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Analysis of Trends in Elderly Welfare Research in South Korea based on BERTopic

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Abstract

Purpose: This study aims to analyze the trends in elderly welfare research in South Korea from 1979 to 2024, using BERTopic, an advanced text-mining technique that facilitates the automatic extraction and visualization of research topics. The rapid aging of South Korea's population has resulted in social and healthcare challenges, making research on elderly welfare increasingly critical. **Design/methodology/approach** We collected English abstracts from the ScienceON database provided by the Korea Institute of Science and Technology Information (KISTI). BERTopic was applied to extract 28 initial topics, which were later clustered into eight major topics, including Social Care, Mental Health, and Welfare Systems. Linear regression analysis was also performed to determine hot and cold topics over time. **Results:** The findings indicate an increasing trend in research focusing on Social Care, Mental Health, and Welfare Systems, suggesting a shift in emphasis towards more integrated, community-based, and psychosocial approaches to elderly welfare. Topics such as Culture/Values, Nutrition/Health Management, and Facilities/Housing have declined in importance, indicating a change in focus from physical health management to mental and social well-being. **Conclusions:** The use of BERTopic allowed for a sophisticated and objective analysis of research trends in elderly welfare. Academically, the findings show that elderly welfare research has evolved from fragmented approaches to more integrated research covering social care and mental health. From a policy perspective, the findings confirm a paradigm shift from facility-based to community-based approaches, emphasizing the need for integrated care that includes mental and social well-being. This suggests that future policy development should prioritize resource allocation to social care and mental health support.

Keywords : Elderly Welfare, BERTopic, Social Care, Mental Health, Research Trends

JEL Classification Code : I18, J14, O35

1. Introduction

South Korea is undergoing an unprecedented demographic shift due to rapid aging. According to a report by Statistics Korea in September 2024, the population aged 65 and older accounts for 19.2% of the total population, and it is projected to surpass 20% in 2025, 30% in 2036, and 40% by 2050. This rapid aging has led to insufficient preparation

for the increasing elderly population, resulting in various social issues that directly impact the quality of life for the elderly. South Korea's elderly poverty rate remains the highest among OECD countries, stemming from changes in family structure, a fragile public support system, and inadequate retirement income security (Kang et al., 2022). According to data published by Statistics Korea (2022), families are increasingly less likely to believe that they

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should care for elderly parents, with this belief dropping significantly from 70.7% in 2002 to 22% in 2020. This indicates a growing consensus that the government and society should share this responsibility.

Health issues among the elderly also warrant attention. The life expectancy at age 65 in 2022 was 20.7 years, higher than the OECD average. However, the subjective health assessment of elderly individuals living alone was less positive compared to the general elderly population (Yi et al., 2024). Additionally, healthcare costs for those aged 65 and over amounted to 5.229 million KRW per person in 2022, with out-of-pocket expenses reaching 1.236 million KRW, reflecting an increase from the previous year and an escalating burden on healthcare costs (Ji et al., 2023).

Mental health among the elderly is also a critical concern. South Korea's elderly suicide rate ranks among the highest in the OECD, with mental health issues like depression and suicidal ideation leading to increased healthcare consumption, placing significant burdens on individuals and society (Kim et al., 2023). These challenges are largely attributed to the psychological difficulties and social isolation experienced by the elderly amid South Korea's rapid socio-economic changes.

Furthermore, improvements are needed in the healthcare service system for the elderly. The lack of a primary care system in Korea has resulted in limited advancements in geriatrics, failing to effectively meet the complex medical needs of an aging population (Ji et al., 2023). Given the multifaceted needs of elderly healthcare services, such as managing comorbidities, ensuring proper nutrition, and preventing functional decline, there is an urgent need to establish an integrated healthcare delivery system.

In this context, the importance of research on elderly welfare is increasingly recognized. This study aims to systematically analyze research trends related to elderly welfare using BERTopic, a text-mining technique that automatically extracts and visualizes topics from large-scale documents. Unlike traditional methods of analyzing research trends, BERTopic addresses the subjectivity and inconsistency inherent in previous approaches, allowing for an objective and systematic analysis of a vast volume of academic literature.

For this analysis, English abstracts of academic papers on "elderly welfare" published in South Korea from 1979 to 2024 were collected from the ScienceON academic database provided by the Korea Institute of Science and Technology Information (KISTI). The collected data underwent preprocessing before performing BERTopic topic modeling, and the temporal changes in the extracted topics were also analyzed.

The findings of this study are expected to be of significant academic and policy relevance. Academically, the systematic identification of changes in research topics

and methodologies over time could guide future research directions, while from a policy perspective, the evolution of major research topics may help identify the development of elderly welfare policies and future challenges. By utilizing BERTopic, a cutting-edge natural language processing technology, this study aims to overcome methodological limitations of previous trend analyses, providing a more objective and comprehensive result.

2. Literature Review

2.1. Elderly Welfare

Elderly welfare encompasses a variety of programs and services designed to improve the well-being and quality of life of older adults. It aims particularly at addressing socio-economic and health challenges faced by the elderly, offering diverse forms of support (Sawhney, 2003). This includes not only financial aid but also a comprehensive range of services aimed at enhancing the health, dignity, self-esteem, and independence of older individuals (Fanshel, 1975).

Campbell et al. (2007) described elderly welfare as encompassing various forms of support aimed at improving quality of life and economic stability, with a particular focus on addressing specific needs for those with chronic illnesses or disabilities. Phillipson (1981) added that elderly welfare includes government initiatives such as social security, nutrition programs, and services stipulated under elder law.

Research on elderly welfare has evolved over time. Early studies primarily focused on basic livelihood security and healthcare accessibility for the elderly (Roseman, 1939). However, more recent research has expanded to take a multidimensional approach. For instance, Cho (2009) demonstrated that the role of the elderly is shifting from being mere recipients of welfare services to active participants in community welfare.

Recent studies have particularly focused on the qualitative aspects of elderly welfare services. Kim et al. (2014) analyzed user-centered care in elderly welfare facilities, emphasizing the importance of respect for privacy and dignity. Jang et al. (2019) highlighted issues in accessibility to elderly healthcare services, while Kang et al. (2022) pointed out that, despite having a multi-tiered income security system, South Korea has a high elderly poverty rate due to relatively low public spending compared to the OECD average.

Lee and Park (2022) have proposed community-centered integrated approaches as a solution to regional disparities in elderly welfare service use, as identified by Yoon and Yoon (2009). Thus, research on elderly welfare has moved beyond simple service provision, increasingly focusing on

improving service quality, community integration, and promoting active participation among the elderly

2.2. BERTopic

BERTopic is a state-of-the-art topic modeling technique developed to discover latent topics within document collections, leveraging pre-trained language models to enhance semantic understanding of documents (Grootendorst, 2022). Unlike traditional topic modeling methods like LDA or NMF, BERTopic employs optimized algorithms at each stage for more sophisticated topic extraction.

Figure 1 illustrates the core components and processes of BERTopic. The foundational step involves using SBERT (Sentence-BERT) for embedding documents in vector space. These high-dimensional vectors are then reduced in dimensionality using UMAP (Uniform Manifold Approximation and Projection), enabling more efficient processing. The reduced-dimensional data is clustered using HDBSCAN (Hierarchical Density-Based Spatial Clustering of Applications with Noise). CountVectorizer is subsequently employed to tokenize the documents, and c-TF-IDF is used to calculate the importance of each token. Finally, a fine-tuning process further refines the topic representations (Lin et al., 2024).

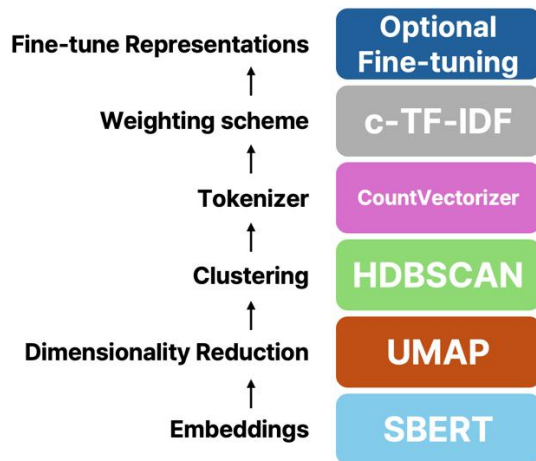


Figure 1: BERTopic's topic modeling process

Compared to traditional topic modeling methods, BERTopic offers several advantages. According to Yang (2022), BERTopic demonstrates state-of-the-art performance in topic modeling through the integration of sentence embedding, dimensionality reduction, and clustering. It also automates the topic extraction process, reducing the need for manual hyperparameter tuning, and has excellent multilingual dataset processing capabilities.

According to Mihajlov et al. (2024), BERTopic demonstrated superior performance compared to LDA and NMF in generating diverse and more detailed topics. Additionally, Tang et al. (2024) emphasized that BERTopic provides enhanced interpretability and transparency through explainable AI techniques, effectively identifying and combining similar topics within large datasets.

Traditional topic modeling methods such as Latent Dirichlet Allocation (LDA) and Latent Semantic Analysis (LSA) treat documents as random mixtures of topics, requiring manual specification of topic numbers and often struggling to capture word relationships effectively. BERTopic overcomes these limitations through several key innovations (Mendonça and Figueira, 2024). Its attention mechanism better understands contextual relationships between words, while automatically determining the optimal number of topics from the data. The model's modular design also allows for customization at each processing stage. Testing has validated these improvements, with optimized configurations showing a 28% increase in topic coherence and a 48% improvement in stability compared to default settings (Mendonça and Figueira, 2024).

3. Methods and Materials

3.1. Research Framework

This study utilized BERTopic, a deep learning-based language model, to analyze research trends related to elderly welfare through the following steps (Figure 2).

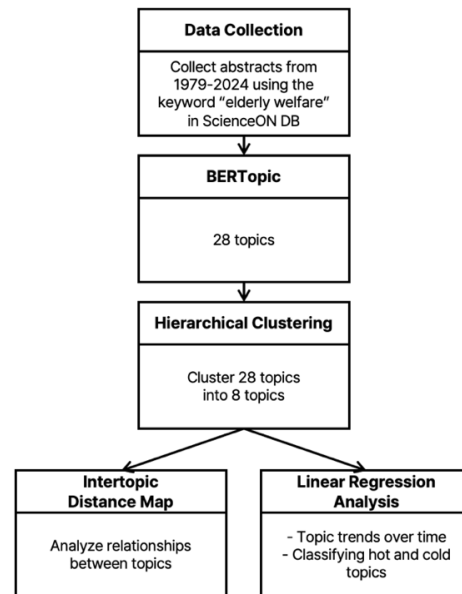


Figure 2: Research framework for topic modeling

First, abstracts of papers published from 1979 to 2024 with the keyword "elderly welfare" were collected from the ScienceON academic database. A total of 2,242 papers were gathered, out of which 1,867 included English abstracts that were selected for analysis. Second, BERTopic was applied to the collected data for topic modeling, resulting in the identification of 28 initial topics. Third, hierarchical clustering was performed based on the similarity between topics, integrating the 28 topics into eight main topics. Finally, the relationships between the eight topics were analyzed using an Intertopic Distance Map, and a linear regression analysis was conducted to classify hot and cold topics based on trends over time

3.2. Data Collection and Preprocessing

For data collection, the keyword "elderly welfare" was used to search the ScienceON academic database for papers published from 1979 to 2024. A total of 2,242 papers were collected, and 1,867 papers with English abstracts were selected for analysis. Although 588 papers contained Korean abstracts, we chose to use English abstracts to maintain consistency in the text analysis and to leverage the English-trained BERT model's capabilities. The analysis was conducted using Python 3.11.8, employing libraries such as BERTopic, UMAP, SentenceTransformer, NetworkX, and NLTK.

Data preprocessing was conducted in the following steps. First, stopwords were removed using NLTK, and commonly used verbs, adjectives, adverbs, and specific symbols in academic papers were also eliminated. The preprocessed text was then converted into sentence embeddings using SentenceTransformer, followed by dimensionality reduction using UMAP and clustering using HDBSCAN, preparing the data for final topic modeling.

4. Results and Discussion

4.1. Word Frequency Analysis

The word frequency analysis of key terms appearing in the English abstracts revealed that the word "social" appeared most frequently (2,467 times), followed by "care" (1,785 times), "health" (1,171 times), "service" (1,102 times), and "satisfaction" (960 times).

The top 20 words included terms related to welfare services such as "social," "care," "service," and "support," as well as terms related to quality of life, such as "health," "satisfaction," and "quality." Other high-frequency words included "facilities," "housing," "community," and socio-economic factors like "family," "job," and "economic."

The word cloud visualization of these results (Figure 3)

intuitively demonstrates the relative importance of each term. Notably, key terms such as "social," "care," "health," "service," and "satisfaction" are prominently displayed, indicating their central role in elderly welfare research. Additionally, terms like "family," "support," "community," "facilities," "policy," and "program" suggest that research on elderly welfare has balanced individual care with institutional support.

4.2. Topic Modeling

The 28 initial topics were consolidated into eight main topics using BERTopic and hierarchical clustering. The dendrogram in Figure 4 illustrates the integration process based on topic similarity, with eight final topics identified at a distance threshold of 0.75. Table 1 shows the top 5 keywords for each topic, while Table 2 (Appendix 1) presents the top 20 keywords and their frequencies for each topic.



Figure 3: Word cloud showing top extracted keywords

The topics were named as follows based on their characteristics:

Table 1: Top 5 keywords for 8 topics

No.	Topic	Keywords
0	Social Care	social, care, satisfaction, job, health, etc.
1	Welfare Systems	care, social, service, policy, local, etc.
2	Facilities/Housing	facilities, housing, facility, care, social, etc.
3	Mental Health	suicidal, abuse, suicide, death, social, etc.
4	Sexual/Marital Relationships	sexual, satisfaction, sex, marital, etc.
5	Nutrition/Health Management	food, health, oral, management, facility, etc.
6	Health Promotion Activities	exercise, music, therapy, control, program, etc.

7	Culture/Values	paradigm, confucian, filial, filial, book, etc.
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The Intertopic Distance Map in Figure 5 visualizes the semantic distances and relative importance of the topics. The size of each circle represents the number of documents included in the topic, while the distance between topics indicates semantic similarity. "Social Care" (Topic 0) and "Welfare Systems" (Topic 1) were the most prominent topics, located close to each other, suggesting that they form the core of elderly welfare research. In contrast, "Culture/Values" (Topic 7) had a smaller share and was more distant from other topics, indicating a relatively independent area of research.

4.3. Trends in Topic-Specific Research

To analyze temporal changes in elderly welfare research, the number and proportion of papers per topic from 1995 to 2024 were examined (Figures 6, 7, 8). Linear regression analysis was conducted to identify hot topics (those showing an increasing trend) and cold topics (those showing a decreasing trend).

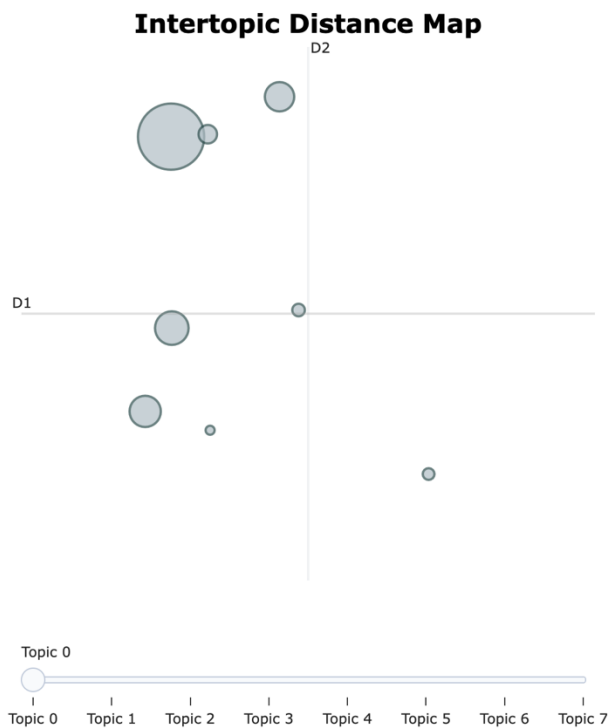


Figure 5: Intertopic distance map

"Social Care" (Topic 0) consistently received the most attention, with a sharp increase around 2010. Most topics experienced increased research activity after 2005, although a general decline was observed after 2020.

Hot topics (Figure 7) included "Social Care" (Topic 0), "Mental Health" (Topic 3), and "Welfare Systems" (Topic 1). Research on "Social Care" has shown a steady rise since 2005, accounting for 50-70% of all research in the field. "Mental Health" research has also increased since the early 2000s, maintaining a level of 10-20%, while research on "Welfare Systems" followed a similar trend.

Cold topics (Figure 8) included "Culture/Values" (Topic 7), "Nutrition/Health Management" (Topic 5), and "Facilities/Housing" (Topic 2). Research on "Culture/Values" has steadily declined since the early 2000s and is now almost nonexistent. "Nutrition/Health Management" and "Facilities/Housing" have also seen relatively decreased attention.

These changes suggest a shift in elderly welfare research from traditional facility- and health management-centered approaches to more holistic approaches encompassing social relationships, mental health, and institutional support. The growing focus on mental health indicates an expansion of interest in elderly well-being beyond physical health to include psychosocial well-being.

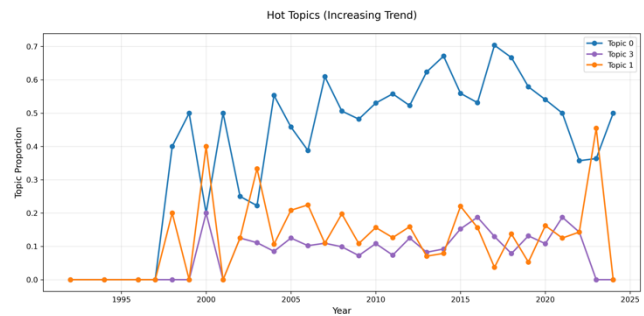


Figure 7: Hot topics (increasing trend)

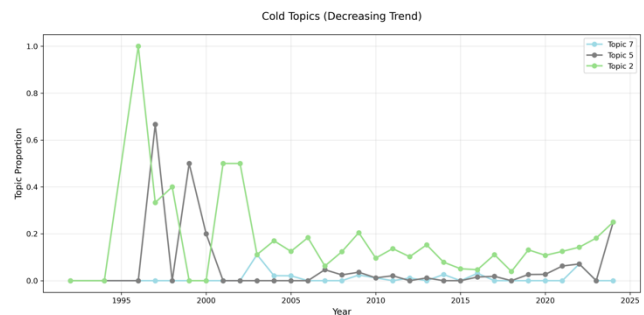


Figure 8: Cold topics (decreasing trend)

5. Conclusions

This study analyzed research trends in elderly welfare in South Korea from 1979 to 2024 using BERTopic. The main conclusions and implications are as follows:

First, research on elderly welfare has covered a wide

range of topics, including "Social Care," "Welfare Systems," and "Health Management." The word frequency analysis revealed that terms such as "social," "care," "health," "service," and "satisfaction" were the most frequently mentioned, suggesting that research in elderly welfare has evolved from individual health management to include broader care and social support aspects.

Second, the importance of research topics has changed over time. Topics like "Social Care," "Mental Health," and "Welfare Systems" have shown increasing trends, becoming central to elderly welfare research. On the other hand, topics like "Culture/Values," "Nutrition/Health Management," and "Facilities/Housing" have declined in importance, indicating a shift in focus from physical environment and health management to mental and social welfare.

Third, the use of BERTopic allowed for a more sophisticated and automated analysis of large-scale data, contributing to a more precise understanding of research trends. The main research topics identified through BERTopic provided an objective basis for setting research directions, enhancing the reliability of the analysis.

These results offer several academic and policy implications. Academically, they show that elderly welfare research has progressed from fragmented approaches to more integrated research covering social care and mental health. This suggests that future research should address elderly welfare at multiple levels, emphasizing psychosocial well-being and social participation.

From a policy perspective, the findings confirm that the paradigm of elderly welfare is shifting from a facility-based to a community-based approach, and from a focus on physical health management to integrated care that includes mental and social well-being. This highlights the need for policy initiatives that expand community-based integrated approaches and mental health support. The growing emphasis on "Social Care" and "Mental Health" research also suggests that resource allocation to these areas should be prioritized in future policy development.

However, this study has several limitations. First, due to the limited number of Korean abstracts (588 papers) compared to English abstracts (1,867 papers), we analyzed only English abstracts to maintain consistency in the BERT-based analysis. This might have excluded some nuanced discussions present only in Korean-language research. Second, our focus on domestic academic papers, while providing a detailed view of South Korea's elderly welfare research landscape, does not capture the broader international context of elderly welfare research.

Future research should expand beyond domestic papers to include internationally published studies to provide a broader perspective on elderly welfare research trends. As natural language processing capabilities for Korean language improve, studies incorporating both Korean and

English abstracts could provide a more comprehensive understanding of research trends. Additionally, in-depth analysis of each research topic could contribute to more practical insights for policy formulation and implementation.

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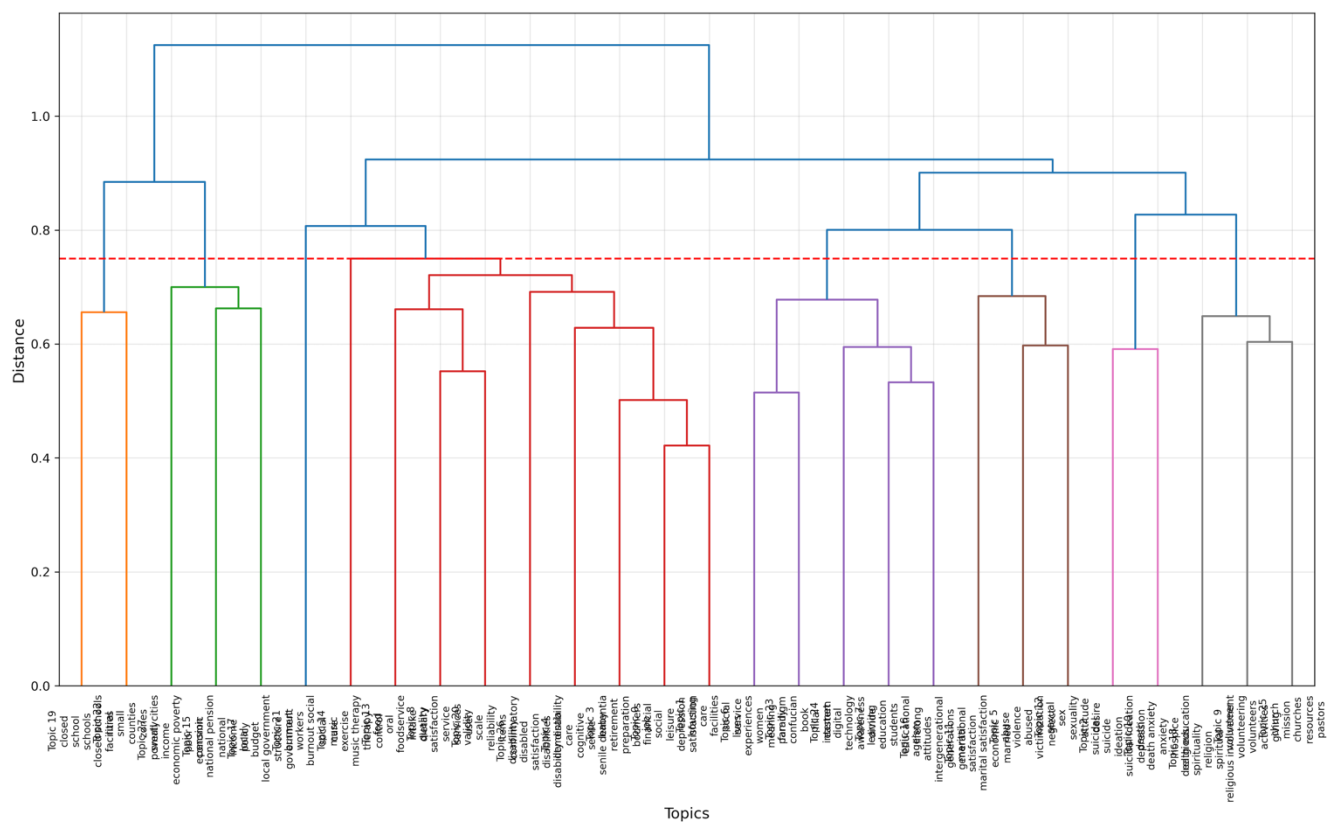
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Appendixes

Appendix 1: (Table 2) Top 20 Keywords Extracted per Topic

Topic 0 Social Care		Topic 1 Welfare Systems		Topic 2 Facilities/Housing		Topic 3 Mental Health	
Word	Frequency	Word	Frequency	Word	Frequency	Word	Frequency
social	948	care	394	facilities	302	suicidal	187
care	547	social	331	housing	292	abuse	179
satisfaction	529	service	205	facility	107	suicide	169
job	467	policy	178	care	85	death	167
health	436	local	143	social	75	social	133
family	332	pension	120	community	70	ideation	123
depression	303	government	113	rural	66	family	112
support	299	insurance	104	public	60	depression	104
service	262	services	103	residential	53	support	60
quality	253	support	85	residents	48	anxiety	56
leisure	250	home	82	service	46	risk	45
stress	215	income	79	local	44	health	45
activities	204	national	76	policy	40	education	41
education	204	financial	69	population	40	care	36
program	177	public	69	location	38	stress	34
workers	174	budget	68	supply	37	violence	33
dementia	167	management	63	services	35	mental	32
participation	167	poverty	63	design	35	service	30
activity	167	security	59	health	34	economic	30
economic	158	community	59	private	33	programs	28
Topic 4 Sexual/Marital Relationships		Topic 5 Nutrition/Health Management		Topic 6 Health Promotion Activities		Topic 7 Culture/Values	
Word	Frequency	Word	Frequency	Word	Frequency	Word	Frequency
sexual	128	food	55	exercise	32	paradigm	16
satisfaction	92	health	36	music	30	social	13
sex	87	oral	35	therapy	28	confucian	9
marital	64	management	28	control	23	filial	8
attitude	41	facilities	28	program	23	book	8
social	33	facility	26	body	15	society	7
women	31	foodservice	24	experimental	14	justice	7
sexuality	29	intake	23	weeks	13	family	6
health	27	care	21	quality	12	sees	6
economic	26	dietary	18	foot	11	multicultural	6
men	23	service	16	patients	11	eastern	6
desire	23	education	16	stroke	11	hyoje	6
education	22	nutrition	16	depression	10	piety	5
married	20	nutrient	13	improved	9	ethics	5
coping	18	hygiene	13	blood	8	caregiving	5
couple	15	items	11	pitch	8	ideology	5
marriage	14	female	11	performed	7	policies	5
programs	13	safety	11	test	7	western	5
spouse	13	support	10	play	7	mokminsimseo	5
behavior	13	charged	10	experiment	7	respect	4

Appendix 2: (Figure 4) Hierarchical Clustering for Topic Selection



Appendix 3: (Figure 6) Topic Trends Over Time

Topic Trends Over Time (Absolute Count)

