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Original Article

Medical cost inflation and its drivers in Indonesian employer-sponsored health insurance for retiree families

Cahya E. Prastyo[1,2*] and Ascobat Gani[3]

[1]Doctoral Program, Faculty of Public Health, Universitas Indonesia, Depok, Indonesia; [2]Humanis Consulting, Jakarta, Indonesia; [3]Department of Health Administration and Policy, Faculty of Public Health, Universitas Indonesia, Depok, Indonesia

*Corresponding author: cahya.edi.epid@gmail.com

Abstract

Rising life expectancy and changes in disease patterns have led to an increase in retiree medical costs. Understanding these trends is essential for ensuring the financial sustainability of retiree healthcare programs. The aim of this study was to analyze medical cost inflation and its drivers in Indonesia's employer-sponsored retiree health insurance program from 2020 to 2023. A retrospective cohort study using total sampling included 29,695 retirees, analyzing medical records and insurance claims to examine demographic transition, cost analysis and relative risk of cost drivers. The study found that the retiree population is aging, characterized by longer life expectancy and a growing proportion of individuals aged above 71 years. Medical cost inflation among retirees is higher compared to the general population, driven by aging, high-cost diseases, increased healthcare utilization, and rising treatment costs. Cardiovascular diseases, diabetes, and chronic kidney disease are major drivers of high medical costs. Inpatient care is the most significant cost component, with a cost risk 14.39 times higher than clinic visits. Medicine and medical treatment are leading cost contributors in the retired population. The rising cost of retiree healthcare necessitates sustainable financing strategies. The study highlights that medical cost inflation in retirees was higher than in the general population, driven by aging, high-cost diseases, increased utilization, and rising treatment costs. Strengthening preventive care, optimizing primary care, and diversifying funding sources are recommended to ensure long-term financial stability.

Keywords: Medical cost, cost driver, retirement, employer-sponsored insurance, financial sustainability

Introduction

Some employers in Indonesia have additional benefits and health services for workers' families during retirement called '*Manfaat Pasti*'. These health service benefits will guarantee health service assistance until the person dies. Due to the long-term commitment, changes in the distribution of high-cost diseases will increase costs, while increased life expectancy will extend the financing period. If the employer does not anticipate this, it could lead to the risk of unsustainable health service financing. Unsustainable health service financing will limit retirees' ability to access health services and financial protection against health costs [1,2].

Life expectancy in Indonesia increased from 71.5 to 73.93 years in 2023. This rise in life expectancy may also occur within the retiree population, which is categorized as elderly [3]. Changes in the number and composition of the population structure over time will impact

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changes in health problems [4]. Health problems caused by population changes impact the types of services and health equipment that must be provided by health facilities [5].

Mostly, studies have been done on retirees and their use of healthcare services in the United States of America (USA) and Europe. A study by Lucifora and Vigani across ten European countries, using the Survey of Health, Aging and Retirement in Europe (SHARE) data from 2005–2015, found that retirees visited doctors and healthcare facilities four times more frequently than when they were still working [6]. A longitudinal study in the USA from 1992–2005 by Dave *et al.* found that after six years of retirement, 5–16% of initially healthy retirees experienced mobility difficulties in daily activities, 5–6% developed chronic illnesses, and 6–9% experienced a decline in mental health [7]. However, retiree health conditions in Indonesia may differ from those in Europe and the USA, as these regions generally have more equitable healthcare coverage and quality. A study in 2015 by Zulman *et al.* on U.S. veterans found that 5% of healthcare transactions among patients with more than three comorbidities accounted for 47% of total healthcare expenditures [8]. A 2019 study by the World Health Organization (WHO) in Europe found that individuals aged 65 and older spent four times more on healthcare than younger individuals. Additionally, a 2017 study among 4.5 million beneficiaries of one health insurer in the Netherlands by Wammes *et al.* found that the top 1% of healthcare transactions accounted for 23% of total healthcare costs, with 76% of these expenses being hospital service charges, excluding medication and intensive care unit (ICU) costs [9]. The type of healthcare services retirees use significantly impacts costs. The trends in diseases and healthcare services among retirees in Indonesia remain unclear. The limited literature on retiree health in Indonesia makes it challenging to map appropriate healthcare services. Understanding these trends is crucial for designing a suitable healthcare financing model for future retirement programs.

The increasing older population and high medical costs burden this group, making it an urgent public health issue. Research on medical costs in the older population is complex and requires longitudinal studies, limiting the literature [10]. Existing studies on retirees in Indonesia are mostly limited to cross-sectional studies on social support during retirement and survival rate analyses using mortality data [11,12]. Furthermore, only one study has been published in international journals [13]. The information currently available is still lacking to assist policymakers in long-term planning and assessing the sustainability of the retiree health service program. This analysis is urgently needed in health services for retirees in Indonesia, particularly those who were privately funded by their previous employers. This analysis is important because the financial capacity to support services depends on the employer's financial ability [14]. Employer-sponsored health plans will be different from health services funded by national health insurance, managed by the state, and private health insurance funded by participant contributions [15].

The source of financing for the program "*Manfaat Pasti,*" which only uses the employer budget to finance health services, has risks. Future financing will be highly dependent on the existence of the employer and the long-term commitment to the health budget for retiree health services. This paper uses longitudinal data from 2020 to 2023, which is much larger than previous studies in Indonesia [16]. The aim of this study was to analyze medical cost inflation and its drivers in Indonesia's employer-sponsored retiree health insurance program from 2020 to 2023, addressing the gap in existing studies. Understanding the key factors driving medical cost inflation in Indonesia's employer-sponsored retiree health insurance program is crucial for policymakers to evaluate the program's long-term sustainability.

Methods

Study design and setting

The study employed a retrospective cohort design, utilizing quantitative data from 2020 to 2023 healthcare service records and membership information obtained from an employer that provides healthcare benefits for retirees. Retiree healthcare services were offered as an additional benefit given to employees after retirement. The study utilized data from retirees of a major state-owned oil and gas company in Indonesia, which has been established for over 60 years and currently employs more than 40,000 people. The *Manfaat Pasti* program allowed retirees to access

healthcare facilities more quickly and easily. At that time, the recruitment period for the employer's defined benefit program had ended, with the last eligible participants being employees who started working in 2003. Although enrollment in the program had concluded, healthcare services continued for current retirees and those projected to retire by the estimated retirement age in 2036, lasting until the end of their lives. This retiree healthcare service operated as a stand-alone program, independently managed by the employer, covering provider selection, provider management, and payments. Since the program was operated without government subsidies or involvement from the National Health Insurance (*Jaminan Kesehatan Nasional*, JKN). The beneficiaries included employees who retire at 56 or take early retirement after at least 15 years of service, along with their spouses. The age could be younger for spouses, as there were no administrative restrictions. The number of beneficiaries changes annually based on the number of new retirees and deceased participants. This study used a total sampling method, analyzing all respondents who utilized healthcare services. The total number of registered beneficiaries from 2020 to 2023 was 31,548, which is the total population. Retirees can use healthcare services at 11 designated private clinics and 12 private hospitals appointed by their employers.

Data collection

Participant data collection

The company recorded participant data when an employee retires and registered as a beneficiary of the retiree healthcare program. The participant data included age, sex, and healthcare provider. The participant data included death registration used for healthcare service termination. Mortality recorded details such as age of death, sex, and the healthcare provider.

Healthcare service data collection

Healthcare service data was collected from billing records submitted by clinics and hospitals to the employer that manages the healthcare program [17]. The cost information recorded by the employer represented the expenses paid by the insurer to clinics or hospitals. However, some medical costs may be paid directly by the participants beyond what the employer covers.

Diagnosis data was collected from patients' medical histories, which clinics and hospitals submit to the employer. Diagnoses follow the guidelines of the International Statistical Classification of Diseases and Related Health Problems, 10th Revision (ICD-10) [18]. The employer's medical advisors verify the diagnoses provided by clinics and hospitals to ensure accuracy in identifying retirees' health conditions and the appropriateness of treatments.

Population and sample

This study focused on retirees who utilized retiree healthcare services from 2020 to 2023. Of the 31,548 registered retirees during this period, 29,695 were recorded as having used healthcare services. The study excluded 1,853 participants who did not use retiree healthcare services. A total of 29,311 participants had complete information on age group, cost, diagnosis, type of service, and type of care, while 384 participants had information only on age group, cost, type of service, and type of care. Three hundred eighty-four participants with incomplete diagnostic information are excluded from the disease-based cost analysis. However, these 384 participants were still included in the medical cost inflation analysis (**Figure 1**).

Dependent variables

The dependent variable in this study was retiree medical costs. Cost was defined as cash or cash equivalents sacrificed to acquire goods and services expected to benefit an organization in the present and the future [19]. In this study, healthcare costs refer to direct expenses paid by the employer to clinics and hospitals due to retirees' use of healthcare services from 2020 to 2023. The benefit of this retired health service provided by the employer excluded long-term care costs. Cost recording was based on the service utilization date, with each year's data covering January 1 to December 31.

Annual costs were counted by summing the monthly claims submitted by clinics and hospitals. These costs already include negotiated discounts between the employer and healthcare providers. However, actual healthcare costs related to specific illnesses may be higher than

recorded by the insurer, as out-of-pocket expenses paid by retirees themselves were not included in the employer's cost records.

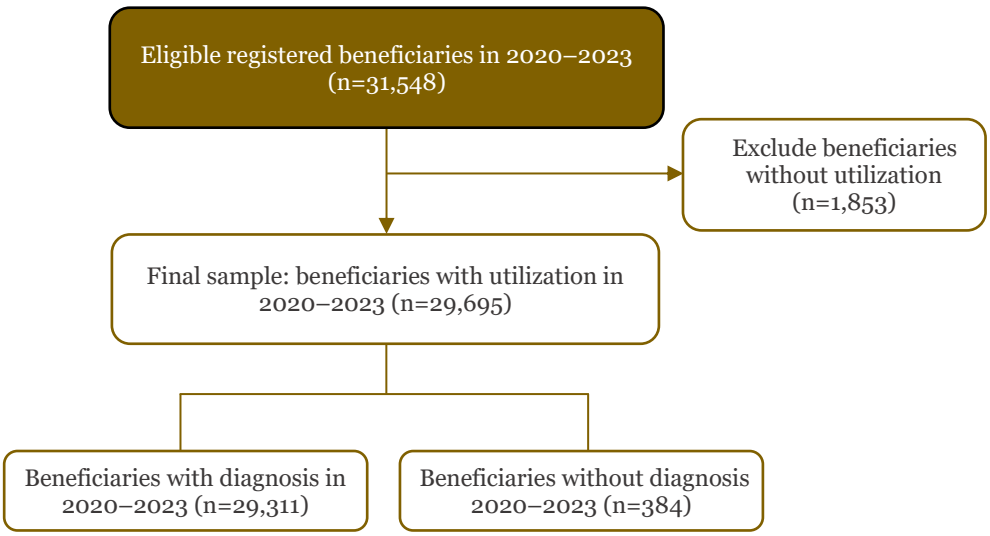

Figure 1. Flow chart of study respondent selection

Independent variable

Cost analysis was conducted based on several independent variables: population composition by age and sex, disease diagnosis, type of healthcare service, and type of care. Population composition refers to the grouping of individuals based on specific variables such as age and sex [20]. Age-based cost analysis will use eight age categories:<56 years, 56–60 years, 61–65 years, 66–70 years, 71–75 years, 76–80 years, 81–85 years, and >85 years. Age data will be treated numerically rather than categorically for the demographic transition index, including life expectancy at retirement and the average age of the retiree population.

Disease classification in this study was based on doctor-diagnosed conditions recorded during clinic or hospital visits. Diagnoses were coded using ICD-10 and limited to primary diagnoses listed in patient records. While patients may have multiple conditions, only high-cost diseases among retirees were included in the analysis.

Healthcare services used by retirees were classified into seven categories, which determine the billing process between clinics/hospitals and the insurer [21], including disposable medical supplies, hospitalization/inpatient care, medicine, doctor visits, supporting examinations, and medical treatment. Service costs were generally based on contracts between the employer and healthcare facilities.

The study categorized types of care into three groups, namely outpatient care at clinics (visits to general practitioners), outpatient care at hospitals (visits to specialists), and inpatient care (hospitalization). This classification helped distinguish between general consultations and specialized medical care, which impacts healthcare costs.

Data quality

The researchers directly verified participant information to ensure the accuracy of participant data, while the retiree healthcare insurance company handled diagnosis and cost verification. For retirees who sought medical treatment, the researcher checked the accuracy of billing records from clinics and hospitals by cross-referencing them with the database of registered retirees receiving healthcare benefits. Diagnosis verification was not conducted directly by the researcher. Instead, it was reviewed by the medical advisor, who verified the diagnosis with clinics or hospitals as part of the approval process for medical services. The insurer's verification team performed cost verification upon receiving bills from clinics or hospitals.

Statistical method

The healthcare service data used in this study was large-scale, consisting of 29,695 people. The researcher utilized Microsoft Power BI Desktop (Microsoft Corp, Washington, US) to conduct the

analysis. The study presented data in two main categories: (1) population characteristics and (2) analysis of relationships between variables.

Population characteristics analysis

Descriptive data were presented using frequency, percentage, mean, range, and standard deviation. In addition to basic demographic data (age and sex distribution), the study calculated: (a) crude death rate (CDR) as the number of deaths in one year divided by the total population in the same year [20]; (b) life expectancy at retirement was defined as the sum of the ages at death of retirees within a year divided by the total number of deaths [22]; and (c) the new participant rate was defined as the number of newly retired employees in a year divided by the total retiree population.

The average age of the existing population was calculated by dividing the sum of the ages of all living and deceased retirees within the year by the total retiree population. Individuals who passed away in previous years were excluded from subsequent calculations. The study used a period prevalence rate to assess the disease burden among retirees, considering that most illnesses in older age were non-communicable diseases. The prevalence rate of disease X was calculated by dividing the number of people diagnosed with disease X by the population in one year [23].

Costs were presented as total medical costs and costs per person. The cost per person was calculated by dividing the total cost by the number of retirees who accessed healthcare services in a year. The study also calculated the annual inflation in healthcare costs. This cost was determined by calculating the annual inflation rate, based on the difference in costs per person divided by the cost per person in the previous year. The healthcare inflation rate observed in the retiree program was then compared to the medical cost inflation values published by Mercer Marsh Benefits (MMB) and Indonesia's Central Bureau of Statistics (BPS) [24]. All cost analyses were conducted in Indonesian Rupiah (IDR).

Relationship between variables

The relationship between costs and independent variables was displayed in contingency tables [25]. The relationship between the three variables was visualized using a contingency table. Since the study followed a cohort design, the relative risk (RR) was used to assess the cost risk associated with different groups. This approach helped determine whether certain groups, such as older retirees or those with specific conditions, faced higher financial risks related to healthcare costs [26,27].

Results

Respondent characteristics

Respondent demographic characteristics are presented in **Table 1**, which showed the number of retirees utilizing healthcare services, categorized by age group and sex from 2020 to 2023. There was a noticeable aging trend in the retiree population. The proportion of younger retirees (<56–65 years old) has decreased, and the 71–75 age group has significantly increased, from 18.73% in 2020 to 24.17% in 2023. Based on sex, it showed that the proportion of females in the population was higher than men, consistent for all years. The proportion of female retirees had increased from 55.85% in 2020 to 58.31% in 2023. The number of male retirees in the population has declined in comparison.

Table 1. Characteristics of respondents by age group and sex (2020–2023) (n=29,695)

Variables	2020		2021		2022		2023		Total	
	n	%	n	%	n	%	n	%	n	%
Age group										
<56	1,147	5.31	825	4.16	820	3.92	747	3.51	1,444	4.44
56–60	2,819	13.04	2,456	12.39	2,454	11.74	2,298	10.79	4,999	12.53
61–65	4,417	20.44	3,862	19.48	3,948	18.89	3,849	18.07	7,714	19.34
66–70	5,940	27.49	5,387	27.17	5,433	25.99	5,249	24.65	10,172	25.50
71–75	4,047	18.73	4,154	20.95	4,714	22.55	5,147	24.17	8,411	21.08
76–80	2,027	9.38	2,066	10.42	2,314	11.07	2,520	11.83	4,310	10.80

Variables	2020		2021		2022		2023		Total	
	n	%	n	%	n	%	n	%	n	%
81–85	793	3.67	776	3.91	881	4.21	1,088	5.11	1,832	4.59
≥86	320	1.48	304	1.53	339	1.62	400	1.88	680	1.70
Sex										
Male	9,498	44.15	8,862	44.69	8,820	42.19	8,878	41.69	12,800	43.11
Female	12,012	55.85	10,968	55.31	12,083	57.81	12,420	58.31	16,895	56.89
Total	21,510	100	19,830	100	20,903	100	19,030	100	29,695	100

Aging population

The aging trend among retirees utilizing healthcare services is presented in **Table 1**. The retiree population is classified as an open population, meaning its composition is dynamic—it changes due to newly retired beneficiaries entering the system and existing beneficiaries exiting due to death [28]. The difference between the total number of respondents in each year and the total sample (n=29,695) could have been due to the fact that the total sample (n=29,695) referred to the entire group of individuals who had accessed healthcare from 2020 to 2023. The total number of respondents for each year (e.g., 21,510 in 2020, 19,830 in 2021, etc.) referred to the actual number of retirees included in the study and who accessed healthcare services in that specific year. Not all retirees in the total sample may have used healthcare services each year due to reasons such as death, being healthy, or not being retired.

Key demographic indicators related to the retiree population, including life expectancy at retirement, crude death rate, new member rate, the average age of beneficiaries, and trends in minimum and maximum age, to further analyze this demographic transition are presented in **Table 2**. Between 2020 and 2023, life expectancy significantly increased, indicating improvements in the retiree's quality of life. Male life expectancy increased from 73.17 years in 2020 to 74.7 years in 2023. Female life expectancy fluctuated: it declined from 72.97 years in 2020 to 72.14 years in 2021, likely due to external factors such as the pandemic, before rising again to 73.96 years in 2023.

Table 2. Demographic transition index in the retiree population (2020–2023)

Demographic transition index	2020	2021	2022	2023
Life expectancy (years)	73.08	72.67	73.53	74.37
Male (years)	73.17	73.04	73.55	74.70
Female (years)	72.97	72.14	73.51	73.96
Crude death rate (%)	4.15	5.57	3.28	2.56
New member rate (%)	1.71	1.20	0.99	0.78
Average age of existing beneficiaries (years)	66.74	67.30	67.85	68.54
Standard deviation of average age (years)	8.057	8.007	7.969	7.960

A sharp increase in the crude death rate was observed in 2021 (5.57%), likely due to the impact of the COVID-19 pandemic. After 2021, mortality rates significantly declined, reaching 2.56% in 2023, reflecting better healthcare management and improved retiree health conditions. The number of new retirees joining the program declined from 1.71% (2020) to 0.78% (2023). The gap between mortality rates and new participant rates led to negative population growth in the retiree population. The average age of retirees increased from 66.74 (2020) to 68.54 (2023), reinforcing the trend of an aging retiree population. This finding aligns with **Table 1**, which showed an increasing proportion of older retirees, particularly in the 71–75 age group.

Medical costs and medical cost inflation

Medical costs in 2020 and 2021 may not have fully reflected the actual financial burden of retiree healthcare services, as government subsidies were provided for COVID-19 patients during the pandemic. The healthcare expenditures incurred by the insurer from 2020 to 2023, illustrating trends in total medical costs and medical costs per person, are presented in **Table 3**. The medical cost inflation rate was compared to general inflation rates published by other institutions in Indonesia. Total medical costs increased significantly over the period. After a slight decline in 2021 (likely due to pandemic-related factors), costs surged in 2022 and 2023. Medical costs per person also rose, indicating that healthcare for retirees has become more expensive. Medical cost

inflation outpaced general inflation, highlighting the growing financial burden of retiree healthcare.

Table 3. Medical costs and comparison of medical cost inflation in retired populations vs general inflation (2020–2023)

Medical costs in the retired population			Inflation		
Years	Total medical cost (IDR)	Cost per person (IDR)	Medical cost inflation in the retired population (%)	Medical cost inflation by MMB (%)	General inflation by BPS (%)
2020	182,018,313,932	8,462,032	(*Ref*)		
2021	168,763,406,085	8,514,373	0.62	10.00	1.87
2022	225,018,663,113	10,770,565	26.50	12.30	5.51
2023	276,061,563,670	12,976,476	20.48	13.60	2.61

BPS: Indonesia's Central Bureau of Statistics or *Badan Pusat Statistik* (BPS); IDR: Indonesian rupiah; MMB: Mercer Marsh Benefits

In 2021, the retiree population's medical cost inflation was lower (0.62%) than the general medical inflation rate (10.00%). This was likely influenced by pandemic-related factors, including government subsidies for COVID-19 treatment and reduced healthcare utilization due to movement restrictions. However, in 2022 and 2023, retiree medical costs surged, exceeding the medical inflation rate reported by Mercer Marsh Benefits (MMB). This indicates that healthcare expenses for retirees grew faster than the broader healthcare market, highlighting increasing financial pressure on the retiree healthcare system.

Medical costs and population composition by age and sex

The increasing proportion of older retirees suggests that more individuals are reaching an age of heightened health risks, leading to more significant healthcare expenditures. The relationship between healthcare costs, age, and sex from 2020 to 2023 is presented in **Table 4**. Medical costs increased significantly with age. The highest cost burden was observed in the 81–85 age group, where costs were 2.66 times higher than those in the <56 age group. Sex differences in medical costs were also evident. The average medical cost per person was IDR 9,545,733. Females had 21% lower medical costs than males, as indicated by an RR of 0.79, meaning that women's healthcare expenses were approximately 79% of those incurred by men.

Table 4. Relative risk and average cost per person by age group and sex (2020–2023)

Variable	Average cost per person from 2020–2023 (IDR)	Relative risk	95% confidence interval
Age group (year)			
<56	6,211,174	(*Ref*)	
56–60	7,778,551	1.25	0.90–1.61
61–65	8,237,955	1.33	0.91–1.74
66–70	10,103,703	1.63	1.00–2.26
71–75	12,256,265	1.97	1.28–2.67
76–80	14,687,717	2.36	1.49–3.24
81–85	16,519,833	2.66	1.65–3.67
≥86	14,975,474	2.41	1.23–3.59
Sex			
Male	12,083,288	(*Ref*)	
Female	9,545,733	0.79	0.71–0.87

The distribution of medical costs by age group from 2020 to 2023 is presented in **Table 5**. Older age groups (66 and above) accounted for a larger share of total medical expenses compared to younger retirees. In 2023, the 66–70 age group contributed 22.85% of total medical costs, while the 71–75 age group accounted for 28.01%. The 81–85 age group showed a significant increase in cost burden over time, reflecting the growing healthcare needs of the elderly population. The 56–60 age group had a lower cost contribution than the older groups but still demonstrated an upward trend, indicating that healthcare expenditures began to rise earlier in retirement.

Table 5. Medical cost distribution by age group (2020–2023)

Age group (year)	Cost distribution by years (%)			
	2020	2021	2022	2023
<56	4.13	2.15	2.52	1.71
56–60	11.26	9.42	8.04	7.49
61–65	17.55	15.52	13.71	13.12
66–70	26.28	28.14	24.85	22.85
71–75	21.62	23.58	25.86	28.01
76–80	12.00	13.94	16.32	16.03
81–85	5.44	5.37	7.01	8.33
>85	1.72	1.87	2.44	2.45
Total	100	100	100	100

Medical costs and disease trends in the retired population

Hypertension (I10) had the highest prevalence rate, while breast cancer (C50) had the lowest among the top nine diseases by total medical cost, as presented in **Table 6**. Five diseases exhibited an increasing trend from 2020 to 2023: essential hypertension (I10), chronic ischemic heart disease (I25), type 2 diabetes mellitus (E11), hypertensive heart disease (I11), and dorsalgia (M54) or back pain disorders. Only one of the nine diseases listed was infectious (pneumonia), while the others were non-communicable diseases (NCDs) commonly associated with aging.

Table 6. Disease prevalence rate in the top nine by total medical cost per disease in the retired population (2020–2023)

Disease	2020 (%)	2021 (%)	2022 (%)	2023 (%)
I10 - Essential (primary) hypertension	24.1	22.7	28.3	37.7
I25 - Chronic ischaemic heart disease	9.7	8.8	11.6	18.9
E11 - Type 2 diabetes mellitus	14.6	11.5	12.1	17.9
N18 - Chronic kidney disease	4.8	2.5	1.8	2.9
N40 - Hyperplasia of prostate	3.6	3.3	3.3	4.8
J18 - Pneumonia	1.3	1.6	0.9	1.5
I50 - Heart failure	2.7	2.1	1.7	2.5
I11 - Hypertensive heart disease	5.7	6.3	6.3	8.2
M54 - Dorsalgia	6.5	4.9	5.5	8.2
C50 - Malignant neoplasm of breast	1.1	0.8	0.6	0.7

Significant changes in the distribution of medical costs by disease category from 2020 to 2023 are presented in **Table 7**. While chronic kidney disease (N18) remained a high-cost burden, its proportion of total medical expenses declined from 13.25% in 2020 to 7.07% in 2023. Chronic ischemic heart disease (I25) saw a substantial increase in cost burden, rising from 4.91% in 2020 to 10.07% in 2023, making it the leading contributor to healthcare expenses. This increase in cost is aligned with the growing prevalence of heart disease in the retired population. Essential hypertension (I10) showed a steady rise from 5.09% in 2020 to 5.79% in 2023, reflecting its growing impact on healthcare costs. Type 2 diabetes mellitus (E11) remained relatively stable in cost contribution, fluctuating between 4.55% and 4.66%, but continued to be a significant source of healthcare expenditure.

Table 7. Top 7 medical costs distribution by disease in the retired population (2020–2023)

2020		2021		2022		2023	
Diagnosis	Total cost (%)	Diagnosis	Total cost (%)	Diagnosis	Total cost (%)	Diagnosis	Total cost (%)
N18	13.25	N18	10.78	I25	7.98	I25	10.07
I10	5.09	I25	8.34	N18	6.69	N18	7.07
I25	4.91	I10	5.55	I10	6.20	I10	5.79
Z00	4.84	E11	4.61	E11	4.66	E11	4.55
E11	4.60	N40	2.57	A41	3.37	A41	2.50
G70	2.47	A41	2.55	N40	2.34	N40	2.44
N40	2.13	J18	1.96	C50	2.17	C50	2.41

A41: other sepsis; C50: malignant neoplasm of breast; E11: type 2 diabetes mellitus; G70: myasthenia gravis and other myoneural disorders; I10: essential (primary) hypertension; I25: chronic ischaemic heart disease; J18: pneumonia; N18: chronic kidney disease; N40: hyperplasia of prostate; Z00: general examination and investigation of persons without symptoms and reported diagnosis.

Medical costs and types of care in the retired population

This study categorized healthcare services into outpatient care at clinics, outpatient specialist services, and inpatient care. The average outpatient cost in the clinic per person was IDR 2,090,014, as presented in **Table 8**. This represented a significant increase from IDR 1,535,045 in 2021 to IDR 2,774,293 in 2022, before slightly decreased in 2023. For outpatient specialist care, the average cost per person was IDR 6,404,882, rising from IDR 5,712,360 in 2020 to IDR 7,162,871 in 2023. The number of outpatient specialist patients increased from 11,634 in 2020 to 12,564 in 2023, in line with rising costs. For inpatient care, the average cost per person was IDR 30,084,217.74, increasing from IDR 26,217,628 in 2020 to IDR 33,871,470 in 2023. The number of inpatient cases surged from 2,625 in 2021 to 4,021 in 2023, indicating a growing demand for hospitalization. The relative risk of medical costs by type of care showed that outpatient specialist care was 3.06 times more expensive than outpatient clinic visits, and inpatient care was 14.39 times more expensive.

Table 8. Relative risk, medical distribution by type of care, and number of patients using healthcare services

Years	Cost per person			Number of persons and type of care		
	Outpatient in clinic (IDR)	Outpatient in specialist (IDR)	Inpatient care (IDR)	Outpatient in clinic (n)	Outpatient in specialist (n)	Inpatient care (n)
2020	1,588,253	5,712,360	26,217,628	20,960	11,634	3,138
2021	1,535,045	5,905,607	28,135,589	19,208	11,078	2,625
2022	2,774,293	5,781,574	29,379,547	20,536	11,641	3,429
2023	2,393,801	7,162,871	33,871,470	20,833	12,564	4,021
Mean	2,090,014	6.404,882	30,084,217			
RR	(*Ref*)	3.06	14.39			
95%CI		1.80–4.46	9.22–20.56			

95%CI: 95% confidence interval; IDR: Indonesian rupiah; RR: relative risk

Healthcare costs by type of service

The type of healthcare service used directly impacts on total medical costs, as expenses are calculated based on the specific services utilized by retirees. The average cost distribution for medicine was highest at 26.82%, as presented in **Table 9**, consistently remaining the largest component of medical costs in the retired population. This was followed by medical treatment at 22.27% and supporting examinations at 15.96%. Inpatient care remained stable throughout the period, averaging 8.63%, while doctor visit costs rose steadily from 12.77% in 2020 to 14.66% in 2023, indicating increased utilization or service fees. The cost share for disposable medical supplies declined notably from 3.90% to 1.46%, likely due to shifts following the COVID-19 pandemic.

Table 9. Cost distribution by type of service (2020–2023)

Type of service	2020 (%)	2021 (%)	2022 (%)	2023 (%)	Mean
Disposable medical supplies	3.90	4.63	1.83	1.46	2.96
Hospitalization/inpatient care	8.62	9.14	8.30	8.45	8.63
Other	8.34	9.98	9.20	11.05	9.64
Medicine	29.36	20.34	31.36	26.23	26.82
Doctor visite	12.77	13.45	13.98	14.66	13.72
Supporting examination	14.45	19.45	14.46	15.47	15.96
Medical treatment	22.55	23.01	20.86	22.67	22.27

The distribution of healthcare costs based on selected ICD-10 diagnosis codes and the types of medical services provided is presented in **Table 10**. Each disease required different types of care, resulting in varying cost allocations. The study found that the medical cost distribution per disease followed distinct patterns. The cost for chronic kidney disease (CKD) (N18) was primarily spent on medical treatment (60.73%), likely due to dialysis and long-term care needs. Chronic ischemic heart disease (I25) incurred the highest costs for medicine (35.10%) and medical treatment (24.53%), reflecting the necessity of ongoing drug therapy and surgical interventions. Essential hypertension (I10) incurred the highest costs for medications (47.25%) and doctor visits (21.26%), indicative of the need for regular check-ups and long-term blood pressure

management. Pneumonia (J18) showed a more balanced cost distribution across services, as patients typically received a combination of outpatient care, hospitalization, and medications. Breast cancer (C50) incurred significant costs for medications (50.81%), largely due to the high expense of chemotherapy and specialized cancer drugs.

Table 10. Medical cost distribution by type of service for each disease

Diagnosis	Medicine (%)	Medical treatment (%)	Supporting examination (%)	Hospitalization (%)	Doctor visit (%)	Disposable medical supplies (%)	Other (%)
N18	12.57	60.73	8.50	3.28	4.29	1.39	9.25
I25	35.10	24.53	11.63	4.79	9.81	2.73	11.43
I10	47.25	7.36	13.37	2.23	21.26	1.43	6.74
E11	46.45	7.62	14.66	4.71	18.59	2.22	5.75
N40	29.75	19.51	16.42	5.92	15.96	1.79	10.65
C50	50.81	16.45	14.04	5.90	6.89	0.79	5.12
J18	20.64	12.45	16.81	23.24	6.60	2.54	17.72
I50	20.69	16.67	15.75	19.38	10.64	2.53	14.34
M54	13.25	9.87	37.1	4.45	25.79	0.80	8.74
I11	34.41	16.47	17.16	4.95	21.20	1.31	4.72

C50: malignant neoplasm of breast; E11: type 2 diabetes mellitus; I10: essential (primary) hypertension; I11: hypertensive heart disease; I25: chronic ischaemic heart disease; I50: heart failure; J18: pneumonia; M54: dorsalgia; N18: chronic kidney disease; N40: hyperplasia of prostate

As age increased, spending gradually shifted from active treatments and medications to hospitalization, highlighting the increased complexity and intensity of care in older retirees is presented in **Table 11**. Medicine consistently dominated cost distribution across all age groups, with the highest share observed in the 56–60 age group (31.45%), possibly reflecting higher medication use for managing chronic conditions at the onset of retirement age. After that, the percentage gradually declined with age. Hospitalization costs increased significantly with age, rising from 7.35% in the under-56 group to 14.17% in those over 85, reflecting increased rates of severe or acute conditions requiring inpatient care in older adults. Medical treatment costs remained relatively stable across age groups, peaking slightly in the 61–65 group (23.56%) before gradually decreasing to 17.50% in those over 85, potentially due to a shifting focus from active treatment to palliative care in older populations. Supporting examinations (e.g., diagnostics and lab tests) consistently accounted for between 14% and 17%, with slight increases in older age groups, possibly due to more frequent monitoring and follow-ups.

Table 11. Medical cost distribution by type of service and age group

Age group (year)	Medicine (%)	Medical treatment (%)	Supporting examination (%)	Hospitalization (%)	Doctor visit (%)	Disposable medical supplies (%)	Other (%)
<56	25.92	23.41	17.18	7.35	14.32	2.36	9.28
56–60	31.45	23.20	14.47	6.99	12.54	2.41	8.93
61–65	27.07	23.56	15.41	7.42	13.98	2.81	9.75
66–70	27.35	22.15	16.01	7.76	14.56	2.64	9.52
71–75	27.23	22.77	15.59	8.10	14.25	2.19	9.87
76–80	25.63	21.50	15.92	10.07	14.27	1.94	10.67
81–85	25.06	20.31	15.45	12.01	13.54	1.95	11.68
>85	25.20	17.50	16.69	14.17	13.21	1.99	11.23

Discussion

The results showed that the retiree population tended to age, with a decrease in the proportion of the younger age group and an increase in the elderly age group. The proportion of females increased, which might have been due to females' higher life expectancy compared to males. Information about this composition was vital for policymaking and planning the resources needed. Demographic changes, especially population aging and shifts in sex proportions, had various impacts. An aging population meant that more people needed health care, especially for chronic diseases such as hypertension, diabetes, and other degenerative diseases. The demand for hospital facilities, medical personnel, and medicines increased. With more older adults, healthcare costs for all beneficiaries increased significantly. It was highly recommended that

employers consider financing partnerships with national health insurance to ensure the sustainability of future health services [29]. In the United States, changes in medical costs were the result of various factors, with aging being a contributing factor but not the main determinant of growth in healthcare expenditures [30]. Similar results were found in studies conducted in Spain and Italy, which showed that the elderly had higher spending on health services [31]. According to epidemiological transition theory, demographic changes influence the shift in disease patterns, leading to changes in health status and, consequently, healthcare services [4]. These healthcare services incur costs that individuals or insurance providers must bear. Understanding disease trends is crucial in determining the type of services required and the associated costs [25].

Following a significant increase in 2021, mortality rates declined, suggesting a recovery from the adverse effects of the COVID-19 pandemic. This reduction in mortality was consistently accompanied by rising life expectancy, reflecting advancements in healthcare services and overall improvements in population health and quality of life. However, from an actuarial and financial standpoint, increased life expectancy introduces heightened risks for pension and health insurance systems [29]. As individuals live longer, insurers and benefit providers are required to sustain healthcare coverage over a more extended period, particularly if coverage is maintained until death.

Medical costs per person in retirement continue to increase yearly; this shows that health services for the elderly are becoming more expensive. This increase could be due to medical inflation, increasing needs for elderly healthcare, or the use of more expensive healthcare technology. General inflation published by the Indonesian Central Bureau of Statistics, known as *Badan Pusat Statistik* (BPS), is much lower than medical cost inflation. Medical costs are increasing much faster than general inflation, which could challenge the sustainability of the elderly healthcare insurance system due to increasing pressure on the healthcare budget [24]. In 2022 and 2023, medical costs in the retired population jumped higher than the MMB-published medical cost inflation. The higher value may occur because medical inflation in retirees tends to have a homogeneous risk as a high-risk population. MMB published inflation covers medical cost inflation for the general population with broader age coverage, not just the older population, allowing for risk sharing. The fact that inflation in the retired population is higher than that in the general population is also highly recommended, as companies monitor medical inflation, specifically in retirees, and policies are needed to control medical inflation to keep it affordable. In addition, the institution that issued the medical cost inflation value was not MMB but also from the WHO study, Willis Tower Watson (WTW), AON, and several other institutions that manage insurance. WHO study shows that hospital costs in Indonesia increased by 364% between 2000–2010, with an average increase of 12–15% per year over the past ten years [32]. Through the Global Medical Trends Survey, Willis Towers Watson presents the value of health cost inflation in Indonesia at 10.33% in 2019, 9.97% in 2020, and 12% in 2021 [33]. Indonesia's health inflation data on the Global Medical Trend Rates conducted by AON shows the value of health cost inflation of 12.7% in 2023 [34].

This study also shows increased costs and relative risk in older age groups. The increase in the elderly group indicates that more and more individuals are at a vulnerable age with higher health risks. The health system must prepare for the increasing burden of healthcare costs for the elderly. Resource planning and retirement policies need to consider the level of cost increase indicated by the relative risk value of costs by age category. Mapping high-risk populations can be a first step in preparing a health system that suits the needs of retirees. Based on sex, females have a higher life expectancy but a lower average cost per person than males, indicating differences in health services or disease risk profiles. This study shows that females have medical costs of around 79% of the costs incurred by males. Lower medical costs for females are possible due to differences in disease patterns between males and females [35]. For example, the risk of cardiovascular disease tends to be higher in males, while females who live longer may experience more degenerative conditions. Females tend to live longer, increasing their likelihood of developing degenerative diseases such as osteoporosis, arthritis, Alzheimer's, and dementia. When examining trends in high-cost diseases, such as cardiovascular conditions, kidney disease, prostate disorders, diabetes, and breast cancer, males were found to be at greater risk for

cardiovascular, kidney, and prostate-related illnesses, while females showed a higher prevalence of diabetes and breast cancer. Within the population at that time, the number of females exceeded that of males. This demographic distribution resulted in a larger denominator when calculating the cost per person for females, thereby producing a lower average cost. On the other hand, the higher total medical costs for males were distributed over a smaller population base, resulting in a higher cost per person.

Based on the diagnosis in retirees, cardiovascular disease and diabetes are contributors to high-cost diseases. The proportion of cardiovascular disease expenditure is 37%. This amount exceeds the costs of Indonesian national health insurance by 21% [36]. The high prevalence of hypertension and type 2 diabetes mellitus, if not appropriately managed, can lead to high-cost complications in the future. Hypertension and heart disease are increasingly dominant. Without intervention, hypertension will increase the risk of complications such as stroke and heart failure in the next few years [37,38]. At the same time, diabetes contributes to more complications, such as kidney disease, nerve problems, and heart disease [39]. As a policy recommendation, diabetes and hypertension management must be prioritized. The insurance company can target the control of hypertension, diabetes, and heart disease so that they do not develop into more severe conditions, thereby reducing the cost of services per person.

Specialist outpatients have a cost risk of 3.06 times higher than clinic outpatients. Inpatients have a cost risk 14.39 times higher than clinic outpatients. This shows that inpatient care has the most significant cost impact on the health system. High costs are influenced not only by the severity of the disease suffered but also by the medical technology used. In some conditions, patients require the use of expensive medical technology. Although improving the quality of care, technological advances and the use of sophisticated drugs and procedures also contribute to rising costs. Patient payments, the government, and insurance companies have increased 200-fold in America over the past 70 years. Spending can increase significantly, which is associated with increasing the intensity and quality of services [40].

With the aging population continuing to grow, the percentage of medical costs for the older group, more than 66 years and over, will increase and dominate the cost distribution by age group in the population. The increasing prevalence of chronic diseases indicates the need for more long-term care, both in hospitals and home care. This study also shows that when age increases, medical costs increase mainly due to the high need for hospitalization and medical examinations. When there is an increase in specialist care, it can mean that the health cases suffered by the population are more complex and have higher severity. Because inpatient care has the most significant cost impact on the health system, it is recommended to reevaluate current health service management and health problems in the population to ensure the service is effective and efficient. As an option, health service insurance managers can increase their focus on disease prevention and management at the clinic level to reduce the need for hospitalization. Managed care management can be an alternative by increasing access to general practitioners or family doctor services, preventing patients from going directly to specialists [29]. Evaluation of clinic and hospital performance is also needed to ensure that supply does not induce demand [29,41]. Strengthening the clinic is accompanied by implementing a stricter referral system so that only complex cases receive specialist care. Chronic kidney disease also results in higher medical cost distribution. However, its prevalence is lower than other diseases. To manage chronic kidney disease as the highest medical cost contributor, we need to develop special policies for the prevention and management of chronic kidney disease, considering the large proportion of medical treatment (60.73% of total expenditure for N18) and is always the top 2 diseases with the highest costs in last 2 years.

Medicine and medical procedures absorb most of the health budget across all age groups. The results of this study are the same as Wammes's finding in the Netherlands, which shows that expensive medical procedures contribute to higher health costs for the elderly [9]. Optimizing drug and medical treatment costs is one of the important things to do when managing retiree health services. With the increase, it is advisable to review the drug procurement strategy to get more competitive prices. Interventions in drugs can be done by optimizing drug regulations and increasing the use of high-quality generics. Efficient medical treatment is also needed for high-cost control to reduce unnecessary treatment. In developed countries, technology such as

telemedicine and more sophisticated diagnostic tools can help reduce the cost of supporting examinations, which currently account for a significant portion of health service costs [42]. Interventions using the latest technology must be chosen carefully and adjusted to population conditions because they can risk increasing costs for initial investment and high-technology maintenance [43].

If costs continue to rise without increasing income or contributions from active participants, the health insurance system for the elderly could face a potential deficit in the retiree health program. Several alternative financial interventions can be taken as solutions, such as policies to adjust employer contributions and health benefits to maintain the financial balance of the pension and health systems. Regarding financing, funding sources should be diversified through cooperation with the Indonesian National Health Insurance program as a mandatory program for Indonesian citizens or cost-sharing with participants [29,44]. For population intervention, strengthening the Disease Prevention Program focuses on preventing chronic diseases (diabetes, hypertension, heart and kidney disease), which are often the main causes of high medical costs. Healthy lifestyle programs for the elderly include sports subsidies, healthy diets, easy access to routine check-ups, increased vaccination, and early health screening to prevent medical complications. The expected results are a reduction in the number of elderly needing intensive medical care, thereby reducing the hospital burden and inpatient costs.

This study is limited when analyzing the medical costs of multiple diseases because it only used the primary diagnosis without considering the secondary diagnosis. Various literature shows that multimorbidity affects the severity of the disease, which will impact the type of service and the costs incurred [45,46]. For generalization purposes, this study was limited because the population included only one employer from a specific industry category. Further research was highly recommended to explore the impact of multimorbidity and disease severity on the types of healthcare services utilized and the costs incurred among the retiree population. Understanding how multiple chronic conditions and the severity of illnesses influenced service needs and expenditures would have provided valuable insights for health planning and resource allocation. Additionally, future studies were suggested to examine interventions that were specifically tailored to the health problems commonly faced by retirees, considering the diversity in employment backgrounds and industries. Since health profiles and service needs varied depending on retirees' previous work environments, a broader analysis involving various employers would have enhanced the generalizability and applicability of the findings.

Conclusion

This study found higher medical cost inflation in retirees compared to the general population, driven by aging, high-cost diseases, increased healthcare utilization, and rising treatment costs. Cardiovascular, kidney, and diabetes-related diseases are the primary cost drivers, leading to more specialist visits and increased hospitalizations. Medications and medical procedures comprise the most significant portion of retiree medical costs. Recommended interventions for cost control and sustainability like strengthening preventive and promotive programs, improving clinical effectiveness as a gatekeeper, and diversifying funding sources for healthcare sustainability.

Ethics approval

Not Required.

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None.

Competing interests

All the authors declare that there are no conflicts of interest.

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Underlying data

User demographic data and healthcare service history of retirees for this study were obtained from Yayasan Kesehatan (YAKES), the institution appointed by the employer to manage retiree healthcare services. Data access was granted under approval number 002/YK1220/2024-S0 and was limited to the scope and objectives of this study. This data is not publicly available and can only be accessed with direct approval from Yayasan Kesehatan.

Declaration of artificial intelligence use

We hereby confirm that no artificial intelligence (AI) tools or methodologies were utilized at any stage of this study, including during data collection, analysis, visualization, or manuscript preparation. All work presented in this study was conducted manually by the authors without the assistance of AI-based tools or systems.

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References

1. Ataguba JE, Kabaniha GA. Characterizing key misconceptions of equity in health financing for universal health coverage. Health Policy Plan 2022;37(7):928-931.
2. Weiner J, Glickman A, Wikelius K, *et al*. What is "affordable" health care?: A review of concepts to guide policymakers. Philadelphia: Leonard Davis Institute of Health Economics; 2018.
3. Kementerian Kesehatan RI. Kelompok usia lansia 60+ tahun. Available from: https://ayosehat.kemkes.go.id/kategori-usia/lansia. Accessed: 8 September 2024.
4. Omran AR. The epidemiologic transition theory revisited thirty years later. World Health Stat Q 1998;53(2,3,4):99-119.
5. Tooth L, Hockey R, Byles J, Dobson A. Weighted multimorbidity indexes predicted mortality, health service use, and health-related quality of life in older women. J Clin Epidemiol 2008;61(2):151-159.
6. Lucifora C, Vigani D. Health care utilization at retirement: The role of the opportunity cost of time. Health Econ 2018;27(12):2030-2050.
7. Dave D, Rashad I, Spasojevic J. The effects of retirement on physical and mental health outcomes. South Econ J 2008;75(2):497-523.
8. Zulman DM, Pal Chee C, Wagner TH, *et al*. Multimorbidity and healthcare utilisation among high-cost patients in the US Veterans Affairs Health Care System. BMJ Open 2015;5(4):e007771.
9. Wammes JJG, Tanke M, Jonkers W, *et al*. Characteristics and healthcare utilisation patterns of high-cost beneficiaries in the Netherlands: A cross-sectional claims database study. BMJ Open 2017;7(11):e017775.
10. Chen J, Zhao M, Zhou R, *et al*. How heavy is the medical expense burden among the older adults and what are the contributing factors? A literature review and problem-based analysis. Front Public Health 2023;11:1165381.
11. Ridho SLZ, Sabli HBHM, Setiawan H. The cross-provincial data of life expectancy effect on pension fund in Indonesia. Int J Soc Sci Bus 2021;5:193-199.
12. Faizah UZ, Widajanti N, Ichwani J. Two-year mortality profile in elderly with frailty: Observational descriptive study in elderly health community in Surabaya, Indonesia. J Community Med Public Health Res 2022;3(1):26-37.
13. Ananta A, Moeis AIA, Widianto HT, *et al*. Pension and active ageing: Lessons learned from civil servants in Indonesia. Soc Sci 2021;10(11):436.
14. Axene D. Health care affordability: A valuable concept in understanding our health care system challenges. In: Health section news. Chicago: Society of Actuaries; 2003.
15. Pitacco E. Health insurance: Basic actuarial models. Cham: Springer; 2014.
16. Putri M, Sugiyanto C. The retirement consumption puzzle effect in Indonesia: Evidence from IFLS 4 and 5. J Indones Econ Bus 2024;39:1-27.
17. Evers SM, Van Wijk AS, Ament AJ. Economic evaluation of mental health care interventions. A review. Health Econ 1997;6(2):161-177.
18. World Health Organization. International statistical classification of diseases and related health problems, 10th revision, Fifth edition, 2016 edition. Geneva: World Health Organization; 2015.

19. Hansen DR, Mowen MM. Managerial accounting 8th edition. Mason: Thomson South-Western; 2007.
20. Mantra IB. Demografi umum, edisi 2 edition. Yogyakarta: Pustaka Pelajar; 2000.
21. The Public Health Agency of Canada. Economic burden of illness in Canada, 2010. Ottawa: Public Health Agency of Canada; 2017.
22. Coale AJ, Demeny P, Vaughan B. Regional model life tables and stables populations, 2nd edition. New York: Academic Press; 1983.
23. MacMahon B, Pugh TF. Epidemiology: Principles and methods. Boston: Little Brown; 1970.
24. MercerMarsh Benefits. Health trends 2024: Getting the right balance between managing costs and meeting employee needs. New York: Mercer Marsh Benefits; 2024.
25. Gordis L. Epidemiology, 5th edition. Philadelphia: Elsevier Health Sciences; 2013.
26. Schneider D, Lilienfeld D. Lilienfeld's foundations of epidemiology. New York: Oxford University Press; 2015.
27. Gerstman BB. Epidemiology kept simple, 2nd edition. California: Wiley-Liss; 2003.
28. Samir K. Population stabilization, human. In: Levin SA, editor. Encyclopedia of Biodiversity (Second Edition). Waltham: Elsevier/Academic Press; 2013: 199-209.
29. Morrisey MA. Health insurance, 2nd edition. Washington: AUPHA Press; 2008.
30. Newhouse JP, Marquis MS. The norms hypothesis and the demand for medical care. J Hum Resour 1978;13:159-182.
31. Prieto DC, Lago-Peñas S. Decomposing the determinants of health care expenditure: The case of Spain. Eur J Health Econ 2012;13(1):19-27.
32. Astuti IY. Analisis penetapan unit cost layanan kesehatan (studi pada Rumah Sakit Jiwa Prof. Dr. Soerojo Magelang). ABIS 2019;7(4).
33. Watson WT. 2021 global medical trends survey report: Global average medical trends by country, 2019-2021. Chigago: Willis Tower Watson Plc; 2022.
34. AON. 2024 global medical trend rates report. Aberdeen: AON Plc; 2024.
35. Pinn VW. Sex and gender factors in medical studies: Implications for health and clinical practice. JAMA 2003;289(4):397-400.
36. Ahdiat A. Jumlah dan biaya kasus penyakit katastropik yang ditanggung BPJS kesehatan (2020-2022). Available from: https://databoks.katadata.co.id/datapublish/2023/07/03/kasus-penyakit-katastropik-di-indonesia-meningkat-pada-2022. Accessed: 12 march 2024.
37. Guo S, Liu X, Gu Z, *et al*. Association of hypertension burden with stroke risk in patients with heart failure with preserved ejection fraction. Heliyon 2024;10(6):e27551.
38. Oh GC, Cho H-J. Blood pressure and heart failure. Clin Hypertens 2020;26(1):1.
39. Nickerson HD, Dutta S. Diabetic complications: Current challenges and opportunities. J Cardiovasc Transl Res 2012;5(4):375-379.
40. Getzen TE. Health economics and financing - 5th Edition. New Jersey: Wiley; 2013.
41. Seyedin H, Afshari M, Isfahani P, *et al*. The main factors of supplier-induced demand in health care: A qualitative study. J Educ Health Promot 2021;10:49.
42. Stoeva M. Technological advancement as a driving factor of contemporary healthcare. Health Technol 2020;10(3):563-565.
43. Johansen T, Ackerman E, Abidakun M, *et al*. Evaluating digital and technology-driven transformations in healthcare: Taking the SOFT approach (YEL2021). Available from: https://ihf-fih.org/news-insights/the-soft-approach/. Accessed: 11 January 2025.
44. Ellis RP, McGuire TG. Supply-side and demand-side cost sharing in health care. J Econ Perspect 1993;7(4):135-151.
45. Marengoni A, Angleman S, Melis R, *et al*. Aging with multimorbidity: A systematic review of the literature. Ageing Res Rev 2011;10(4):430-439.
46. Nimako BA, Baiden F, Sackey SO, Binka F. Multimorbidity of chronic diseases among adult patients presenting to an inner-city clinic in Ghana. Global Health 2013;9(1):61.