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Analysis of Factors Affecting Complete Basic Immunization Coverage

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Abstract

The coverage of complete basic immunization in Solok City has shown a decline in recent years. In 2021, only 23% of targeted infants received complete basic immunization. This figure increased in 2022 to 52.2% out of 1,343 infants, but dropped again in 2023 to 45% out of 1,361 infants, indicating a serious concern. This study aims to analyze the factors influencing complete basic immunization coverage in Solok City including knowledge, attitudes, beliefs, infrastructure, service accessibility, cost, family support, and incentive provisions and to identify the most influencing factors. This research employs a mixed-methods approach, combining quantitative and qualitative methods. The design follows an explanatory sequential model, where quantitative data is collected and analyzed first, followed by in-depth qualitative research examining input, process, and output components. The approach was chosen to provide a comprehensive and accessible understanding. Quantitative data was gathered from 222 respondents using questionnaires, while qualitative data was obtained through in-depth interviews, observations, and document reviews. The findings revealed that 62.2% of mothers had fully immunized their infants. Chi-square tests indicated that knowledge, attitudes, beliefs, family support, and incentive provisions each had a p-value of 0.000 (<0.05), showing a significant association. Meanwhile, infrastructure (p=0.163 >0.05) and cost (p=0.129 >0.05) were not statistically significant. The study concludes that attitudes, family support, and incentive provision are the most strongly correlated variables with complete basic immunization coverage.

Introduction

Complete basic immunization coverage in Indonesia remains low, with health workers still facing significant challenges. The number of children who received no immunizations at all between 2018 and 2023 reached 1,879,820. This figure will increase by 432,615 in 2023.(Ministry of Health, 2023). Seeing that immunization coverage is not optimal and not evenly distributed because parents of babies still do not understand the importance of immunization, this remains a major challenge in implementing immunization in Indonesia (Hargono et al., 2022; Azizatunnisa' et al., 2021).

This situation results in the continued prevalence of vaccine-preventable diseases (VPD3I) in the community (Tamba et al., 2024; Kolobova et al., 2022). This indicates that children who do not receive immunizations are at high risk of contracting dangerous diseases that can lead to disability and even death. Furthermore, the presence of unimmunized children hinders the

achievement of herd immunity, which can ultimately trigger outbreaks or extraordinary events (KLB) in the community.(Ministry of Health, 2023).

In 2023, at least 94 measles outbreaks were recorded in 66 districts/cities, 4 rubella outbreaks in 4 districts/cities, 103 diphtheria outbreaks in 68 districts/cities, 7 cases of CVDPV2 circulating vaccine-derived poliovirus type 2 polio in 7 districts/cities, 1 case of VDPV1 or derived poliovirus type 1 polio in 1 district/city, 14 cases of neonatal tetanus in 12 districts/cities, and 13 deaths due to neonatal tetanus in 11 districts/cities. Furthermore, the spread of pertussis cases was reported in 149 districts/cities across 29 provinces in 2023.

In Indonesia, the government's immunization coverage target is 90% for infants under two years of age (Ministry of Health, 2023). However, this achievement is still far from expectations in some regions. In the Solok City area, the achievement of complete basic immunization over the past few years has shown a fluctuating trend and even a decline (Solok City Health Office, 2023). In 2021, of the 1,335 targeted infants, only 23% received complete basic immunization. This achievement increased in 2022 to 52.2% of 1,343 infants, but decreased again in 2023 with an achievement of 45% of 1,361 infants (Solok City Health Office, 2023). This indicates a large gap and is a serious problem in the implementation of the immunization program in Solok City.

The low immunization rate in Solok City has resulted in more children contracting preventable diseases. This is evident in the steadily increasing number of pediatric patients hospitalized in pediatric polyclinics. In 2021, there were 1,075 children treated, rising to 1,920 in 2022, and further increasing to 2,045 in 2023 (Solok City Health Office, 2023). This data indicates that dangerous diseases such as measles, diphtheria, and polio still threaten children in Solok City because immunization coverage has not yet reached all children. If immunization is not increased, cases of illness in children could continue to rise. This increase in cases reflects the lack of protection provided through immunization programs in the community. This situation adds to the challenges in efforts to improve child health and reinforces the urgency of expanding immunization coverage and other child health services. Therefore, an evaluation of complete basic immunization coverage in Solok City is needed.(Solok City Health Office, 2023).

A comprehensive evaluation of basic immunization coverage needs to consider individual determinants, including predisposing, leveraging, and reinforcing factors. These factors can vary, especially in Solok City. Predisposing factors such as age, education level, knowledge, and community attitudes toward immunization play an important role in determining immunization coverage.(Green & Kreuter, 2005)Meanwhile, leveraging factors such as the role of cadres and midwives are key in facilitating immunization accessibility (Mulyani & Sugiarto, 2021). Reinforcing factors, including social support and government policies, can motivate and encourage adherence to the immunization schedule.(Notoatmodjo.Soekidjo, 2012; Wong et al., 2025).

The implementation of the immunization program in Solok City, within the context of systems theory, can be viewed as part of a larger health system (Amalia et al., 2025; Lukman et al., 2025). The interactions between the various components and actors within the system determine the final outcome.(Lasswell, 1948).Existing evaluations may already encompass systemic aspects, but often lack a holistic approach that takes into account individual factors. Therefore, evaluations that combine a systemic approach with in-depth analysis of individual determinants are needed to provide a more comprehensive picture of the successes or challenges in achieving immunization coverage.

This approach will not only help identify weaknesses in the program but also offer more specific and contextual solutions to improve immunization coverage in Solok City. In this context, Lawrence Green's theory is relevant because individual health is influenced by two

main categories, namely behavioral factors and non-behavioral factors. Behavioral factors are divided into three important elements: first, predisposing factors, which include age, education, knowledge, and attitudes; second, enabling factors, which include the role of cadres and midwives; and third, reinforcing factors, which include social support and government policies.(Yoselina et al., 2022)

Parents' age and education also influence decisions about immunizing their children. Furthermore, changes in social, economic, and political factors can influence public responses to health issues, including immunization.(Agutina, 2016).Low parental knowledge about the importance of immunization contributes to low immunization coverage, where good knowledge has been shown to have a positive impact on their decisions.(Suryani & Jannah, 2021). Public attitudes towards the immunization program and the delivery of appropriate information also play an important role in increasing participation.(Jati et al., 2021).Several studies also show that training for health workers and optimal supervision can increase immunization coverage in the community.(Nurul Khomariah et al., 2018)

Various factors contribute to immunization coverage. Previous research has identified several determinants that influence immunization rates. Mothers' low knowledge of the immunization schedule, coupled with a lack of access to accurate information from health workers, are among the main reasons for low participation. This study also underscores the important role of health workers in raising mothers' awareness of the importance of immunization. The study also highlighted that distance from health facilities and low economic conditions also affect access to and participation in immunization programs.(Iska, 2023)This study revealed that parents from low-income families tend to delay or even skip their children's immunizations due to cost and distance. The study shows that negative public attitudes toward immunization are often fueled by misinformation or hoaxes about vaccine side effects. In this context, the role of health workers in providing accurate education is key to reducing public resistance.(Julerezky, 2023).

Such an evaluation should have been conducted by the program, but in an effort to increase immunization coverage in Solok City, the infant immunization system needs to be comprehensively analyzed through three main components: input, process, and output. From an input perspective, several critical aspects include the availability of resources such as health workers, vaccines, proposed activity plans, and an adequate budget to support the implementation of the immunization program. A lack of these resources can be a major obstacle to achieving immunization targets.(Nurul Qamarya, Zamli, Hafsah, et al., 2024). Furthermore, during the process stage, the role of health workers in providing immunization services, including counseling, data collection, and field implementation, is crucial to ensure all infants receive their immunizations on schedule. This process also includes educational and outreach strategies to raise public awareness of the importance of immunization, as well as approaches that address barriers such as vaccine-related beliefs and myths. Accuracy and consistency in implementing this process determine the effectiveness of the immunization program.

The complete basic immunization program in Solok City aims to increase immunization coverage and control the incidence of Immunization-Preventable Diseases (VPD3I). Analysis of this coverage not only serves as a benchmark for program performance but also serves as a basis for continuous improvement of the immunization system.

This study aims to analyze the achievement of complete basic immunization in Solok City using a systems theory approach and identification of determinants. The results of the analysis are expected to form the basis for developing more targeted policies to improve program effectiveness. Furthermore, increased immunization coverage also contributes to improving children's nutritional status and preventing infectious diseases, indirectly supporting efforts to improve the quality of human resources.

Methods

Phase I Quantitative Research

This study employed a mixed methods approach, a combination of quantitative and qualitative methods. An explanatory sequential design was chosen, in which quantitative data was collected and analyzed first, followed by in-depth analysis using qualitative data, including input, process, and output components. This approach was chosen to provide a more comprehensive understanding of the factors influencing low immunization coverage in Solok City.Time and Place of Research. This research started from the proposal creation until the research was implemented from January to June 2025. This research was conducted in Solok City, West Sumatra Province. The population in this study included all mothers who had babies in Solok City, totaling 1,182 babies, with a distribution of 623 babies in Lubuk Sikarah District and 559 babies in Tanjung Harapan District. Of these,. The sampling technique used stratified random sampling with strata based on sub-district areas to ensure proportional representation. The research sample consisted of 222 mothers of babies, consisting of 117 respondents from Lubuk Sikarah (52.7%) and 105 respondents from Tanjung Harapan (47.3%), where this division was adjusted to the population proportion of each sub-district. Data collection in this study used a mixed-methods approach (a combination of quantitative and qualitative) to obtain comprehensive data related to immunization participation at Posyandu in Solok City. The following are details of the methods used: structured questionnaires, document studies, and field observations. Data analysis and data presentation in this study are univariate analysis, bivariate analysis, and multivariate analysis.

Phase II Qualitative Research

After quantitative analysis identified the dominant factors associated with low immunization coverage, qualitative research was conducted to deepen understanding of the context, mechanisms, and reasons behind the statistical findings. This qualitative approach used in-depth interviews with relevant stakeholders. This study aimed to analyze the implementation of the immunization coverage program in Solok City by examining various factors influencing the program's success.

This study aims to conduct a comprehensive analysis of the implementation of the basic immunization coverage program in Solok City through an in-depth qualitative approach. Using the Input-Process-Output (IPO) framework, this study seeks to identify various determinants that influence the effectiveness of the immunization program, both supporting and inhibiting factors. The research findings are expected to provide evidence-based policy recommendations to increase immunization coverage and reduce the incidence of Immunization-Preventable Diseases (PD3I) in the study area (Rachman et al., 2024). This study used a qualitative case study design with an exploratory approach. Data collection was conducted through in-depth semi-structured interviews, participant observation, and a review of program documents. Primary data collection was conducted using in-depth interviews using a semi-structured interview guide. Secondary data were obtained from document searches conducted by collecting files related to the implementation of Posyandu activities. Data processing was carried out after the data were completed through in-depth interviews. The results of the in-depth interviews were transcribed in detailed and complete written form according to what was obtained from seeing and hearing both directly and recordings. Data analysis of the Miles and Huberman model is carried out by reducing data (data reduction), presenting data (data display) and drawing conclusions and checking data (conclusion drawing and verification).

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Result and Discussion

Knowledge

The study revealed that 59.5% of respondents were classified as having low knowledge. The weakest aspect of knowledge was understanding the function of the MR vaccine, where most did not know that this vaccine prevents measles and rubella (German measles) (83.8%). The results of this study indicate a relationship between knowledge and complete basic immunization coverage. This study is in line with research conducted by Mulyani et al. on maternal knowledge about the completeness of basic immunizations for infants, which showed that the majority of respondents (60.1%) had insufficient knowledge.(Mulyani et al., 2018)This research is different from the research of Dwi Nengsih and Hendriyani regarding the relationship between knowledge and maternal compliance in complete basic immunization. It is known that the majority of respondents (51.2%) have good knowledge.(Dinengsih & Hendriyani, 2018). The results of data analysis using the chi-square test showed that there was a relationship between knowledge and complete basic immunization coverage in providing basic immunization (p value = 0.000), However, research conducted by Elbert, et al. was not in line with this research, most respondents (65%) of mothers had high knowledge (Elbert et al., 2023).

This research was explored in more depth and revealed that mothers only received education during the integrated health post (posyandu), namely when the midwife or immunization officer would provide immunization, the immunization officer provided education in the form of education regarding the type of vaccine to be injected, the benefits of the vaccine, and treatment if side effects occur after the vaccine is injected, parents who received education were only parents who came to the integrated health post and the Community Health Center if there were any who refused, meaning that the parents never received any health education at all from health workers,

Although health workers have provided technical education to increase knowledge, particularly about the MR vaccine, during immunization services, public understanding remains at an alarming level. This gap arises from various interrelated factors, ranging from the short duration of education sessions, poorly targeted communication methods, and the lack of mechanisms to ensure that the information provided is truly understood. This situation is further complicated by the fact that the public perceives the MR vaccine as unfamiliar compared to other, more familiar, basic vaccines.

To address these challenges, a more innovative and comprehensive educational approach is needed. The outreach system needs to be redesigned so that it is not limited to immunization visits. Developing engaging visual educational media, such as infographic posters or short videos, can help convey information in a more digestible manner. Utilizing digital platforms like WhatsApp groups or social media also has the potential to expand the reach of information dissemination, given the increasing penetration of smartphones in the community.

The communication skills of health workers need to be continuously improved through specialized training. Standard educational materials should be presented in simpler language and with concrete examples relevant to everyday life. A community-based approach involving integrated health post (Posyandu) cadres and local religious leaders can create a multiplier effect, as these figures are typically more trusted by the community.

Innovation in information delivery methods is also important. Using visual aids that compare immunized and unimmunized children, or providing direct testimonials from parents who have experienced the effects of measles and rubella, may be more effective in raising public

awareness. A structured follow-up system through home visits or a child immunization progress monitoring book can help ensure that the information provided truly sticks.

This transformation in public health communication strategies must be implemented holistically, involving all relevant stakeholders. Health offices, community health centers (Puskesmas), integrated health post (Posyandu) cadres, community leaders, and religious organizations need to work together to create a massive movement to increase understanding of complete basic immunization. This approach also needs to be sensitive to the local socio-cultural context, as the effectiveness of health communication is heavily influenced by cultural factors.

Attitude

The results of the study showed that the majority of respondents (51.4%) with mothers' attitudes who did not know the risk of their children contracting diseases was greater if they were not immunized, the results of this study also stated that there was a relationship between attitudes and complete basic immunization coverage. The results of this study are in line with research conducted by Illiah et al. regarding respondents' attitudes towards complete basic immunization (63.2%) had a negative attitude. (Scientific & Imelda, 2024)The results of data analysis using the chi-square test showed that there was a relationship between attitudes and complete basic immunization coverage (p value = 0.000). In a study conducted by Langer et al., this was not in line with this study. Most respondents (84%) had an attitude of never refusing vaccines.(Langer et al., 2024), in Amadea et al's research on mothers' attitudes regarding basic immunization, this was also not in line with the majority of respondents (92.2%) who supported it. (Amadea Wibowo et al., 2020).

This research was explored in more depth to reveal the problem that most respondents still do not understand the risk of children contracting diseases if they are not immunized, the attitude of mothers who do not care and do not understand the risks that their children will receive in the future (29.7%), this problem is caused by the lack of educational meetings to provide understanding to mothers about the importance of immunization, as well as limited funding for programs to increase immunization coverage. This problem is reported every month in lokmin (mini workshops), but there has been no follow-up resolution due to budget limitations. As a result, at the output level, this problem continues to recur without a solution, so that the immunization target is not achieved.

A stable attitude in a person can be a predictor of their behavior towards the things that are the target of that attitude.(Pakpahan & Silalahi, 2021)In this context, the more negative a mother's attitude toward immunization, the more difficult it is for her child to receive it. Therefore, efforts to increase understanding and positive perceptions of immunization are key to increasing community participation.

These improvements in attitudes and behaviors will encourage proactive behaviors such as routinely immunizing children, seeking valid information about vaccines, and even encouraging others to participate in immunization programs. Conversely, negative attitudes toward immunization are characterized by doubts about vaccine safety, excessive concern about side effects, and rejection of government vaccination programs. These negative attitudes typically result in avoidance behaviors such as delaying or even refusing immunization, reluctance to seek accurate information, and the potential to spread misinformation about vaccines. These differences in attitudes are clearly visible in patterns of visits to health facilities, consistency in immunization schedules, responses to health campaigns, and how they respond to information related to immunization. Positive attitudes will increase immunization coverage, while negative attitudes risk decreasing vaccination rates and increasing vulnerability to preventable diseases.

Efforts to shift negative attitudes toward immunization to positive ones require a comprehensive, multidimensional, and sustainable approach. Key efforts include comprehensive education through personal counseling by trained health workers who can address public concerns empathetically and based on scientific evidence. The government needs to strengthen transparent information campaigns about vaccine safety, involving religious and community leaders trusted by residents as agents of behavior change. Reward systems such as certificates or incentives for families with complete immunizations can serve as extrinsic motivation, while cultural approaches that combine health messages with local values will increase acceptance. It is also crucial to establish a credible side effect surveillance system to address public concerns, while implementing supportive regulations, such as requiring complete immunization for certain public services. Honest and consistent risk communication through traditional and digital media, involving survivors of vaccine-preventable diseases, will help shape a more balanced perception.

Belief or Religion

The results of the study showed that the majority of respondents (54.5%) did not believe. The problem is trust in religious figures who do not actively support the complete basic immunization program, this study states that there is a relationship between trust and the coverage of complete basic immunization, the results of this study are in line with research conducted by Rahmawati A et al., namely respondents' trust in complete basic immunization (70.5%) with distrust in immunization(Rahmawati & Wahjuni, 2014). The results of data analysis using the chi-square test indicate that there is a relationship between belief or religion and complete basic immunization coverage (p value = 0.000). In a study conducted by Nur Jelita et al. on the influence of religious figures on the status of complete basic immunization of infants, this is not in line with this study, namely (88.5%) do not believe in immunization.(Nur Jelita Amin Daman & Arief Hargono, 2017)In Rahmatina et al.'s research on religious factors in providing basic immunizations, it was also not in line with the majority of respondents (53.1%) who believed in immunizations.(Rahmatina, 2021). And research conducted by Masyudi et al. in research on factors related to the provision of complete basic immunizations amounted to (66.7%) belief or religion supporting immunization.(Masyudi et al., 2023).

This research, explored in more depth, revealed the problem of low public trust or religion in complete basic immunization, especially in trust in religious leaders who are not active in supporting the complete basic immunization program, which is completely absent until now. So far, religious leaders have never been involved in the immunization program, either directly or indirectly, namely from families, including rarely participating in the complete basic immunization program, Community Health Centers currently have not established regular cross-sectoral cooperation with religious leaders, this year there is a budget efficiency that requires the management of the budget as small as possible, meaning that many community health center programs cannot be implemented, of course this cannot add programs or even create program innovations so that religious leaders do not feel involved in immunization socialization. As a result, hoax issues—such as the assumption that vaccines are made from haram or non-sterile materials—are widely spread without any clarification from credible parties. In fact, religious leaders should play an active role in providing correct information, supporting immunization programs, and correcting misinformation in the community.

The Head of the Community Health Center and the Immunization Coordinator revealed that the main obstacle to building this cross-sector collaboration is budget constraints. Every cross-sector collaboration, including the involvement of religious leaders, requires adequate program planning and funding. Without financial support, education and advocacy efforts cannot be optimal, leaving the issue of public trust in immunization unresolved.

Budget constraints often hinder cross-sector collaboration. Therefore, dedicated funding from local governments or other funding sources is needed to support advocacy activities and the involvement of religious leaders. Regular training programs for religious leaders on the importance of immunization should also be implemented so they can become effective agents of change in their communities.

At the community level, a dialogic approach through discussion forums or focus group discussions (FGDs) between health workers, religious leaders, and residents can help address doubts directly. Testimonials from parents whose children have been immunized with positive results can also be a powerful persuasive tool. Thus, public trust in immunization can be built gradually through a combination of religious, scientific, and participatory approaches. These efforts aim not only to increase immunization coverage but also to strengthen public health resilience through the synergy between science and religious values. If implemented consistently, these steps can reduce resistance to immunization and ensure more equitable health protection for children.

Infrastructure

The results of the study showed that the majority of respondents (53.6%) stated that the facilities and infrastructure in immunization activities were inadequate, especially the provision of brochures/posters with information about immunization. This study stated that there was no relationship between facilities and infrastructure and complete basic immunization coverage. This study was different from the study conducted by Agustina et al., a study on the availability of facilities for the implementation of complete basic immunization (66.7%), namely facilities and infrastructure supported immunization activities.(Agustina et al., 2022). Distance to service refers to the physical or geographic distance between a customer's residence or location and a healthcare facility. This distance can be a critical factor influencing whether a person will seek or use available healthcare services (Levesque, 2013).

This research, further explored, revealed that one problem identified in the study was the unavailability of brochures, leaflets, or other educational materials about immunization at Integrated Health Posts (Posyandu). In fact, such informational materials are crucial for increasing public understanding, especially among mothers, about the importance of complete basic immunization for children. Without easily accessible information media, the public has difficulty obtaining accurate knowledge and is vulnerable to exposure to misinformation or hoaxes related to immunization. The main reason Posyandu does not provide brochures/posters or leaflets is that printing requires regular time coordinated by the health promotion program.

The main obstacle in providing these brochures and leaflets is limited funding. Printing high-quality outreach materials with attractive designs and clear information requires significant costs. Meanwhile, available budgets at community health centers (Puskesmas) or integrated health posts (Posyandu) are often very limited and prioritized for other needs, such as core programs or direct immunization activities. As a result, efforts to disseminate information through print media like brochures and leaflets are hampered.

The impact of this problem is low immunization coverage in some areas, due to inadequate public education. If brochures and leaflets are available, information about immunization schedules, benefits, and potential side effects can be conveyed in a more structured manner. However, without adequate funding support, this solution is difficult to implement. This indicates that increasing budget allocations for public education infrastructure is an urgent need for more effective immunization programs. Therefore, it is hoped that funding management will be more focused on achieving complete basic immunization coverage by adding supporting programs and equipment in the future.

Service Access

The results of the study showed that the majority (55.4%) had easy access, with the main problem being that immunization service hours did not match the needs of mothers and babies. This study indicates a relationship between service access and complete basic immunization coverage. This study aligns with the research of Murani et al. regarding factors related to complete basic immunization coverage (72%) and affordable service access.(Murani, 2024)This research differs from Rahmi et al's research on factors that influence the completeness of basic immunization in infants (55%) remote service access.(Rahmi & Husna, 2018). Research conducted by Hafid et al. on the influence of access to services on the status of complete basic immunization (65.2%) due to the difficulty of accessing services(Hafid et al., 2016)Access to health facilities has been shown to significantly increase participation in complete basic immunization (OR=2.976). Further analysis revealed that immunization service hours that do not meet mothers' needs also contributed to low participation. Mobile immunization programs implemented in several regions have been shown to increase immunization coverage, demonstrating that innovation in health services can be an effective solution to address accessibility issues.

This research was explored in more depth to reveal the problem that the hours of immunization services at the integrated health post (posyandu) do not suit the needs of mothers, this is caused by the immunization schedule that changes every month even though it has been set in the second week of each month, this results in an inconsistent schedule on the same day and date, especially if there is a calendar with holidays or red dates, meaning that posyandu activities will be postponed or even brought forward from the second week of each month, this is one of the things that makes mothers unable to bring their babies to the posyandu, especially if there is a need or work schedule, so there is a risk that mothers do not bring their babies to the posyandu, coupled with the currently integrated program, namely the posyandu program which is combined from aspects of all ages, namely posyandu for babies, toddlers and the elderly. Because many elderly people come and the immunization officers are limited, namely 2 people or even 1 person, which results in long queues, long queues of course parents who bring babies also queue at posyandu activities, babies who feel restless and hot will cause irritation, parents feel uncomfortable, finally the parents of the baby are lazy to bring the baby early to the posyandu and more often bring the baby after 11 o'clock, but many also do not want to bring the baby to the posyandu again.

To address this issue, a restructuring of the service system is needed to be more responsive to community needs. First, standardize the immunization schedule so that it is fixed and easy for the community to remember, for example by setting a specific day each week (e.g., every second Wednesday) without being affected by national holidays. Schedule changes should only be made in emergencies and should be widely communicated through various channels, including social media, announcements at integrated health posts (Posyandu), and chain messages to cadres. To address long queues caused by the integration of Posyandu services, it is necessary to separate service times for infant immunizations from those for toddlers and the elderly. For example, the mornings should be specifically for infant immunizations (8:00-10:00) and the afternoons for other services. A time-slot queue system can be implemented to reduce visitor congestion. Additional immunization staff during peak hours should also be considered, either by involving additional cadres or health workers from community health centers.

Service innovations such as mobile immunization services that reach densely populated residential areas or remote areas need to be expanded. These services can be scheduled regularly with fixed routes so that the public can predict the arrival of the immunization team. For working mothers, immunization services can be opened outside of normal business hours (for example, in the afternoon) or on weekends at certain community health centers. The use

of information technology can help improve accessibility. An online registration system for immunizations can reduce waiting times, while text message reminders can remind parents about their children's immunization schedules. With this more structured and user-oriented approach, it is hoped that accessibility barriers that have hampered immunization coverage can be significantly overcome.

Cost

The results of the study showed that the majority (64%) were not burdened by the cost of immunization, with the main problem being that immunization activities affect the income of the baby's parents, this study stated that there was no relationship between costs and complete basic immunization coverage. This study is in line with the research of Nurhayati et al. regarding economic factors on incomplete basic immunization (55.7%) were not burdened by the cost of immunization.(Nurhayati, 2023). research conducted by Agnestia et al. on the determinants of completeness of immunization is not in line with this research (54%) are burdened if the baby gets sick after immunization.(Agnestia Latumahina et al., 2020). Costs did not show a statistically significant effect (p=0.129), but still have important clinical implications, indicating an awareness of the importance of immunization despite the additional costs.

This research is explored more deeply by revealing the problem that delivering or carrying out infant immunization affects the mother's income for working mothers, this problem arises because the immunization schedule is during the working hours of health workers, of course it will be the same as the working schedule of the baby's mother, if the mother is an employee, perhaps she can get permission but few want permission just to bring the baby for immunization, this affects the salary received if there is a cut on vacation, but for mothers whose income is influenced by daily income, it will have a big impact so that working mothers of babies on average never bring their babies for immunization, more mothers of babies who bring immunizations than mothers of babies who work as housewives.

While the direct costs of immunization are not a major burden, this study reveals significant indirect economic challenges, particularly for parents of casual workers who lose income when they have to take their children for immunizations during work hours. Addressing this issue requires innovative approaches that take into account the economic realities of families. Expanding immunization service hours to evenings or weekends at community health centers (Puskesmas) and integrated health posts (Posyandu) could be a solution, allowing working parents to access services without sacrificing income. Mobile immunization programs targeting industrial areas or markets are also effective in reaching workers.

Collaboration with the workplace needs to be strengthened through workplace immunization programs or paid immunization leave policies. It's also important to emphasize education about the long-term economic benefits of immunization—that the potential cost of treatment for preventable diseases far outweighs the daily lost income. By combining service flexibility, strategic partnerships, and appropriate communication approaches, it's hoped that these indirect economic barriers can be overcome without compromising immunization coverage.

Family Support

The results of the study showed that the majority (51.4%) of families did not support immunization, with the main problem being the lack of family reminders regarding the immunization schedule. This study stated that there was a relationship between family support and complete basic immunization coverage. This study was in line with Santoso's research on family support for providing complete basic immunization (57.9%) and there was no family support.(Santoso, 2021). The research conducted by Dwi Sapta Aryantiningsih is not in line with this research (82.4%) supported by the family(Dwi Sapta Aryantiningsih, 2014). research conducted byFamily visits were shown to be a significant reinforcing factor influencing

immunization participation (OR=4.661). The husband's role appeared crucial, with 89% of respondents stating that the decision to immunize usually involved their husband, as head of the household. Furthermore, support from in-laws and other extended family members also increased immunization compliance by up to 2.3-fold.

This research further explored the issue by revealing that one of the main obstacles to immunization implementation is the lack of support from family members to remind children about their immunization schedules. This is due to families' lack of awareness of the schedule, as immunization information is generally only conveyed to parents via WhatsApp messages from village midwives or integrated health post (Posyandu) cadres. As a result, other family members—such as partners or extended family—do not have clear access to information, and thus cannot help remind or support mothers in fulfilling their immunization schedules. This condition often leaves mothers feeling unsupported, even forgetting or delaying their babies' immunizations.

The monthly immunization scheduling process complicates the reminder process. Although immunizations are routinely administered in the second week of each month, the dates and days vary, making it difficult for families to maintain a consistent schedule. However, if immunizations were scheduled for the same date and time each month—for example, the 10th—families would find it easier to remember and organize their schedules. This would maximize family support in reminding them of the immunization schedule.

Therefore, efforts are needed to increase public awareness of the immunization schedule, not only to mothers but also to all family members, whether through chain messages, announcements at integrated health posts (Posyandu), or other media. Furthermore, a consistent schedule with fixed dates each month will make it easier for families to remember and support their children's immunization program. This will increase family involvement and improve immunization coverage.

Incentives / Awards

The results of the study showed that most respondents (69.8%) wanted to be given incentives or rewards. The main problem was that mothers would be more motivated if there were direct incentives in the form of basic necessities or vouchers. This study showed a very significant relationship between incentives and complete basic immunization coverage. This research is in line with Irwan's research on the relationship between support and basic immunization status (86.9%) and rewards.(Irwan, 2024).Providing incentives and rewards showed the strongest influence in increasing immunization participation, with an Odds Ratio (OR) value reaching 9.048. This means that the group that received incentives had a 9 times higher chance of participating than those who did not. Simple forms of incentives such as basic necessities or vouchers were able to increase participation by up to 54%, proving the effectiveness of a psychological-social approach in public health programs. This finding also reveals that extrinsic motivation can be an effective strategy to encourage behavior change, especially in the context of immunization coverage that still needs to be improved, this study is in line with the research of Yuriati et al. where giving rewards was proven effective in increasing immunization.(Yuriati & Sulistyawati, 2024)This research is also in line with what Laurensia et al. did with a strategy of providing goods and services to increase interest in immunization.(Laurensia Febrihianto, 2024).

This study explored further by revealing the problem that the provision of incentives in the form of basic necessities is highly desired by parents of infants who have the potential to increase the coverage of complete basic immunization, however this cannot be realized by the Community Health Center or the Health Office at this time because considering the limited funds for implementing this program, there is a possibility that large funds are needed to be able to provide incentives in the form of basic necessities to all immunization targets. The

Health Office is trying to find alternative funding solutions. The Community Health Center has not been able to start this incentive program because it is still waiting for official direction and decisions from the Head of the Community Health Center and the local Health Office.

At the implementation level, there is a gap between community expectations for incentives or basic food assistance and the budget available at the community health center (Puskesmas) level. This situation makes incentive-based solutions less effective in conditions of limited funding. However, empirical evidence shows that incentive systems have proven highly effective in increasing immunization coverage. Tiered reward systems—which provide different rewards based on immunization completion—have shown optimal results in maintaining long-term community participation. For example, providing certificates for basic immunizations, along with additional rewards for those who complete all doses, has been shown to create sustained motivation and recognize parents' progressive efforts.

While effective, implementing incentives requires careful consideration of the potential for community dependence on material rewards. The ideal strategy is to combine initial incentives with ongoing educational programs about the benefits of immunization. This approach aims to build intrinsic community awareness, so that participation is not solely dependent on external rewards. In this way, incentives serve as an initial catalyst that is then supported by sound health literacy, creating more sustainable behavior change in support of the national immunization program.

Key Factors in Complete Basic Immunization Coverage

Based on the results of the multivariate analysis conducted, this study revealed three determinant factors that significantly influence the coverage of complete basic immunization. The results of the analysis showed that the incentive or reward variable emerged as the most dominant factor with an OR value of 3.841 (95% CI: 1.631-9.048) and a statistical significance of p = 0.002. This finding indicates that mothers who do not receive incentives are almost four times more likely to not complete their children's immunizations compared to those who receive incentives. Especially in the provision of basic necessities because mothers see immunization as having benefits and can help the economy so that coming to the integrated health post for immunization and receiving basic necessities is a big advantage for the baby's parents.

The second factor that is no less important is the attitude towards immunization, with OR 2.223 (95% CI: 1.099-4.498) and p = 0.026. These results reveal that negative perceptions about immunization can increase the risk of incomplete immunization more than twofold. This negative attitude stems from mothers' ignorance that their children will easily contract diseases if not immunized. This attitude is caused by the lack of information received by parents, so that the risk of unimmunized babies is high, they will easily contract diseases.

Family support emerged as the third significant factor with OR 2.201 (95% CI: 1.095-4.426) and p = 0.027. These data underscore the crucial role of social support systems in encouraging immunization participation. Lack of involvement of husbands or other family members in the decision-making process about immunization can be a serious obstacle in achieving optimal immunization coverage. Especially in immunization schedules that are not known to the family, husbands or parents cannot access the immunization schedule because the immunization schedule is known based on information from village midwives and cadres in WhatsApp groups that are only known to mothers in the group, while the husbands and parents of the baby's mother do not know so there is no role and support from the family in reminding the immunization schedule, this is caused by the lack of a fixed schedule for immunization activities, even though immunization activities are routinely carried out every month but the date always changes because the schedule is in the second week of each month, meaning that each month the schedule is not the same, this is what cannot be made a routine schedule as a

reminder by the husband and family to the baby's mother. So the parents of the baby, especially the mother of the baby, feel unsupported by the family because the family is the first support for complete basic immunization activities. This is relevant in the context of Indonesian culture where family health decisions are often collective.

Based on these findings, several strategic recommendations can be put forward. First, a structured and sustainable incentive program needs to be developed. Incentives don't always have to be material, but can also take the form of social recognition such as certificates or symbolic awards. Second, educational programs need to focus on changing attitudes with approaches tailored to the target population, for example through community meetings or social media. Third, interventions should involve all family members, especially husbands and community leaders, to create an environment conducive to immunization.

Interestingly, several factors often considered important, such as confidence in immunization and access to services, were insignificant in this model. This may indicate that in the study area, the primary issue lies not with service availability or vaccine hesitancy, but rather with motivation and social support. These findings provide clear direction for policymakers to focus more resources on aspects that truly impact outcomes.

Implementing these recommendations requires a multisectoral approach and collaboration across stakeholders. The Health Office can partner with community organizations, religious leaders, and the private sector to create a comprehensive program. Rigorous monitoring and evaluation are also necessary to ensure the effectiveness of interventions. With this evidence-based approach, it is hoped that coverage of complete basic immunization can be significantly increased, ultimately contributing to improved overall public health.

To address the challenge of immunization refusal, a "Healthy Family Movement" policy can be implemented that integrates cultural and structural approaches. As Notoatmodjo (2010) stated, "changes in health behavior require a holistic approach that involves the entire social system." This policy includes: (1) training Posyandu cadres as agents of change, (2) strengthening technology-based monitoring systems, and (3) developing community-based incentive schemes.(Notoatmodjo, 2010)

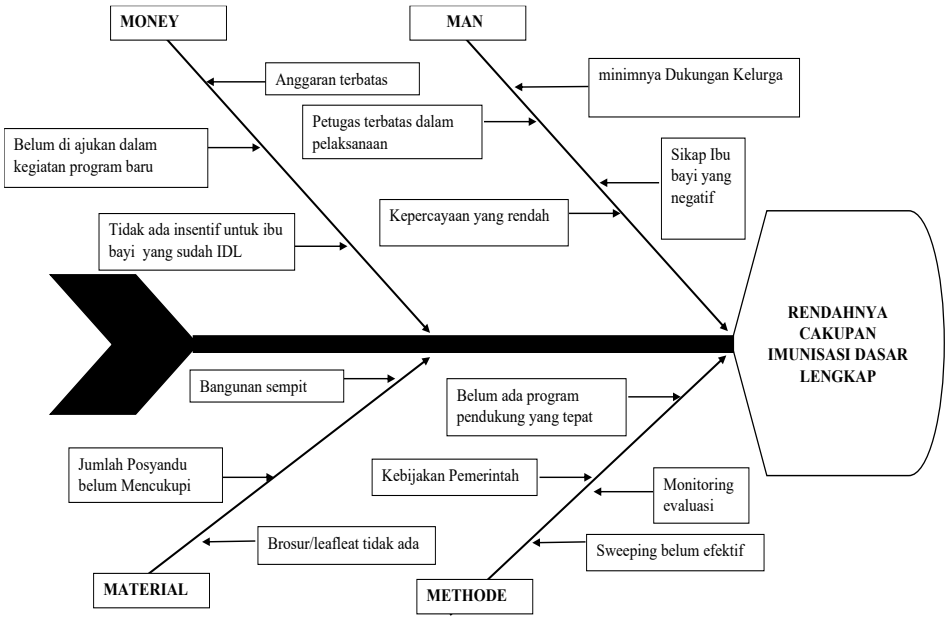

Figure 1. Fishbone Diagram (Ishikawa, 1968) On The Low Coverage Of Complete Basic Immunization In Solok City In 2024

The implementation of this policy is supported by research by Mahendradhata (2021) which shows that "multicomponent interventions can increase immunization coverage by up to

25%"(Mahendradhata et al., 2017). The digital tracking system developed refers to the e-health concept.(Eysenbach, 2001)

Conclusion

The findings of this research bring up a few significant results about full basic immunization coverage. The majority of the respondents were aged 20-29-year, were of high school education, and were mostly Muslim, but over half had not immunized their children against the basics. Although knowledge was not significantly related with immunization coverage, attitudes, family support, and provision of incentives were strongly related, and incentives were the most dominant. Women who were not given incentives like food packages or vouchers were nearly four times more likely to leave the immunization of their child incomplete than the women who received the incentives. Trust in health services and available facilities, however, were not significantly correlated, which indicates that behavioral and motivational factors are more important than structural ones. Regarding the inputs aspects, the current policies and regulations including Minister of Health Regulation No. 12/2017 and No. 43/2019 are sufficient but not well applied on the local level, and despite the availability of health workers, there is a gap in specific training of immunization officers. The infrastructure, such as vaccines and equipment, is typically sufficient, but there are still challenges in transportation, cold chains, and the narrow range of integrated health posts, which continue to operate out of the homes of residents. There is funding available under BLUD Puskesmas, but it has not been leveraged to fund incentives or new programs.

Regarding the process, planning based on the Proposed Activity Plan (RUK) places more focus on broad strategies, including monitoring via doors-to-door tactics, whereas creative solutions, including online education, social media advertising, or partnering with the local community, are not integrated. Posyandu activities are implemented in a regular manner and are limited by budget constraints, which do not allow resolving the issues based on attitudes, family composition, and motivation. Supervision is also mostly quantitative as it is more about data reporting than working with non-technical barriers, and field visits to health offices are made only once in four months. As a result, the indicators of output reveal that the immunization coverage is not at the target, which is mostly caused by resistance to immunization in the community associated with negative attitudes, family support, and incentives. To overcome these issues, the most effective measures will be to offer food packages or vouchers as the motivational incentive, create educational videos and other content based on testimonials to be distributed online, encourage the use of immunization schedules in family WhatsApp groups and offer in-depth counseling to mothers to dispel hesitancy. Also, cross-sectoral partnership with health offices, sub-districts, and religious leaders along with immunization officers training, family-based sweeps, and penetration of hard-to-reach locations would play a key role in enhancing the program results and bringing immunization coverage nearer to national goals.

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