

# Socioeconomic Disparities in Infant Mortality: Evidence from the 2017 Indonesia Demographic and Health Survey

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| ARTICLE INFO                                                                                                                                                                          | ABSTRACT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |  |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|
| Manuscript Received: 11 Jan, 2025<br>Revised: 08 Feb, 2025<br>Accepted: 07 Mar, 2025<br>Date of Publication: 09 Apr, 2025<br>Volume: 8<br>Issue: 4<br>DOL: 10.56228/mapple: v9:4.6850 | <ul> <li>Introduction: Indonesia did not meet the MDGs and SDGs targets. Factors contribute to the reduction of infant mortality in Indonesia in the last decade need to be unders:</li> <li>Methods: This cross-sectional study uses a dataset from the 2017 Indonesia Demogrand Health Survey (IDHS). The sample size is 3413 infants. Multiple logistic regree results are performed by odds ratio (OR).</li> <li>Results: Infants living in the middle wealth index were at higher risk of infant</li> </ul> |  |  |  |
| KEYWORDS                                                                                                                                                                              | compared to infants with the poorest and poor counterparts (AOR=1.73; 95% CI=1.14~2.61). The risk of infant death was almost two times higher among infants who were horn in Sumators (AOR=1.82; $05\%$ CI=1.02, 2.27). Let a and Pali (AOR=2.14, 05%                                                                                                                                                                                                                                                            |  |  |  |
| Drinking Water;<br>Infant Death;<br>Region;<br>Residence Type;<br>Wealth Index                                                                                                        | CI=1.21~3.76), and Sulawesi (AOR=2.39; 95% CI=1.02~3.27), Java and Bali (AOR=2.14, 95% CI=1.21~3.76), and Sulawesi (AOR=2.39; 95% CI=1.15~4.96) than infants who were born in Papua and Maluku.<br><b>Conclusion:</b> Infants living in the middle wealth index, Sumatera, Java and Bali, and Sulawesi had a higher mortality risk than others.                                                                                                                                                                  |  |  |  |

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### **INTRODUCTION**

Infant and child mortality is a global issue that is one of the United Nations Sustainable Development Goals (SDGs) (1). The Infant Mortality Rate (IMR) is the key to population health and a measure of health disparities between communities (2, 3), in various countries, especially for developing countries. The Sustainable Development Goals (SDGs) in 2030 are for neonatal mortality of 12 deaths per 1000 live births and under-five mortality of 25 deaths per 1000 live births (4). Globally, the IMR worldwide has decreased from 63 deaths per 1000 live births from 1990 to 1995 to 23 deaths per 1000 live births in 2025 (5,6). Meanwhile, the Infant Mortality Rate (IMR) in Indonesia has decreased from 32 per 1,000 live births (2012), to 29 per 1,000 live births (2017) (5, 7). However, this decline is far from the target set by SDGs in 2030.

Previous research has revealed a strong relationship between sociodemographic, maternal, and infant factors. Infant mortality has been linked to socioeconomic situations and health-related factors such as income, education, fertility, and housing (3). A study conducted in Sierra Leone found that the most common predictor of under-five mortality was the community level, such as the area of residency (8), because geographical areas have various features for health and environmental factors (9,10). However, factors contributing to the reduction of infant mortality in Indonesia in the last decade need to be understood.

Indonesia has a big and diversified population, necessitating increasing efforts to minimize the death rate of children under the age of five. Infant mortality is avoidable (11). As a result, there is an urgent need to identify the factors that cause infant death at the community and socioeconomic levels so that appropriate interventions can be developed. On the other hand, there were relatively little in the published studies about factors associated with infant mortality in Indonesia. Those studies have generally not used the national representative data. The present study was conducted in Indonesia, focused on infant death, and used a national database with a high response of around 97-99%. The potential factors associated with infant mortality will be assessed, based on the conceptual framework of child survival. As a result, the purpose of this study is to investigate the influence of socioeconomic and related to infant mortality at various levels in Indonesia.

#### **METHOD**

The study uses a cross-sectional design to estimate the association between risk factors and infant death in Indonesia using data sources from the 2017 IDHS. Information collected through the IDHS survey is subject to reporting bias although detailed evaluation of DHS data indicates that these data are fairly well reported. Likewise, problems related to unequal weighting of sample units. The status of the infant mortality variable has the potential to produce recall bias, so it is necessary to recheck and validate the maternal and child health book. The author has carried out weighting before the data is analyzed. The sampling design of the IDHS used two-stage stratified sampling, including national and province-level, and covered census blocks covering rural and urban areas. The woman who gave birth in the last five years, only having a singleton baby, was identified and eligible as a respondent. The sample size was 3,413 infants.

The selection of independent variables such as wealth index and type of residence is based on previous research, which explains that research results are inconsistent (9,12,13). Likewise, research on the relationship between regional variables and infant mortality in Indonesia is limited (1, 17). The dependent variable is infant death, dichotomized into two groups which are survived and did not survive. The independent variables are proximate factors such as wealth index, residence area, region type, and source of drinking water. The operational definitions of dependent variables are described in Table 1.

| Variables social economic | Definition and category                                                                                                                                                                                                                               |  |  |  |  |
|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|
| Wealth index              | economic parameter status in the household.                                                                                                                                                                                                           |  |  |  |  |
|                           | 1= poorest and poor (Ref); 2= middle; 3=richest and richer                                                                                                                                                                                            |  |  |  |  |
| Region                    | the administrative province where the participants live based on Indonesia's regional disparities of maternal and health care utilization.<br>1= Papua and Maluku (Ref); 2= Sumatera; 3=Java and Bali; 4=Nusa Tenggara; 5= Kalimantan; and 6=Sulawesi |  |  |  |  |

Table 1. Operational definition and categorizations of explanatory variables

| Variables social economic | Definition and category                         |  |  |
|---------------------------|-------------------------------------------------|--|--|
| Residence type            | area/type of cluster.                           |  |  |
|                           | 1= urban (Ref); 2= rural                        |  |  |
| Source of drinking water  | access to safe drinking water for the household |  |  |
| _                         | 1= un improved source (Ref); 2= improved source |  |  |

Descriptive statistical analysis is performed by frequency and percentage of each variable. Chi-square and Logistic regression tests were used to determine the association between infant death and each predictor variable. The crude odds ratio performed the statistical test result. A multivariate logistic regression to control for potential confounders was performed by adjusted odds ratio (aOR). Challenges in secondary data analysis are related to data limitations and quality, so the authors carry out data cleaning, including deleting invalid data, normalizing data, and handling missing values before the data is analyzed. Another challenge is overfitting. Authors should perform cross-validation and regulation techniques to test model reliability and reduce complexity.

#### **Ethical Approval**

The Research Ethics Committee of Universitas Ahmad Dahlan has approved for human research, Number: 012107048

### **RESULTS**

Table 2 list the characteristics of infant death. The highest percentage of wealth index is the poorest and poorest status, living in Java and Bali region, and rural area residents, and using unimproved drinking water.

| Table 2.  | Distribution | of infant | death by | v selected | factors in | <b>IDHS</b> | 2017 |
|-----------|--------------|-----------|----------|------------|------------|-------------|------|
| 1 4010 2. | Distribution | or mane   | acath o  | ,          | Incroit II |             | 2017 |

|                           | IDHS 2017                 |       |  |
|---------------------------|---------------------------|-------|--|
| Variables Social Economic | <u> </u>                  | %     |  |
|                           | $\mathbf{n} = \mathbf{n}$ | 3413  |  |
| Wealth index              |                           |       |  |
| Poorest and poor          | 1392                      | 40.78 |  |
| Middle                    | 684                       | 20.03 |  |
| Richest and rich          | 1337                      | 39.19 |  |
| Region                    |                           |       |  |
| Papua and Maluku          | 125                       | 3.66  |  |
| Sumatera                  | 822                       | 24.08 |  |
| Java and Bali             | 1849                      | 54.17 |  |
| Nusa Tenggara             | 156                       | 4.57  |  |
| Kalimantan                | 205                       | 5.99  |  |
| Sulawesi                  | 257                       | 7.52  |  |
| Residence type            |                           |       |  |
| Urban                     | 1659                      | 48.60 |  |
| Rural                     | 1754                      | 51.40 |  |
| Source of drinking water  |                           |       |  |
| Un improved source        | 1708                      | 50.04 |  |
| Improved source           | 1705                      | 49.96 |  |



### A description of the child is alive is presented in Figure 1

Figure 1 illustrates that the percentage of a child alive 0-11 months is higher than that of a child not alive.

Table 3 shows the multivariate logistic regression analysis and adjusted ORs. The study found infants living in middle households (aOR=1.7; 95% CI=1.14-2.61) than infants living in poor and poorest wealth index. Furthermore, an infant born in Sumatera (aOR= 1.83; 95% CI= 1.02-3.27), Java and Bali (aOR= 2.14; 95% CI= 1.21-3.76), as well as Sulawesi (aOR= 2.39; 95% CI= 1.15-4.96) were more likely higher to have infant death than those living in Papua and Maluku. Meanwhile, a household with an improved source of drinking water and living in an urban area was not associated with infant death.

| Variables                | Did not survived | Survived | COR (95%CI)        | AOR (95%CI)        |
|--------------------------|------------------|----------|--------------------|--------------------|
| Wealth index             |                  |          |                    |                    |
| Poorest and poor         | 113              | 1279     | Ref                | Ref                |
| Middle                   | 34               | 650      | 1.71 (1.15-2.54)** | 1.73 (1.14-2.61)** |
| Richest and rich         | 92               | 1246     | 1.19 (0.90-1.59)   | 1.24 (0.89-1.73)   |
| Region                   |                  |          |                    |                    |
| Papua and Maluku         | 17               | 108      | Ref                | Ref                |
| Sumatera                 | 61               | 761      | 1.96 (1.10-3.49)*  | 1.83 (1.02-3.27)*  |
| Java and Bali            | 120              | 1729     | 2.26 (1.31-3.90)** | 2.14 (1.21-3.76)** |
| Nusa Tenggara            | 11               | 144      | 1.97 (0.89-4.35)   | 2.00 (0.90-4.41)   |
| Kalimantan               | 14               | 191      | 2.11 (1.00-4.45)*  | 1.96 (0.93-4.16)   |
| Sulawesi                 | 15               | 242      | 2.48 (1.20-5.14)*  | 2.39 (1.15-4.96)*  |
| Residence type           |                  |          |                    |                    |
| Urban                    | 119              | 1539     | Ref                | Ref                |
| Rural                    | 119              | 1636     | 1.07 (0.82-1.39)   | 1.25 (0.93-1.70)   |
| Source of drinking water |                  |          |                    |                    |
| Un-improved source       | 119              | 1589     | Ref                | Ref                |
| Improved source          | 119              | 1588     | 1.00 (0.77-1.30)   | 0.99 (0.75-1.30)   |

Table 3. Bivariate and multivariate analysis of factors associated with infant death.

COR Crude odds ratio; AOR Adjusted odds ratio \*p<0.05 \*\*p<0.01; Indonesia Demographic and health Surveys (IDHS)

# DISCUSSION

Infants with a middle household wealth index were less likely to experience infant death than those with the poor and poorest wealth indices. Increased local economic activity greatly lowers the likelihood of the same woman losing a child before her first birthday (15). A previous study reported that infant mortality was higher in the poor and

middle classes than in the wealthier classes (12–14,16,17). Unskilled health workers are more likely to be born to women with lower household incomes than to those with higher incomes. The likelihood that a woman may take antenatal care for times and Skills Birth Attendance (SBA) during childbirth is higher for those whose household income is high since they can afford to travel to medical facilities and pay for family members to accompany them (18,19). Additional research demonstrates that poor newborns are more likely to be exposed to health risks than their wealthier counterparts, and they have a lower resistance to disease due to malnutrition and other dangers that are prevalent in poor communities. Wealthy people often benefit more from public health subsidies than impoverished persons (20). Potential causes of this elevated infant mortality rate include an increased risk of maternal infection and inadequate access to high-quality healthcare (21). Interestingly, a country's unequal distribution of infant mortality has not been confined to just geographical location and socioeconomic status (22).

Indonesia is an archipelagic country with a characteristic of unequal development speed between regions. This inequality impacts health development, namely the distribution of health facilities and workers, which is not evenly distributed across all islands. This results in disparities in health services between regions (23–26). Areas with good economic movement tend to have good accessibility to healthcare facilities. The utilization of maternity healthcare facilities in the West is better than in the East. The Ministry of Health reported similarly that the average Healthy Family Indicator in eastern Indonesia was very low with a more varied topography (26,27).

This study found that region type is associated with infant death. Research conducted in the United States reported similar results. This area study can be classified into metropolitan, noncore counties, and large metropolis. A study reported that residents residing in noncore counties and large metropolitan had a higher risk of infant mortality, including neonatal deaths, than their counterparts. Our analysis found minimal evidence of a local healthcare resource's independent contribution to higher infant mortality rates in peripheral parts of the United States after controlling for socioeconomic and individual characteristics, even though access to healthcare may have a special significance to maternal and newborn health (28).

A mother mourns the death of her infant. The reality that the mother had given birth to him and cared for him with love, which gave him strength, had disappeared. The close relationship between mother and infant causes the mother to be haunted by feelings of loss throughout her life. These events can cause significant stress. Especially if the child dies in a poor family in a remote area with limited access to health services. The mother will blame herself for her inability to save her baby. Constant emotions of guilt will worsen the mother's stress levels. Mothers should be informed of any causal factors that may enhance stress coping. Confidence in oneself that one is capable, and social support from family (29–31).

In this study, babies born in Sumatra, Java and Bali, and Sulawesi are more prone to die than babies born in Papua and Maluku. These results differ from several studies in Indonesia, which show that Papua and Maluku, Java, Bali, Sumatra, and Sulawesi are known to have much higher infant mortality rates due to dense populations. The eastern region lags behind the western region, especially when compared to the Java-Bali region as the center of government.

Geographically, conditions in the eastern part of Indonesia also show more extreme variability compared to the western part. These conditions make some parts of Eastern Indonesia fall into the category of isolated or remote areas, and some other areas were quite challenging to reach due to the limited availability of roads and public transportation (27). Maluku and Papua were found to have lower disparities in access to health for women and children than Java, Bali and Sumatra. The geography of the Indonesian archipelago makes remote islands challenging to reach. The availability of reliable transportation to these remote islands also influences this situation. Eastern Indonesia also has limited health facilities. The ratio of health centers per sub-district was below the national ratio of health centers per sub-district.

In addition, in the eastern region, there is a belief that health workers have a tough challenge to strive for better maternal health, this does not only apply to the community but also applies to health beliefs encompassed by health workers because they are an inseparable part of the community itself. This condition causes some of the population to have low and very low socioeconomic status, so access to health facilities and services, including the use of ANC in Indonesia, is limited (32–36).

The Indonesian government has set several policies to improve the quality of health services in eastern Indonesia areas with limited access. Filmer reports more specifically on government policies at the micro and macro levels and their implementation, local government capabilities and infrastructure, and access and quality of services. Government policies must be able to provide health services and guarantees, especially for people who are classified as poor. The government can improve the quality of life of children and reduce child mortality rates (37).

Although the results of this study indicate was no relationship between residence and infant mortality, the unevenness of health service infrastructure was also related to rural and urban disparities. Urban areas were likely to use more than people living in rural areas. Residential density causes health development to be concentrated in urban areas. In contrast, rural areas often experience a lack of access to adequate health facilities and services compared to urban areas. Communities have public trust in treating children with the help of traditional birth attendance (38,39). Traditional birth attendances were chosen as birth attendants because the community considers that they pay them cheaper (40,41). This condition was exacerbated by decision-making in rural areas, carried out through family deliberations, resulting in women's powerlessness in accessing health services (42).

### CONCLUSION

Wealth index and region type were the significant determinants of infant death. Infants living in the middle Infants living in the middle wealth index have a higher risk of mortality compared to infants in the poor and poorest. Significant impacts occur on less privileged communities who still struggle to access adequate healthcare services due to low income. The residence remains a barrier for pregnant women to receive proper antenatal care and delivery facilities, as well as healthcare professionals. The distance to hospitals or community health centers was quite far from their homes, especially for those residing in the Papua and Maluku regions. The study still has several limitations. It was not possible to include several potential confounding variables. Recall bias cannot be eliminated with this type of data collection technique.

### RECOMMENDATION

There were various strengths to this study. The IDHSs feature strong response rates and a representative sample that is countrywide. In addition, the study's questionnaire is standardized and has been approved by previous researchers. Some innovations include mobile hospitals, Flying Doctors Health Care (FDHC), sea ambulances, and special budget policies for the Papua and Maluku.

### **AUTHOR'S CONTRIBUTION STATEMENT**

Yuniar Wardani, Suci Musvita Ayu, and Liena Sofiana drafted and finalised the manuscript and interpreted the analysis. Ichtiarini Nurullita Santri and Asa Ismia Bunga Aisyahrani were responsible for data collection and analysis. Mochamad Iqbal Nurmansyah assisted with substantial improvements to the manuscript. Meanwhile, Moh. Irma Sukarelawan assisted in the interpretation of research results and in improving the quality of language.

### **CONFLICTS OF INTEREST**

Both authors declare that they have no competing interests.

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