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Socioeconomic, Spatial, and Infrastructural Determinants of Health among Single Older Women: A Descriptive Analysis

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A B S T R A C T

Introduction: Population aging poses major challenges, particularly in developing countries such as Indonesia. In West Java Province, Tasikmalaya Regency has the highest number of single older women, a group vulnerable to health decline due to physical and social isolation. **Objective:** This study aimed to assess the health status of single older women using the Activity of Daily Living (ADL) instrument and to analyze the influence of socioeconomic, spatial, and infrastructural factors on their health. **Method:** A mixed-method approach was employed, involving a quantitative survey using the OARS-ADL instrument and qualitative interviews with 383 respondents selected through cluster sampling across 39 subdistricts. Spatial disparities were analyzed using GIS-based topographic mapping.. **Result:** The findings show that most respondents fall within the "Good" and "Mildly Impaired" health categories, based on ADL scores. Elderly women in lowland areas have better ADL scores compared to those in hilly or mountainous regions due to better accessibility to healthcare facilities. The data also reveal that single elderly women are highly dependent in instrumental ADL activities such as medication management and financial handling, while they show higher independence in basic physical ADL tasks like eating, bathing, and dressing. **Conclusion:** The ADL instrument proves effective in evaluating the health status of elderly individuals and reflects their level of independence. Geographic and infrastructural factors play a critical role in shaping health outcomes, particularly in rural and topographically challenging areas. These results highlight the urgent need for inclusive health policies and long-term care strategies to address accessibility gaps for single elderly women in Indonesia.

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1. INTRODUCTION

Population aging represents a major demographic transition with profound implications for health systems, social structures, and long-term care, particularly in low and middle-income countries (Leung et al., 2021). A country or region is categorized as experiencing aging populations if the percentage of people aged 60 and above reaches more than 10% of the total population (Heryanah, 2015). According to demographic transition theory, declining fertility and mortality rates shift population structures toward older age groups, increasing vulnerability to chronic disease and functional decline (Amandeep Singh et al., 2020).

The issue of aging populations is not simple but rather a complex problem involving demographics, health, and social issues that are of global importance (Rudnickaa et al., 2020). The world's largest elderly population is in Japan, followed by Italy and Finland (WHO 2021). In addition to increasing life expectancy, the phenomenon of aging populations also increases the demand for long-term care.

Aging populations are one of the most significant social transformations of the 21st century, impacting nearly every sector of society, including health, economics, social welfare, infrastructure, and public policy (Caldwell, 2006). The health, social, and economic sectors are the most affected. Economically, an increase in the proportion of older adults can increase pension and healthcare costs. Socially, changes in family and community structures occur due to the decreasing number of productive adults who can support the growing elderly population. From a health perspective, the increasing need for long-term care and complex care often exceeds the capacity of available healthcare services. Overall, an aging society presents a complex challenge that requires attention and action from various stakeholders to ensure that the elderly can live healthy and prosperous lives.

The theory of demographic transition according to (Bongaarts, 2009), suggests that aging populations occur due to changes in conditions from high population growth with high fertility and mortality rates to low population growth with low fertility and mortality rates (Belloni & Cesari, 2019). According to data from (WHO, 2021), in 1950 no country had more than 10% of its population aged 60 years or older. During the period 2015-2050, the number of elderly people is projected to increase from 12% to 22%. By 2050, the number of elderly people is projected to reach 2 billion, with 80% of them residing in low- and middle-income countries such as Indonesia.

Indonesia, as a developing country with medium to low income and the fourth most populous country in the world, has entered a period of aging population due to demographic transition (Andriani et al.,2018). The demographic transition in Indonesia is caused by the demographic dividend that began in 2012 and is predicted to end in 2037(Fajria, 2020). Indonesia, the world's largest archipelagic country, consists of 33 provinces with an uneven distribution of population, causing the demographic transition in Indonesia to not occur uniformly across all provinces, meaning not all provinces will experience an aging population.

West Java Province has the largest population, with 48.27 million people, or more than 17% of Indonesia's total population, and is a province experiencing an aging population (BPS, 2021). A unique demographic phenomenon related to the elderly population exists in West Java Province. Based on data from the Dinas Sosial Provinsi Jawa Barat in 2022, the highest number of single elderly people is in Tasikmalaya Regency with a total of 7,004 people spread across 39 sub-

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districts. The proportion of elderly women (4,255 individuals) is higher than that of elderly men (2,749 individuals). This is due to the tendency for women to choose older partners, making them more likely to become widows due to the death of their spouses (Astina, 2022; Kalache et al., 2005). Additionally, women have a higher life expectancy than men, resulting in a large number of single elderly women over the age of 80 in Tasikmalaya Regency (BPS, 2021). This demographic condition makes Tasikmalaya Regency a relevant setting to examine elderly health from a socioeconomic and spatial perspective.

The health issues of the elderly are becoming increasingly important, given that Indonesia faces a triple burden of disease, namely high rates of infectious diseases, an increase in non-communicable diseases, and the re-emergence of diseases that were previously controllable (Sigalingging et al., 2021). The elderly generally suffer from degenerative diseases, such as hypertension, stroke, and heart disease, which require long-term care and high costs (Mikton et al., 2021). In this case, the accessibility of health facilities is an important factor, especially for the elderly living in remote or rural areas. Transportation restrictions, inadequate infrastructure, and transportation costs are often barriers for the elderly in accessing the health services they need (Natasya Nazla Prasetyo et al., 2023).

Single elderly women were selected as the focus of this study because they face greater vulnerability to social isolation, economic dependency, and functional decline compared to elderly men or elderly individuals living with family members (Enarson & Morrow, 1998; Smith et al., 2020). These conditions place single elderly women at higher risk of reduced independence and poorer health outcomes, particularly in rural and topographically constrained areas.

This regional study is important because there is a complex relationship between spatial, social, infrastructure, and policy strategy characteristics developed in places where older adults live or receive care (Andrews et al., 2007; Burholt, 2006; Norman et al., 2022; Urbaniak et al., 2020; Wong et al., 2020). Gatrell and Elliott (2014) in their book "Geographies of Health: An Introduction" also emphasize the importance of understanding the distribution of diseases and health risk factors in a geographical context to develop effective health interventions.

The elderly with good access to health facilities and easily accessible transportation tend to have a higher degree of health. The elderly with good access to health services are more likely to receive timely and appropriate care, which ultimately improves their quality of life. Good accessibility allows single elderly women to remain active and independent and reduces the health risks associated with aging (Higgs et al., 2017).

Health indicators for the elderly are key to evaluating the health status of the elderly population, particularly single elderly women in Tasikmalaya Regency. One important measurement tool used is the Activity of Daily Living (ADL), which describes the ability of the elderly to perform daily activities independently, including eating, dressing, and walking. A decrease in ADL scores indicates a loss of independence that can have a significant impact on the quality of life of the elderly. Elderly with low ADL generally need easier access to health facilities to meet their more intensive care needs.

This study aims to assess the health status of single elderly women in Tasikmalaya Regency using the Activity of Daily Living (ADL) approach and to examine how socioeconomic, spatial, and infrastructural factors influence their functional independence. The findings are expected to

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contribute to evidence-based nursing practice and elderly health policy, particularly in rural settings.

2. METHODS

Research Design

This study uses a quantitative and qualitative (mixed method) approach. Quantitative approaches were used to collect primary data through questionnaires to obtain ADL scores, descriptive statistical analysis to describe and distribute ADL scores, and geographical map visualization using GIS (*Geographic Information System*) to show the distribution of health degrees. Meanwhile, the qualitative approach involved interviews on the socio-economic factors that influence the level of independence among the elderly, as well as an exploration of subjective experiences related to physical or social barriers in performing daily activities.

This study employed a mixed-methods explanatory design, in which quantitative data were collected and analyzed first to describe the health status of single elderly women, followed by qualitative data to support and contextualize the quantitative findings.

Population and Sample

The study population consisted of 4,255 single elderly women residing in 39 subdistricts of Tasikmalaya Regency, West Java Province. Cluster sampling was applied using subdistricts as sampling units to ensure geographic representation across the study area. Sample size was determined using G-Power analysis with an F-test, assuming a medium effect size, a significance level of $\alpha = 0.05$, and statistical power of 0.90, resulting in a minimum required sample of 323 respondents. To anticipate non-response, the sample size was increased by 10%, resulting in a target sample of 383 respondents.

Instrument

Characteristics of the health status of single elderly women in Tasikmalaya Regency can be obtained by collecting detailed information on the health of these elderly individuals through field surveys and interviews. Functional health status was assessed using the Older Americans Resources and Services (OARS) instrument developed by Fillenbaum and Smyer (1981), consisting of 15 items measuring Activity of Daily Living (ADL). This instrument originally created by (Fillenbaum & Smyer, 1981) to assess the ability of single elderly women to perform more complex tasks necessary to live independently using 6-point rating scale with the total of 15 questions. The OARS instrument has demonstrated acceptable validity and reliability in previous studies, however, in this study, the instrument was used as an assessment tool without conducting independent psychometric testing. ADL scores were interpreted as Very Good (26–30), Good (21–25), and lower scores indicating reduced functional independence.

The table contains 15 indicators of daily activities used to assess the degree of independence of single elderly women in performing various activities in their daily lives. Each indicator has questions/statements addressed to respondents to assess their ability to perform these activities. The assessment results are given in the form of indicator “2” if the elderly are able to perform

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activities without assistance, '1' if they need a little help, and "0" if the elderly are completely unable to perform these activities.

Research Procedure

This research aims to identify the health level of single elderly women in Tasikmalaya Regency. The research was conducted by observing and interviewing single elderly women in the area. The observation aimed to obtain direct information from single elderly women about their daily activities and assess their ability to carry them out.

Furthermore, conducting a survey that focuses on the daily activities of single elderly women in Tasikmalaya Regency. This survey will use the "Instrumental Activities of Daily Living (IADL)" instrument, which contains questions related to the abilities of single elderly women in various aspects of daily life. The instrument includes indicators such as communication skills, ability to shop, prepare meals, manage household chores, wash clothes, walk, manage medication responsibilities, and handle finances.

The data collected from the "Instrumental ADL Activities" survey will then be processed and analyzed to determine the health level of single elderly women in Tasikmalaya Regency. This level will reflect the ability and independence of single elderly women in carries out their daily activities.

The analysis results will be presented in several forms of reports, including maps showing the distribution of health levels in the Tasikmalaya Regency area, graphs to observe comparisons and trends in indices over time, as well as statistical and descriptive analyses that provide a deeper understanding of the research findings.

Table 1. Instrument of Older Americans Resources and Service (OARS) Multidimentional Functional Assesment.

No	Level of Daily Activity	Question/Statement	Indicator
***Instrumental* ADL**			
1	Telephone Use	Are you able to use the telephone independently?	2, 1, 0
2	Mobility	Are you able to travel to distant places on foot?	2, 1, 0
3	Shopping	Are you able to shop for groceries or clothing by yourself?	2, 1, 0
4	Meal Preparation	Are you able to prepare your own meals?	2, 1, 0
5	Housekeeping	Are you able to perform household chores independently?	2, 1, 0
6	Medication Management	Are you able to take your medication without assistance?	2, 1, 0
7	Financial Management	Are you able to manage your own finances?	2, 1, 0
***Physical* ADL**			
8	Eating	Are you able to eat independently?	2, 1, 0
9	Dressing	Are you able to dress and undress yourself without help?	2, 1, 0
10	Personal Grooming	Are you able to maintain your personal appearance (e.g., comb your hair) by yourself?	2, 1, 0
11	Walking	Are you able to walk without assistance?	2, 1, 0
12	Transferring	Are you able to get in and out of bed by yourself?	2, 1, 0
13	Bathing	Are you able to bathe or shower independently?	2, 1, 0
14	Toilet Use	Have you ever experienced difficulty reaching the toilet in time?	2, 1, 0
15	Continence	How often do you experience urinary or fecal incontinence (during the day or night)?	2, 1, 0

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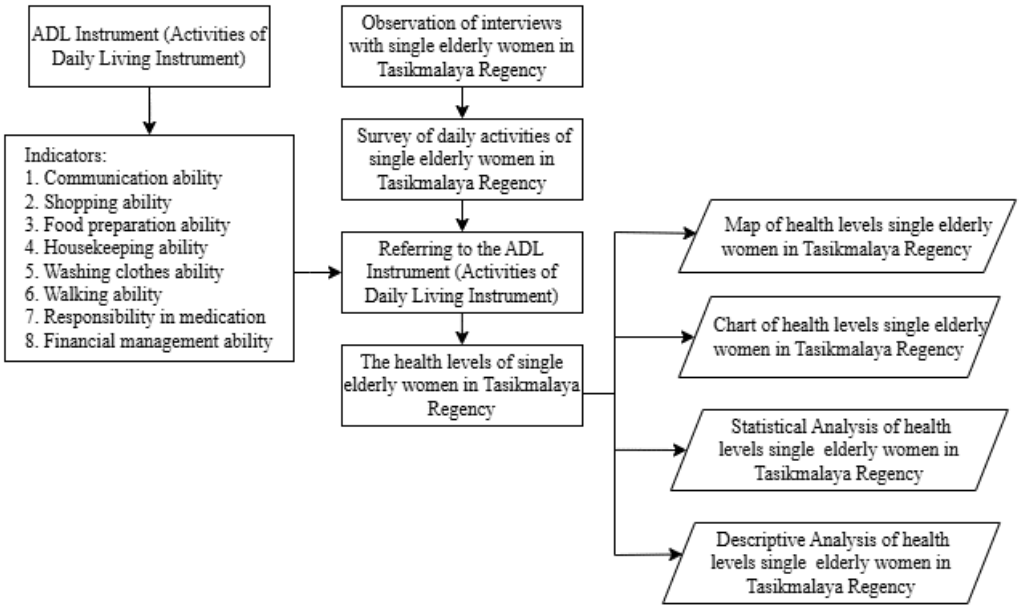

Figure 1. Research Procedure Chart

Table 2. Demographic Characteristics of Single Elderly Women (n:383)

Variables	Mean ± SD /n(%)	Min-Max
Age (years old)	84.09 ± 2.94	**71 – 98**
Type of Elderly		
Middle Elderly (70-79 years old)	1 (0.3)	
Old Elderly (>80 years old)	382 (99.7)	
Types of Topography		
Lowlands	263 (68.7)	
Mountainous	1 (0.3)	
Hills	119 (31.1)	
Air Quality		
Very Good	77 (20.1)	
Good	64 (16.7)	
Moderate	91 (23.8)	
Unhealthy	88 (23)	
Very Unhealthy	63 (16.4)	
Distance to healthcare facility		
Accessible	142 (37.1)	
Moderate	143 (37.3)	
Poor Access	77 (20.1)	
Unreachable	21 (5.5)	

Data Analysis

This study used both primary and secondary data. The primary data involved interviews and surveys, while the secondary data involved various sources, with the aim of determining the health of the elderly that could predict their spatial health status. The health level of single elderly women was measured based on their ability to perform daily activities independently, which reflects their physical and functional well-being. Physical well-being is the overall physical condition of the elderly, measured using a Likert scale questionnaire. Elderly women with higher ADL scores are considered to have a better degree of health.

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3. RESULT

3.1 Characteristics of Respondents

A total of 383 single elderly women were included in this study. Most respondents were aged over 70 years. Based on residential characteristics, the majority of respondents resided in lowland areas of Tasikmalaya Regency. All respondents lived alone without a spouse, reflecting the vulnerable living conditions of the study population (Table 2).

The total of 388 respondents agreed to participate in this study. Based on Table 1, the average age is 84.09 (SD± 2.94), majority is old elderly (99.7%) and live in lowlands. The biggest percentage with the total of 91 (23.8%) elderly live in moderate air quality and have moderate distance to access healthcare facility (37.3). The health level of single elderly women in Tasikmalaya Regency shows two levels of health, namely good and fairly good. The results of this study show several categories that explain the health level of the elderly.

3.2 Distribution of ADL Scores

This study sampled every subdistrict in Tasikmalaya Regency. The number of samples collected per subdistrict varies, ranging from 3-8 single elderly women. Figure 2 shows a scatter plot of the research samples, visualizing the ADL score level on the y-axis and the subdistrict location on the x-axis. In general, the samples obtained in this observation were concentrated in the "Good" and "Mildly Impaired" categories. This shows that the health characteristics of single elderly women in Tasikmalaya Regency are not widely distributed in the "Severely Impaired" category. It also indicates that the health characteristics of single elderly women as viewed from the ADL approach do not show significant differences between one respondent and another.

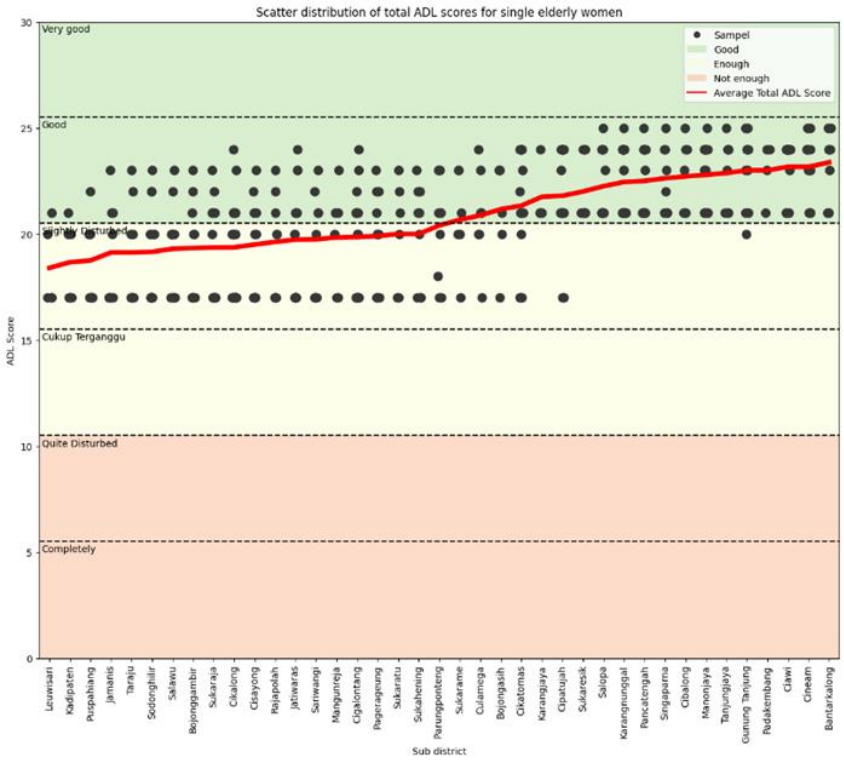

Figure 2. Scatter distribution of total ADL

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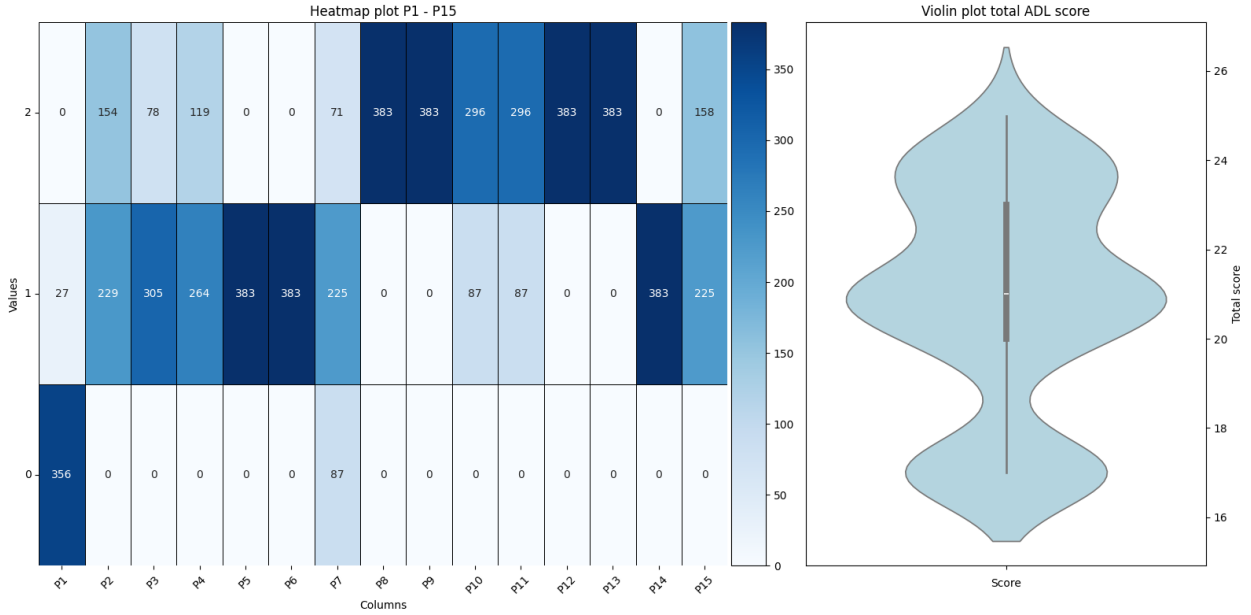

Figure 3. Heatmap of Questionnaire Scores (Left), and Distribution of Total ADL Scores in Violin Plot (Right)

The health assessment system in the ADL (Activity of Daily Living) approach involves extensive interviews to obtain information from respondents regarding their ability to perform daily activities. Figure 3, left panel, illustrates in detail theability of respondents to perform daily activities that have an impact on the health indicators of single elderly women. The x-axis on the "Plot Heatmap P1-P15" represents questions 1-15, while the y-axis represents the responses to each question. A value of 0 indicates that the respondent is unable to perform the daily activity or has not performed it. A value of 1 means the respondent requires external assistance, such as from close relatives, to perform the daily activity. A value of 2 indicates that the respondent is able to perform the daily activity independently without any difficulties.

The right panel in Figure 3 shows the distribution of total ADL scores of single elderly women respondents in this observation, visualized in a violin plot. The total score range in the graph shows values between 16 and 26, indicating that the entire sample in this observation falls into the "Good" and "Mildly Impaired" subcategories. Based on the interpretation of Figure 3, the majority of respondents had a total ADL score of 21, followed by a total ADL score of 24.

Based on the questions in Table 2, the results of this study show the number of respondents from various questions regarding Details of Daily Life Activity. P1 indicates that 356 respondents don't use the phone in their daily lives, while 27 respondents use the phone but need help from relatives. P2 indicates that 229 respondents need help from relatives to walk, while 154 respondents are able to walk independently. P3 indicates that 305 respondents need help shopping, while 78 respondents are able to shop independently. P4 shows that 264 respondents require assistance from relatives to cook meals, while 119 respondents are able to cook independently without any problems. P5 shows that 383 respondents require assistance from relatives to do household chores, and no respondents are able to do household chores independently. Question P6 shows that all 383 respondents require assistance to take medication, and no respondents are able

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to do so independently. P7 shows that 87 respondents do not manage their own finances, 225 respondents require assistance from relatives, and 71 respondents are able to manage their own finances independently.

In terms of physical ADL, P8 shows that all 383 respondents were able to eat independently without assistance, P9 shows that all respondents were able to dress independently, P10 shows that 296 respondents were able to groom themselves independently, while 87 respondents required assistance from relatives, P11 shows that 296 respondents were able to walk independently, while 87 respondents needed help from relatives, P12 showed that all 383 respondents were able to get in and out of bed independently, P13 showed that all respondents were able to bath independently, P14 showed that all respondents had difficulty reaching the bathroom on time, and P15 showed that 225 respondents reported that they wet themselves or soiled themselves three times a week or more, while 158 respondents reported experiencing it once or twice a week.

3.3 Spatial Distribution of Health Status

Spatial analysis revealed clear geographic variations in functional health status among single elderly women. Subdistricts located in lowland areas tended to exhibit higher average ADL scores, whereas lower scores were more frequently observed in hilly and mountainous subdistricts. These patterns indicate that geographic conditions and accessibility to health infrastructure influence functional independence across the study area.

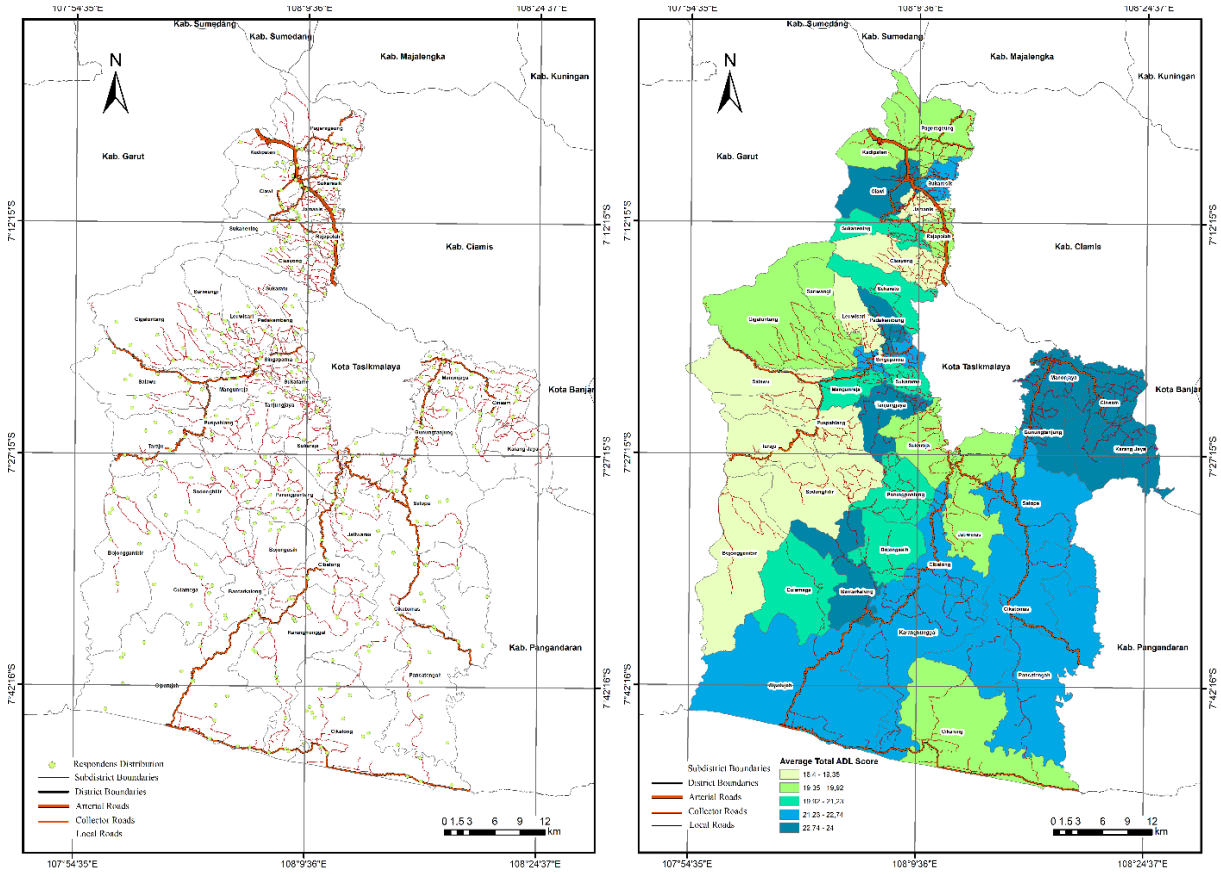

Figure 4. Respondents Distribution Map (left), Average Total of ADL Score Map (right)

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The map on the left side of Figure 4 displays the spatial distribution of the 383 single female elderly respondents across the 39 subdistricts of Tasikmalaya Regency, West Java. Each dot represents an individual respondent who participated in the survey using the ADL (Activity of Daily Living) instrument. The figure illustrates that the respondents are evenly spread throughout the regency, ensuring a balanced representation from both densely populated and remote rural subdistricts. This spatial distribution is crucial for subsequent analysis, as it supports the investigation of how geographic and infrastructural factors influence the health status and level of independence among elderly women. The uniformity in sampling also enhances the reliability of the spatial analysis conducted using GIS tools, allowing for more accurate correlation between location and ADL score variations.

The map shows that each subdistrict in Tasikmalaya Regency has several samples representing the ADL scores of single elderly women in that subdistrict. From a geographical perspective, based on the map of average ADL scores per subdistrict in Tasikmalaya Regency (Figure 4), the distribution pattern of average ADL scores in Tasikmalaya Regency varies, with some areas showing a concentrated pattern and others showing a random distribution pattern. To clarify the variation in the total ADL score distribution, the map classifies five total ADL score classes using a quantile approach.

The subdistricts in the northeastern part of Tasikmalaya Regency, consisting of Gunungtanjung, Manonjaya, Cineam, and Karang Jaya subdistricts, form a cluster with a high average ADL score classification category, namely 22.74–25. Meanwhile, in the southwestern part of Tasikmalaya Regency, which includes the subdistricts of Salawu, Puspahiang, Taraju, Sodonghilir, and Bojonggambir, a cluster pattern with low average ADL scores is observed, ranging from 18.4 to 19.35. However, in the central to northern part of Tasikmalaya Regency, the distribution of average ADL scores across subdistricts forms a random pattern that is difficult to predict. This geographical visual pattern shows that some areas in Tasikmalaya Regency may have a strong influence between geographical features and the ADL scores of single elderly women, while in other parts it is difficult to predict geographically. Therefore, this study uses a clustering approach to understand the influence between geographical features and ADL scores.

4. DISCUSSION

The Activity of Daily Living (ADL) scores of single elderly women in Tasikmalaya Regency provide an accurate overview of their level of independence in performing daily activities such as eating, bathing, dressing, and walking. Lower ADL scores indicate functional limitations that reflect declining physical capacity and increased care needs, particularly among elderly women living alone (Leung et al., 2021). This finding is consistent with studies showing that reduced ADL performance is associated with higher vulnerability to degenerative diseases and long-term care dependency (Mikton et al., 2021).

Tasikmalaya Regency has a varied topography, including mountains, highlands, and lowlands, which can affect the mobility of single elderly women. From a health geography perspective, physical environment acts as a structural determinant of health, where difficult terrain limits daily mobility and access to healthcare(Verma & Dash, 2020). Consistent with this framework, elderly women living in lowland areas demonstrate higher ADL scores compared to those residing in hilly or mountainous regions.

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Meanwhile, single elderly women residing in the highlands of Tasikmalaya Regency face greater challenges in maintaining independence in daily activities, as reflected in their lower ADL scores compared to those living in lowland areas (Kotavaara et al., 2021).

This study shows that single elderly women living in areas with limited geographical accessibility tend to have lower ADL scores. Reduced access to health facilities decreases the frequency of preventive and curative healthcare utilization, which contributes to functional decline and reduced independence (Huang et al., 2019). These low ADL scores indicate that many elderly women in mountainous areas face serious challenges in accessing health support.

In the context of global development frameworks, these findings align with Sustainable Development Goal (SDG) 3, which emphasizes equitable access to healthcare and healthy aging. (WHO, 2021). The spatial disparities observed in this study highlight structural barriers that hinder the achievement of SDG 3 for vulnerable elderly populations in rural and topographically challenging areas (Nations, 2015).

Elderly women with low ADL scores show a higher need for health care, especially in rural areas where access to health facilities is still limited (Norman et al., 2022). This shows a gap in the achievement of SDG 3 in remote areas such as Tasikmalaya Regency. Limited mobility due inaccessible topography places elderly women as a vulnerable group in achieving the SDGs, particularly SDG 3. Developing better accessibility for this group is crucial to achieving inclusive health and welfare (Andrews et al., 2007).

The Program Indonesia Sehat dengan Pendekatan Keluarga (PIS-PK) is particularly relevant for addressing functional decline among elderly women, as it emphasizes family-based and preventive healthcare interventions. Strengthening this program in rural and highland areas could help mitigate spatial barriers that contribute to lower ADL scores (Ministry of Health, 2022). The findings from this study indicate that families play an important role in supporting the independence of the elderly, especially in remote areas, so this program needs to be strengthened in Tasikmalaya (Wulandari & Laksono, 2019).

A decline in ADL scores underscores the growing need for long-term care services, particularly for single elderly women who experience functional limitations and limited family support. This finding supports the integration of community-based long-term care models in rural settings, where institutional care access remains limited (Mikton et al., 2021). Elderly individuals with low ADL scores require intensive and ongoing care, so local governments need to develop long-term care programs focused on the elderly in rural areas (Belloni & Cesari, 2019).

Aging population studies confirm that Indonesia, as a developing country, will face major challenges in providing inclusive health services for the elderly (Norman et al., 2022). With an aging population, especially in rural areas, health policies must strengthen services that are responsive to the elderly. The decline in ADL scores among elderly women in Tasikmalaya Regency shows that accessibility to health services is still an issue that must be resolved by the government (WHO, 2021).

Additionally, social and economic factors interact with spatial constraints to exacerbate functional vulnerability among single elderly women. Living alone, limited income, and weak social support networks amplify the negative effects of geographical isolation, reinforcing the need for integrated social and health interventions at the community level (Rowe & Kahn, 1997). Local

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governments should consider policies that strengthen the role of communities in supporting the well-being of the elderly (Belloni & Cesari, 2019).

5. CONCLUSION

The results of this study indicate that the Activity of Daily Living (ADL) instrument is a widely used assessment tool for describing the functional health level of the elderly, including single elderly women in Tasikmalaya Regency. Higher ADL scores are associated with better functional independence, whereas lower scores reflect increased dependency and vulnerability among elderly individuals. This study contributes novelty by integrating ADL assessment with spatial analysis to illustrate geographic disparities in functional health status, an approach that remains limited in elderly health research in Indonesia. Despite its usefulness, the ADL instrument has limitations, including limited sensitivity to subtle functional changes and potential challenges in cultural adaptation within the Indonesian context, which may affect the interpretation of functional independence among elderly populations.These findings are relevant to the Indonesian context, where the elderly population is rapidly increasing, and provide implications for health policy and nursing practice, particularly in designing spatially targeted and community-based interventions for single elderly women. Future research is recommended to incorporate culturally adapted instruments and longitudinal designs to better capture functional health changes over time.

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