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PROTECTING CHILDREN'S HEALTH: THE ROLE OF IMMUNIZATION IN REDUCING MORBIDITY IN INDONESIA

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ABSTRACT

This study aims to analyze the effect of complete immunization on child morbidity, measured based on the child's illness history within the past month. The data used are secondary data from the Indonesia Family Life Survey (IFLS) Wave 5 conducted in 2014, with a total of 739 child respondents. The analytical method employed in this study is the probit estimation model to identify the relationship between immunization status and the likelihood of a child falling ill. The estimation results indicate that children who received complete immunization have a 50.8% lower probability of experiencing illness requiring rest compared to those who did not receive full immunization. These findings support the preventive health approach, wherein immunization plays a vital role in reducing the risk of morbidity among children. In addition, the study also finds that the higher the mother's level of education, the lower the likelihood of child morbidity. This finding underscores the importance of maternal education in health-related decision-making and better child care practices at the household level.

Keywords: Immunization, morbidity, child, probit, IFLS

1. INTRODUCTION

In recent years, several studies have examined child health, as it is one of the key indicators supporting the achievement of the Sustainable Development Goals (SDGs) launched by the United Nations (UN). The SDGs encompass 17 goals and targets for global development by 2030, declared by both developed and developing countries at the UN General Assembly in September 2015. One of these goals is to ensure healthy lives for all people of all ages (United Nations, 2015). As the future generation of the nation, the youth population, namely children under the age of 17, requires special attention, particularly concerning health. Children who are not yet capable of managing their own health are vulnerable to various diseases, especially when their parents fail to monitor their behaviors and the surrounding environmental conditions (Bhargava et al., 2008; Kong et al., 2021).

Child health is a matter of critical importance, as it relates to a child's survival and development into productive adulthood. Children under the age of 17 are included as a target group within Indonesia's health development programs. In 2018, the child population in Indonesia accounted for approximately 30.1 percent of the total population, or around 79.5 million individuals (Kong et al., 2021). Hygiene, dietary patterns, and daily activities are among the factors that influence health. Children are particularly vulnerable to their surrounding environmental conditions, which often results in common health issues

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such as fever, coughing, and suboptimal growth manifested in stunting or weight loss (Fajariyah & Hidajah, 2020).

An individual who is ill generally begins to experience symptoms or health complaints. The 2018 National Socio-Economic Survey (Susenas) defines a person as having a health complaint if they experience physical or mental health disturbances due to acute or chronic illness, accidents, criminal acts, or other causes. A person is considered to be sick if these health complaints interfere with their ability to carry out daily activities. According to the 2018 Susenas data published in the 2019 Indonesian Child Profile (Ministry of Women's Empowerment and Child Protection), 31.59 percent of children aged 0–17 years experienced health complaints. Meanwhile, the proportion of children whose health complaints disrupted their work, schooling, or daily activities thus classified as sick was recorded at 15.89 percent (Kong et al., 2021).

One of the primary ways to prevent the transmission of disease is through immunization in children. Immunization helps protect children from infection, reduces their likelihood of falling ill, and plays a crucial role in preventing disease outbreaks. The importance of immunization is grounded in the paradigm that promotive and preventive efforts are fundamental to improving health status (Mathew, 2012; Rezaeizadeh et al., 2024). Indonesia has implemented its immunization program since 1956, and through this program, the country was declared free from smallpox in 1974. Since then, government initiatives have expanded into broader immunization development programs aimed at preventing the transmission of vaccine-preventable diseases (VPDs), including tuberculosis, diphtheria, pertussis, measles, polio, tetanus, and hepatitis B (Strauss et al., 2016).

According to the Minister of Health Regulation Number 12 of 2017 concerning the implementation of immunization, a child is considered to have received complete basic immunization if they have been administered one dose of Hepatitis B-0 (HB-0), one dose of Bacillus Calmette-Guérin (BCG) vaccine to prevent tuberculosis, three doses of diphtheria-pertussis-tetanus (DPT) vaccine, four doses of oral polio vaccine or three doses of inactivated polio vaccine (IPV), and one dose of measles vaccine (Ministry of Health, 2017). Currently, immunization programs are provided free of charge by the government through midwives, integrated health service posts (posyandu), community health centers (puskesmas), doctors, or hospitals. According to the 2019 Indonesian Child Profile published by the Ministry of Women’s Empowerment and Child Protection, 57.9 percent of children aged 12–23 months had received complete immunization, while 32.9 percent had received incomplete immunization. Nevertheless, there remains a proportion of children aged 12–23 months who have not received any immunization at all.

This study aims to examine the impact of complete immunization on child health and morbidity, as measured by the child's illness history. Utilizing a probit estimation model, this research seeks to identify the effects of complete immunization on children. Previous studies have highlighted the positive impact of immunization on health. Jit et al. (2015) found that basic immunization improves both productivity and long-term health. Similarly, Belay et al. (2025), MacDonald et al. (2024), Shattock et al. (2024) demonstrated that immunization programs enhance survival chances, reduce the risk of stunting, and decrease the incidence of infectious diseases. This study offers a unique contribution by focusing on the health dimension of children based on illness history an aspect that has not been fully explored while adopting the criteria for complete immunization as defined by the Indonesian Ministry of Health. This approach provides a more holistic perspective, allowing for a comprehensive assessment of child health. The study is expected to offer a significant contribution to our understanding of the importance of complete immunization in supporting overall child health and development.

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2. RESEARCH METHODOLOGY

Data

The data used in this study are derived from secondary sources, specifically the Indonesia Family Life Survey (IFLS) Wave 5 conducted in 2014. IFLS is a nationally representative survey that provides longitudinal datasets at the individual, household, and community levels, conducted across 13 provinces in Indonesia. This study integrates data from IFLS 5 to construct a dataset that includes information on child immunization, child health history, and other relevant variables required for the analysis. The IFLS 5 data are utilized to obtain health histories that serve as a basis for measuring child morbidity. Morbidity can be defined as the rate of illness, encompassing both incidence and prevalence of disease, which reflects the occurrence of health conditions over a specific period (Hasan et al., 2021; Nichol, 2011). In this study, morbidity is measured using an indicator of whether the child experienced an illness that required rest within the past month.

The variable of interest in this study is whether the child received complete immunization. According to the Minister of Health Regulation Number 12 of 2017 on the implementation of immunization, a child is considered to have received complete basic immunization if they have received one dose of Hepatitis B-0 (HB-0), one dose of Bacillus Calmette-Guérin (BCG) vaccine to prevent tuberculosis, three doses of diphtheria-pertussis-tetanus (DPT) vaccine, four doses of oral polio vaccine or three doses of inactivated polio vaccine (IPV), and one dose of measles vaccine (Ministry of Health, 2017). Furthermore, IFLS 5 data are also utilized to obtain the control variables included in this study. These control variables consist of the child's age, gender, household expenditure, mother's highest level of education, residential area (rural or urban), and household size. A detailed description of the variables used in this study is presented in Table 1 below.

Table.1 Variable Descriptions

Variables	Description
Outcome Variable	
Morbidity	Child experienced illness requiring rest in the past month, 1=Yes 0=No
Variable of Interest	
Complete Immunization	Child received complete immunization, 1=Yes 0=No
Control Variables	
Age	Age of the child (Years)
Mother's Education	Mother's highest level of education (Years)
Household Consumption	Total monthly household consumption (Million Rupiah)
Urban	Household resides in an urban area, 1=Yes 0=No
Household Size	Total number of household members (Persons)

Source: Indonesian Family Life Survey Wave 5

Estimation Method

The estimation method used to analyze the impact of complete immunization on child morbidity is the probit model. The probit method, or probit regression, is employed to examine the relationship between a binary dependent variable (with two possible outcomes, such as yes or no) and one or more independent variables, whether quantitative or qualitative in nature [h]. The probit model is applied to assess the effect of immunization on child morbidity. The model used is specified as follows:

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$$probit\ morbidity_i = ln\frac{morbidity}{1-morbidity} = \beta_0 + \beta_1 Complete\_Immunization_i + \gamma_s X_i + \varepsilon_i$$

$$p = \frac{exp(\beta_0+\beta_1 Complete\_Immunization_i+\gamma_s X_i+\varepsilon_i)}{1+exp\ (\beta_0+\beta_1 Complete\_Immunization_i+\gamma_s X_i+\varepsilon_i)}$$

where $morbidity$ is a binary variable indicating whether the child experienced an illness requiring rest in the past month, as recorded in the IFLS 5 data. $Complete\ Immunization$ is also a binary variable, indicating whether the child received complete immunization, based on the IFLS 5 data. X_i represents a vector of control variables, including the child's age, gender, household expenditure, mother's highest level of education, residential area (rural or urban), and household size. The subscript i denotes each individual child in the sample, while ε captures *unobserved characteristics.*

3. RESULTS AND ANALYSIS

Descriptive Statistics

Table 2 presents the descriptive statistics for the two outcome variables in this study, namely the incidence of illness and the child's immunization status. Out of a total of 739 observations, 55% of children were recorded as having experienced an illness requiring rest in the past month, as indicated by the mean value of 0.55 for the corresponding binary variable. Meanwhile, the proportion of children who received complete immunization was 52%, as reflected in the mean value of 0.52. Detailed descriptions of the variables used in this study, along with the corresponding summary statistics, are presented in the following table:

Table.2 Descriptive Statistics

Variables	Obs	Mean	Std. Dev	Min	Max
Outcome Variable					
Morbidity	739	0.55	0.49	0	1
Variable of Interest					
Complete Immunization	739	0.52	0.47	0	8
Control Variables					
Age	739	1.92	0.99	1	3
Mother's Education	739	8.60	4.96	0	16
Household Consumption	739	1.87	1.28	0.11	11.48
Urban	739	0.58	0.49	0	1
Household Size	739	5.06	1.95	2	15

Source: Indonesian Family Life Survey Wave 5

The average age of children in this study is 1.92 years with a standard deviation of 0.99, indicating that most children in the sample are between 1 and 3 years old. The mother's highest level of education averages 8.60 years, with considerable variation (standard deviation of 4.96), ranging from no formal education to 16 years of schooling. The average monthly household consumption is 1.87 million Rupiah, with a maximum value reaching 11.48 million Rupiah, reflecting disparities in consumption across households. Approximately 58% of households reside in urban areas, as indicated by the mean value of 0.58 for the binary variable. Meanwhile, household size ranges from 2 to 15 members, with an average of 5.06 persons and a standard deviation of 1.95. These data provide a preliminary overview of the demographic and socioeconomic characteristics of the households included in the research sample.

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Probit Estimation Results

Table 3 presents the marginal effects derived from the probit estimation conducted in this study. Based on the probit results, the variable indicating whether a child received complete immunization has a statistically significant effect on child morbidity and development, as measured by the indicator of whether the child experienced illness requiring rest within the past month. The following table displays the marginal effects from the probit estimation, highlighting the impact of complete immunization on child morbidity and developmental outcomes:

Table 3. Probit Estimation Result

Variables	Coefficient	Std. Error
Variable of Interest		
Complete Immunization	-0.509***	(0.030)
Control Variables		
Age	0.012	(0.047)
Mother's Education	-0.002**	(0.010)
Household Consumption	0.069	(0.039)
Urban	0.156	(0.096)
Household Size	-0.069	(0.026)
Constant	0.262	(0.198)
Observation	739	739

* p<0.1, ** p<0.05, *** p<0.01

Based on the probit model estimation results presented in Table 3, the main variable of interest in this study is the child's complete immunization status, defined as a dummy variable with a value of 1 if the child received all required immunizations and 0 otherwise. The coefficient for this variable is negative at -0.509 and statistically significant at the 1% level, indicating a significant negative relationship between complete immunization status and the probability of a child falling ill. Specifically, children who received complete immunization have a 50.8% lower probability of experiencing illness requiring rest compared to those who did not receive complete immunization.

These estimation results align with the theory of preventive health, which posits that immunization serves as a form of long-term health investment capable of reducing the risk of morbidity in children (Boppart et al., 2022). Vaccines function by developing specific immunity against certain diseases, thereby enabling children who have received complete immunization to possess a more prepared immune system when facing infections (Postma et al., 2022). This finding is also consistent with empirical evidence from previous studies, such as (Jit et al., 2015), which demonstrated that basic immunization enhances productivity and long-term health in developing countries. Furthermore, analyses by MacDonald et al., (2024) and Belay et al., (2025) revealed that basic immunizations such as measles and polio not only reduce the incidence of specific diseases but also increase survival chances, lower the risk of stunting, and decrease the occurrence of infectious diseases. Therefore, the significantly negative result of the complete immunization status variable in the probit model further reinforces the importance of immunization programs as a primary strategy to reduce child morbidity and improve public health outcomes from an early age.

Based on the probit model estimation results in Table 3, the control variables included in the analysis serve to account for various demographic and socioeconomic household characteristics that may influence the likelihood of a child becoming ill. Among the control variables analyzed, only the mother's highest level of education shows a

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statistically significant effect at the 5% confidence level. The negative coefficient of -0.002 indicates that the higher the mother's level of education, the lower the probability that the child will experience illness requiring rest. This finding reinforces the view that maternal education plays a crucial role in household health practices, including child care, disease prevention, and health-related decision-making (Le & Nguyen, 2020; Paul et al., 2022). It is also consistent with previous studies, which show that more educated mothers tend to have better access to health information and demonstrate greater attentiveness in maintaining their children's health (Agyen et al., 2024).

Meanwhile, the variables of a child's age, total household consumption, urban residence, and household size do not exhibit a statistically significant relationship with the probability of a child falling ill. The insignificant coefficient for child's age suggests that within the sample's age range (1–3 years), age differences do not yet contribute to substantial variation in illness risk (Le & Nguyen, 2020). Household consumption shows a positive but insignificant coefficient, which may imply that although higher consumption could reflect greater economic capacity, it does not necessarily guarantee protection against illness (MacDonald et al., 2024). Likewise, residing in an urban area does not yield a significant effect, which may be attributed to environmental factors or differences in access to healthcare services that are not fully captured by the model. Additionally, household size is not statistically significant, indicating that household composition does not directly affect child health status in the context of this study.

4. CONCLUSION

Based on the probit model estimation results, it can be concluded that complete immunization has a significant effect in reducing the probability of morbidity among young children. The negative and statistically significant coefficient of the complete immunization status variable indicates that children who receive complete immunization are less likely to experience illness requiring rest within the past month. Specifically, the probability of a child falling ill decreases by 50.8% compared to those who did not receive complete immunization. This finding is consistent with the theory of preventive health and is supported by various previous studies that affirm the effectiveness of vaccination in building immunity and reducing the risk of infectious diseases, as well as its impact on improving child survival rates and developmental outcomes.

In addition, among the control variables, maternal education is shown to have a significant and negative relationship with child morbidity. This indicates that the higher the mother's level of education, the lower the likelihood of the child experiencing health problems. This finding highlights the importance of socioeconomic factors, particularly maternal education, in supporting child health at the household level. Conversely, other control variables such as the child's age, household consumption, area of residence, and household size do not show a significant influence on child morbidity. This may be due to limited variation in the data or the exclusion of other relevant dimensions such as environmental quality and access to healthcare services. Therefore, the findings of this study emphasize the importance of optimizing immunization coverage and improving maternal education as key strategies in disease prevention and enhancing child health outcomes.

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