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# Socioeconomic Determinants and Infant Death in Indonesia

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## ABSTRACT

**Introduction:** Indonesia did not meet the target of MDGs and SDGs. Factors contributing to the reduction of infant mortality in Indonesia in the last decade need to be understood.

**Methods:** This study is cross-sectional and uses a dataset from the 2017 Indonesia Demographic and Health Survey (IDHS). The sample size is 3413 infants. Multiple logistic regression results are performed by odds ratio (OR).

**Results:** Infants living in the middle wealth index were at higher risk of infant death 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 born in Sumatera (AOR=1.83; 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.

**Conclusion:** Infants living in the middle wealth index had a higher risk of mortality than others. The risk of infant death was also higher for infants in middle status than for the poorest and poor.

**KEYWORDS:** Drinking water; Infant death; Region; Residence type; Wealth indeks;

## 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 inequality and the performance of the health service system, as well as the amount of social and health disparities between communities (2, 3), is a valid indication of population health and the performance of health-care systems, as well as the amount of social and health disparities between communities. Infant death contains various information to improve services in the health sector 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). In 2016, infant mortality contributed to more than 75% of all under-five deaths (5). Globally, the IMR worldwide has decreased from 63 deaths per 1000 live births from 1990 to 1995 to deaths per 1000 live births in 2025 (6). Meanwhile, the Infant Mortality Rate (IMR) in Indonesia has decreased for three decades, from 34 per 1,000 live births (2008) to 32 per 1,000 live births (2012), and 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). Previous research 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. 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 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 and independent variables are described in Table 1.

**Table 1.** Operational definition and categorizations of explanatory variables.

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. 1= Papua and Maluku (Ref); 2= Sumatera; 3=Java and Bali; 4=Nusa Tenggara; 5= Kalimantan; and 6=Sulawesi
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). The Research Ethics Committee of Universitas Ahmad Dahlan has approved for human research, Number: 012107048

## RESULTS

Table 2 list the characteristics of infant death. Among 3,413 samples, 6.97% infants did not survive and 93.03% survived infants.

**Table 2.** Distribution of infant death by selected factors in IDHS 2017.

Variables	IDHS 2017	
	n	%
n = 3413		
A child alive 0-11 months		
No	238	6.97
Yes	3175	93.03
<b>Social Economic</b>		
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
2 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

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.

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

2 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)
2 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)

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 (12). A previous study reported that infant mortality was higher in the poor and middle classes than in the wealthier classes (13-17). 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 health care (21). Interestingly, a country's unequal distribution of infant mortality has not been confined to just geographical location and socioeconomic status (22).



This study found that region type 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 (23).

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 (24-26).

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 eastern Indonesia also show more extreme variability than in the western region. These conditions make parts of East Indonesia fall into the category of isolated or remote areas, and some other areas are quite difficult to reach due to the limited available roads and public transportation facilities. 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.

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 (27-31).

## CONCLUSION

Wealth index and region type were the significant determinants of infant death. 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 is 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 are 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. This finding can help the health care provider would better emphasize antenatal counseling and health promotion regarding family planning.

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