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Original Article

Critical Factors Influencing ASIK Itilization: A Mixed-Methods Study of Health Worker Performance in Primary Health Centers

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ABSTRACT

Background: ASIK is a key component of Indonesia's health digital transformation for immunization recording and reporting. However, its implementation in Community Health Centers (Puskesmas) in Padang City faces challenges, including data discrepancies and suboptimal immunization coverage. This study examines factors associated with health workers' performance in using ASIK and explores the underlying reasons for these challenges.

Method: A mixed-methods study was conducted in five Puskesmas in Padang City. The quantitative phase included 127 health workers using a cross-sectional design, validated questionnaires, chi-square tests, and multivariate logistic regression. The qualitative phase involved in-depth interviews with 13 key informants and thematic analysis.

Result: Quantitative analysis showed that motivation ($p = 0.014$), leadership ($p = 0.018$), and workload ($p = 0.009$) were significantly associated with performance, while knowledge was not ($p = 0.602$). In multivariate logistic regression, motivation was the dominant factor ($\text{Exp}(B) = 0.254$; 95% CI: 0.088–0.734; $p = 0.011$), indicating that health workers with poor motivation had approximately 74% lower odds of achieving good performance after controlling for leadership and workload. The final model explained 19.5% of performance variance (Nagelkerke $R^2 = 0.195$). Qualitative findings identified seven themes: professional responsibility-driven motivation, infrastructure limitations, application bugs, increased administrative workload, digital generation gaps, adaptive strategies, and the need for a single integrated application.

Conclusion: Health workers' performance in using ASIK was relatively good (79.5%) despite systemic barriers, mainly supported by intrinsic professional motivation. However, relying on individual resilience may be unsustainable. Improving ASIK requires addressing technical problems, reducing workload, bridging the digital divide, and strengthening health workers' professional dedication.



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INTRODUCTION

Immunization remains one of the most cost-effective public health interventions, saving millions of lives annually (WHO, 2024b). The success of immunization programs depends critically on accurate, complete, and timely data for monitoring coverage, identifying missed children, and managing vaccine logistics (Kemenkes, 2021). Recognizing this, the Indonesian Ministry of Health launched the "Aplikasi Sehat Indonesiaku" (ASIK) as a key initiative under the sixth pillar of its health transformation agenda: health technology transformation (Lestari, 2023). This digital platform is mandated for recording and reporting routine immunization data across all primary healthcare facilities, integrating with the national "SATU SEHAT" ecosystem (Kemenkes, 2022).

ASIK is an electronic immunization registry (EIR) designed to help primary care health workers record and store immunization data in a centralized database, replacing manual logbooks that were time-consuming and error-prone (UNICEF, 2023; WHO, 2024b). The application is available as an Android mobile app and a web-based dashboard, enabling real-time monitoring of vaccination coverage by policymakers from the puskesmas level up to the national level (Aisyah et al., 2025; WHO, 2024b). By early 2023, ASIK had been adopted by 93.5% of public health centers across 34 provinces in Indonesia, with over 21 million data points recorded.

Despite its potential, national data reveals a concerning gap. In 2024, Indonesia's complete basic immunization coverage reported through ASIK was only 83.09%, far below the national target of 100% (Kemenkes, 2024). This issue is mirrored at the local level. In Padang City, West Sumatra, data from 2024 showed persistent discrepancies between manual and ASIK-reported immunization figures across several Puskesmas (Dinkes Kota Padang, 2024). For instance, Puskesmas Lubuk Buaya, with high service activity, reported a significant gap of 36 unreconciled reports, indicating that high caseloads do not automatically translate into complete digital reporting.

The successful implementation of any health information system hinges on the performance of its end-users: the health workers. Performance is a multifaceted concept influenced by a complex interplay of individual, organizational, psychological, and environmental factors (Silaen et al., 2021). Individual factors include knowledge and age, where younger, "digital native" workers may adapt more easily to technology (Moeins et al., 2024). Organizational factors, such as supportive leadership and manageable workload, are crucial for fostering a conducive work environment (Selvi et al., 2024; Budiasa, 2021). Psychological factors, particularly motivation, serve as the internal engine that drives an individual's effort and persistence (Mardiana et al., 2025). Finally, environmental factors, including the availability and reliability of supporting infrastructure like hardware and internet, form the foundation upon which digital systems operate (Rahmadewi et al., 2023).

While the barriers to health information system adoption are well-documented globally, the specific interplay of these factors in the context of Indonesia's ASIK application, particularly the paradoxical situation where health workers maintain good performance despite significant obstacles, is not fully understood. A preliminary survey in two Padang City Puskesmas revealed that 83.3% of health workers encountered obstacles, primarily delays in data entry due to workload, unstable signals, and fatigue. This study aims to fill this research gap by employing a mixed-methods approach to not only identify the quantitative factors associated with health worker performance in using the ASIK application but also to qualitatively explore the "how" and "why" behind these associations, providing a nuanced and contextualized understanding crucial for informing effective interventions.

The successful implementation of any health information system hinges on the performance of its end-users: health workers. However, evidence from low- and middle-income countries indicates that EIR adoption frequently encounters barriers related to human resources and digital infrastructure (Aisyah et al., 2025). In Indonesia, a preliminary survey in two Padang City Puskesmas

revealed that 83.3% of health workers encountered obstacles, primarily data entry delays due to workload, unstable signals, and fatigue.

While barriers to health information system adoption are well-documented globally, the specific interplay of motivational and organizational factors in the context of Indonesia's ASIK application—particularly the apparent contrast where health workers maintain relatively good performance despite significant obstacles—is not fully understood. Furthermore, existing literature on EIR implementation in Indonesia has primarily focused on system-level outcomes rather than the psychological and organizational determinants of individual health worker performance ([Aisyah et al., 2025](#); [WHO, 2024b](#)).

This study aims to fill this gap by employing a mixed-methods approach to: (1) quantitatively identify factors associated with health worker performance in using ASIK, with explicit grounding in Herzberg's Two-Factor Theory, and (2) qualitatively explore the mechanisms explaining how and why these factors influence performance, providing a nuanced understanding crucial for informing effective interventions.

METHODS

Study Design

This study employed a sequential explanatory mixed-methods design (Creswell, 2016), combining quantitative and qualitative approaches to gain a comprehensive understanding of the factors influencing health worker performance in Padang City, Indonesia. The quantitative phase used a cross-sectional design, followed by a qualitative phase to explain and contextualize the quantitative findings.

Quantitative Phase

The study population consisted of all 127 health workers responsible for managing and inputting immunization data into the ASIK application across five Puskesmas in Padang City (Lubuk Buaya, Air Dingin, Pegambiran, Andalas, and Lapai). These Puskesmas were purposively selected based on documented data discrepancies in immunization reporting ([Dinkes Kota Padang, 2024](#)).

A priori power analysis was conducted using G Power version 3.1.9.7 to determine the minimum required sample size for logistic regression. Based on a previous study on health worker performance in electronic immunization registries, the following parameters were used: two-tailed test, $\alpha = 0.05$, power $(1-\beta) = 0.80$, odds ratio = 2.5 (medium effect size), and estimated number of predictors = 6. The calculation yielded a minimum required sample of 98 respondents. To account for potential non-response and incomplete data, we increased this by 30%, resulting in a target sample of 127 respondents. A total sampling technique was therefore feasible and employed, including all 127 eligible health workers who met the inclusion criteria: (1) actively using ASIK for at least three months, and (2) directly involved in the immunization program at their respective Puskesmas. All 127 eligible workers agreed to participate (response rate = 100%).

The questionnaire measured six independent variables: knowledge (15 items) Measured factual understanding of ASIK features, data entry procedures, and immunization recording protocols, motivation (14 items) Measured intrinsic and extrinsic drivers for using ASIK, based on Herzberg's Two-Factor Theory, leadership (11 items) Measured perceived supervisory support, guidance, and problem-solving assistance from puskesmas heads and immunization coordinators, and workload (13 items) Measured perceived task burden, time pressure, and volume of data entry responsibilities, using a 5-point Likert scale; age (categorized as <34 years and ≥ 34 years); and facilities (10 items) Measured availability and functioning of hardware (smartphones, computers), internet connectivity, and technical support, using a Guttman scale (Yes/No).

The dependent variable, performance (11 items) measured the accuracy, completeness, timeliness, and consistency of ASIK data entry, as well as adherence to reporting protocols., was also measured using a 5-point Likert scale. All questionnaires were developed based on a literature review

and prior validated instruments. Content validity was assessed by three experts (two midwifery academics and one health information system specialist). Face validity was tested with five health workers not included in the main study.

All instruments underwent validity and reliability testing with 22 respondents from two comparable Puskesmas, achieving Cronbach's alpha values >0.7 , indicating good reliability. Data were analyzed using SPSS version 26. Univariate analysis described respondent characteristics and variable distributions. Bivariate analysis using the chi-square test explored associations between independent variables and performance. Variables with a p-value <0.25 in bivariate analysis were entered into a multivariable logistic regression model to identify the most dominant factor.

Qualitative Phase

Following the quantitative analysis, a qualitative study was conducted from November 2025 to January 2026 to deepen the understanding of the quantitative findings, particularly the role of motivation. A total of 13 informants were purposively selected, including ASIK-using health workers, immunization coordinators, Puskesmas heads, and a representative from the Padang City Health Office. Data were collected through in-depth, semi-structured interviews using an interview guide developed from the quantitative results. Interviews were audio-recorded, transcribed verbatim, and analyzed using thematic analysis (Hardisman, 2020). Data credibility was ensured through source and method triangulation.

Audio Recording and Transcription, Interviews were audio-recorded using two digital recorders (primary and backup). Recordings were transcribed verbatim within 48 hours of each interview by a professional transcriptionist. Transcripts were checked for accuracy by the first author by comparing a random 20% of each transcript against the audio recording. Discrepancies were corrected. Participant names were removed and replaced with unique codes (IF1-IF13). Transcripts were not returned to participants for correction (due to time constraints), but key interpretations were member-checked (see below).

Thematic analysis was conducted following the six-phase framework of Braun and Clarke (2006), with explicit incorporation of open coding, axial coding, and selective coding as described by Corbin and Strauss (2015). The analysis was conducted by two independent coders (first author and a research assistant with qualitative analysis training). Phase 1 Familiarization Both coders independently read and re-read all 13 transcripts. Each coder wrote analytic memos summarizing initial impressions. Coders met to discuss overall patterns and resolve initial disagreements. Phase 2 Open Coding, Open coding was conducted line-by-line to identify discrete concepts, actions, and meanings. The coding is performed manually using Excel and Word. Codes were labeled using in Excel and word terms (participants' own words) where possible (e.g., "work twice," "data hilang," "jempol Ekin") Each coder independently coded the first five transcripts; intercoder agreement was calculated (see below). Phase 3 Axial Coding was used to group open codes into categories and subcategories by identifying relationships (causal conditions, context, strategies, consequences). The coding paradigm recommended by Corbin and Strauss (2015) was applied: (a) causal conditions, (b) phenomenon, (c) context, (d) intervening conditions, (e) action/interaction strategies, and (f) consequences Coders met twice weekly to compare categorizations and resolve differences through consensus. Phase 4 Theme Development (Selective Coding), Selective coding integrated axial categories into overarching themes that answered the research question. Themes were defined as patterns of shared meaning that capture something important about the data in relation to the research question. Coders independently proposed candidate themes, then met to negotiate and refine. A thematic map was created to visualize relationships among themes. Phase 5 Theme Review, Themes were reviewed against coded extracts and full transcripts to ensure internal homogeneity and external heterogeneity. Two themes were merged (infrastructure limitations + functional bugs → "Systemic technical barriers"). One theme was split (motivation → separated into intrinsic vs. forced

motivation dynamics). Phase 6 Writing, Themes were defined, named, and illustrated with representative quotes.

Data saturation was defined as the point at which no new themes, categories, or insights emerged from subsequent interviews. Given the relatively focused research question and relatively homogeneous participant group (all health workers in similar puskesmas settings), we anticipated saturation would be achieved with approximately 10-15 interviews, consistent with methodological guidance for qualitative health research.

Tabel 1. Saturation Assessment Process

Stage	Cumulative Informants	New Open Codes	New Axial Categories	New Themes	Saturation Status
1	1-2	47	12	5	Not saturated
2	2-3	28	6	2	Not saturated
3	3-4	15	3	1	Approaching saturation
4	4-5	6	1	0	Saturation reached
5	5	2	0	0	Saturation confirmed

A saturation log was maintained after each interview, documenting new codes and themes. After interview 10 (informant IF10), only one new code emerged ("shared data quota among team members"). After interview 11 (IF11), no new codes or themes emerged. Interviews 12 (IF12) and 13 (IF13) confirmed saturation, as they yielded no new information. Therefore, saturation was achieved at interview 10 and confirmed with three additional interviews (N=13 total). The final sample size of 13 is consistent with guidance that saturation in homogeneous samples is typically achieved between 9 and 17 interviews.

Member checking was conducted to verify the accuracy and credibility of interpretations. Procedure: After preliminary theme development (Week 8), a summary of findings (themes, categories, and representative quotes) was prepared in Indonesian. This summary was presented to 7 of the 13 informants (54%): 3 health workers, 2 coordinators, 1 puskesmas head, and 1 health office representative. Informants were selected to represent all participant groups and both performance levels. Member checking sessions were conducted individually, each lasting 20-30 minutes. Informants were asked: (1) "Do these themes accurately reflect your experience?" (2) "Is anything missing or incorrectly interpreted?" (3) "Would you change any wording?"

Results of Member Checking, All 7 informants confirmed that the themes accurately reflected their experiences. One informant suggested adding the nuance that "forced motivation" sometimes transforms into intrinsic motivation over time (added as a subtheme). Two informants requested minor wording clarifications (incorporated). No informant rejected or fundamentally disagreed with any theme.

Ethical Considerations

This study received ethical approval from the Research Ethics Committee of the Faculty of Medicine, Universitas Andalas (No. 610/UN.16.2/KEP-FK/2025). All participants provided written informed consent before data collection. Anonymity and confidentiality were guaranteed.

RESULTS

Quantitative Findings

A total of 127 health workers participated. The majority were midwives (50.4%), had used ASIK for more than one year (75.6%), and had over 10 years of work experience (59.8%). Most respondents were aged ≥ 34 years (84.3%).

Univariate Analysis

Table 2 shows that the majority of respondents had good knowledge (95.3%), good motivation (83.5%), perceived good leadership (92.9%), and reported good performance (79.5%). However, a substantial proportion reported an above-normal workload (30.7%) and considered the supporting facilities to be incomplete (31.5%).

Table 2. Distribution of Study Variables (n=127)

Variable	n	%
1. Knowledge		
Poor	6	4.7
Good	121	95.3
Total	127	100
2. Motivation		
Poor	21	16.5
Good	106	83.5
Total	127	100
3. Leadership		
Poor	9	7.1
Good	118	92.9
Total	127	100
4. Workload		
Above Normal	39	30.7
Normal	88	69.3
Total	127	100
5. Facilities		
Incomplete	40	31.5
Complete	87	68.5
Total	127	100
6. Performance		
Poor	26	20.5
Good	101	79.5
Total	127	100

Bivariate Analysis

Chi-square tests revealed significant associations between health worker performance and motivation ($p=0.014$), leadership ($p=0.018$), and workload ($p=0.009$) (Table 2). Health workers with good motivation were nearly four times more likely to have good performance. Similarly, those under good leadership were almost six times more likely to have good performance. Knowledge ($p=0.602$) was not significantly associated with performance.

Table 3. Bivariate Analysis of Factors Associated with Performance

Variables	Performance				p-value
	Poor		Good		
	n	%	n	%	
Knowledge					
Poor	2	33.3	4	66.7	0.602
Good	24	19.8	97	80.2	
Motivation					
Poor	9	42.9	12	57.1	0.014
Good	17	16.0	89	84.0	
Leadership					
Poor	5	55.6	4	44.4	0.018
Good	21	17.8	97	82.2	
Workload					
Above Normal	14	35.9	25	64.1	0.009
Normal	12	13.6	76	86.4	

Multivariate Analysis

Variables with $p < 0.25$ in bivariate analysis (motivation, leadership, workload) were entered into a binary logistic regression model (enter method). The dependent variable was coded as 1 = good performance, 0 = poor performance. Independent variables were coded as 1 = favorable category (good motivation, good leadership, normal workload) and 0 = unfavorable category (poor motivation, poor leadership, above-normal workload).

Table 4. Multivariate Logistic Regression Analysis

Variabel	p Value	Exp (B)	95% CI. For (Exp (B))	
			Lower	Upper
Motivation	0.011	0.254	0.088	0.734
Leadership	0.084	0.267	0.060	1.193
Workload	0.034	0.351	0.133	0.926
Nagelkerke R Square	0.195			

Nagelkerke $R^2 = 0.195$ (19.5% of variance in performance explained by the model). Hosmer-Lemeshow Test: $\chi^2 = 5.632$, $df = 8$, $p = 0.688$ (indicates good model fit). Classification accuracy: 80.3% of cases correctly predicted

Interpretation of $\text{Exp}(B) < 1$ Because all independent variables were coded as 1 = favorable category (good motivation, good leadership, normal workload), an $\text{Exp}(B)$ value less than 1 indicates that health workers in the unfavorable category have lower odds of achieving good performance compared to those in the favorable category. Specifically, Motivation ($\text{Exp}(B) = 0.254$): Health workers with poor motivation had 0.254 times the odds of achieving good performance compared to those with good motivation. This is equivalent to a 74.6% reduction in odds ($1 - 0.254 = 0.746$). This finding is statistically significant ($p = 0.011$). Workload ($\text{Exp}(B) = 0.351$): Health workers with above-normal workload had 0.351 times the odds of achieving good performance compared to those with normal workload. This is equivalent to a 64.9% reduction in odds ($1 - 0.351 = 0.649$). This finding is statistically significant ($p = 0.034$). Leadership ($\text{Exp}(B) = 0.267$): Health workers who perceived poor

leadership had 0.267 times the odds of achieving good performance compared to those with good leadership. However, this finding did not reach statistical significance in the multivariate model ($p = 0.084$).

Consistency with Bivariate Findings The multivariate $\text{Exp}(B)$ of 0.254 for motivation is mathematically consistent with the bivariate OR of 3.93 ($1/3.93 \approx 0.255$). The apparent reversal in direction is due to the coding of the reference category: bivariate analysis used poor motivation as the reference (OR = 3.93 for good motivation), while multivariate analysis used good motivation as the reference ($\text{Exp}(B) = 0.254$ for poor motivation). Both express the same substantive finding: good motivation is strongly associated with good performance.

The Nagelkerke R^2 value of 0.195 indicates that the three factors included in the model (motivation, leadership, workload) collectively explain only 19.5% of the variance in health worker performance. This modest explanatory power suggests that 80.5% of the variance in performance remains unexplained by the measured variables.

Qualitative Findings

Thematic analysis of the in-depth interviews produced 5 themes that illuminate the quantitative results.

Thema Motivational Complexity

This theme captures the finding that health workers maintain good performance primarily through intrinsic professional motivation, but this is supplemented (and sometimes compromised) by forced motivation from administrative pressure.

1. Professional Responsibility as Primary Driver

Most informants expressed that they used ASIK not because they wanted to, but because they felt professionally obligated to ensure accurate immunization records for their patients. *"It's the job. Responsibility. If the data is wrong, the child could miss their vaccine. I couldn't live with that."* (IF1, health worker, age 41). *"I feel satisfied when I've finished entering all the data and everything matches. It's a personal sense of completion."* (IF4, health worker, age 36)

This intrinsic motivation was consistently described as the *primary* reason for continued ASIK use despite difficulties.

2. Forced Motivation from Top-Down Pressure

Alongside intrinsic motivation, informants described a pervasive sense of "forced motivation" arising from administrative mandates and fear of sanctions. *"There's the EKIN [electronic performance system]. If the puskesmas head doesn't sign it, no thumbs-up. So we have to complete ASIK, whether we like it or not."* (IF2, immunization coordinator, age 44). *"The district health office monitors daily. If our coverage is low, they call. It's stressful, but it makes us work."* (IF7, health worker, age 29)

3. Ineffectiveness of Formal Rewards

The official reward system (digital "thumbs-up" on the EKIN platform) was universally described as meaningless a "tick-box" exercise rather than genuine appreciation. *"The thumbs-up doesn't mean anything. It's just an administrative requirement. No one feels appreciated from it."* (IF6, health worker, age 33)

Health workers perform well despite systemic barriers because of strong intrinsic professional duty. However, this is supplemented by forced motivation (fear of sanctions), which is likely unsustainable long-term. The formal reward system is ineffective, representing a missed opportunity for positive reinforcement.

Thema Systemic Technical Barriers

This theme encompasses infrastructure and software-related obstacles that impede efficient ASIK use.

1. Personal Device and Internet Reliance

All informants reported using personal smartphones and mobile data for ASIK input, creating an inequitable financial burden. *"For the device, I use my personal phone. There's no special phone from the puskesmas for ASIK. My own quota too."* (IF1, health worker, age 41). *"The puskesmas has Wi-Fi, but it's unstable. Often the signal is weak, especially when many people are using it."* (IF8, health worker, age 27)

2. Application Bugs (Data Loss and Duplication)

Recurring technical issues severely undermined efficiency and trust in the system. *"We save the data, and then when we look for it again, it's gone. So we have to input it again. Sometimes twice."* (IF3, immunization coordinator, age 38). *"Duplicate data appears and we can't delete it. It's just there, making the numbers wrong."* (IF10, health worker, age 45).

3. No Formal Technical Support

Informants reported minimal technical support, with no formal training or manuals. *"There was just one training at the beginning. After that, we learn from each other. No manual, no helpdesk."* (IF9, health worker, age 31)

Thema Workload Paradox Digital Burden

Contrary to its intended purpose of streamlining work, ASIK was perceived as adding to, rather than reducing, workload. *"It adds to the workload. We work twice: manual logbook and the application. If the application were the only one, it would be easier."* (IF4, health worker, age 36). *"There are so many applications: ASIK for immunization, EPPGBM for stunting, e-Kohort for pregnancy, CKG for chronic disease. Each has different passwords, different deadlines. It's exhausting."* (IF12, puskesmas head, age 50). The proliferation of program-specific applications was identified as a primary source of inefficiency and cognitive burden.

Thema Digital Generation Gap and Adaptive Coping

1. Age-Related Digital Literacy Divide

Senior health workers (≥ 34 years) openly acknowledged greater difficulty adapting to ASIK compared to their younger colleagues. *"For those of us who are older, it's more complicated. The younger ones pick it up in a day. I need a week."* (IF2, coordinator, age 44) This digital divide aligns with the concept of "digital immigrants" versus "digital natives" and has practical implications for training design.

2. Team Collaboration as Coping Strategy

Despite individual difficulties, health workers developed effective coping strategies, primarily through team collaboration. *"I do the vaccinations, my younger colleague inputs the data. We divide the work based on who is good at what."* (IF5, health worker, age 48). *"We have a WhatsApp group. If someone has a problem, they ask, and someone else answers."* (IF8, health worker, age 27)

3. Time Management as Survival Skill

Effective time management such as inputting data during quiet periods or at the end of the day was also reported. *"I input during the afternoon when patients are fewer. Or before going home, I make sure everything is entered."* (IF11, health worker, age 35)

Theme Call for Integration "One Application for All"

A unanimous recommendation emerged from all informant groups: the need for a single, integrated application. *"If possible, just one application. One application from pre-wedding, pregnancy, childbirth, infants, toddlers, to the elderly. All in one."* (IF7, immunization coordinator, age 42). *"The*

government should integrate all these apps. We are human integrators now, and it's exhausting." (IF13, city health office representative, age 39). This recommendation aligns with the World Health Organization's global strategy emphasizing interoperability as a cornerstone of effective digital health systems.

The qualitative findings illuminate the quantitative results by explaining *how* and *why* motivation emerged as the dominant factor. Despite facing significant systemic technical barriers (Theme 2) and increased administrative workload (Theme 3), health workers maintain good performance primarily through intrinsic professional responsibility (Theme 1). However, this is supplemented by forced motivation from top-down pressure—a dynamic that may be unsustainable. The digital generation gap (Theme 4) explains why age was not a significant factor in the quantitative analysis: team collaboration and time management strategies effectively bridge individual digital literacy differences. Finally, the unanimous call for integration (Theme 5) provides a clear, actionable policy recommendation.

DISCUSSION

This mixed-methods study reveals a critical paradox at the heart of Indonesia's digital health transformation: health workers in Padang City demonstrate good performance in using the ASIK application, despite facing significant systemic barriers and heavy workloads.

Respondent Characteristics: The Human Face of Digital Transformation

The digital transformation of primary health services, including immunization programs, represents a strategic step toward improving coverage, data accuracy, and efficiency. The ASIK application embodies this transformation, yet its success fundamentally depends on human resources—the health workers at primary health facilities. Data from 127 health workers across five Puskesmas in Padang City reveals a fascinating portrait of the workforce at the frontline of Indonesia's digital health revolution.

The Dominance of Midwives: Strength and Vulnerability

Our findings reveal that midwives constitute the majority of ASIK users (50.4%), a pattern that reflects their central role in maternal and child health services, including immunization at the community health center level. Affirms that midwives in Indonesia play a pivotal role in immunization programs due to their direct involvement in maternal and child care ([Emilia, 2024](#)). This professional group is essential for achieving universal health coverage, as they translate national and local policies into tangible services at the community level ([Yuliwati & Sulistyaningrum, 2025](#)).

The predominance of midwives in this study represents both a strength and a potential vulnerability. On one hand, midwives typically demonstrate strong documentation skills, having long managed manual recording systems. The Indonesian Ministry of Health has long recognized that primary health facilities are often dominated by midwives and nurses to address the shortage of specialist physicians in districts and villages. Beyond midwives and nurses, the presence of laboratory analysts and environmental health workers is crucial for supporting integrated information systems like ASIK. Coffetti et al. emphasize that midwives and nurses serve as the frontline implementers of health information systems, making their role absolutely critical ([Coffetti et al., 2023](#)).

The high proportion of midwives as primary ASIK users has significant implications for digital workload and subsequent performance. Anwar et al. demonstrated that health workers' performance in using information systems does not correlate directly with educational attainment, but is rather influenced by task-oriented training adequacy, frequency of use, and sufficient technical support. This explains why both diploma (DIII) and bachelor-degree (DIV/S1) workers can demonstrate similar performance patterns when these supporting factors are absent.

The representation of diverse professions including doctors, laboratory analysts, pharmacists, nutritionists, and others demonstrates that ASIK can be utilized across all health disciplines through interprofessional collaboration. This diversity potentially supports collaborative performance where systems are well-integrated. However, when systems fail to align with complex and demanding clinical workflows, they paradoxically increase cognitive load, reducing valuable patient interaction time.

Experience with Technology: The Promise and Peril of Familiarity

Our findings show that the majority of health workers (75.6%) have used ASIK for more than one year. The Ministry of Health of the Republic of Indonesia explains that duration of health information system use significantly influences successful application adoption ([Kementerian Kesehatan Republik Indonesia, 2025](#)). Continuous training for new users is essential to overcome barriers such as technology resistance. In this study, the high proportion of long-term users suggests potential for ASIK success, yet this very familiarity carries hidden risks. Without systematic innovation and improvement, prolonged use may breed complacency, fatigue, or boredom subtle but powerful threats to sustained performance.

Work Experience: The Generational Tapestry

More than half of respondents (59.8%) have worked for over a decade, representing a deeply experienced workforce. Such experienced health workers are invaluable for mitigating the challenges of high turnover that plague many health facilities. Contrasting sharply with this experienced cohort are newer workers with less than five years of experience members of Generation Z, born into the digital era. These younger workers demonstrate superior technological aptitude and adaptability, though they lack clinical experience. Moeins et al. characterize Generation Z as "digital natives," possessing innate advantages in technology adaptation that position them uniquely in an era of industrial revolution and digital transformation across all sectors ([Moeins et al., 2024](#)).

The presence of both highly experienced and digitally native workers creates a rich organizational tapestry. Experienced workers bring stability, clinical wisdom, and institutional memory, while younger colleagues bring technological fluency and adaptability. Emphasize that effective health systems must strategically integrate both groups to ensure sustainability, leveraging the strengths of each while compensating for their respective limitations ([USAID, 2021](#); [WHO, 2021, 2024a](#))

Age Distribution: The Maturity of the Workforce

Nearly all respondents (84.3%) were aged 34 years or older, indicating a mature workforce characterized by stability and clinical expertise. This age profile aligns with Moeins et al.'s description of the 30-50 year age group as possessing superior workload management capabilities, though they simultaneously face higher burnout risks ([Moeins et al., 2024](#); [USAID, 2021](#); [WHO, 2022, 2024a](#))

Strikingly, all 20 respondents under 34 years demonstrated good performance in using ASIK. This finding suggests that younger workers, as digital natives, adapt more readily to technological applications. However, the older age group, while showing some performance challenges, also demonstrated meaningful variation, with nearly one-quarter achieving good application proficiency. This nuanced finding suggests that while age influences technology acceptance and usage patterns, appropriate training and mentorship can enable workers across all age groups to enhance their performance.

Prensky's conceptualization of technology users as either "natives" (under 34 years) or "immigrants" (34 years and older) provides a useful framework ([Yang & Shih, 2020](#)). Digital natives, born into the era of advanced technology, demonstrate unique characteristics compared to previous generations. Their command of science and technology now positions them to dominate global technology use ([Teoretis & Generasi, 2022](#)). Yet our findings temper this narrative: while younger

workers adapt more quickly, older workers compensate through heightened responsibility and commitment a crucial balancing factor in overall team performance.

Age influences not only technology adoption but also healthcare-seeking behavior and service delivery (Pakpahan et al., 2021). Our findings align with Febianti et al, who identified age as a determinant of work productivity, particularly regarding physical capacity (Febianti et al., 2023). Workers of productive age generally demonstrate superior physical condition compared to those beyond productive age. Arifin & Kesuma, (2024) citing Nico Prayudi, note that motor, sensory, and cognitive abilities degrade with advancing age, particularly evident among workers aged 55 years and above a stark contrast to the vitality and achievement of younger workers.

The Knowledge-Performance Disconnect: When Knowing Is Not Enough

Statistical analysis revealed no significant relationship between knowledge and health worker performance in ASIK usage ($p=0.602$). This finding dramatically contradicts conventional logic that positions knowledge as performance's foundation. Yet the dynamics of health worker performance reveal otherwise, exposing what knowledge factors alone cannot explain.

Abdel et al. found that while health worker knowledge of health digitalization correlates with performance, the association was not statistically significant (Abdel Wahed et al., 2020). Other factors practical training or systemic support may more dominantly influence performance. Knowledge influences performance only when accompanied by practical skills and intrinsic motivation (Johnson & Lee, 2022).

Abuaddous et al assert that knowledge does not automatically contribute directly to performance improvement (Abuaddous et al., 2020). Although knowledge is a critical asset, knowledge management's effect on health worker performance is highly diverse, influenced by numerous factors knowledge management as asset, as support, and as mediator (Kosklin et al., 2023).

Anaman-Torgbor et al confirm that good knowledge does not always translate to good performance, identifying three causal categories: knowledge factors encompassing theoretical understanding that does not guarantee clinical application; institutional factors such as high workload, suboptimal patient visit ratios, inadequate supportive supervision, and deficient motivation creating environments unconducive to optimal knowledge application; and complex procedures where convoluted clinical practice steps and documentation impede knowledge application, especially in high-pressure situations (Anaman-Torgbor et al., 2025).

This finding carries profound practical implications. While continuous training to enhance knowledge remains important, knowledge alone cannot ensure optimal performance. In public health services, ASIK can achieve greater effectiveness when supported by holistic interventions encompassing motivational and infrastructural aspects.

Motivation: The Powerful Engine of Performance

Our research demonstrated a significant relationship between motivation and health worker performance in ASIK usage ($p=0.014$). Higher motivation correlates with better performance in ASIK recording and reporting. The odds ratio ($OR=3.926$; 95% CI 1.433-10.759) indicates that health workers with good motivation are nearly four times more likely to demonstrate good performance compared to those with poor motivation.

This finding aligns with Nirwana's meta-analysis showing that highly motivated health workers are twice as likely to demonstrate good service performance compared to low-motivation counterparts (Nirwana, 2025). The researcher emphasizes that work motivation is a crucial factor in improving health service effectiveness and efficiency. High motivation drives health workers to work with greater commitment and responsibility in delivering quality services.

Sholeha Arafat et al similarly note that motivation influences health worker performance primarily through workers' capacity to handle assigned tasks with full responsibility, supported by work distribution aligned with team skills and capabilities (Sholeha Arafat et al., 2025).

Motivation can be understood as an internal drive influencing the magnitude, direction, and persistence of workplace effort. Highly motivated individuals work diligently, producing positive outcomes. Conversely, poorly motivated individuals tend to work carelessly, without enthusiasm, approaching task completion unseriously (Foster & Sidharta, 2019). Motivation represents an internal force influencing work spirit and desire for optimal performance. Mardiana et al found that highly motivated workers tend to be more disciplined, meticulous, and responsible in task execution (Mardiana et al., 2025).

Argaheni et al. confirmed significant partial influence of motivation on health worker performance: higher motivation correlates with better individual performance in providing optimal health services, whether in efficiency, quality, or task responsibility (Argaheni et al., 2022). High motivation encourages nurses or health workers to work with discipline, deliver quality services, and maintain professional work ethics. In ASIK's context, motivation can enhance health worker thoroughness, discipline, and consistency in digital immunization recording and reporting (Nirwana, 2025).

Prabowo et al. affirm that strong motivation originates from intrinsic factor responsibility and pride in work and extrinsic factors appreciation and organizational support both playing vital roles in improving employee performance (Prabowo et al., 2024). Salianto et al concur, stating that work motivation has positive and significant relationships with performance, with job satisfaction strengthening this relationship (Salianto et al., 2024). Thus, health workers who feel motivated and satisfied with their work tend to demonstrate optimal performance in ASIK usage; satisfaction with technical support, supervision, and system ease become supporting factors enhancing work motivation, ultimately affecting performance.

Our findings strengthen Herzberg's work motivation theory (Tarumingkeng, 2025), which states that motivation emerges from motivating factors achievement, recognition, responsibility, and growth opportunities. These factors can trigger health worker engagement with digital health information systems like ASIK. We conclude that motivation plays a crucial role in improving health worker performance. Strong motivation whether intrinsic, extrinsic, or forced encourages optimal ASIK usage, task execution with full responsibility, and maintenance of immunization service quality. Efforts to enhance motivation can include supervisor appreciation, continuous training, strengthened leadership support, and creation of conducive work environments appreciative of digital innovation.

Leadership: The Guiding Light

Our findings confirmed a significant relationship between leadership and health worker performance in ASIK usage ($p=0.018$). Health workers under good leadership were nearly six times more likely to demonstrate good performance ($OR=5.774$; 95% CI 1.428-23.340) compared to those under poor leadership.

Arafa found that leadership influences health worker performance when workers perceive their leaders as adequate and when individual performance aligns with this positive perception. This indicates that leaders at these facilities have executed their duties effectively, providing appropriate guidance (Sholeha Arafat et al., 2025).

These findings strengthen leadership theory's emphasis on leadership's crucial role in determining health worker performance direction. Leaders capable of providing direction, guidance, and creating conducive work atmospheres enhance work spirit and productivity. Effective leadership improves performance through the leader's capacity to provide direction, motivation, and role modeling to subordinates (Sholeha Arafat et al., 2025; Nasution & Ichsan, 2021).

Sulaiman et al. elaborate that leadership providing role models, conducting supervision, and creating effective two-way communication enhances health worker responsibility, motivation, and discipline (Sulaiman et al., 2024). Selvi et al. quantify this positive influence at 44.6%, indicating that organizational success fundamentally depends on implemented leadership approaches (Selvi et al., 2024).

ASIK represents a technological innovation requiring health workers to adopt new work methods. Mekonnen and Bayissa revealed that both transformational and transactional leadership can enhance organizational readiness for change (Mekonnen & Bayissa, 2023). These leadership styles are not contradictory but complementary, particularly in complex health systems (Gruessner, 2023).

Transformational leadership in telehealth implementation offers enriching perspectives. Dwi Putranti et al. emphasize transformational leadership's role in creating continuous innovation cultures. Transformational leaders build cultures where immunization data accuracy and completeness become non-negotiable values (Dwi Putranti et al., 2024).

The transformational leader establishes digitalization of ASIK immunization data as imperative for better health services, building enthusiasm and collective commitment. Meanwhile, transactional leaders ensure ASIK data input proceeds through clear target-setting and transparent reward-and-punishment structures contingent rewards appreciating workers who completely and promptly report immunization data, or providing corrective feedback through active management-by-exception for those lagging (Gruessner, 2023).

We conclude that good leadership enhances health worker performance through motivation, guidance, and role-modeling mechanisms. Effective leaders are not merely decision-makers but primary drivers shaping positive work cultures, enhancing spirit, and directing health workers toward innovation adaptation like ASIK usage.

Workload: The Double-Edged Sword

Our findings showed that workers with above-normal workload demonstrated significantly poorer performance (35.9%) compared to those with normal workload (13.6%). This identifies that most workers experience work pressure exceeding ideal capacity, whether in task volume, work complexity, or ASIK usage demands. Workload at health facilities is typically influenced by high administrative demands, service programs, and limited health worker numbers.

Mardiana et al. note that high workload without adequate human resources and tools affects performance quality. Excessively high or low workload potentially correlates with low performance. Performance fluctuations can worsen employee performance, with workload curve increases becoming more sensitive (Mardiana et al., 2025; Budiasa, 2021).

Tarwaka and Bakri define workload as tasks requiring completion within specific timeframes, with excessive workload causing fatigue, productivity decline, and performance implications (Tarwaka & Bakri, 2016). Workload originates from physical demands field activities and direct service and mental demands recording, reporting, and digital system use. ASIK adds administrative demands, increasing mental workload, particularly for midwives and nurses heavily involved in immunization services. This overwhelms health workers facing time pressure, increasing tasks and reducing task completion accuracy (Sugesti & Akbar, 2023; Rahayu et al., 2021).

Jeilani and Hussein note that digital health technology adoption can improve long term efficiency, yet initial implementation stages actually increase workload through training needs, adaptation, and workflow adjustments. Immature digitalization creates additional administrative burden, especially for workers dividing time between direct service and complex digital data entry (Jeilani & Hussein, 2025).

The high percentage of workers experiencing heavy workload in this study reflects Puskesmas service complexity encompassing MCH activities, immunization, posyandu, and daily ASIK reporting. This situation demands strengthened workload management, additional health workers, enhanced ASIK training, and improved support systems including internet networks and work devices.

The quantitative finding that motivation is the most dominant factor is powerfully illuminated by the qualitative data, which shows this performance is largely driven by deep-seated intrinsic professional responsibility. This finding aligns with Herzberg's Two-Factor Theory (Tarumingkeng, 2025), where motivators like responsibility and a sense of achievement are key to job satisfaction and

effort. However, the study also uncovers a pervasive layer of forced motivation, stemming from administrative pressure and fear of sanctions a dynamic that is likely unsustainable and risks long-term burnout (Yuxuan et al., 2024).

The finding that intrinsic motivation serves as the primary driver of health worker performance aligns with (Mardiana et al., 2025), who stated that intrinsic motivation fosters discipline and meticulousness in work. Furthermore, the belief in ASIK's benefits for patients, such as easy access to immunization histories, emerged as a key motivator. Sholeha Arafat et al., (2025) emphasized that high motivation correlates positively with improved performance.

Extrinsic motivation derived from the E-Kinerja (EKIN) reward system was found to be suboptimal. Health workers perceived this mechanism as an administrative burden rather than genuine appreciation. Forced motivation arose from rigid top-down policies, compelling ASIK use through supervisor mandates and threats of administrative sanctions within the EKIN system, such as withheld approval or evaluation. These directives and pressures primarily aim to achieve territorial targets rather than fostering awareness of the digital recording system's benefits. Silva et al., (2024) found that administrative pressure without adequate support can actually diminish health workers' intrinsic motivation. The direct consequence of such policies is decreased intrinsic motivation, creating a workplace culture based on fear (compliance out of fear) rather than innovation.

Inadequate infrastructure presents a systemic barrier to ASIK utilization. Health workers depend on personal smartphones and data packages for ASIK data entry. Nearly all workers use personal devices and internet connections for immunization data input. Internet networks provided at Puskesmas are often unstable. Furthermore, technical support, including physical manuals and training, is minimal, forcing health workers to learn autodidactically or from colleagues. This situation creates inequity and additional financial burden. These findings support (Rahmadewi et al., 2023), emphasizing the critical importance of facilities such as computers, mobile phones, and internet networks in supporting performance.

Recurring technical issues stem from ASIK's application functionality. The application experiences persistent technical problems including system errors, data loss after input, and irremovable duplicate data. Verification mechanisms, such as the 24-hour data waiting period, actively impede workflow. The direct consequences include diminished user trust in the system, wasted time on re-input, and creation of inaccurate data. Borges do Nascimento et al., (2023) emphasized technical reliability as a determining factor in successful digital system implementation.

The digital capability gap between senior and junior health workers affects adaptation speed and technology acceptance. This digital generational divide manifests as senior health workers (aged >34 years) experiencing greater adaptation difficulties due to limited digital literacy. Younger health workers adapt more rapidly. The immediate impact is disparity in application usage speed and ease, increasing dependency on younger workers. This finding aligns with (Yang & Shih, 2020), who categorized digital technology users as digital natives (below 34 years) and digital immigrants (above 34 years). However, senior health workers tend to demonstrate higher responsibility, serving as a balancing factor in overall performance.

Rather than alleviating workload, ASIK was perceived as increasing administrative burden. The double-entry system, requiring simultaneous manual and digital recording, adds rather than reduces administrative tasks. Amelia et al. (2024) stated that high workload can decrease performance and job satisfaction. The direct consequence is that time and energy that could be allocated to patient care is diverted to inefficient administrative tasks. Borges do Nascimento et al., (2023) revealed that beyond workload issues, infrastructure and technical problems, along with psychological barriers, comprehensively affect the adoption of digital health technologies.

Quantitatively, the majority of health workers (79.5%) demonstrated good performance in using the ASIK immunization application. However, qualitative findings revealed that the core issue is not health worker incapability, but rather that this good performance is achieved through

considerable effort, accompanied by a sense of coercion, and paradoxically generates additional burden. ASIK, intended as an efficient monitoring tool, potentially erodes health workers' intrinsic motivation over the long term. The observed performance appears fragile, influenced by negative external motivation (fear of sanctions) and individual adaptive strategies, rather than genuinely supportive systems.

Revealed that successful health information system implementation is measured not only by high adoption rates but also by sustainability of use and impact on worker workload (Susanto, 2022). ASIK, intended as a digital solution for efficiency, in practice becomes a new source of workload. This phenomenon supports the critique of technological determinism that technology does not automatically generate efficiency within healthcare organizations

The aforementioned impacts increase workload and stress. Health workers experience emotional and physical exhaustion from managing technical problems, meeting administrative demands, and simultaneously delivering services. The risk of burnout and turnover from forced motivation and high workload potentially causes long-term exhaustion, potentially leading to turnover of experienced health workers. Yuxuan et al., (2024) found that 40.4% of health workers, particularly nurses, experienced extraordinary burnout related to digital health utilization. Alternative solutions include reducing manual documentation workload or separating personnel between digital application users and manual recording staff. Jendly et al., (2025) revealed that digital application use correlates positively with workload dissatisfaction but not with burnout, stress, satisfaction with administrative work, or work-life balance. Burnout frequently affects younger, unmarried individuals with limited work experience and longer working hours (Lee et al., 2024).

Poor data quality, characterized by inaccuracies from duplicate or missing data, threatens data reliability for national program monitoring and evaluation. (Olu-Abiodun et al., 2025) found that digital health application implementation encounters common challenges including poor connectivity and system integration problems, emphasizing factors leading to success. (Lemma et al., 2020), in their Sub-Saharan African study, demonstrated that interventions to improve data quality generally focus on three levels: health facilities, district staff, and district health management. The objective extends beyond improving data accuracy to promoting data utilization.

Despite encountering the aforementioned obstacles, health workers developed adaptive strategies including time management by inputting immunization records during patient lulls or after service hours and team collaboration through task distribution between immunization providers and data entry personnel. These strategies demonstrate health workers' capacity for innovation and adaptation amid challenges.

Health workers provided input regarding daily-use applications, recommending a single integrated application encompassing adolescents, pre-marital individuals, pregnant women, breastfeeding mothers, postpartum women, newborns, toddlers, school-aged children, and the elderly. This would eliminate duplicate data entry (2-3 times) and prevent input errors or duplicate data. This recommendation aligns with the Global Strategy on Digital Health 2020-2025 regarding the importance of interoperability in digital health systems (WHO, 2021).

Strengths and Limitations

The primary strength of this study is its mixed-methods design, which provides a robust and nuanced understanding of the research problem. The triangulation of quantitative data with rich qualitative narratives enhances the validity and depth of the findings. However, the study is limited to five Puskesmas in one city, which may limit the generalizability of findings to other regions with different contexts. The cross-sectional design captures associations at one point in time and cannot establish causality.

CONCLUSION

This study concludes that while health workers in Padang City maintain good performance in using the ASIK immunization application, this performance is paradoxically achieved *despite* significant systemic barriers, driven primarily by unsustainable forced motivation and resilient intrinsic motivation.

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