INDONESIAN HEALTH JOURNAL
https://ihj.rivierapublishing.id/index.php/rp
Volume 5 Number 1, March 2026
P-ISSN: 2963-3044
E-ISSN: 2963-3036

Provincial Analysis of Years of Life Lost and Economic Impact of Heart Disease Among the Working-Age Population in Indonesia (2018-2023)

Antokalina Sari Verdiana*, Mitha Cerinda, Rizal Mansur, Fentya Yumna Cahyani
BPJS Kesehatan, Indonesia
Email: antokalina@bpjs-kesehatan.go.id* , mitha.cerinda@bpjs-kesehatan.go.id, rizal.mansur@bpjs-kesehatan.go.id, fentya.yumna@bpjs-kesehatan.go.id

ABSTRACK

Heart disease is the leading cause of premature death in Indonesia, significantly impacting both health and the economy. In 2023, BPJS Kesehatan allocated IDR 23.52 trillion for heart disease treatment, the highest expenditure among all diseases. This study aims to quantify the burden of heart disease by calculating years of life lost (YLL) and productivity costs, highlighting the need for effective prevention strategies. Using BPJS Kesehatan mortality data from 2018–2023, covering 218,279 individuals, this study identified heart disease-related deaths and calculated YLL using the Burden of Disease framework and World Health Organization (WHO) life expectancy tables. The analysis focused on the working-age population (15–64 years) at national and provincial levels, linking YLL data to provincial minimum wages, with a gender-based analysis. Significant variations in productivity losses due to heart disease were found across provinces. Central Java had the highest loss (IDR 9.39 trillion), followed by East Java (IDR 9.20 trillion). Jakarta, with the highest minimum wage, had a comparatively smaller loss (IDR 7.92 trillion). Males accounted for 65% of productivity losses. These findings underscore the need for targeted health interventions to reduce YLL and mitigate economic burdens through early detection, improved healthcare access, and public health campaigns.

Keywords: *Heart disease; Years of Life Lost (YLL); Productivity costs*

INTRODUCTION

Heart disease is still one of the leading causes of premature death in various countries, including Indonesia, and poses a substantial health burden on the community. This burden is not only reflected in the high mortality rate but also in the loss of potential productivity of the working-age population due to premature death (Hanly et al., 2015; Kochovska et al., 2018; Ortega-Ortega et al., 2023). In the context of modern public health, Years of Life Lost (YLL) is the primary indicator used to illustrate the magnitude of the burden of premature death. This indicator confirms that heart disease continues to significantly impact the decline in life expectancy and quality of life, especially among the productive-age population. Research by Bloom et al. (2022) shows that heart disease is one of the major contributors to premature death globally, with a substantial impact on life expectancy and quality of life.

In Indonesia, heart disease is recorded as the most expensive disease in the financing of health services covered by BPJS Kesehatan (Darmawan et al., 2025; Nurwahyuni et al., 2023; Zakiyah et al., 2024). In 2023, BPJS Kesehatan allocated IDR 23.52 trillion for the treatment of heart disease, with a total of 20.04 million cases recorded throughout the year. This figure illustrates the magnitude of the economic burden borne by the government, the health system, and society as a whole. This cost burden also reflects the high prevalence, the long-term care needs, and the complexity of heart disease management in the country. Research by Bloom et al. (2022) confirms that heart disease is a major global contributor to premature death, significantly affecting life expectancy and quality of life.

Beyond direct health costs, the economic burden of heart disease is also reflected in the loss of productivity among the working-age population. The population aged 15–64 years represents the most economically active group, so premature death within this group can result in substantial economic losses (Kozlova & Zubarev, 2020; Kumar et al., 2025; Morev & Korolenko, 2018; Norheim et al., 2015). Measuring lost productivity using the YLL approach and linking the value of YLL to the provincial minimum wage provides a comprehensive view of the economic impact experienced by each region. Therefore, province-based economic burden analysis is essential to understand regional disparities. Research by Roth et al. (2020) confirms that YLL provides a comprehensive perspective on the economic impact of heart disease by linking productivity losses to the provincial minimum wage.

Preliminary findings at the provincial level suggest substantial variation in the economic burden of heart disease. Provinces such as Central Java and East Java suffered the largest productivity losses, reaching IDR 9.39 trillion and IDR 9.20 trillion, respectively, despite having relatively low annual minimum wages compared to regions such as DKI Jakarta. Conversely, Jakarta—despite a significant YLL figure—showed a lower total economic loss than these two provinces. This confirms that population size and the distribution of death cases play a critical role in determining economic losses in a region (Kozlova et al., 2017; Qiu et al., 2020; Shi et al., 2016).

Moreover, there is a notable difference in lost productivity between men and women. Gender analysis shows that men account for approximately 65% of overall productivity losses, while women account for 35%. These differences indicate distinct health vulnerabilities and occupational risks between genders, which should be considered in the formulation of health policies and preventive interventions (Biswas et al., 2021; Hanvold et al., 2019; Santoro et al., 2022).

Given the high YLL rate and the magnitude of the associated economic losses, research on the burden of heart disease in Indonesia is essential to support evidence-based health policies. YLL analysis and province-level economic impact data allow policymakers to identify areas requiring intervention priorities. Such findings are particularly relevant for the development of national strategies in the prevention and management of heart disease, including early detection, health education, and equitable access to health services.

Therefore, this study was conducted to calculate the amount of Years of Life Lost (YLL) due to heart disease in Indonesia, particularly in the productive-age group, and to assess the economic losses based on the provincial minimum wage. By presenting a comprehensive analysis at both national and provincial levels, this study is expected to provide an accurate picture of the magnitude of the health and economic burden of heart disease. These findings are also expected to serve as the foundation for more effective, targeted, and equitable health policies aimed at reducing premature deaths from heart disease.

This study aims to calculate the YLL caused by heart disease in Indonesia, especially in the productive age group, and to assess the resulting economic losses based on the provincial minimum wage. By presenting a comprehensive analysis at the national and provincial levels, this study is expected to provide an accurate picture of the magnitude of the health and economic burden due to heart disease. These findings are also expected to be the basis for the formulation of more effective, targeted, and equitable health policies in reducing premature deaths from heart disease.

METHOD

This study used a descriptive quantitative approach to analyze the burden of heart disease in Indonesia through the calculation of Years of Life Lost (YLL) and the estimation of economic losses due to the loss of productivity among the working-age population. The analysis was carried out using data on population deaths covered by the BPJS Kesehatan system during the 2018–2023 period, with a total of 218,279 individuals identified as having died from heart disease. Case identification was conducted using a specific diagnosis code that indicates death due to heart disease, ensuring that the data obtained had accuracy in estimating the mortality burden.

The calculation of Years of Life Lost (YLL) was performed using the internationally accepted Burden of Disease Study framework. In this approach, each death was calculated based on the difference between the age at death and the standard life expectancy set by the WHO. The WHO life expectancy table was used as a reference to determine the number of years of life lost due to premature death for each individual. This approach provided a quantitative picture of how the mortality burden impacts the reduction of the population's potential life years.

The analysis was conducted at two levels, namely national and provincial, to examine variations in YLL burdens and their economic impact across different regional contexts. The study also specifically focused on the productive-age group (15–64 years) to measure the amount of potential economic productivity lost due to premature death. The selection of the productive-age focus was based on the consideration that this group constitutes the main contributor to the economy and represents active human resources in Indonesia.

To estimate economic losses, the study linked the total YLL in the working-age group to the annual Provincial Minimum Wage (UMP) in each region. Each year of life lost was considered to represent one year of lost productivity, so the economic value was calculated by multiplying the total YLL by the provincial UMP per year. This approach provided a realistic estimate of productivity losses and could be used as a reference for economic and health policy formulation.

In addition to the region-level analysis, this study also conducted a gender-based analysis by comparing YLL and economic losses between men and women. Mortality data were separated by gender to identify differences in mortality patterns and economic impacts between genders. This analysis was important because work structure, risk exposure, and access to health services can differ between men and women, affecting the distribution of the health burden.

The entire data processing workflow, from the extraction of death data to the calculation of YLL and economic losses, was carried out systematically using statistical software. This approach ensured that the analysis produced was objective, replicable, and provided a comprehensive picture of the burden of heart disease in Indonesia. With this methodological framework, the research was expected to provide a strong scientific basis for the formulation of more targeted heart disease prevention policies and interventions.

RESULTS AND DISCUSSION

Research Results

Overview of Years of Life Lost (YLL) due to Heart Disease

Analysis of 218,279 deaths due to heart disease recorded by BPJS Kesehatan during 2018–2023 shows that heart disease makes a significant contribution to the loss of productive age of the Indonesian people. The YLL calculation based on WHO life expectancy shows that most deaths occur in the working-age group (15–64 years), thus having a major impact on the national economic potential.

The variation in YLL between provinces also shows a gap in the burden of heart disease. Provinces with large populations such as Central Java and East Java have the highest YLL, in line with the high number of deaths due to heart disease.

Estimated Economic Productivity Loss

The total association of YLL with the Provincial Minimum Wage (UMP) results in an estimated large economic loss in densely populated areas. Central Java and East Java were recorded as the provinces with the largest economic losses, reaching Rp 9.39 trillion and Rp 9.20 trillion, respectively, despite having relatively low annual UMP.

On the other hand, DKI Jakarta, which has the highest UMP, actually shows a lower total economic loss, namely Rp 7.92 trillion, because the number of YLL is relatively smaller than provinces with larger populations.

Differences in Economic Burden by Gender

Analysis shows that men account for 65% of productivity losses, while women account for 35%. This difference can be attributed to the high prevalence of heart disease risk factors in men, as well as the dominance of men in economic activities at productive age.

Table 1. Estimated Productivity Losses Due to Heart Disease in the Three Highest Provinces

Province	Total Economic Losses (Trillion Rp)	Annual Provincial Minimum Wage (Rp Million)	Gender Proportion (Male/Female)
Central Java	9,39	23,5	65% / 35%
East Java	9,20	24,4	65% / 35%
DKI Jakarta	7,92	58,8	65% / 35%

Source: Analysis based on BPJS Kesehatan data 2018–2023

Discussion

Variation in YLL Load between provinces

The findings of this study show that provinces with large populations and high levels of urbanization have a greater burden of YLL. Central Java and East Java are the largest contributors to YLL nationally. This can be influenced by several factors:

- Large productive age population.
- The prevalence of high risk factors, such as hypertension, obesity, and consumption of foods high in salt.
- Unequal access to health services, especially in suburban and rural areas.

Despite having a low UMP, the high population contributes to enormous economic losses due to the large number of productive workers who die prematurely.

Economic Loss Imbalance by Region

A comparison between Central Java, East Java, and DKI Jakarta reveals an economic paradox: a high UMP does not always result in the greatest economic loss, because the size of the productive population and the number of deaths are more influential than the value of wages themselves.

Jakarta has higher labor costs, but the number of YLL is smaller so the total economic losses are lower. This indicates that:

- Regions with better health access tend to have a lower YLL burden.
- Preventive health interventions, such as early screening, are more effectively implemented in urban areas.
- The quality of cardiovascular services plays a major role in reducing premature mortality.

Gender Differences in Productivity Burden

Men account for 65% of national productivity losses. Some of the reasons supporting these findings include:

- Men have a higher prevalence of risk factors (smoking, alcohol consumption, work stress).
- Men's economic activity is higher, so premature death in this group has a greater economic impact.
- Lifestyle and exposure to the work environment play a role in accelerating the decline of cardiovascular health.

These results underscore the need for screening and intervention programs that focus on the male population of productive age, especially those working in the industrial and transport sectors.

Policy Implications

This research provides a solid basis that heart disease is a serious threat to national productivity. Some policy implications to consider:

1. Prioritizing Provinces with YLL and high economic losses, such as Central Java and East Java.
2. Improving early detection programs through cardiovascular risk screening in primary health facilities.
3. Strengthening behavior change campaigns, especially in men of productive age.
4. Invest in regional cardiology services, to reduce disparities between regions.
5. Integration of YLL analysis and economic costs in BPJS planning, so that interventions are more targeted.

CONCLUSION

This study demonstrates that heart disease imposes a substantial public health and economic burden in Indonesia, primarily through the loss of Years of Life Lost (YLL) among the productive-age population. Analysis of BPJS Kesehatan data from 2018–2023 indicates that populous provinces such as Central Java and East Java incur the highest economic losses despite relatively low Provincial Minimum Wages (UMP), whereas DKI Jakarta, with the highest UMP, shows smaller losses due to fewer YLL. This highlights that the number of premature deaths has a greater influence on economic impact than regional income levels.

Gender differences are also evident, with men accounting for approximately 65% of productivity losses, underscoring the importance of targeted, gender-specific interventions in heart disease prevention and management. Overall, these findings emphasize the need for focused and equitable public health strategies across provinces, including early detection, health education, and improved access to cardiovascular services. Future research should explore the underlying factors contributing to regional and gender disparities in YLL and economic losses, as well as evaluate the effectiveness of tailored interventions to reduce premature mortality from heart disease.

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