

Determinants of Maternal Adaptation to Childhood Vaccination in 21st-Century Southernmost Thailand

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Abstract

This study investigates maternal behavioral adaptation toward childhood immunization within the sociocultural context of Southernmost Thailand, evaluating how individual capacities and contextual correlates influence vaccination completion. A quantitative cross-sectional survey was conducted among 1,200 mothers of children aged five years or older in Pattani, Yala, and Narathiwat. Using a three-stage, stratified, multi-stage random sampling technique, geographic and demographic representativeness was ensured. Data were collected via structured interviews using a validated instrument (IOC ≥ 0.60), and binary logistic regression was employed to identify significant predictors of immunization adherence. Results indicated a childhood vaccination completion rate of 63.7%. Multivariate analysis revealed that maternal adaptation was strongly driven by socio-economic stability and modern health literacy. Mothers with stable socio-demographic profiles, particularly government officials (OR = 7.98; 95% CI [2.67, 23.81]) and business owners (OR = 6.74; 95% CI [2.54, 17.87]), had significantly higher odds of completing. High service satisfaction (OR = 4.39; 95% CI [3.09, 6.23]) and maternal COVID-19 vaccination history (OR = 3.28; 95% CI [1.53, 4.22]) emerged as robust positive predictors. Conversely, specific contextual determinants, including paternal decision-making authority and vaccine safety anxiety, significantly hindered adherence, reflecting the enduring influence of traditional patriarchal structures. The persistent disparity in Southernmost Thailand is driven by a complex interplay between modern enablers and traditional constraints. Strictly medical or economic approaches are insufficient to address this variation in uptake, as barriers are deeply rooted in the region's unique sociocultural and structural scaffolding. Future public health interventions should prioritize precision public health and improvements in service design while addressing patriarchal influences and linguistic gaps to bridge the existing coverage deficit.

Keywords

Childhood vaccination; health literacy; maternal adaptation; southern border provinces; vaccine hesitancy

Introduction

Immunization has remained one of the most successful and cost-effective public health interventions in history, preventing an estimated 3.5 to 5 million deaths annually from diseases such as diphtheria, tetanus, pertussis, influenza, and measles (World Health Organization [WHO], 2026). Despite these global advancements, progress has stagnated in recent years; global vaccination coverage has dropped from 86% in 2019 to 83% in 2020, leaving approximately 23 million children under the age of one without basic vaccines (WHO, 2025). While Thailand's national healthcare system has successfully maintained vaccination rates above the recommended 90% threshold through the Expanded Program on Immunization (EPI), a critical disparity has persisted in the three southernmost provinces of Pattani, Yala, and Narathiwat.

This persistent gap is exacerbated by a limited understanding of supply-side factors and the enabling environment, hindering the effectiveness of immunization programs in the region. Historically, localized research in Southern Thailand identified significant gaps in routine immunization adherence (Jeharsae et al., 2019), findings that were reinforced by national survey data showing coverage consistently hovering below the 70% (Coordination Center for Public Health, Region 12, 2025). These disparities were further reinforced by national survey data from the pre-pandemic era (National Statistical Office Thailand [NSO] & UNICEF Thailand, 2020).

Most alarmingly, the situation has worsened in the post-pandemic era. National household surveys now indicate that vaccination coverage has plummeted to below 50% in certain districts (NSO & UNICEF Thailand, 2023). This distressing trend is further corroborated by recent provincial health monitoring reports, which highlight how the severe strain on local service delivery during the COVID-19 recovery phase has further eroded the system's ability to maintain routine immunization schedules (Ministry of Public Health, 2024).

The consequences of this immunization deficit are evident in the recurring outbreaks of vaccine-preventable diseases. For instance, the 2019 measles outbreak in southernmost Thailand involved 2,802 cases—accounting for 30% of Thailand's total infections—while subsequent waves between 2020 and 2023 reported an additional 400 cases, with alarmingly high mortality rates among children under 3 years of age (Department of Disease Control, 2023). Beyond mandated vaccines, the landscape is further complicated by “optional” vaccines (e.g., IPD, Rotavirus), which require out-of-pocket expenditure and a complex parental trade-off between perceived disease severity and the desire to minimize side effects (Tongpua & Cheawchanwattana, 2013).

Historically, the resistance to immunization in this region was viewed through a static lens, focusing on socio-political determinants. Extensive literature has consistently attributed low uptake to poverty, logistical barriers stemming from civil unrest (Zimmermann & Curtis, 2019), and religious concerns about the Halal status of vaccines (McNeil et al., 2019). However, contemporary evidence from the Southern border provinces emphasizes that maternal factors remain pivotal; specifically, maternal occupation and time-related economic constraints—such as the inability to take leave from work or challenges associated with cross-border employment in Malaysia—often hinder parents from completing immunization schedules, even amidst public health crises (Lohmae et al., 2023).

The contemporary landscape reveals a profound clash between these traditional constraints and the complexities of the 21st century. Relying solely on static factors offers an incomplete picture, as modern mothers are no longer passive recipients of traditional wisdom but active navigators of a complex digital information ecosystem. As Dearing (2009) posited, the adoption of new health practices is driven more by social modeling and peers' experiences than by technical data. In this digital era, Maternal Health Literacy has emerged as a critical determinant, where a mother's ability to evaluate online sources critically determines whether connectivity empowers her or propagates vaccine hesitancy through misinformation (Sahitia et al., 2025). Furthermore, the aftermath of COVID-19 has introduced "pandemic fatigue" and altered trust in public health systems (WHO, 2022).

Understanding this interplay between deep-seated cultural beliefs and modern digital health literacy has become essential for designing policy interventions that resonate with contemporary society. To bridge this critical knowledge gap, this study adopts Andersen's Behavioral Model of Health Services Use. This framework was originally conceptualized to explain the individual and social factors driving healthcare access (Andersen, 1995). It was further refined to incorporate the critical role of environmental contexts and health system provider-related factors (Andersen & Davidson, 2007). Unlike previous studies, this research integrates 20 dynamic variables—spanning both traditional contextual determinants and modern individual capacities—to reveal why immunization gaps persist in a digital world and to offer a new evidence base for precise public health interventions.

Research objective

To investigate the multidimensional determinants of maternal adaptation to childhood vaccination in the 21st-century context of southernmost Thailand.

Research hypothesis

Hypothesis 1 (H₁): Mothers with higher socio-economic status, greater health literacy, and higher adaptability to modern health interventions are significantly more likely to achieve full childhood vaccination completion.

Hypothesis 2 (H₂): Positive engagement with the healthcare system, characterized by high service satisfaction and consistent maternal care utilization, positively predicts a higher likelihood of achieving full immunization status.

Hypothesis 3 (H₃): Traditional sociocultural barriers, linguistic differences, and specific contextual constraints in the Southern Border Provinces significantly reduce the odds of maternal vaccine adherence.

Methods

Study design and setting

A quantitative, cross-sectional survey design was employed to investigate the determinants of maternal adaptation to childhood vaccination in the southern border provinces of Pattani, Yala, and Narathiwat. While this design provides a vital snapshot of vaccination adherence, the authors acknowledge the inherent limitation of cross-sectional data, specifically the inability to infer temporal causality between the identified determinants and vaccination outcomes. Data collection was conducted over three months from February 1 to April 30, 2024.

Population and sample

The target population comprised mothers aged 20–59 residing in the southern border provinces of Pattani, Yala, and Narathiwat, Thailand ($N \approx 448,939$) (Department of Provincial Administration, 2025). Participants were eligible if they had at least one child aged five years or older, enabling a comprehensive evaluation of adherence to the full childhood vaccination schedule. The sample size was determined using Cochran's (1977) formula for large populations:

$$n = (Z^2 p (1-p)) / e^2$$

Based on a 95% confidence level ($Z = 1.96$), a conservative proportion estimate of 0.5 ($p = .5$), and a 3% margin of error ($e = 0.03$), the minimum required sample was 1,067. This was adjusted to 1,200 participants to account for non-response and ensure data completeness. A three-stage stratified multi-stage random sampling technique was employed to ensure geographic representativeness across urban and rural areas. First, the sample was stratified by province. Second, Probability Proportional to Size (PPS) was applied at the district and sub-district levels to reflect actual population densities. Finally, simple random sampling was used to select households at the village level.

Research instruments and data quality

Data were collected using a structured questionnaire developed from contemporary literature and the constructs of Andersen's Behavioral Model. The instrument consisted of three sections: Socio-demographics, Vaccine Knowledge, and Perceptions/Satisfaction.

The content validity was confirmed by three experts in public health and epidemiology, yielding an Item-Objective Congruence (IOC) index of 0.60–1.00. Reliability was established through a pilot study ($n = 30$) involving mothers with characteristics similar to those of the target group. The Kuder-Richardson 20 (KR-20) coefficients were 0.935 for the Vaccine Knowledge section (binary outcomes) and 0.916 for the Perceived Risk section.

Satisfaction was measured using a single-item numeric rating scale (0–10). In the pilot study, the mean score was 7.70 ($SD = 1.83$). For multivariate analysis, scores were dichotomized using this mean as the cutoff point: scores ≥ 7.70 indicated "Satisfied," while scores indicated "Unsatisfied."

Fieldwork was conducted from February to April 2024. To minimize Social Desirability Bias and overcome linguistic barriers, the study recruited local research assistants fluent in the regional dialect (Melayu/Yawi). Before data collection, all enumerators underwent rigorous calibration training to standardize interview techniques and minimize interviewer bias. To ensure ethical standards and honest reporting, participants were assured of strict anonymity

and informed that their responses would not affect their future access to healthcare. Written informed consent was obtained from all participants before the structured interviews commenced.

Variables and measurements

Dependent variable

The primary outcome was the completion of the basic childhood immunization series for children aged five years and older. Vaccination status was assessed via maternal self-reporting. To ensure data validity, the official vaccination record book (Pink Book) was used solely as a reference to cross-check maternal responses. In cases where the physical record was unavailable, enumerators employed a rigorous chronological probing protocol to verify consistency between the child's age and the specific vaccination doses received. To avoid multicollinearity and redundancy in the analytical models, the vaccination record book was not included as an independent variable. Still, it was used strictly for quality control of the dependent variable. The final status was coded as 1 (Complete) and 0 (Incomplete/ No vaccination).

Independent variables

Based on Andersen's Behavioral Model, 20 independent variables were operationalized to link theoretical constructs to measurable data. Before final selection, all variables were verified through preliminary correlation analysis and Crosstabulation (Chi-square) to ensure statistical suitability and minimize multicollinearity. The variables were categorized into two hierarchical models:

Model 1 (Individual Predisposing & Enabling Factors) focused on maternal capacity and comprised 13 variables. These included Socio-demographics (maternal age, marital status, household size, number of children, occupation, and household income) and Health System Interface factors (consistency of antenatal care and satisfaction with vaccination services). Proxies for Health Literacy and Modern Behavior included maternal vaccine knowledge score (Functional Literacy), language used with healthcare providers (Communicative Literacy), perceived risk of non-immunization (Critical Literacy), maternal COVID-19 vaccination history (Trust in Modern Science), and child health status.

Model 2 (Contextual Determinants) incorporated seven additional variables representing the broader sociocultural environment. This included the Geo-Cultural Setting (residential area, province, and religion) and Social Structure and Norms, specifically paternal decision-making authority regarding vaccination, anxiety regarding post-vaccination safety, family beliefs regarding vaccination, and community vaccination culture.

To bridge the gap between abstract theoretical constructs and measurable data, specific variables were operationalized to serve as critical proxies for health literacy, modern adaptability, and traditional structures within Andersen's framework.

Operationalization and proxies

The study operationalized 20 dynamic variables into three primary domains, aligned with the dimensions of Andersen's Behavioral Model.

First, regarding Individual Capacity, the study examined three distinct dimensions of Maternal Health Literacy (MHL). The maternal vaccine knowledge score was utilized as a proxy for Functional Literacy, reflecting the mother's fundamental cognitive ability to process medical information. The language used with healthcare providers served as an indicator of Communicative Literacy, capturing potential access barriers and the capacity to negotiate effectively within health systems. The perceived risk of non-immunization was selected to represent Critical Literacy, demonstrating the ability to appraise information and evaluate actual health risks amidst the modern "infodemic."

Second, to assess Modern Adaptability, maternal COVID-19 vaccination history was employed as a behavioral barometer. This variable served as a proxy for Trust in Modern Science, distinguishing mothers who accepted contemporary medical interventions from those susceptible to pandemic-related misinformation or "vaccine hesitancy" spillover effects. Finally, Contextual Structures were operationalized to capture the unique sociocultural environment of Southern Thailand. Paternal decision-making authority was included to measure the influence of Patriarchal Structures on maternal autonomy. Furthermore, family beliefs and religious affiliation were used to reflect deep-seated cultural norms. At the same time, anxiety regarding post-vaccination safety was categorized as a Psychological Barrier, serving as a measurable outcome of community rumors and negative news exposure.

Statistical analysis

Data management and analysis were performed using IBM SPSS Statistics for Windows, Version 26.0 (IBM Corp., 2019). The analysis commenced with descriptive statistics, utilizing frequencies and percentages to characterize categorical variables and means with standard deviations for continuous variables. To screen potential predictors, a univariate analysis using Crosstabulation and Chi-square (χ^2) tests was conducted. Variables with p values $< .25$ were selected for inclusion in the multivariable model to ensure that potential confounders were not overlooked. Furthermore, to ensure model stability and prevent statistical artifacts – such as extreme Odds Ratios due to sparse data – categorical variables with small cell counts were regrouped before the regression analysis.

For the multivariable analysis, a binary logistic regression model was employed to identify significant determinants of vaccination completion. Before model execution, multicollinearity was rigorously assessed; variables with Variance Inflation Factor (VIF) values exceeding the acceptable threshold ($VIF > 5$) were excluded to prevent overfitting. The equation represents the regression model:

$$\log (P / (1 - P)) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n,$$

where P represents the probability of a child receiving all recommended vaccinations, β_0 is the intercept, and $\beta_1, \beta_2, \dots, \beta_n$ are the regression coefficients. The results were reported as adjusted odds ratios (OR) with 95% Confidence Intervals (CI). The model's goodness of fit was assessed using the Hosmer-Lemeshow test ($p > .05$, indicating a satisfactory fit). In

contrast, the Nagelkerke R^2 statistic was used to determine the proportion of variance explained by the model (Szumilas, 2010).

Results

Demographic characteristics of the sample

The study sample comprised 1,200 mothers from the southern border provinces, distributed across Narathiwat (39.7%), Pattani (34.7%), and Yala (25.7%). The participants had a mean age of 36 years ($SD = 6.804$; range: 20–50 years). The majority were Muslim (80.8%), with the remainder identifying as Buddhist (19.2%). Regarding daily communication, the local Malay dialect was the most common (60%), followed by Standard Thai (24.3%) and the local Southern Thai dialect (12%). In terms of marital status, over 60% were legally married, 29.2% were in religiously recognized unions, and 9% were widowed, divorced, or separated. The sample was nearly evenly distributed between urban (51%) and rural (49%) areas. Educationally, 26.5% held a bachelor's degree, 20.6% had completed secondary school, and 19.7% had a primary education.

Regarding employment, the largest group consisted of homemakers (40.2%), followed by laborers (31.8%), self-employed individuals (11.3%), government officials (9%), and state enterprise employees (2.2%); notably, 2.8% were unemployed, a proportion similar to that of farmers. Income distribution revealed that 31.3% earned 5,000–9,999 THB per month (159–318 USD), 25.5% earned 2,000–4,999 THB (64–159 USD), and approximately 20% earned less than 2,000 THB (≤ 64 USD), with the remainder earning over 10,000 THB (≥ 318 USD).

At the household level, 37% reported a monthly income of 5,000–9,999 THB, followed by 10,000–19,999 THB (318–637 USD) (20.3%), 2,000–4,999 THB (13.4%), and 20,000–29,999 THB (637–955 USD) (10.5%). The average household size was 5 members (range: 2–16), and the average number of children was 2.6 (range: 1–9).

Husbands had a mean age of 40 years (range: 17–66). The majority had completed primary education (23.3%), followed by those with a bachelor's degree (20.7%) and lower secondary education (20%). In terms of occupation, 58% were laborers, 13.1% were self-employed, and 8.5% were government officials. Regarding monthly income, 40% earned 5,000–9,999 THB, 20.7% earned 2,000–4,999 THB, and 14.8% earned 10,000–19,999 THB. Concerning child health, 96.7% of participants reported their children were generally healthy and rarely ill.

Crucially, regarding childhood immunization status, while the majority of children (63.7%, $n = 765$) had received the complete set of vaccines, a significant proportion (36.3%, $n = 435$) had incomplete records or zero doses, highlighting a critical gap in health coverage.

Logistic Regression Analysis of Determinants Influencing Vaccination Completion. As shown in Table 1, a binary logistic regression analysis was conducted to identify predictors of maternal adaptation and behavior related to the completion of basic childhood immunizations.

Model 1: Individual Demographic and Economic Determinants Model 1, focusing on demographic and economic determinants, incorporated 13 independent variables: maternal

age, marital status, household size, number of children, occupation, household income, consistency of antenatal care (ANC), satisfaction with vaccination services, maternal COVID-19 vaccination history, child health status, maternal vaccine knowledge score, perceived risk of non-immunization, and language used with healthcare providers. This model demonstrated a predictive capability of 29% (Nagelkerke $R^2 = .290$).

Occupational status was a dominant predictor. Business owners/self-employed individuals were 5.03 times more likely to ensure complete vaccination (OR = 5.030; 95% CI [2.019, 12.529]) compared to the unemployed. Similarly, government officers/state enterprise employees were 4.59 times more likely (OR = 4.587; 95% CI [1.658, 12.689]), agricultural workers were 3.50 times more likely (OR = 3.502; 95% CI [1.058, 11.593]), and homemakers were 2.25 times more likely (OR = 2.245; 95% CI [1.002, 5.032]) to vaccinate their children compared to the unemployed. Additionally, widowed, divorced, or separated mothers were 2.61 times more likely to complete the vaccination series (OR = 2.614; 95% CI [1.304, 5.238]) compared to those not legally married.

Satisfaction with vaccination services was also a robust predictor; mothers who reported being “satisfied” were 4.39 times more likely to ensure complete vaccination (OR = 4.391; 95% CI [3.093, 6.233]) than dissatisfied mothers.

Regarding maternal COVID-19 vaccination, mothers who received a mixed regimen (2 doses of Sinovac + 1 AstraZeneca booster) were 2.54 times more likely to ensure childhood vaccination (OR = 2.538; 95% CI [1.527, 4.218]) compared to unvaccinated mothers. Likewise, those fully vaccinated with two doses of Pfizer were 1.96 times more likely to complete the series (OR = 1.962; 95% CI [1.063, 3.623]) compared to unvaccinated mothers.

Other positive predictors included communicating in the Local Southern Thai dialect, which increased the likelihood by 2.33 times (OR = 2.329; 95% CI [1.125, 4.825]) compared to Local Malay speakers. Attending ≥ 5 ANC visits increased the likelihood by 1.88 times (OR = 1.880; 95% CI [1.397, 2.530]) compared to those with incomplete ANC. Conversely, households with a monthly income of 2,000–4,999 THB were significantly less likely (OR = 0.387; 95% CI [0.175, 0.855]) to complete vaccinations than the lowest-income group (< 2,000 THB).

Model 2: Socio-Cultural and Contextual Determinants Model 2 expanded the analysis by integrating 7 additional social and cultural variables: residential area, province, religion, paternal decision-making authority regarding vaccination, anxiety regarding post-vaccination safety, family beliefs regarding vaccination, and community vaccination culture. This inclusion increased the predictive capability to 35% (Nagelkerke $R^2 = .350$).

Occupational status showed stronger associations in this final model. Government officers were 7.98 times more likely to complete vaccinations (OR = 7.980; 95% CI [2.675, 23.811]) compared to the unemployed. This was followed by business owners, who were 6.74 times more likely (OR = 6.740; 95% CI [2.541, 17.876]), agricultural workers (3.76 times; OR = 3.760), general employees (2.96 times; OR = 2.958), and homemakers (2.35 times; OR = 2.353) compared to the unemployed.

Satisfaction with services remained strong; satisfied mothers were 4.07 times more likely to vaccinate (OR = 4.074; 95% CI [2.816, 5.893]) compared to dissatisfied mothers. Language played a significant role; mothers communicating in the Local Southern Thai dialect were 2.86 times more likely (OR = 2.859; 95% CI [1.226, 6.669]), and those speaking Standard Thai were

1.59 times more likely (OR = 1.593; 95% CI [1.100, 2.306]) to vaccinate their children compared to local Malay speakers.

Regarding COVID-19 immunization, the likelihood of childhood vaccination was 3.29 times higher among mothers who received two doses of Pfizer (OR = 3.285; 95% CI [1.727, 6.249]) than among unvaccinated mothers. Similarly, those receiving the mixed regimen were 3.249 times more likely (95% CI = 1.901, 5.551]), and those receiving two doses of AstraZeneca were 1.869 times more likely (95% CI = 1.059, 3.301]) to be vaccinated compared to unvaccinated mothers.

In terms of contextual factors, mothers who did not require permission from the household head were 1.99 times more likely to complete vaccinations (OR = 1.987; 95% CI [1.359, 2.903]) than those who required paternal consent. Residing in rural areas increased the likelihood by 1.77-fold (OR = 1.765; 95% CI [1.261, 2.469]) compared with urban areas. Furthermore, mothers living in Yala province were 2.17 times more likely to vaccinate their children (OR = 2.166; 95% CI [1.054, 4.451]) compared to those residing in Pattani.

Table 1: Determinants Influencing Mothers' Adaptation in Ensuring Their Children Receive the Complete Set of Childhood Vaccinations

Variable	Model 1		Model 2	
	Odds ratio	95% CI	Odds ratio	95% CI
Individual Predisposing and Enabling Factor				
Age	1.014	0.990, 1.039	1.019	0.993, 1.045
Occupation (Not Working®)				
Housewife/Housework	2.245	1.002, 5.032	2.353*	1.285, 7.276
Government Officer / State Enterprise	4.587**	1.658, 12.689	7.980***	2.675, 23.811
General Employee	2.208	0.964, 5.061	2.958*	1.209, 7.238
Agriculture/Fisheries	3.502*	1.058, 11.593	3.760*	1.045, 13.532
Business Owner/ Self-employed	5.030**	2.019, 12.529	6.740***	2.541, 17.876
Marital Status (Not Registered®)				
Legally Married	0.912	0.659, 1.261	1.038	0.734, 1.469
Widowed/Divorced/Seperate	2.614**	1.304, 5.238	2.353*	1.153, 4.801
Household Income (Below 2,000 THB®)				
2,000–4,999 THB	0.387*	0.175, 0.855	0.454	0.199, 1.039
5,000–9,999 THB	0.566	0.266, 1.203	0.593	0.272, 1.293
10,000–19,999 THB	0.823	0.374, 1.812	0.602	0.264, 1.375
20,000–29,999 THB	0.608	0.249, 1.482	0.448	0.176, 1.140
30,000 THB and above	0.659	0.264, 1.647	0.395	0.148, 1.089
Number of Household Members	1.150**	1.040, 1.277	1.119*	1.004, 1.248
Total Number of Children	0.828**	0.727, 0.944	0.829**	0.725, 0.949
Children's Health (Unhealthy®)				
Healthy	0.914	0.414, 2.018	1.875	0.717, 0.939
Pregnancy Test (Incomplete/Inadequate Antenatal Care®)				
≥ 5 times	1.880***	1.397, 2.530	1.890***	1.372, 2.604
Maternal Vaccine Knowledge Score				
	1.073***	1.032, 1.115	1.041	0.995, 1.089

Variable	Model 1		Model 2	
	Odds ratio	95% CI	Odds ratio	95% CI
Perceptive Risks of Not Vaccinating	0.993	0.949, 1.038	0.986	0.940, 1.035
Satisfaction with Services				
Satisfied	4.391***	3.093, 6.233	4.074***	2.816, 5.893
Language Used to Communicate with Vaccine Service Providers (Local Malay®)				
Standard Thai	1.304	0.935, 1.820	1.593*	1.100, 2.306
Local Thai	2.329*	1.125, 4.825	2.859*	1.226, 6.669
Maternal COVID-19 Vaccination (Not Received at All®)				
Complete 2 doses of Sinovac and 1 booster dose of AstraZeneca	2.538***	1.527, 4.218	3.249***	1.901, 5.551
Complete 2 doses of AstraZeneca	1.627	0.952, 2.780	1.869*	1.059, 3.301
Complete 2 doses of Pfizer	1.962*	1.063, 3.623	3.285**	1.727, 6.249
1 dose of any type	1.285	0.657, 2.515	1.324	0.671, 2.614
Contextual and Structural Determinants				
Religion (Islam®)				
Buddhism	-	-	0.661	0.304, 1.436
Residential Area (Urban®)				
Rural	-	-	1.765**	1.261, 2.469
Province (Pattani®)				
Narathiwat	-	-	0.854	0.585, 1.246
Yala	-	-	2.166*	1.054, 4.451
Anxiety about Side Effect (Yes®)				
No	-	-	1.400	0.979, 2.002
Consent Required from Household Head for Taking Child to Receive Vaccine (Requires Consent®)				
No Consent Required	-	-	1.987***	1.359, 2.903
Family Beliefs Regarding Vaccination (Religious Objections®)				
Religious Acceptance	-	-	0.838	0.409, 1.719
Cultural Conflict regarding Child Vaccination (Culturally compatible ®)				
Incompatible with culture			0.729	0.339, 1.619
R²	0.290		0.350	
df	26		34	
-2Loglikelihood	1,285.223		1,216.034	

Note: * $p < .05$, ** $p < .01$, *** $p < .001$.

Discussion

This study reveals a critical immunization gap in Southernmost Thailand, identifying that 36.3% of children have incomplete vaccination records. The findings indicate that the determinants of vaccination have evolved beyond traditional narratives of poverty and basic literacy. Instead, the current landscape is defined by a complex interplay of “Institutional Integration,” “Social Capital,” and “Trust in Modern Science.”

A striking finding in this study is the diminishing role of maternal age and general education as primary predictors. This result diverges from earlier localized studies in Southern Thailand. While Lohmae et al. (2023) observed that maternal health literacy and adequate access to information can empower caregivers to overcome structural hurdles, and Domang and

Prateepko (2019) emphasized the vulnerability of younger, less experienced mothers, our findings suggest a paradigm shift. In the current digital era, universal internet access appears to narrow the traditional “information gap,” allowing mothers with primary education to access health information comparable to those with higher degrees (Jinarong et al., 2023). This finding provides a more nuanced understanding of Hypothesis 1 (H_1), suggesting that maternal adaptability to modern health interventions may now outweigh the impact of traditional formal education in predicting vaccination completion.

However, Occupational Status has emerged as a definitive structural determinant. Government officers and business owners are significantly more likely to vaccinate their children compared to the unemployed. This aligns with Asif et al. (2019), positing that stable occupation provides the necessary socio-economic scaffolding for health compliance. While Zimmermann and Curtis (2019) highlighted the impact of broad logistical constraints and McNeil et al. (2019) focused on specific religious barriers, our data suggest that contemporary obstacles are more intrinsically tied to institutional scaffolding. Government officers are embedded in formal structures that mandate health compliance, creating a normative environment for vaccination. In contrast, unemployed mothers often lack this organizational discipline and structural support, echoing the concerns raised by McNeil et al. (2019) regarding how socio-economic marginalization—rather than a simple lack of knowledge—continues to hinder healthcare navigation.

Interestingly, a “Welfare Paradox” was observed: households in the lower-middle-income bracket are significantly less likely to complete vaccinations than the poorest group. While the poorest receive targeted state assistance, the “working poor” fall through the cracks of the safety net, facing precarious work schedules and being ineligible for intensive aid (Jinarong et al., 2023). This structural exclusion of the ‘working poor’ likely explains why vaccination coverage in certain districts has plummeted below the 50% threshold in the post-pandemic era (NSO & UNICEF, 2023). However, our findings, showing a 63.7% completion rate, suggest a partial recovery or more resilient maternal adaptation within our sampled population compared to broader regional estimates, potentially due to the specific timing of our data collection in the post-pandemic phase. It suggests that the strain on local service delivery, as identified by the Ministry of Public Health (2024), disproportionately affects those who lack both state subsidies and the flexibility afforded by high-income occupations. Furthermore, unlike parents in other regions who may pay for optional vaccines to reduce side effects (Tongpua & Cheawchanwattana, 2013), our findings suggest that for mothers in Southernmost Thailand, structural support remains a more fundamental barrier than vaccine quality.

Contrary to assumptions about urbanization, this study finds a “Rural Advantage” attributed to higher Social Cohesion. In rural villages, vaccination functions as a socially reinforced norm through social modeling. Influential community members act as ‘Opinion Leaders’ (Dearing, 2009). This is consistent with evidence that close social circles are the most trusted sources of information (Tongpua & Cheawchanwattana, 2013). In contrast, urban environments exhibit “Social Fragmentation,” leaving mothers isolated.

A particularly nuanced discovery in this study is the concept of Transferable Trust, as evidenced by the link between maternal COVID-19 vaccination and childhood immunization. Mothers who opted for complex medical regimens, such as heterologous (mixed-dose) COVID-19 vaccines, demonstrate a form of cognitive resilience against the prevailing “infodemic.” This ability to effectively navigate through layers of misinformation and

prioritize scientific intervention serves as a primary indicator of the high health literacy and adaptability proposed in Hypothesis 1 (H₁).

Conversely, the refusal of COVID-19 vaccines serves as a potent “Risk Marker” for deep-seated mistrust in state-sponsored health interventions. This mistrust appears to transcend specific diseases, extending to routine childhood vaccinations and posing a persistent challenge to national health security (WHO, 2026). These findings provide strong empirical support for Hypothesis 2 (H₂), which posits that positive engagement with the healthcare system—characterized by high service satisfaction and consistent maternal care utilization—is a key predictor of immunization status. Our data suggests that those who ‘trusted’ the system during the pandemic are the same group that successfully navigates routine services.

Simultaneously, these results validate Hypothesis 3 (H₃) by illustrating how traditional sociocultural barriers, linguistic differences, and specific contextual constraints in the Southern Border Provinces continue to reduce the odds of vaccine adherence. The 'transferable trust' observed in some mothers is effectively neutralized in others by the friction of these deep-seated cultural factors. Ultimately, this reveals a complex interaction in which institutional trust (H₂) must continually compete with localized sociocultural resistance (H₃) to determine the final health outcomes for children in this digital yet traditional landscape.

Furthermore, the role of Patriarchal Authority remains a critical determinant; mothers who do not require paternal permission are twice as likely to complete their child’s vaccinations. This underscores how traditional household power structures continue to dominate maternal autonomy. Specifically, while Smuseneto et al. (2017) highlighted that paternal authority remains the primary factor in household decision-making, Daya et al. (2018) further demonstrate that this influence extends directly to child-related health outcomes, with paternal consent serving as a gatekeeper for vaccine adherence.

Conclusion and policy recommendation

A complex clash between Modern Enablers and Traditional Constraints currently drives the immunization gap in Southern Thailand. The findings demonstrate that determinants of vaccination have evolved beyond the traditional narratives of poverty and basic literacy; instead, the current landscape is defined by the interplay among Institutional Integration, Social Capital, and Trust in Modern Science. While digital connectivity has narrowed the traditional information gap, structural barriers—particularly occupational instability and linguistic divides—continue to hinder full immunization. Ultimately, strictly medical or economic approaches are insufficient for addressing this disparity, as the barriers are deeply rooted in the region’s unique sociocultural and structural scaffolding.

The findings indicate that policy interventions must evolve from universal campaigns to precision public health strategies through three primary pillars: First, public health authorities should transition to precision public health by leveraging maternal COVID-19 vaccination history as a risk-stratification tool to provide data-driven, individualized counseling. This targeted engagement aligns with WHO technical guidelines for reaching under-vaccinated communities and mitigating pandemic fatigue by addressing the specific anxieties of mothers in Southern Thailand. Second, the healthcare ecosystem must be revitalized to bridge structural and linguistic gaps. This involves establishing a targeted support system for

unemployed mothers and addressing the urban health void, as highlighted by UNICEF Thailand (2025).

Simultaneously, as suggested by Domang and Prateepko (2019), health communication should pivot to short-form video content in local Malay dialects, using trusted community ambassadors to ensure health information is culturally resonant and accessible. Third, the quality of healthcare delivery must prioritize the user experience in clinics through a twofold approach: cultural competence and strengthening the safety net. Specifically, healthcare staff training should focus on cross-cultural communication to foster an empathetic and welcoming atmosphere, as Zimmermann and Curtis (2019) emphasized that effective communication is the cornerstone of clinical trust. By prioritizing this clinical experience, the system can foster long-term trust and encourage return visits, ensuring that children do not fall through the safety net, a critical outcome supported by the work of Jinarong et al. (2023).

Building upon these recommendations, future investigations should adopt the dyadic approaches proposed by Daya et al. (2018) to understand the nuances of paternal decision-making better. Longitudinal studies are also necessary to assess whether pandemic-driven health behaviors translate into sustained adherence to immunization, in line with the WHO's (2022) broader monitoring goals. Furthermore, as Al Shamsi et al. (2020) suggested, quasi-experimental research on bilingual interventions would provide the empirical evidence needed to justify public investment in upgrades to non-clinical services. Ultimately, applying the framework of Gopalan et al. (2020) would allow for a deeper exploration of how patient-centered care and high-quality service environments can foster a genuine, long-term commitment to healthcare among local families.

Ethical statement

This study was conducted in accordance with ethical guidelines. It was approved by the Human Research Ethics Committee of Prince of Songkla University, Pattani Campus, under project code REC Number: psu.pn.2-063/64.

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References

- Al Shamsi, H., Almutairi, A. G., Al Mashrafi, S., & Al Kalbani, T. (2020). Implications of language barriers in healthcare: A systematic review. *Oman Medical Journal*, 35(2), Article e122. <https://doi.org/10.5001/omj.2020.40>
- Andersen, R. M. (1995). Revisiting the behavioral model and access to medical care: Does it matter? *Journal of Health and Social Behavior*, 36(1), 1–10. <https://doi.org/10.2307/2137284>
- Andersen, R. M., & Davidson, P. L. (2007). Improving access to care in America: Individual and contextual indicators. In R. M. Andersen, T. H. Rice, & G. F. Kominski (Eds.), *Changing the U.S.*

- health care system: Key issues in health services policy and management* (3rd ed., pp. 3–31). Jossey-Bass.
- Asif, A. M., Akbar, M., Tahir, M. R., & Arshad, I. A. (2019). Role of maternal education and vaccination coverage: Evidence from the Pakistan Demographic and Health Survey. *Asia Pacific Journal of Public Health*, 31(8), 679–688. <https://doi.org/10.1177/1010539519889765>
- Cochran, W. G. (1977). *Sampling techniques* (3rd ed.). John Wiley & Sons.
- Coordination Center for Public Health, Region 12. (2025). *Raingan sukhaphawa mae lae dek pi 2568* [Maternal and child health report 2025]. [https://www.ahsouth.com/\(ahsouth\)/project/report/issue?planningId=4293&year=2025](https://www.ahsouth.com/(ahsouth)/project/report/issue?planningId=4293&year=2025)
- Daya, S., Lillahkul, N., & Kornnoin, J. (2018). Prasopkan khong phu pokkhong dek chao Thai Muslim to kan patiset kan rap borikan sangsoem phumikhumkan rok duai vaksin nai dek ayu 0–5 pi [Experience of parents of Thai Muslim children aged 0–5 years who rejected immunization services]. *Journal of the Department of Medical Services*, 43, 137–141. <https://he02.tci-thaijo.org/index.php/JDMS/article/view/247857>
- Dearing, J. W. (2009). Applying diffusion of innovation theory to intervention development. *Research on Social Work Practice*, 19(5), 503–518. <https://doi.org/10.1177/1049731509335569>
- Department of Disease Control. (2023). *Sarup rai ngan kan faeo rawang rok pracham pi 2566* [Annual Epidemiological Surveillance Report 2023]. Ministry of Public Health. <https://apps-doe.moph.go.th/boeeng/annual/Annual/Annual%20Report%202023.pdf>
- Department of Provincial Administration. (2025). *Sathiti prachakon thang kan thabian ratsadon* [Population statistics for civil registration]. <https://stat.bora.dopa.go.th/stat/statnew/statMONTH/statmonth/#/displayData>
- Domang, R., & Prateepko, T. (2019). Patchai thi mi phon to phu pokkhong nai kan nam dek ayu 0–5 pi rap kan sangsoem phumikhumkan rok phuenthan khong changwat Pattani [Factors affecting parents on seeking basic immunization program for their children aged 0–5 years in Pattani Province]. *Journal of Health Science*, 28(2), 225–235. <https://thaidj.org/index.php/JHS/article/view/6414>
- Gopalan, M., Rosinger, K., & Ahn, J. B. (2020). Use of quasi-experimental research designs in education research: Growth, promise, and challenges. *Review of Research in Education*, 44, 218–243. <https://doi.org/10.3102/0091732X20903302>
- IBM Corp. (2019). *IBM SPSS Statistics for Windows* (Version 26.0) [Computer software].
- Jeharsae, R., Hasamoh, A., Talek, M. F., Jehalee, H., Tohpa, H., & Piriyaart, J. (2019). *Situation analysis of children in the southern border provinces, 2018–2019*. Prince of Songkla University.
- Jinarong, T., Chootong, R., Vichitkunakorn, P., & Songwathana, P. (2023). Muslim parents' beliefs and factors influencing complete immunization of children aged 0–5 years in a Thai rural community: A qualitative study. *BMC Public Health*, 23, Article 1348. <https://doi.org/10.1186/s12889-023-15273-y>
- Lohmae, U., Kajornkittiya, K., Dowrote, N., Wansa-aree, R., & Cheni, R. (2023). *Pra sob karn khong poo pok krong tor karn num boot ma rub vac cine peun than pai tai sa tha na karn karn phrae ra bard khong rok tid cheua virus corona 2019* [Experience of parents on seeking basic immunization program during the situation of the coronavirus outbreak (COVID-19)]. *Journal of The Royal Thai Army Nurses*, 24(3), 407–414. <https://he01.tci-thaijo.org/index.php/JRTAN/article/view/263311>
- McNeil, D. A., Mueller, M., MacDonald, S., McDonald, S., Saini, V., Kellner, J. D., & Tough, S. (2019). Maternal perceptions of childhood vaccination: Explanations of reasons for and against vaccination. *BMC Public Health*, 19, Article 49. <https://doi.org/10.1186/s12889-018-6338-0>
- Ministry of Public Health. (2024). *Rabop khleng khomun dan kanphaet lae sukhaphap (HDC): Tua chiwat krasuang* [Health data center (HDC): Ministry key performance indicators]. <https://hdc.moph.go.th/center/public/kpi/1/2024>
- National Statistical Office Thailand (NSO), & UNICEF Thailand. (2020, July). *Thailand Multiple Indicator Cluster Survey 2019: Survey Findings Report*. https://catalogapi.nso.go.th/api/doc/MICS_31_2.pdf
- National Statistical Office Thailand (NSO), & UNICEF Thailand. (2023, September). *Thailand Multiple Indicator Cluster Survey 2022: Report of 12 selected provinces in Thailand*. <https://www.unicef.org/thailand/media/11846/file/MICS%202022%20Thailand%2012%20selected%20provinces%20EN.pdf>

- Sahitia, S., Idris, I. B., Safian, N., Ali, R. F., Shamsuddin, K., & Hod, R. (2025). Barriers to childhood immunization in rural and remote areas: A qualitative exploration from the perspectives of community leaders in Sindh, Pakistan. *Qualitative Health Research*, 35(3), 349–365. <https://doi.org/10.1177/10497323241263279>
- Smuseneto, A., Tongsamsi, K., Benrit, P., & Useng, N. (2017). Phetsawithi nai chiwit somrot khong chao Thai Muslim changwat Pattani [Sexuality in the marital life of Thai Muslims in Pattani Province]. *Thammasat Journal of History*, 4(1), 270–323. <https://doi.org/10.14456/thammasat-history.2017.6>
- Szumilas, M. (2010). Explaining odds ratios. *Journal of the Canadian Academy of Child and Adolescent Psychiatry*, 19, 227–229. <https://pmc.ncbi.nlm.nih.gov/articles/PMC2938757/>
- Tongpua, S., & Cheawchanwattana, A. (2013). Patchai thi mi phon to kan sue vaksin thang lueak khong phu pokkhong kan sueksa doi kan samphat na sun anamai thi 6 Khon Kaen [Factors associated with parents' decision on purchasing optional vaccines: An interview study at Health Promotion Center 6, Khon Kaen]. *Isan Journal of Pharmaceutical Sciences*, 9(2), 37–49. <https://doi.org/10.14456/ijps.2013.9>
- UNICEF Thailand. (2025, May). *Impact report 2024: From promise to progress*. <https://www.unicef.org/thailand/reports/impact-report-2024>
- World Health Organization (WHO). (2022, July). *Global COVID-19 vaccination strategy in a changing world: July 2022 update*. <https://www.who.int/docs/default-source/coronaviruse/global-covid-19-vaccination-strategy-in-a-changing-world---july-2022-update.pdf>
- World Health Organization (WHO). (2025, July 15). *Immunization coverage*. <https://www.who.int/news-room/fact-sheets/detail/immunization-coverage>
- World Health Organization (WHO). (2026). *Vaccines and immunization*. <https://www.who.int/health-topics/vaccines-and-immunization>
- Zimmermann, P., & Curtis, N. (2019). Factors that influence the immune response to vaccination. *Clinical Microbiology Reviews*, 32, Article e00084-18. <https://doi.org/10.1128/CMR.00084-18>