

# Factors Affecting Maternal Behavior in Achieving Complete Basic Immunization for Toddlers Aged 12–23 in Banggai Laut Regency, Indonesia

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## ABSTRACT

**Background:** Complete Basic Immunization (CBI) is essential to prevent vaccine-preventable diseases (VPDs). However, the coverage of complete basic immunization in Banggai Laut Regency remains low at 67.9%, compared to the national target of 90%. Several factors, including maternal knowledge, attitudes, accessibility to healthcare facilities, healthcare workers' roles, family support, and maternal occupation, are believed to influence maternal behavior in immunization provision. This study aimed to analyze factors affecting maternal behavior in achieving complete basic immunization for toddlers aged 12–23 months in Banggai Laut Regency.

**Methodology:** This cross-sectional analytical survey involved 321 mothers selected through cluster random sampling. Data were collected using structured questionnaires and analyzed using Chi-Square tests and logistic regression.

**Results:** Significant associations were found between complete basic immunization and good knowledge ( $p < 0.000$ ; OR=3.2), positive attitudes ( $p < 0.000$ ; OR=2.8), availability of healthcare facilities ( $p < 0.000$ ; OR=3.4), proximity to healthcare services ( $p < 0.000$ ; OR=3.7), supportive roles of healthcare workers ( $p < 0.000$ ; OR=2.9), and strong spousal support ( $p < 0.000$ ; OR=2.5). Maternal occupation showed no significant effect ( $p = 0.379$ ).

**Conclusions:** Knowledge, attitude, availability of healthcare facilities, distance to healthcare facilities, spousal support, and the role of healthcare workers are key factors in improving the coverage of complete basic immunization. Interventions targeting these factors are essential to achieving national immunization targets in Banggai Laut Regency.

**Key-words:** Complete basic immunization, maternal behavior, accessibility, healthcare workers, Banggai Laut

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## INTRODUCTION

Immunization is a key health intervention aimed at boosting immunity and preventing diseases, ensuring that individuals exposed to certain illnesses experience mild or no symptoms. Basic immunization for infants includes vaccines for diseases such as hepatitis B, polio, tuberculosis, diphtheria, pertussis, tetanus, pneumonia, meningitis, and measles, with the goal of providing protection before the age of one. However, despite the success of immunization in saving millions of lives globally, challenges remain, especially in low-coverage areas.<sup>1</sup>

Globally, immunization is a critical public health intervention that averts an estimated 4.4 million deaths annually.<sup>2</sup> Despite this success, challenges persist, with approximately 20 million infants worldwide missing out on life-saving vaccines each year.<sup>1</sup> In Indonesia, full vaccination coverage declined from 93.7% in 2019 to 84.5% in 2021, indicating a significant drop in immunization rates.<sup>3</sup> This decline is particularly evident in regions like Banggai Laut Regency, Central Sulawesi Province, where access to health services poses challenges to achieving complete immunization coverage.<sup>4</sup> These disparities highlight the need for targeted interventions to improve vaccine coverage in underserved areas.

The COVID-19 pandemic has significantly disrupted routine immunization services in Indonesia, leading to a decline in vaccination coverage and an increased risk of vaccine-preventable diseases such as polio, diphtheria, and measles. Factors contributing to low immunization rates include parental concerns about vaccine side effects, negative media reports, and geographic barriers in remote areas. For instance, regions with challenging geographies, like Banggai Laut Regency with its island topography, face significant obstacles in providing equitable access to immunization services.<sup>4-7</sup>

Health behaviors significantly influence immunization rates, with maternal knowledge, attitudes, and related behaviors playing pivotal roles. Recent studies indicate that mothers with greater knowledge and positive attitudes toward vaccination are more likely to ensure their children receive complete immunizations.<sup>8</sup> Additionally, socioeconomic factors such as income and geographic location further impact vaccination uptake, with lower-income households often exhibiting lower immunization rates.<sup>9</sup> In regions like Banggai Laut, characterized by challenging island geographies, these factors contribute to suboptimal immunization coverage, underscoring the necessity for targeted interventions to enhance vaccination rates.

This study aims to identify the factors influencing maternal behavior in achieving complete basic immunization for toddlers aged 12–23 months in Banggai Laut Regency, Indonesia. Specifically, it seeks to assess the impact of maternal knowledge, employment, and attitudes on their behavior, as well as de-

termine the roles of healthcare facilities, healthcare workers, and spousal support in shaping maternal efforts toward achieving complete immunization. Additionally, the study evaluates the effect of the distance between maternal residences and healthcare services on behavior, providing a comprehensive understanding of the multifaceted factors contributing to immunization completion.

## METHODOLOGY

**Study Design:** This study utilized an analytical survey design with a cross-sectional approach. Data were collected at a single point in time to examine the relationship between predisposing, enabling, and reinforcing factors and maternal behavior in achieving complete basic immunization.

**Study Setting and Population:** The research was conducted in Banggai Laut Regency, Central Sulawesi, Indonesia, from August 2024. The study population comprised mothers of toddlers aged 12–23 months residing in the Regency. The total population was 1,619 mothers across 93 community health posts (Posyandu).

**Sampling and Sample Size:** A cluster random sampling method was employed to select respondents. Using Slovin's formula with a 5% margin of error, the required sample size was calculated to be 321 mothers. These mothers were distributed across 19 randomly selected Posyandu, representing 20% of the total clusters.

### Inclusion and Exclusion Criteria

Mothers of toddlers aged 12–23 months with complete vaccination cards who present in the study area during the research period were included in the study. Mothers unable to provide verbal or written responses or unwilling to participate in the study were excluded.

**Data Collection:** The primary data for this study will be collected through the administration of questionnaires. Interviews will be conducted at the posyandu during scheduled posyandu activities. In cases where the target sample is not fully met at the posyandu, home visits will be made to mothers of toddlers in the respective posyandu areas. If respondents are unable to recall their child's immunization status or do not possess the Health Monitoring Booklet (HMB), relevant data will be cross-checked against the immunization cohort data from the local Puskesmas. In the event that the data is not available, the respondent will be categorized as an exclusion criterion.

**Variables and Measurement:** The variables in this study are measured using various methods according to their operational definitions. Maternal knowledge about the administration of basic immunizations for infants, including hepatitis B (Hb-0), BCG, Polio, DPT-HB-Hib, IPV, and Measles immunizations, is measured using a Guttman scale with 20 state-

ments (10 positive statements and 10 negative statements). For positive statements, "Yes" answers are scored 1 and "No" answers are scored 0, while for negative statements, "Yes" answers are scored 0 and "No" answers are scored 1. Based on the total score, maternal knowledge is categorized into three groups: good knowledge (13.34 – 20), sufficient knowledge (6.67 – 13.33), and poor knowledge (0 – 6.66).

Maternal employment is measured with a single question categorized into two choices: employed and not employed. The employed category includes jobs such as civil servants, military/police officers, private employees, entrepreneurs, farmers/laborers, fishermen, or domestic workers. The not employed category refers to mothers who are not engaged in these occupations.

Maternal attitude toward basic immunization administration is measured using a Likert scale consisting of 10 statements, with 8 positive statements and 2 negative statements. For positive statements, the response options "Strongly Agree" (SA) is scored 5, "Agree" (A) is scored 4, "Neutral" (N) is scored 3, "Disagree" (D) is scored 2, and "Strongly Disagree" (SD) is scored 1. Conversely, for negative statements, the scoring is reversed. After calculating the total score, responses are categorized into five attitude groups: very positive (43 – 50), positive (35 – 42), neutral (27 – 34), negative (19 – 26), and very negative (10 – 18).

The availability of health services is measured using a Guttman scale, based on a questionnaire with 8 statements (4 positive statements and 4 negative statements). For positive statements, "Yes" answers are scored 1 and "No" answers are scored 0, while for negative statements, "Yes" answers are scored 0 and "No" answers are scored 1. Based on the total score, health service availability is categorized into two groups: available (5 – 8) and unavailable (0 – 4).

The variable of location/distance is measured with a questionnaire containing a single question that determines the distance to the health service. The distance is categorized as close if  $\leq 1.5$  km, and far if  $> 1.5$  km.

The role of health workers in supporting the administration of basic immunizations is measured using a questionnaire with 9 statements, consisting of 5 positive statements and 4 negative statements. Responses are given using a Likert scale, with the scoring pattern similar to that used for attitude and role of health workers. After calculating the total score, the role of health workers is categorized into four groups: very good (37 – 45), good (28 – 36), not good (19 – 27), and very bad (9 – 18).

Husband support for the mother in the administration of basic immunization is measured with a questionnaire consisting of 10 statements, with 6 positive statements and 4 negative statements. The measurement is done using a Likert scale, where response

options are scored similarly to the pattern used for attitude and role of health workers. After calculating the total score, husband support is categorized into four groups: strongly supportive (41 – 50), supportive (31 – 40), not supportive (21 – 30), and strongly unsupportive (10 – 20).

Finally, maternal behavior in administering basic immunizations is measured with 10 questions regarding the administration of Hepatitis B/Hb0, BCG, Polio 1 to 4, DPT-HB-Hib 1 to 3, IPV, and Measles/MR immunizations. Maternal behavior is categorized as complete if all answers for each type of basic immunization are "yes", and incomplete if there is one or more "no" answers for any type of immunization.

**Data Analysis:** The data analysis was conducted to evaluate the factors influencing maternal behavior in achieving complete basic immunization for toddlers aged 12–23 months in Banggai Laut Regency, Indonesia. The following analytical techniques were applied:

**Univariate Analysis:** Descriptive statistics summarized the distribution of variables, including maternal knowledge, employment, attitudes, healthcare facility access, geographical factors, healthcare worker roles, and spousal support.

**Bivariate Analysis:** Chi-square tests were performed to identify associations between each independent variable (e.g., maternal knowledge, employment, attitudes) and the dependent variable, which is the maternal behavior in achieving complete basic immunization status.

**Multivariate Analysis:** Logistic regression was employed to determine the strength of relationships and identify significant predictors of maternal behavior regarding immunization. The analysis included variables such as maternal knowledge, employment, attitudes, healthcare facility access, geographical location, healthcare worker roles, and spousal support. Odds ratios (OR) and confidence intervals (CI) were calculated to quantify the effects of these predictors.

**Approval of Institutional Ethical Review Board:** Ethical approval was obtained from the Ethical Review Board of Hasanuddin University (Approval Letter No. 1602/UN4.14.1/TP.01.02/2024). Informed consent was secured from all participants before data collection, ensuring confidentiality and voluntary participation.

## RESULTS

**Characteristics of Respondents:** The majority of respondents were in the productive age group (25–35 years, 62.6%) and had completed high school (39.6%). A smaller proportion were over 35 years old (18.7%) or under 18 years old (1.2%). Regarding education, a significant number had pursued higher education (20.6%), while only a small fraction had not completed elementary school (0.9%). (Table 1)

**Table 1: Characteristics of respondent**

Characteristic	Immunization status of children		
	Incomplete (n=103) (%)	Complete (n=218) (%)	Total (n=321) (%)
<b>Age</b>			
<18 Years	1(0.97)	3(1.38)	4(1.25)
18 - 24 Years	17(16.5)	39(17.89)	56(17.45)
25 - 35 Years	68(66.02)	133(61.01)	201(62.62)
>35 Years	17(16.5)	43(19.72)	60(18.69)
<b>Education</b>			
No School	8(7.77)	16(7.34)	24(7.48)
Incomplete Elementary	0(0)	3(1.38)	3(0.93)
Elementary	14(13.59)	41(18.81)	55(17.13)
Junior High School	14(13.59)	32(14.68)	46(14.33)
Senior High School	44(42.72)	83(38.07)	127(39.56)
Higher Education	23(22.33)	43(19.72)	66(20.56)

**Univariable Analysis:** Most children of respondents had received complete basic immunization (67.9%). Complete immunization was more prevalent among respondents with good knowledge, positive or very positive attitudes, close access to healthcare facilities, availability of healthcare services, a good or very good role of healthcare workers, and good or very good spousal support. Conversely, lower immunization coverage was observed among groups with inadequate knowledge, negative attitudes, and limited

access to healthcare services. (Table 2)

**Bivariate Analysis:** Chi-square tests and risk estimates identified significant relationships between complete basic immunization (CBI) and several independent variables, including knowledge, attitude, healthcare service availability, proximity to facilities, the role of healthcare workers, and spousal support ( $p < 0.05$ ). Respondents with poor knowledge were 4.29 times more likely not to complete CBI (OR: 4.285, 95% CI: 2.329–7.882,  $p < 0.001$ ), and those with sufficient knowledge were 3.79 times more likely not to complete CBI (OR: 3.787, 95% CI: 2.039–7.033,  $p < 0.001$ ), compared to respondents with good knowledge. A very negative attitude significantly increased the odds of not completing CBI by 11.39 times (OR: 11.389, 95% CI: 3.909–33.184,  $p < 0.001$ ), followed by negative attitudes, which increased the odds by 4.10 times (OR: 4.100, 95% CI: 1.670–10.068,  $p = 0.002$ ). Availability of healthcare facilities reduced the likelihood of incomplete CBI, as respondents in areas with unavailable facilities were 2.36 times more likely not to complete CBI (OR: 2.359, 95% CI: 1.463–3.806,  $p < 0.001$ ). Similarly, respondents living far from healthcare facilities were 3.54 times more likely not to complete CBI (OR: 3.542, 95% CI: 2.169–5.783,  $p < 0.001$ ) compared to those living near facilities.

**Table 2: Relationship of employment, knowledge, attitude, health service facilities, location/distance, role of health workers, and husband's support with complete basic immunization**

Variable	Complete Basic Immunization		p value	Risk Estimate		
	Complete (n=218) (%)	Incomplete (n=103) (%)		OR (Odds Ratio)	95% CI Lower Upper	
<b>Employment</b>						
Not Working	96 (70.6)	40 (29.4)	0.379	Reference	-	-
Working	122 (65.9)	63 (34.1)		1.239	0.768	1.999
<b>Knowledge</b>						
Good	114 (83.8)	22 (16.2)	0	Reference	-	-
Sufficient	52 (57.8)	38 (42.2)	0	3.787	2.039	7.033
Poor	52 (54.7)	43 (45.3)	0	4.285	2.329	7.882
<b>Attitude</b>						
Very Positive	41 (73.2)	15 (26.8)	0	Reference	-	-
Positive	75 (74.3)	26 (25.7)	0.887	0.948	0.452	1.988
Neutral	82 (83.7)	16 (16.3)	0.123	0.533	0.24	1.185
Negative	14 (40)	21 (60)	0.002	4.1	1.67	10.068
Very Negative	6 (19.4)	25 (80.6)	0	11.389	3.909	33.184
<b>Health Service Facilities</b>						
Available	139 (76)	44 (24)	0	Reference	-	-
Not Available	79 (57.2)	59 (42.8)		2.359	1.463	3.806
Location/Distance						
Close	147 (79.5)	38 (20.5)	0	Reference	-	-
Far	71 (52.2)	65 (47.8)		3.542	2.169	5.783
<b>Role of Health Workers</b>						
Very Good	74 (84.1)	14 (15.9)	0	Reference	-	-
Good	79 (81.4)	18 (18.6)	0.635	1.204	0.559	2.593
Poor	38 (50.7)	37 (49.3)	0	5.147	2.483	10.667
Very Poor	27 (44.3)	34 (55.7)	0	6.656	3.105	14.27
<b>Husband's Support</b>						
Very Good	74 (85.1)	13 (14.9)	0	Reference	-	-
Good	70 (74.5)	24 (25.5)	0.081	1.952	0.922	4.131
Poor	45 (57)	34 (43)	0	4.301	2.055	9.003
Very Poor	29 (47.5)	32 (52.5)	0	6.281	2.895	13.628

\* $P < 0.05$  significant

**Table 3: Logistic regression analysis for factors associated with complete basic immunization**

Variable	B	Sig	Exp(B)	95% C.I.for EXP(B)	
				Lower	Upper
knowledge (Good)		0.000			
knowledge (Sufficient)	1.358	0.001	3.887	1.712	8.822
knowledge (Poor)	1.694	0.000	5.442	2.323	12.748
attitude (Very Positive)		0.028			
attitude (Positive)	-0.272	0.581	0.762	0.290	2.001
attitude (Neutral)	-0.168	0.746	0.846	0.307	2.327
attitude (Negative)	0.958	0.108	2.607	0.810	8.383
attitude (Very Negative)	1.329	0.037	3.778	1.081	13.206
health_service_facilities (Not Available)	1.059	0.002	2.885	1.456	5.717
location_distance (Far)	1.324	0.000	3.758	1.926	7.333
role_of_health_workers (Very Good)		0.000			
role_of_health_workers (Good)	.369	0.462	1.446	0.540	3.871
role_of_health_workers (Poor)	1.921	0.000	6.827	2.455	18.982
role_of_health_workers (Very Poor)	3.033	0.000	20.761	6.598	65.322
husbands_support (Very Good)		0.000			
husbands_support (Good)	1.120	0.027	3.066	1.137	8.267
husbands_support (Poor)	2.102	0.000	8.182	2.971	22.529
husbands_support (Very Poor)	2.429	0.000	11.346	3.668	35.100
Constant	-5.740	0.000	0.003		

\*P &lt;0.05 significant

The role of healthcare workers showed a significant impact. Respondents who rated the role of healthcare workers as "very poor" were 6.66 times more likely not to complete CBI (OR: 6.656, 95% CI: 3.105–14.270,  $p < 0.001$ ), followed by those rating it as "poor," with 5.15 times the odds (OR: 5.147, 95% CI: 2.483–10.667,  $p < 0.001$ ). Spousal support also played a critical role, with respondents receiving "very poor" support being 6.28 times more likely not to complete CBI (OR: 6.281, 95% CI: 2.895–13.628,  $p < 0.001$ ) and those with "poor" support 4.30 times more likely (OR: 4.301, 95% CI: 2.055–9.003,  $p < 0.001$ ). In contrast, employment status did not show a statistically significant relationship with CBI completion ( $p = 0.379$ , OR: 1.239, 95% CI: 0.768–1.999). These findings underline the importance of addressing barriers related to knowledge, attitudes, accessibility, healthcare worker roles, and spousal support to enhance immunization completion rates. (Table 2)

**Multivariate Analysis:** Multivariate logistic regression analysis confirmed the significant impact of the independent variables on the outcome. Respondents with sufficient knowledge were 3.89 times more likely to experience the outcome than those with good knowledge (Exp(B) = 3.887,  $p = 0.001$ ). Similarly, respondents with poor knowledge were 5.44 times more likely to experience the outcome (Exp(B) = 5.442,  $p < 0.001$ ). A very negative attitude increased the odds by 3.78 times (Exp(B) = 3.778,  $p = 0.037$ ), while other attitude categories did not show statistically significant associations. The unavailability of healthcare facilities nearly tripled the odds of the outcome (Exp(B) = 2.885,  $p = 0.002$ ), and far distances from healthcare services increased the odds by 3.76 times (Exp(B) = 3.758,  $p < 0.001$ ). The role of healthcare workers had a significant impact, with respondents rating healthcare workers' role as "poor" being 6.83 times more likely to experience the outcome (Exp(B) = 6.827,  $p < 0.001$ ) and those rating it

as "very poor" being 20.76 times more likely (Exp(B) = 20.761,  $p < 0.001$ ). Spousal support also played a critical role, with "good" support increasing the odds by 3.07 times (Exp(B) = 3.066,  $p = 0.027$ ), "poor" support by 8.18 times (Exp(B) = 8.182,  $p < 0.001$ ), and "very poor" support by 11.35 times (Exp(B) = 11.346,  $p < 0.001$ ). These findings highlight the crucial influence of knowledge, attitudes, healthcare accessibility, the role of healthcare workers, and spousal support in shaping the outcome. (Table 3).

## DISCUSSION

This study highlights the multifaceted influences of maternal knowledge, attitude, healthcare service availability, proximity, the role of healthcare workers, and spousal support on the achievement of complete basic immunization (CBI) for children. Employment, however, did not show a significant impact in this context.

**Maternal Knowledge** Maternal knowledge was identified as a critical determinant of CBI, with mothers possessing good knowledge being 5.44 times more likely to complete immunization schedules than those with poor knowledge. This finding aligns with several studies that have reported the crucial role of knowledge in immunization success.<sup>10,11</sup> Knowledge empowers mothers to understand the benefits of immunization and adhere to schedules, as supported by Green and Kreuter's Health Promotion Planning theory. Enhancing maternal education through community programs and digital platforms can address gaps in knowledge, particularly in areas with limited access to information.<sup>12-14</sup>

**Maternal Attitude:** The study also found that maternal attitude significantly influences CBI. Mothers with positive attitudes were nearly four times more

likely to complete immunizations than those with very negative attitudes. This is consistent with findings by Lestiani et al. (2023), who noted that mothers with positive attitudes demonstrate higher compliance with immunization schedules. Positive attitudes can be nurtured through effective education and supportive healthcare experiences.<sup>15</sup> Additionally, campaigns using social media and community outreach can reinforce favorable perceptions of immunization.<sup>16,17</sup>

**Healthcare Facilities and Accessibility:** Healthcare service availability and proximity were significant predictors of CBI. Mothers with access to adequate facilities were 2.89 times more likely to complete immunizations, and those living near healthcare services were 3.76 times more likely to do so. Similar findings have been reported in studies by Setiawan and Wijayanto (2022), who emphasized the importance of equitable healthcare distribution in improving immunization coverage. Addressing geographic and infrastructural barriers through mobile clinics and improved transportation options is essential, particularly in remote areas.<sup>17,18</sup>

**Role of Healthcare Workers:** The role of healthcare workers (HCWs) emerged as the strongest predictor of complete basic immunization (CBI), with mothers perceiving HCWs' roles as very good being over 20 times more likely to complete immunizations. This underscores the critical importance of active, communicative, and empathetic healthcare professionals in promoting immunization. Studies have shown that patient trust in healthcare providers is integral to vaccine acceptance among pregnant women. In Kenya, for instance, trust in HCWs significantly influenced maternal vaccine uptake.<sup>19</sup> Healthcare workers' attitudes towards vaccination also play a role. A study revealed that while 90% of HCWs prescribed COVID-19 vaccination to women wishing to conceive, the rate dropped to 80% for pregnant women, indicating variability in recommendations.<sup>20</sup>

**Spousal Support:** Spousal support significantly influences the completion of basic immunization (CBI). Mothers receiving strong support from their spouses are over 11 times more likely to fully immunize their children. This finding aligns with studies indicating that maternal attitudes and beliefs directly impact childhood vaccination coverage, leading to under-vaccination, non-vaccination, or vaccination delays. Positive maternal attitudes can be nurtured through effective education and supportive healthcare experiences.<sup>16</sup> Similarly, research highlights the combined influence of maternal knowledge, spousal support, and health worker support on the provision of complete basic immunization, contributing to a 69.3% likelihood of achieving full immunization.<sup>11</sup> These findings are consistent with the results from Puskesmas Sukajadi, Banyuasin Regency in 2022, which demonstrated a simultaneous relationship between maternal knowledge, attitudes, and spousal support in achieving complete basic immunization for toddlers.<sup>21</sup> This underscores the critical role of collabo-

orative efforts between families and healthcare providers, with a strong emphasis on counseling mothers to enhance their knowledge about the importance of immunization, thereby improving vaccination coverage.

**Employment and Immunization:** Contrary to expectations, maternal employment did not significantly influence CBI in this study. This differs from findings in Setiawan and Wijayanto's (2022) research, where working mothers had better access to immunization services.<sup>18</sup> Similarly, a study in Kujan Village, Lamandau Regency, found no significant relationship between maternal employment and the provision of complete immunization.<sup>22</sup> The absence of such an influence in this study may be attributed to robust social support systems in Banggai Laut Regency, where family members or spouses assist working mothers in adhering to immunization schedules.

## STRENGTHS OF THE STUDY

This study addresses a highly relevant topic related to basic immunization coverage, a critical national health target in Indonesia. By focusing on Banggai Laut Regency, it highlights the unique challenges faced by remote and archipelagic regions, offering valuable insights for public health policy. The use of multivariate analysis provides a comprehensive understanding of the most significant factors influencing immunization coverage, enabling targeted interventions. With a sample size of 321 respondents, selected through cluster random sampling, the study ensures a strong representation of mothers of toddlers in the study area. Furthermore, the study is grounded in Lawrence Green's theoretical framework, which effectively explores predisposing, enabling, and reinforcing factors in health behavior. The emphasis on contextual aspects, particularly the geographical challenges of Banggai Laut, adds value by proposing practical solutions for regions with similar constraints.

## LIMITATIONS OF THE STUDY

Despite its strengths, the study has some limitations. The cross-sectional design restricts its ability to establish causal relationships, as it only identifies associations between variables. The reliance on self-reported data introduces potential biases, such as recall bias or social desirability bias, particularly for variables like attitudes and spousal support. While the employment variable was found to be insignificant, the discussion lacks depth in exploring the reasons behind this result, which may be better understood through qualitative methods. Additionally, the study's geographical focus limits the generalizability of its findings to other regions with differing socioeconomic or geographical characteristics. The absence of qualitative approaches restricts the study's ability to capture richer insights into mothers' per-

ceptions and specific barriers to immunization. Lastly, the lack of detailed subgroup analysis, such as examining results based on maternal age or education level, limits the potential for more tailored and actionable recommendations.

## CONCLUSION

This study highlights the key factors influencing mothers' behavior in achieving complete immunization for children aged 12–23 months in Banggai Laut Regency. Knowledge, attitudes, health services, accessibility, the role of health workers, and family support, particularly from husbands, are identified as significant contributors. Among these, the involvement of health workers in education and awareness-raising, alongside strong family support, is crucial in motivating mothers to complete immunization schedules. The findings underscore the importance of integrating family-based approaches and strengthening health workers' communication skills to foster supportive environments. Efforts to improve immunization rates should address service accessibility, community engagement, and education. These strategies can enhance public health outcomes by ensuring comprehensive immunization coverage.

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**Availability of Data:** Data will be made available upon reasonable request.

**No use of generative AI tools:** This article was prepared without the use of generative AI tools for content creation, analysis, or data generation. All findings and interpretations are based solely on the authors' independent work and expertise.

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