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The Spatial Distribution of Elderly Welfare Service in South Korea*

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Abstract

Purpose: This study aims to not only measure the elderly welfare supply index but investigate spatial patterns and determinants of local elderly welfare services in South Korea. **Research design, data, and methodology:** The index for local elderly welfare services is measured by employing standardized scores for critical variables related to elderly welfare. The present study utilized the GIS technique and Moran's *I* index to examine spatial patterns of elderly welfare services. The determinants of local elderly welfare service are analyzed by a series of regression models using R. **Results:** Spatial imbalance and asymmetric distribution were serious in the supply of elderly welfare service. It was also confirmed that the factors affecting the level of welfare services for the elderly vary depending on the type of service. In particular, the higher the proportion of the elderly population and the social welfare budget, the lower the level of welfare services for the elderly. **Conclusions:** Given the circumstance of spatial mismatch between supply and demand for elderly welfare services, it is necessary to consider and provide policy tactics about how the economic benefits and welfare budgets generated in the region can contribute to strengthening the welfare service system for the elderly.

Keywords : Elderly Welfare Service, Spatial Distribution, GIS, Welfare Budget

JEL Classification Code: I31, I38, J18

1. Introduction^a

Over the past decades, South Korea has experienced a rapid asymmetry of population composition due to low birth rates and an aging population. Since this urgent demographic shift is the most important policy issue facing the Republic of Korea, preemptive and active policy responses are needed. If this imbalance in the demographic structure continues to worsen, the size of the economically active population will decrease and it will inevitably have great difficulty in supporting the large elderly population.

The proportion of the elderly population increased significantly from only 2.9% in 1960 to 15.7% in 2020 and is expected to reach 37% in 2050. In general, the elderly

population ratio is higher in advanced countries, and the elderly population ratio in most OECD countries is higher. Currently, the elderly population ratio in Korea is not the 29th highest among 37 OECD countries, but the average annual growth rate of the elderly population over the past decade has reached 4.4%, significantly higher than the OECD average of 2.6%. Eventually, if this trend continues, by 2041, one in three populations is expected to become the oldest OECD country to become an elderly person (Korea Economic Research Institute, 2021).

While the income level of the people has stagnated due to the recent deterioration of the economic situation, the demand for welfare is increasing significantly. In particular, an increase in the proportion of the elderly population entails

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the cost of welfare services such as medical care and residential for the elderly.

In the past, the Republic of Korea had a Confucian tradition in which children were responsible for supporting the elderly. However, due to the decrease in the number of family members, most people agree with the social consensus that this traditional system is no longer working and that government intervention is needed to support the elderly (Jung, 2017). After all, it is inevitable that the government's budget to strengthen welfare services for the elderly will increase (Sung & Ahn, 2006; Kim, 2019). However, it is difficult for the central government's uniform policy to have a great effect on improving welfare services for the elderly. Regional welfare services are easy to reflect the policy needs of the beneficiary class and can lead to immediate policy execution much smoother. In particular, the Republic of Korea has made various efforts to further strengthen decentralization, and this trend is expected to continue in the future. Therefore, it is very important to understand how smoothly local welfare services for the elderly are being provided.

Meanwhile, there is a problem that the level of welfare services for the elderly group is spatially unbalanced. Accordingly, differences in physical and mental health levels of the elderly are observed according to their residential area. (Seo, Suh, & Kim, 2020).

Basically, the policy response to a specific population and the accompanying provision of public services have a spatial context. In a situation where various community-based welfare policies are emphasized, the level of welfare facilities and related services for the elderly is likely to differ depending on the region. In particular, since it is common for local governments' financial level to have a great influence on the level of local welfare services, the imbalance in welfare services for the elderly between urban and rural areas is intensifying. The problem that many of the welfare facilities for the elderly in Korea are concentrated in urban areas rather than in rural areas has been steadily pointed out. In the end, if there is a regional gap in welfare services for the elderly, it is necessary to empirically accurately grasp this phenomenon.

Despite such differences in the size of the elderly population and between regions in welfare services for the elderly, academic efforts to elaborately grasp the relationship between these demographic characteristics and policy services in a spatial context were insufficient. In particular, few indicators have been developed to measure the level of welfare services for the elderly at the regional level. Accordingly, it is not easy to develop specific and applicable policy alternatives. Measuring the capabilities and levels of welfare services for the elderly based on the microscopic spatial unit of the city and grasping the spatial context, it is possible to provide desirable and efficient

services and help select target areas that require preemptive policy responses.

The purpose of this study is as follows. First, the regional level of elderly welfare service supply index is measured using data related to the number of facilities and workers by four types of facilities related to elderly welfare in the region. Second, the measurement results of the elderly welfare service index at the Si-Gun-Gu level are visualized through a map to confirm spatial trends. In addition, the spatial dependency on welfare services for the elderly is revealed through the Moran's *I* Index. Third, several critical factors affecting welfare services for the elderly at the local level are analyzed using a regression analysis model.

2. Theoretical Background and Prior Literature

2.1. The concept of supply and demand of social welfare services

To measure the demand and supply of social welfare services, a conceptual understanding of the demand and supply of social welfare services must precede. This is because the concept of supply and demand of social welfare services is very different from the concept discussed in economics (Bae & Lee, 2013).

First, looking at the concept of demand, demand in economics means a desire to buy goods at a certain cost by an individual's judgment, but demand in social welfare may not be related to individual needs, may not be based on individual judgment, and the cost may not be directly borne by the beneficiary (Jeong, Kang, Kim, & Lee, 2015). In other words, in the field of social welfare, it is argued that demand is a more collective dimension, including both individual and social needs, unlike economic demands explained at the individual level. In this way, the social welfare sector calls for attention to individual demands such as care issues, gender issues, and incomplete employment issues, as well as also calls for social demands arising from targets that require special protection or care. However, unlike theoretical discussions, the current social welfare sector still understands the demand for social welfare services only as social and collective. Therefore, the frontline of social welfare services still limits the concept of demand to social conditions that can justify differential service allocation to residents, and social conditions that can justify differential service allocation are identified as the size of the target group (Seo, 2008; Jeong et al., 2015). Above the reasons, most of the studies measuring the demand for social welfare services mainly use the size of the weak such as social fund recipients, the elderly, the disabled, children, and adolescents (Kim & Kim, 2004; Park, 2006; Seo, 2008; Ha & Shin, 2014).

The concept of the supply of social welfare services is also different from the economic concept. The economic concept of supply can be defined as goods to be sold at a certain price (Park, 2014). Conversely, the concept of supply in the social welfare sector is not to sell goods at a certain price, but to deliver them to those who need them free of charge or at a low cost. Thus, the supply of social welfare services is a social supply to meet the basic needs that appear as a collective and social demand, and there is a lot of gaps from the economic concept (Jeong et al., 2015). Then, who and how do we supply social welfare services? The supply of social welfare services has traditionally played a leading role by the central government. However, with the marketization trend, the central government's unilateral supply began to be considered inefficient, and recently, so-called "privatization alternatives" have emerged that use private resources such as individuals, families, and religious facilities, corporate welfare, and personal insurance (Kim & Kim, 2004). However, privatization of welfare not only violates the basic approach to welfare to solve individual risks socially but also poses the risk of overlooking public responsibility to the people (Jeong et al., 2015).

To examine the institutional capabilities of welfare services, the key is to consider social and collective demand and government-centered institutional supply. Based on the above, the demand for welfare services for the elderly can be defined as "the size of the elderly population who wants to improve the quality of life for the government" and supply of welfare services for the elderly can be defined as "the government's activities that provide resources and services necessary for the elderly to improve their quality of life".

2.2. Demand and supply of welfare services for the elderly

The elderly welfare service is a social service aimed at helping the elderly lead a healthy and stable retirement life with their families and relatives by providing various services necessary for elderly and elderly families who are unable to perform independent daily life due to mental and physical reasons." (Ministry of Health and Welfare, 2017).

The demand for elderly welfare services varies depending on political, socio-cultural, and demographic changes surrounding the elderly, making it difficult to objectify the demand for elderly welfare at the regional level. Therefore, the size of the elderly population who can be used most basic and commonly is widely used as a proxy variable to measure the demand for welfare for the elderly (Choi, 2019). According to this, it can be seen that the demand for welfare services for the elderly in Korea is rapidly increasing. In fact, the Republic of Korea has not escaped from the bottom of the fertility rate among OECD countries.

In addition, many diseases that were thought to be incurable years ago have become treatable due to the development of medical technology (Jung, 2018). For this reason, the aging index of Korea has nearly doubled compared to 2010. Korea is the fastest aging country in the world, so the demand for welfare services for the elderly is bound to increase rapidly.

Meanwhile, most of the welfare services for the elderly are provided in the form of non-monetary services such as counseling, rehabilitation, care, information provision, welfare facilities use, competency development, and social participation support (However, social insurance and public assistance are monetary forms of services). Welfare services for the elderly can be largely divided into two types: institutional welfare services and social welfare services for the elderly, depending on how the contents of the service are delivered. First, institutional welfare services for the elderly are welfare services that support economic independence or economic stability that is directly needed in the real life of the elderly. Institutional welfare services for the elderly include services such as the creation and operation of basic old-age pensions and welfare funds, job programs for the elderly, as well as, in a broad sense, prevention of elder abuse and Promotion of the idea of respect for the elderly. Next, the social elderly welfare service is a welfare service that provides happiness to the elderly by supporting basic food, clothing, shelter, and leisure through welfare facilities. Article 31 of the Welfare of the Elderly Act in Korea stipulates welfare facilities for the elderly as "residential welfare service facilities," "medical welfare service facilities," "leisure welfare service facilities," "comprehensive welfare service facilities," "protection institutions" and "job support institutions". As such, most of the welfare services for the elderly are supplied through welfare facilities for the elderly. Therefore, it is important to check quantitative aspects such as the number of welfare facilities, programs of facilities, manpower, and budget for the elderly to objectively grasp the level of welfare services for the elderly. Table 1 below is a summary of the supply institutions of welfare services for the elderly by type.

Table 1: Welfare Service Providers for the Elderly

Type	Facilities and institutions
Residential Welfare Service	Nursing Home for the Elderly
	Community Home for the Elderly
	Welfare Housing for the Elderly
Medical Welfare Service	Treatment Facilities for the Elderly
	Treatment Community Home for the Elderly
Leisure Welfare Service	Senior Citizen Center
	Senior Welfare Center
	Senior Class

Comprehensive Welfare Service	Facilities that Provide Visiting Care Services
	Facilities that Provide Day and Night Protection Services
	Facilities that Provides Bath Services
	Facilities that Provides Comprehensive Welfare Service
Protection Institutions	Institutions that Specializes in Protecting the Elderly
Job Support Institutions	Institutions that Supports Jobs for the Elderly

Source: Article 31 of the Welfare of the Elderly Act in Korea

2.3. Factors influencing the supply of social welfare services

The Korean government and academia's interest in the level of local social welfare services continue to increase. In particular, studies comparing the level of social welfare services between regions are drawing attention, and the reasons are as follows. First, this is because the local autonomy system implemented in 1995 has been firmly established. In particular, in the field of social welfare services, the role of local governments has become more important because nearly half of the existing central government welfare programs have been transferred to the local government (Park, 2006). Therefore, the importance of examining how reasonably each local government fulfills its responsibilities and how much resources are needed for such responsibilities is increasing day by day (Jeong et al., 2015). Another reason for the growing interest in the level of local social welfare services is the continuous increase in welfare demand due to new social risks (Yoon, 2013). In particular, the desire for various welfare services continues to increase at the local level and also at the national level due to low birth rates, aging society, expansion of poverty and income polarization, expansion of women's social participation, and dissolution of families (Kim, Park, Yi, & Cho, 2009). For the above reasons, the issue of 'efficiency of welfare service supply at the local level' is bound to become important (Ko,

Lim, & Hwang, 2010).

Research on the distribution or competency of social services by the region has been conducted for a long time, especially in the United States. In the United States, since a large portion of front-line social services are supplied through nonprofit organizations, many studies have been conducted to analyze the regional distribution and capabilities of nonprofit organizations and to confirm how they relate to regional demographic variables. Introducing a major study in this regard, Wolch (1980) measured the relationship between potential social service users and the number of social service institutions in Philadelphia. Continuously, there is a study conducted by Bielefeld and his colleagues (Bielefeld, Murdoch, & Walldell, 1997), which identified the causal relationship between the demographic characteristics based on the Dallas Census Block Group and the number of non-profit social service institutions, and Peck (2008) who explored the relationship with the supply (number of institutions) of non-profit organizations providing local social services. These previous studies in the United States confirm that the supply and demand of social services in the region have a statistically significant positive relationship. Additionally, some studies have emphasized that this correlation does not reach the level of providing equal services by region.

In the case of Korea, research on the supply and demand of local social services has continued for a considerable period since the late 1990s. Unlike U.S. studies, however, domestic studies remained at a level that simply compared the supply and demand of welfare services at an exploratory level (e.g., Kim, 1994; Lee, Ryu, Kang, Park, Shin, Kim, & Lee, 2002; Hwang, 2008; Bae and Lee, 2013; Kim, Moon, Joo, & Kim, 2014). In other words, it was negligent in explaining the causal relationship between local differences in welfare services. Therefore, this study designs and investigates the causal relationship between the demand and supply of welfare services for the elderly, which was not covered in previous studies. The preceding studies reviewed to obtain the basic ideas for variable selection are shown in Table 2 below.

Table 2: Previous Studies on the Supply and Demand of Social Welfare Services

Region	Researcher	Demand variables	Supply variables
The U.S.A.	Wolch (1980)	age, race, income, occupation, elderly, disabled, female, working poor	human service facilities
	Wolch & Geiger (1983)	income, intergovernmental grants, city age, population density, population change, elderly, minority, welfare recipients, Crime, Infant mortality	philanthropies, member-benefit organizations
	Bielefeld, Murdoch & Waddell (1997)	income, age, minority, race	social services, health services, education services
	Corbin (1999)	church density, congregation density, religious diversity, race, income, poverty, moralistic culture, traditionalistic culture	nonprofit social services

	Joassart-Marcelli & Wolch (2003)	income, Unemployment, education, property, population growth, race, incorporation date, suburb, charter, housing units rental, government generosity	nonprofit organizations, nonprofit expenditures
	Peck (2008)	poverty, unemployment, race	nonprofit organizations, nonprofit expenditures
Korea	Kim (1994)	elderly	welfare budget, welfare manpower
	Lee et al. (2002)	unemployment, poverty, elderly, child	social welfare expenditure, social welfare centers
	Hwang (2005)	elderly, poverty	social development budget, social welfare centers, social welfare center workers
	Kang & Yoon (2008)	elderly	social welfare center workers, elderly welfare budget
	Bae & Lee (2013)	population, life expectancy, fertility, single household, suicide, poverty, financial independence	social welfare budget, public officials, social welfare facilities
	Kim (2013)	elderly	elderly welfare center, elderly welfare center workers
	Kim et al. (2014)	elderly, elderly poverty	elderly welfare center, elderly welfare center workers, elderly welfare budget

3. Methodology

3.1. Measuring local elderly welfare service index

The data used in this study to measure the level of supply of welfare services for the elderly are the "2020 Welfare Status for the Elderly" data provided by the Ministry of Health and Welfare of Korea. This data is largely divided into residential, medical, leisure, and home care services to identify the current status of facilities and its name is specified in Article 31 of the Welfare of the Aged Act. This data shows the number of facilities and the size of facility workers by type of welfare facility for the elderly as an analysis unit in 251 cities, counties, and districts nationwide. In order to examine the level of supply of elderly welfare services by region, the number of elderly welfare facilities per 1,000 elderly population and the number of elderly welfare workers per 1,000 elderly population were measured. These two indicators tell us how much the level of service supply varies locally depending on the type of welfare for the elderly. In this study, the service supply index for each of the four types is derived using both types, and furthermore, the local elderly welfare service supply index considering all four types of service levels is measured.

The steps for designing measures are as follows. First, the values of the number of facilities and the number of workers in the relevant city, county, and district observations were converted into standardized scores by using the average and standard deviation of the number of facilities and workers for each type of elderly welfare facility.

Subsequently, the average of the standardized score of the number of facilities and the standardized score of the number of workers was calculated to obtain the service supply index for each type of elderly welfare. Finally, the final regional elderly welfare service supply index was measured by summing all four types of service supply indices. The related formula for deriving these indicators is as follows.

$$RI_i = \frac{SRF_i + SRE_i}{2}, SRF_i = \frac{RF_i - RF_m}{RF_s}, SRE_i = \frac{RE_i - RE_m}{RE_s} \quad (1)$$

In Equation (1), RI_i is the residential welfare service index for the elderly, and SRF_i and SRE_i represent the standardized score of the number of residential welfare facilities and the standardized score of the number of employees in residential welfare facilities, respectively. In the subsequent formula to calculate this standardized score for the number of facilities, RF_i is the number of residential welfare facilities in the i area, RF_m is the mean for the number of residential welfare facilities, RF_s is the standard deviation for the number of residential welfare facilities. In the final formula to calculate the standardized score for the number of employees, RE_i is the number of residential welfare employees in the i area, RE_m is the mean for the number of residential welfare employees, RE_s is the standard deviation for the number of residential welfare employees.

$$MI_i = \frac{SMF_i + SME_i}{2}, SMF_i = \frac{MF_i - MF_m}{MF_s}, SME_i = \frac{ME_i - ME_m}{ME_s} \quad (2)$$

In Equation (2), MI_i is the medical welfare service index for the elderly, and SMF_i and SME_i represent the standardized score of the number of medical welfare facilities and the standardized score of the number of employees in medical welfare facilities, respectively. In the subsequent formula to calculate this standardized score for the number of facilities, MF_i is the number of medical welfare facilities in the i area, MF_m is the mean for the number of medical welfare facilities, MF_s is the standard deviation for the number of medical welfare facilities. In the final formula to calculate the standardized score for the number of employees, ME_i is the number of medical welfare employees in the i area, ME_m is the mean for the number of medical welfare employees, ME_s is the standard deviation for the number of medical welfare employees.

$$LI_i = \frac{SLF_i + SLE_i}{2}, SLF_i = \frac{LF_i - LF_m}{LF_s}, SLE_i = \frac{LE_i - LE_m}{LE_s} \quad (3)$$

In Equation (3), LI_i is the leisure welfare service index for the elderly, and SLF_i and SLE_i represent the standardized score of the number of leisure welfare facilities and the standardized score of the number of employees in leisure welfare facilities, respectively. In the subsequent formula to calculate this standardized score for the number of facilities, LF_i is the number of leisure welfare facilities in the i area, LF_m is the mean for the number of leisure welfare facilities, LF_s is the standard deviation for the number of leisure welfare facilities. In the final formula to calculate the standardized score for the number of employees, LE_i is the number of leisure welfare employees in the i area, LE_m is the mean for the number of leisure welfare employees, LE_s is the standard deviation for the number of leisure welfare employees.

$$EWI_i = RI_i + MI_i + LI_i \quad (4)$$

In the final Equation (4), EWI_i is the local elderly welfare service index as a composite measure that considers all three kinds of elderly welfare services and is calculated as the sum of the three indices.

3.2. Analyzing Spatial Distribution for Elderly Welfare Service

An analysis strategy for analyzing the spatial pattern of the supply of local elderly welfare services is possible through the use of the Geographic Information System (GIS). The most basic approach to confirm the spatial context of a specific variable is to visually show the variation of values across regions. The four welfare service

indices for the elderly will be analyzed through mapping by dividing the entire Si-Gun-Gu observations into four quartile grades. Quartile maps of these four indices were created through ArcGIS (version 9.3), the most common geographic information system software in the world.

Both demographic characteristics and the level of policy services for a specific target group are likely to have similar patterns locally. In other words, the level of welfare services for the elderly in a certain area is likely to have a deep connection with geographically adjacent neighboring regions. Therefore, it would be necessary to measure the level of spatial dependency of various welfare services for the elderly. This study employs Moran's I index which precisely captures spatial dependency. This particular spatial measurement has been widely used not only in geographical statistics but also in various social science fields (Anselin & Griffith, 1988).

Basically, the Moran's I coefficient is an indicator of how clustered regions with similar values for a specific variable have spatial autocorrelation. The Moran's I coefficient has a value of -1 to 1, and the closer it is to 1, the more positive spatial autocorrelation is, showing a pattern in which adjacent spatial units have similar values throughout the entire research area. On the other hand, if the coefficient's value is close to -1, it is interpreted that values in adjacent spatial units for a specific variable show negative spatial autocorrelation with different patterns. Since this Moran's I coefficient is measured for the entire study area, it is called the global Moran's I and can be expressed by Equation (5) below.

$$I = \frac{N}{\sum \sum w_{ij}} \frac{\sum \sum w_{ij} (X_i - \bar{X})(X_j - \bar{X})}{\sum (X_i - \bar{X})^2} \quad (5)$$

In this equation, N is the number of spatial units indexed by i and j , X is the variable, $\bar{X}$ is the mean of X , and w_{ij} is the factor of the spatial weight matrix. The spatial weight matrix, w_{ij} has a value of 1 if the spatial units i and j are adjacent to each other, otherwise 0. In order to create a spatial weight matrix, this study used the Rook method, a representative method of the proximity scale considering only neighbors facing the boundary polygon. This method takes into account the fact that the level of welfare services for the elderly is affected by the service level of adjacent Si-Gun-Gu areas.

3.3. Model Specification

The unit of analysis is the county-level administrative jurisdiction of South Korea, which is Si-Gun-Gu. As mentioned in the previous chapter, the level of elderly welfare service is likely to be varied by region and locality. This study assumes that a certain level of elderly welfare

service in the Si-Gun-Gu geographic unit is expected based on demographic characteristics, urbanity, health-related components, financial and economic circumstances. In addition, if a series of elements have effects on the elderly welfare service, these effects could vary by the specific type of welfare service. Thus, it is necessary to distinguish the type of welfare service in our analytic models. The regression models for Si-Gun-Gu level elderly welfare service can be set up as follows:

$$\begin{aligned} RI_i &= \alpha_1 + \alpha_2 O_i + \alpha_3 P_i + \alpha_4 R_i + \alpha_5 S_i + \alpha_6 H_i + \alpha_7 L_i + \alpha_8 B_i \\ &+ \alpha_9 F_i + \alpha_{10} W_i + u_i \end{aligned} \quad (6)$$

$$\begin{aligned} MI_i &= \beta_1 + \beta_2 O_i + \beta_3 P_i + \beta_4 R_i + \beta_5 S_i + \beta_6 H_i + \beta_7 L_i + \beta_8 B_i \\ &+ \beta_9 F_i + \beta_{10} W_i + v_i \end{aligned} \quad (7)$$

$$\begin{aligned} LI_i &= \gamma_1 + \gamma_2 O_i + \gamma_3 P_i + \gamma_4 R_i + \gamma_5 S_i + \gamma_6 H_i + \gamma_7 L_i + \gamma_8 B_i + \gamma_9 F_i \\ &+ \gamma_{10} W_i + \epsilon_i \end{aligned} \quad (8)$$

$$\begin{aligned} EWI_i &= \delta_1 + \delta_2 O_i + \delta_3 P_i + \delta_4 R_i + \delta_5 S_i + \delta_6 H_i + \delta_7 L_i + \delta_8 B_i + \delta_9 F_i \\ &+ \delta_{10} W_i + \eta_i \end{aligned} \quad (9)$$

The dependent variables, RI_i , MI_i , LI_i , and EWI_i , represent residential service, medical service, leisure service, and comprehensive welfare service for elderly people in area i respectively. O_i is the elderly population ratio, P_i is the poverty rate, R_i is a dummy variable indicating whether the area is rural or not, S_i is the percentage of people with high mental stress, H_i is the percentage of people feeling healthy, L_i is healthy living practice rate, B_i is the number of businesses per 1,000 people, F_i is the financial independence ratio of local government, and W_i is the percentage of the social welfare budget. These 4 models' error terms are u_i , v_i , ϵ_i , and η_i .

This study aims to analyze the factors affecting the supply of welfare services for the elderly at the local level. To this end, a series of important characteristics that are highly related to the supply of local welfare services for the elderly, which various previous studies have paid attention to, were included in the regression analysis model. First of all, the model considered the elderly population ratio and poverty rate as demographic factors, and a dummy variable indicating whether the area is rural or not was added to control regional characteristics. Subsequently, health factors included stress perception rate, healthy life perception rate, and healthy life practice rate. Lastly, the number of

businesses, financial independence, and the proportion of welfare budgets were considered as financial and economic factors. The figure below shows the details of these models.

4. Findings

In order to explore a spatial pattern of local elderly welfare services, the present study utilizes the GIS mapping technique and visualizes spatial distributions for three types of elderly welfare services as well as comprehensive service levels. Figure 1 displays the spatial aspect of both residential welfare service and medical welfare service across the country by providing quartile maps.

The map showing the spatial pattern of residential welfare services on the left shows that cities and counties with high levels of residential welfare services are relatively evenly distributed throughout the country. However, areal units with high service levels tend to cluster throughout Gyeonggi-do and in Gangwon-do and Chungcheongbuk-do adjacent to Gyeonggi-do. On the contrary, areal units with low levels of residential welfare services were intensively distributed in the eastern part of Gangwon-do and Gyeongsangbuk-do, the western part of Chungcheongnam-do, and the inland of the border between Jeollanam-do and Gyeongsangnam-do. In the case of medical welfare services on the right, the polarization of spatial distribution was clearly revealed. Areal units with high service levels are concentrated in the entire Gyeonggi-do and some areas of Gangwon-do and Chungcheong-do, which are geographically adjacent to the Seoul metropolitan region. On the other hand, low medical welfare services were identified in Seoul and some metropolitan urban areas, and Gyeongsang-do also showed relatively low levels of medical welfare services compared to other local regions.

The following Figure2 shows the spatial distribution of leisure welfare services for the elderly and comprehensive welfare services for the elderly. Looking at the spatial distribution of leisure welfare services on the left, there appears to be a very clear regional disparity. Most areal units with high levels of leisure welfare services are highly concentrated in Jeolla-do. In contrast, Seoul metropolitan area and some other metropolitan regions including Busan seem to suffer from low leisure welfare services. Looking at the map on the right, which shows the level of comprehensive welfare services considering all three sub-elements of welfare services for the elderly, it is revealed that there is clear spatial dependence across the nation. The high level of welfare services for the elderly was remarkable in Gyeonggi-do and was confirmed in Chungcheong-do, Gangwon-do, which is geographically close to Seoul. In addition, it was also found that the level of welfare services for the elderly is generally high in Jeolla-do. On the other hand, in many metropolitan areas such as Seoul and Busan,

the overall level of welfare services for the elderly was revealed. It was also interesting that the level of elderly welfare services in Gyeongsang-do was lower than that of high elderly welfare services in Jeolla-do.

The maps of the four elderly welfare service indices discussed earlier suggest that there is a high level of spatial dependence. This means that cities, counties, and districts with similar levels of welfare services for the elderly tend to be geographically clustered. In the end, welfare services for the elderly are likely to spatially affect each other. The level of such spatial autocorrelation can be analyzed through the Moran's I index, which is widely used in geographic statistics. This index has a value between -1 and 1, and the

closer it is to 1, the stronger the static spatial autocorrelation, and the closer it is to -1, the stronger the negative autocorrelation. This study measured the Moran's I index for four indicators using GeoDa software. According to the measurement results, the Moran's I value for residential welfare services was low at 0.12, but the Moran's I value for medical welfare services and leisure welfare services was very high at 0.61 and 0.44, respectively. In addition, in the case of the comprehensive residential welfare service index, the Moran's I value was high at 0.49, so there was spatial dependence in the strong positive direction. In addition, all measurements were found to be statistically significant at the 0.01 level.

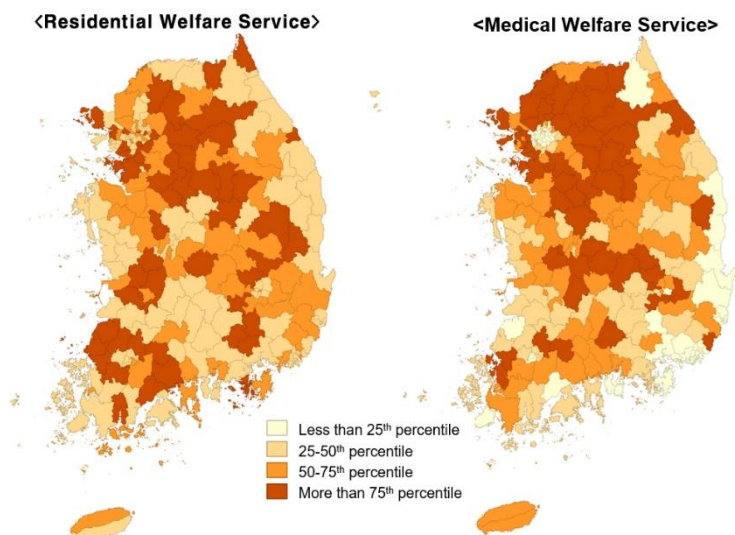


Figure 1: Spatial pattern of residential Welfare Service and Medical Welfare Service

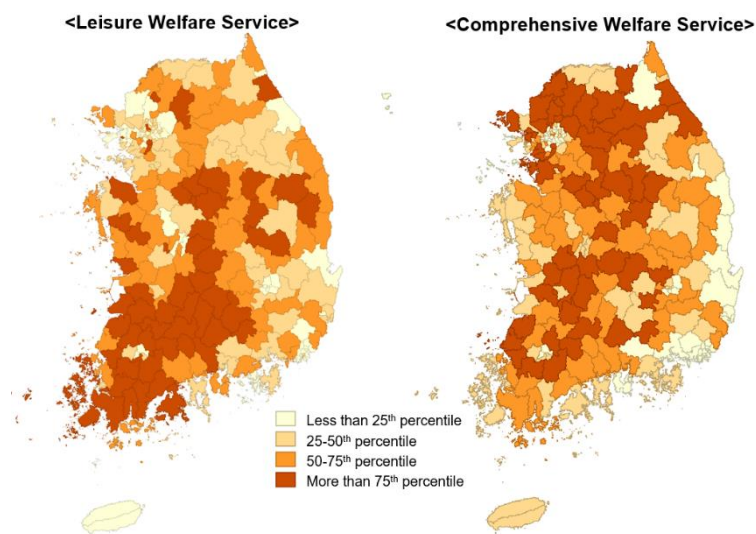


Figure 2: Spatial pattern of Leisure Welfare Service and Comprehensive Welfare Service

Table 3: Descriptive Statistics

Variable	Obs	Mean	SD	Min	Max
Residential Welfare Service	229	0	0.93	-0.69	3.73
Medical Welfare Service	229	0	0.97	-1.54	3.84
Leisure Welfare Service	229	0	0.67	-0.87	3.91
Comprehensive Welfare Service	229	0	1.75	-3.01	5.84
Percentage of Old people	229	22.10	8.45	8.20	41.50
Poverty Rate	229	4.39	1.50	1.21	9.30
Rural area (dummy)	229	0.36	0.48	0	1
Percentage of people with high mental stress	229	24.75	4.38	10.00	36.40
Percentage of people feeling healthy	229	42.80	7.22	29.70	68.30
Healthy living practice rate	229	27.66	8.48	9.70	62.10
Number of businesses per 1,000 people	229	90.20	40.15	49.90	476.60
Financial independence rate	229	25.01	12.71	6.60	68.00
Percentage of social welfare budget	229	34.30	15.29	11.40	66.60

Descriptive statistics for all dependent and independent variables are displayed in Table 3. Since the welfare service indices for the elderly were derived from standardized scores, the average had a value of 0, but there was some deviation between the minimum and maximum values. In particular, the comprehensive elderly welfare service index showed more pronounced variations between observations. Most variables, except for the dummy variable (rural area), also tend to have relatively larger variations from one area to another.

Table 4: OLS Regression Results for residential and Medical Welfare Service Models

Variable	Residential Welfare Service		Medical Welfare Service	
	Coefficient (SE)	β	Coefficient (SE)	β
Old People(%)	-0.032(0.016)**	-0.287	-0.082(0.015)**	-0.711
Poverty Rate(%)	-0.011(0.062)**	-0.018	0.099(0.059)**	0.152
Rural area (dummy)	0.236(0.206)**	0.122	0.240(0.198)**	0.119
High mental stress(%)	0.020(0.016)**	0.095	0.028(0.015)**	0.124
Feeling healthy(%)	0.012(0.009)**	0.092	0.002(0.008)**	0.017
Healthy life practice(%)	0.006(0.008)**	0.052	-0.020(0.008)**	-0.176
Businesses per 1000 People	0.003(0.002)**	0.149	-0.003(0.002)**	-0.132
Financial independence(%)	-0.007(0.007)**	-0.094	-0.011(0.007)**	-0.146
Social welfare budget(%)	-0.022(0.006)**	-0.372	-0.036(0.006)**	-0.561
$adjR^2$	0.0866		0.2353	
F	3.40		8.79	

N	229	229
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Note: ** $p < 0.01$, * $p < 0.05$

Table 4 shows the OLS regression results for the Si-Gun-Gu level residential and medical Welfare Services for the elderly. For residential welfare services, the percentage of old people, the number of businesses, and immigrant segregation are statistically significant. More businesses and a higher percentage of the elderly population in the area are associated with higher residential welfare services for the elderly group. Interestingly, the coefficient of the elderly population is negative which means that a higher ratio of the elderly population leads to reduce residential welfare service. This result seems to be quite controversial because the fact that areas with a high proportion of the elderly population have a low level of residential welfare services suggests the existence of spatial mismatch in terms of regional-based welfare services. In addition, the proportion of social welfare budgets was also found to be statistically significant. Therefore, it was confirmed that the increase in the proportion of the local social welfare budget rather lowered the level of residential welfare services. These results suggest that raising the ratio of the social welfare budget does not lead to an improvement in the level of welfare services for the elderly.

For medical welfare services, the percentage of old people, the percentage of healthy life practices, the number of businesses, and the percentage of social welfare budget are negatively significant. Similar to the results of the residential welfare service model, the high proportion of the elderly population and the high social welfare budget was found to lower the level of medical welfare services, and the increase in the number of businesses also led to a decline in the level of medical welfare services. In addition, the high proportion of healthy life practices was found to lower the level of medical services, and on the contrary, an increase in the poverty rate led to an increase in medical welfare services.

Table 5: OLS Regression Results for Leisure and Comprehensive Welfare Service Models

Variable	Leisure Welfare Service		Comprehensive Welfare Service	
	Coefficient (SE)	β	Coefficient (SE)	β
Old People(%)	0.017(0.010)**	0.219	-0.093(0.026)**	-0.461
Poverty Rate(%)	0.033(0.037)**	0.074	0.121(0.101)**	0.103
Rural area (dummy)	0.197(0.125)**	0.140	0.672(0.338)**	0.185
High mental stress(%)	0.031(0.010)**	0.203	0.079(0.026)**	0.197
Feeling healthy(%)	0.012(0.005)**	0.132	0.026(0.015)**	0.109

Healthy life practice(%)	-0.007(0.005)**	-0.093	-0.022(0.013)**	-0.106
Businesses per 1000 People	-0.001(0.001)**	-0.063	-0.001(0.003)**	-0.019
Financial independence (%)	0.004(0.005)**	0.081	-0.014(0.013)**	-0.099
Social welfare budget(%)	-0.015(0.004)**	-0.348	-0.073(0.010)**	-0.641
<i>adjR</i> ²	0.3656		0.3134	
<i>F</i>	15.60		12.56	
<i>N</i>	229		229	

Note: ** $p < 0.01$, * $p < 0.05$

Table 5 summarizes the results of regression analysis for the leisure welfare service model and the comprehensive welfare service model. Three variables were statistically significant for leisure welfare services, but they showed different aspects from the results of the models discussed above. For leisure welfare services, the percentage of high mental stress, the percentage of people feeling healthy, and the percentage of the social welfare budget are statistically significant. Two health-related variables have positive coefficients, so higher mental stress and a higher percentage of a healthy population in the area are associated with higher leisure welfare services for the elderly group. Therefore, it was found that the high level of stress among residents in the region strengthens leisure welfare services, and at the same time, the more residents feel healthy, the better the level of leisure welfare services. Lastly, the social welfare budget is negatively significant again in this model.

Looking at the determinants of the comprehensive elderly welfare service, which is the last regression model, the ratio of the elderly population, whether they live in rural areas, a high proportion of mental stress, and the proportion of social welfare budgets are statistically significant. Both the proportion of the elderly population and the proportion of the social welfare budget was negatively significant, so the increase in the proportion of the elderly population and social welfare budget lead to a decline in the level of comprehensive welfare services. On the other hand, the rural dummy variable and the proportion of people having high mental stress have negative regression coefficients. Therefore, it was confirmed that the level of comprehensive elderly welfare services in rural areas was lower than in urban areas, and the higher the proportion of the population suffering from high stress, the lower the level of comprehensive elderly welfare services.

5. Conclusions

Many previous studies have not focused on developing

indicators that measure the level of supply of community-based elderly welfare services. This study attempted to develop indicators that previous studies neglected. The spatial balance of the distribution of welfare services for the elderly is a very important factor in realizing a unified and consistent welfare policy nationwide. However, the spatial distribution of welfare facilities in Korea does not lead to balanced regional development as well as equal access to welfare facilities to elderly groups (Cho, Choi, No, Oh, & Kim, 2021). Nevertheless, it is essential to develop highly objective indicators to accurately diagnose these problems. Therefore, the four types of local elderly welfare service indicators presented in this study will be widely used by various researchers in the future.

As a result of measuring the supply level of four types of elderly welfare services for 229 Si-Gun-Gus nationwide, spatial imbalance and asymmetry of service distribution were remarkable. Among the four types, medical, leisure, and comprehensive welfare services had a very high level of spatial dependence. On the other hand, residential welfare services showed relatively weak spatial dependence, confirming an even distribution of services nationwide. In the case of medical welfare services, it was found that very high capabilities exist in the entire Gyeonggi-do outside Seoul and in Gangwon-do and Chungcheong-do adjacent to Gyeonggi-do. In the case of leisure welfare services, the patterns were completely different, indicating that Si-Gun-Gus in Jeolla-do had very high service levels. Finally, in the case of comprehensive welfare services, many cities and counties in Gyeonggi-do, Gangwon-do, and Chungcheongbuk-do, which surround or are located close to Seoul, had high service levels. In addition, the level of welfare for the elderly was high in many Si-Gun-Gus in Jeolla-do. In contrast, Si-Gun-Gus in Gyeongsang-do generally showed very low welfare services for the elderly compared to other regions.

As a result of examining the determinants affecting local elderly welfare services, the results were somewhat different depending on the type of elderly welfare service. However, overall, the proportion of the elderly population and the proportion of the social welfare budget were statistically significant factors in most models. In other words, if the elderly population ratio and the social welfare budget ratio were high, the level of welfare services for the elderly fell. In addition, it was an interesting discovery that the level of leisure welfare services and comprehensive welfare services increased when the proportion of the population suffering from high stress was high. In addition, it was impressive that the higher the number of businesses, the lower the level of housing and medical welfare services.

These series of analysis results suggest the following implications for us. First, welfare services for the elderly

are not provided at a high level in areas where many elderly people live in Korea. This implies that there is a spatial mismatch between the distribution of welfare services and the groups subject to the policy. Second, an increase in the proportion of the social welfare service budget does not increase the actual level of welfare services for the elderly. This explains that the size of the social welfare service budget is not important, but how effectively the government's budget is used to improve welfare services for the elderly. Third, regional economic growth does not necessarily entail an improvement in welfare services for the elderly group. Therefore, it is necessary to consider more about how the economic benefits generated in the region can contribute to strengthening the welfare service system for the elderly. In addition, we must pay attention to that financial independence fails to guarantee a significant contribution to local welfare services for the elderly. Increasingly, it has been confirmed that local governments take responsibility for the welfare of the elderly and spend huge budgets, but it does not involve substantial improvement in welfare levels. Thus, the central government needs more active intervention. Lastly, policymakers need to pay attention to the analysis results that there is no relationship between the poverty rate and welfare services for the elderly. The purpose of welfare services is to protect the socially disadvantaged. However, it is questionable whether the welfare services for the elderly that have been provided so far are effectively delivered to the poor elderly. As a result, a lot of policy efforts should be made to ensure that welfare services for the elderly are more concentrated in areas where there are many poor elderly people.

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