their efforts on technology and quality of life. Wearable devices together with *telemedicine* and *smart homes* demonstrated how technology started to

enable elderly people to maintain their independence while monitoring their health. Research on *chronic diseases, mental health, and frailty* continued, but with a greater focus on prevention, physical activity, nutrition, and exercise.

Research in the post-2020 period became primarily focused on artificial intelligence (AI), machine learning (ML) and virtual reality (VR) technologies. Moreover, the issue of pensions remains a highly debated topic to this day. However, some important topics in ageing population research show low occurrences, revealing potential research gaps. For example, keywords such as *primary healthcare, artificial intelligence (AI)*, and *health policy* remain underrepresented in ageing population research. These important topics receive less attention than the frequently studied keywords which include COVID-19, healthy ageing and dementia. Therefore, future research should build upon existing technological trends in AI, ML and VR as well as investigate the less researched areas of primary healthcare, artificial intelligence and health policy.

Figure 4.6: Overlay Visualisation of Co-occurrence Network




Source: Generated by the author using VOSviewer (Van Eck & Waltman, 2014) (https://tinyurl.com/2xup5ga9)

## 4.8 Word Cloud of Keywords

To address the final research question, RQ7 (What are the important keywords in the ageing population before and after the era COVID-19 pandemic?), Figure 4.7 and 4.8 the word cloud of keywords during these two periods.

Certain terms remain unaffected by the pandemic, representing ongoing research themes in the ageing population field. Keywords like *elderly*, *ageing population*, *dementia*, *frailty*, *chronic disease*, *healthcare*, and *quality of life* appear in both periods, indicating that health, well-being, and healthcare systems for ageing population remain important in the field of research.

Before COVID-19, terms such as *health promotion*, *assistive technology*, *active ageing*, *social security*, *demographic change*, and *diabetes* were more prevalent. These terms reflect a broader emphasis on societal and technological influences on ageing, along with efforts to enhance the quality of life for older populations through supportive infrastructure.

In contrast, terms that exclusively emerged after COVID-19 highlight the significant impact of the pandemic on the research landscape. For example, keywords such as *COVID-19*, *cognitive decline*, *artificial intelligence*, *machine learning*, *internet of things*, and *mental health* reflect an increased focus on the pandemic's impact on older adults, mental health challenges, and the application of emerging technologies.

Figure 4.7: Word Cloud of the Indexed Keywords (before COVID-19)


Source: Generated by the author using Biblioshiny (Aria & Cuccurullo, 2017)

Figure 4.8: Word Cloud of the Indexed Keywords (after COVID-19)


Source: Generated by the author using Biblioshiny (Aria & Cuccurullo, 2017)

## 4.9 Chapter Summary

Chapter 4 addresses the seven research questions stated in Chapter 1, exploring the current state, trends, contributors, and key themes in ageing population research. The findings highlight the interdisciplinary nature of the field, with a predominant focus on medicine, and reveal a growing volume of publications over time, reflecting the increasing recognition of ageing as a global issue. The analysis identifies key contributors, including influential authors, institutions, and countries, and highlights the most impactful publications in ageing population research. Co-occurrence and thematic analyses reveal key research areas such as health conditions, cognitive health, technology, and ageing-friendly design, with emerging trends in AI and smart homes. The impact of COVID-19 is evident, with a shift toward mental health and technology, while ongoing concerns like frailty and dementia remain central. Overall, the results emphasise the evolving and interdisciplinary nature of ageing population research, with a growing focus on technology and global ageing challenges.

# CHAPTER 5: DISCUSSION, CONCLUSION & IMPLICATIONS

## 5.0 Introduction

The key findings of the bibliometric analysis of ageing population research are presented in Chapter 5, which reveals trends and interdisciplinary nature of the field. The chapter discusses the implications for practice in four dimensions: theoretical, methodological, practical and societal. It also provides recommendations for future research, focusing on gaps in areas such as AI, healthcare policy, and economic challenges. The study's limitations are recognised, and directions for future work are proposed. The chapter ends by highlighting the importance of the findings and the need for further research in order to address the challenges of an ageing society.

## 5.1 Summary of Key Findings

The bibliometric analysis of ageing population research reveals several key findings that highlight the evolving landscape of this field. The study identifies important trends in publication types, authorship, subject areas, and citation metrics that show the scope and interdisciplinary nature of the research. The majority of publications in this field are journal articles and the majority of them are in English. The subject areas of ageing population research are diverse, with the largest contributions coming from medicine, followed by social sciences, nursing, engineering and computer science. This multidisciplinary approach reflects the complex nature of ageing, encompassing healthcare, social policy, and technological advancements.

The number of publications has grown substantially because the ageing population has emerged as a major worldwide concern with a 6.17% compound annual growth rate from 1940 to 2024. The rise in the number of contributing authors from various fields suggests that the ageing population is no longer viewed solely through the lens of medicine but as a broader societal challenge requiring input from multiple disciplines. Key contributors Miguel Riella and Marcello Tonelli demonstrate their significant influence in the field through their 36 published works while Chatterji Somnath and Dong XinQi achieve higher citation impacts despite their smaller number of publications.

The most frequently cited documents in the research indicate that *disability prevention, healthcare workforce planning* and *chronic disease management* have shaped the development of ageing population research. The co-occurrence network analysis reveals five main research clusters which include "health and chronic conditions," "cognitive health and technology," "healthy ageing and chronic disease management," "age-friendly design and accessibility" and "demographics, policy and economic impact" of an ageing society. These clusters provide insight into the interconnectedness of various research areas.

The thematic map analysis shows that chronic diseases and dementia research continues to dominate; however, new research gaps have formed specifically in primary healthcare and artificial intelligence and health policy areas. The impact of the COVID-19 pandemic on ageing population research is also evident, with a marked increase in research focused on mental health, cognitive decline, and the application of technologies such as AI and machine learning. The pandemic has revealed greater vulnerabilities in older adults thus increasing research interest in technologies that can enhance elderly care.

In conclusion, the bibliometric analysis highlights the growing significance of ageing population research, through increased interdisciplinary collaboration and technological implementation. It also identifies critical gaps that could inform future research directions, which are the topic of health policy, artificial intelligence, and economic challenges.

## 5.2 Implications for Practice

This study provides valuable implications across four key dimensions, including theoretical, methodological, practical, and societal. These implications help to enhance the understanding of the impact of bibliometric analysis in ageing population research.

### 5.2.1 Theoretical Implications

The study extends the theoretical framework of ageing population research through literature landscape mapping, theme identification and trend observation. The analysis underscores the interdisciplinary nature of the field, integrating medical, social, and technological perspectives. The co-occurrence and keyword analyses reveal dominant themes such as chronic diseases, cognitive health, technology, demographics, policy, and economic impacts. These thematic structures help us understand the current direction of research and provide a foundation for future studies, which will strengthen the theoretical basis of ageing population research.

### 5.2.2 Methodological Implications

The methodology supports bibliometric analysis to functions as a powerful tool to analyse the extensive body of literature within a research area. The research used PRISMA diagrams to provide transparency throughout the study selection process. The literature analysis included clustering analysis, co-occurrence analysis, thematic mapping and word cloud analysis to establish relationships within the dataset. The study developed co-occurrence networks and thematic maps through VOSviewer and Biblioshiny tools which established results that future studies can replicate. The research method provides a complete understanding of research patterns and reveals unexplored investigation opportunities.

### 5.2.3 Practical Implications

The practical implications of this study offer meaningful insights for researchers, policymakers, and industry practitioners. The results of this study can help researchers detect new trends and unmet needs in ageing population research including the use of AI, machine learning and assistive technologies in elderly care. Policymakers can address the socio-economic challenges and provide evidence for the development of policies related to healthcare infrastructure, pension systems and long-term care. Industry practitioners can also use these insights to develop innovative solutions that improve the independence and well-being of older adults. The study provides a basis for the formulation of effective, context-specific policies to meet the needs of ageing populations.

### 5.2.4 Societal Implications

This study demonstrates how society needs to focus on addressing the challenges that come with ageing population. It highlights the necessity for *age-friendly designs* and the integration of *gerontechnology* to accommodate the physical and cognitive needs of older adults. The findings also contribute to a broader societal understanding of the demographic shifts and the economic and social consequences of an ageing society.

Furthermore, the research result will shape public conversations while teaching educational programs to develop a culture which promotes active ageing alongside social inclusion and sustainable caregiving. The study also demonstrates that addressing ageing population challenges requires joint efforts between people and institutions together with policymakers.

## 5.3 Recommendations for Future Research

Based on the bibliometric analysis of ageing population research, several key recommendations for future research have emerged, focusing on identified gaps, current trends, and dominant themes in the existing studies.

One key trend in the field is the growing focus on technology, particularly artificial intelligence (AI), machine learning (ML), and smart homes, in supporting elderly care. However, there are gaps in understanding how these technologies can be effectively implemented and accessed, especially in diverse socio-economic settings. Future research should focus on assessing the effectiveness and accessibility of these technologies, particularly in real-world applications. In addition, research is needed to explore the impact of these technologies on healthcare policies and their role in addressing the economic challenges associated with an ageing population.

While current research addresses chronic diseases, cognitive health, and healthcare interventions, there is a gap in studies related to health policies, pension systems, and palliative care. These areas are becoming increasingly important as the ageing population grows. Future research should focus on the economic and social impacts of policies related to long-term care, pensions, and social security, especially in rapidly ageing countries. This would provide valuable insights for developing sustainable social policies to support older populations.

Another area to focus on is the prevention and management of chronic conditions such as dementia and frailty. Research should continue to explore interventions that help older adults maintain their health, including physical activity, nutrition, and social engagement. A holistic approach that includes physical, mental, and social health is needed to improve quality of life and reduce healthcare costs. Future studies should explore community-based interventions and preventive healthcare programs that promote healthy ageing.

The analysis also shows a strong focus on demographic and economic factors in countries like Japan and China. While the effects of ageing are well-studied in these regions, further comparative studies involving countries with different economic backgrounds would provide important insights into the global impact of an ageing population. These studies would help policymakers in both developed and developing countries better prepare for the economic changes that accompany population ageing.

In conclusion, future research should continue exploring technological advancements in elderly care, while also addressing underexplored areas such as health policy, economic planning, and the social aspects of ageing. By broadening the scope of research, scholars can offer a more comprehensive understanding of the challenges and opportunities associated with an ageing population, ultimately helping to develop effective strategies for healthy ageing globally.

## 5.4 Limitations and Future Directions

The research provides a thorough overview of ageing population studies, yet several limitations apply to this study. The research has a main drawback because it relies exclusively on data from the Scopus database. The research method provided consistent results but restricted the study to a specific data set. Future research that uses multiple databases as a data source will provide more comprehensive results by including additional relevant studies in the field.

The keyword search strategy is another limitation. The extensive search may have failed to detect articles which employed alternative terminology. Future research should adopt a wider set of keywords while seeking input from field experts to maximise the retrieval of relevant literature.

The article classification process into themes depended on researcher interpretation which remained subjective despite efforts to maintain consistency. The article classification process into themes depended on researcher interpretation, which

remained subjective despite efforts to maintain consistency. The results indicate that future studies should collaborate with more authors to enhance the research process.

Bibliometric analysis reveals research patterns but fails to deliver comprehensive insights about study depth together with real-world applications. Future research should integrate content reviews together with meta-analyses to provide an advanced comprehension of the field in addition to bibliometric analysis. The inclusion of grey literature would enhance the understanding of ageing population research by providing a broader perspective.

## 5.5 Conclusion

This bibliometric study of ageing population research, based on 2,568 papers, reveals several trends, challenges and opportunities in the field. The study shows that there is a significant rise in the number of scholarly papers, especially since the 20th century, which indicates that the ageing population is being recognised as a major issue in the interconnected world.

The United States and the United Kingdom are shown to be the leading contributors, showing these nations have dedicated substantial attention to ageing population topic. However, this trend also points to the need for further research in other key regions where the ageing population is becoming a major issue, such as China, Japan, South Africa, and Singapore.

The analysis identifies five main themes: “health and chronic conditions,” “cognitive health and technology,” “healthy ageing, chronic disease management,” “age-friendly design and accessibility,” and “demographics, policy, and economic impact.” These themes have important practical implications. For academia, they show the importance of interdisciplinary research in medicine, technology, social sciences and economics. Industry should concentrate on creating assistive technologies, smart homes, and AI driven health solutions for the elderly.

Policymakers are called upon to reform healthcare, pension systems, and long-term care to address the needs of an ageing population.

The limitation of this study stresses the need to incorporate multiple data sources and qualitative analysis in future research. As we move towards a more age conscious future, it is important to understand and encourage research on the ageing population for the benefit of society. Therefore, this bibliometric analysis, provides a solid foundation for future research endeavours, steering the global ageing population sector towards actionable insights and solutions for emerging challenges.

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