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DETERMINANTS OF SMILE HEALTH APPLICATION IMPLEMENTATION IN SUPPORTING NATIONAL HEALTH INSURANCE SERVICES AT COMMUNITY HEALTH CENTERS IN SOUTH KONAWE REGENCY, SOUTHEAST SULAWESI, INDONESIA

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ABSTRACT

Background: The availability of medicines, vaccines, and consumable medical materials at community health centers is the basis for guaranteed benefits for participants of the National Health Insurance (NHI). The Ministry of Health requires community health centers to record health logistics in real time through the SMILE application (Electronic Health Logistics Inventory Monitoring System), but in practice, recording is often delayed until it approaches the reporting deadline. Quantitative evidence regarding policy implementation factors that determine SMILE implementation is still limited. This study aims to analyze the influence of communication, resources, disposition, and bureaucratic structure based on George C. Edwards III's theory on the implementation of the SMILE application at community health centers in South Konawe Regency.

Methods: A quantitative cross-sectional study was conducted across all 26 community health centers (puskesmas) in South Konawe Regency from October to November 2026. The sample consisted of all persons in charge (PJ) of SMILE, two people per puskesmas (n = 52), selected by total sampling. Data were collected through a 59-item Likert questionnaire that was valid and reliable (Google Form; Cronbach's alpha 0.791–0.946) as well as direct observation of the conformity of physical stock with SMILE stock. Data were analyzed using Fisher's exact test and multiple linear regression (α = 5%), accompanied by robustness tests using robust standard error (HC3), cluster standard error per puskesmas, and bootstrapping.

Results: As many as 88.5% of PJ implemented SMILE well. Bivariate analysis showed that all four variables were significantly related to SMILE implementation ($p \leq 0.021$). Simultaneously, all four variables had a significant effect on SMILE implementation ($F = 9.186$; $p < 0.001$) with an explanatory contribution of 39.1% (adjusted $R^2 = 0.391$). However, multiple regression analysis showed that only bureaucratic structure had a positive and significant effect (B = 0.691; β = 0.558; 95% CI: 0.190–1.191; p = 0.008), while communication (p = 0.183), resources (p = 0.922), and disposition (p =

0.423) did not have a significant effect. Observation results showed that the average stock accuracy only reached 36.5% and was positively correlated with the SMILE implementation score (ρ = 0.582; p = 0.002).

Conclusion: Bureaucratic structure, especially written SOPs and handover procedures, are the most decisive factors in SMILE implementation. Communication, resources, and disposition are not significant after controlling for other variables, likely due to the high correlation between variables (r = 0.58–0.83). The Health Office needs to establish standard SOPs for SMILE recording, appoint Acting Officers and replacement officers through decrees, and regularly verify physical stock and system stock. Cross-sectional designs and self-report measurement limit cause-and-effect interpretation.

Keywords: Policy implementation; SMILE; Bureaucratic structure; Health logistics; Community Health Centers; National Health Insurance

1 INTRODUCTION

Digital technology for managing health logistics is increasingly developing in many developing countries. In South Africa, healthcare workers consider mobile vaccine stock reporting beneficial, but its sustainability depends on technical support, network quality, and higher-level follow-up (1) . In Ethiopia, logistics data accuracy relates to training, supervision, and feedback to officers (2). In Uganda, district-based electronic reporting improves the timeliness and completeness of routine health reports (3). Many health information systems in developing countries fail not because of their technology, but because of gaps between system design and realities at implementing facilities (4). The performance of routine health information systems is jointly determined by technical, organizational, and behavioral factors (5).

In Indonesia, digital transformation is one of the pillars of health system transformation based on Law Number 17 of 2023 concerning Health, health information system regulations, and the One Data Health policy (6–8). Vaccine logistics recording is also part of the national immunization implementation regulations. In the logistics sector, this policy is realized through the SMILE Health application (Electronic Health Logistics Inventory Monitoring System) developed by the Ministry of Health together with UNDP since 2018 (9). Through the Minister of Health Decree Number HK.01.07/MENKES/1568/2024, SMILE was designated as part of the SATUSEHAT platform (10) . This application is now used in more than 10,000 community health centers and its coverage has expanded from vaccines to essential medicines and program drugs (11,12) . During the trial phase, SMILE was reported to reduce recording errors and vaccine stock shortages. These benefits are only achieved if every transaction is recorded completely, on time, and accurately by the health center staff (13).

Scientific research on the implementation of SMILE at community health centers is still very limited. A qualitative study on 15 pharmaceutical personnel in East Kotawaringin Regency found that SMILE makes vaccine recording faster, more real-time, and more controlled, but its use is hindered by staffing shortages, power outages, weak coordination with immunization managers, and application features that still need development. (14). The study only discusses vaccine management and does not quantitatively analyze implementation factors using policy implementation theory.

The role of SMILE is closely related to the National Health Insurance (NHI) program, which guarantees medicines, medical devices, and consumable medical supplies as part of participant benefits (15–17) . As primary health facilities (PHCS), community health centers are the first contact and referral filter for participants, funded through performance-based capitation (18,19). Drug availability remains a challenge for NHI services at PHCS (20). Drug planning in the NHI era is based on usage data and remaining stock reported by community health centers, and this data is now recorded through SMILE (21). Inaccurate data can cause medicine shortages so participants have to buy medicines themselves or be referred for them; drug shortages are recorded as one of the causes of the high number of non-specialist referrals from PHCS (22).

South Konawe Regency has 26 community health centers (puskesmas) spread across rural, mountainous, coastal, and small island areas, with communities heavily dependent on puskesmas for NHI services. Previous research in this area noted delays and mismatches in the puskesmas health information system, and unstable internet networks were reported as obstacles to the use of the information system by officers (23) (24).

Preliminary studies through interviews with program managers at the Health Office and community health center drug managers reinforce this picture. SMILE recording tends to be done simultaneously before the reporting deadline, not at the time of transactions, so the advantage of real-time monitoring is not utilized. Officers generally concurrently perform service and administrative duties, staff changes are not accompanied by structured handovers, and dashboard data has not been processed into routine feedback. As a result, the application is seen more as a reporting obligation than a stock control tool (25) ,26)

These issues stem more from how SMILE policies are implemented than from their application. Therefore, this study uses George C. Edwards III's policy implementation theory, which states that successful implementation is determined by four interrelated factors: communication, resources, disposition, and bureaucratic structure (27,28). Other implementation models emphasize policy standards and interorganizational communication, the difficulty level of the problem and the structure of the legislation, or the content and context of the policy; Edwards III's model was chosen because all four variables are under the control of the implementing organization (29,30) . These four factors correspond to field problems: weak feedback reflects communication, limited networks and overlapping tasks reflect resources, the view that SMILE is an administrative burden reflects disposition, and the absence of handover procedures reflects bureaucratic structure. This model also proves relevant for analyzing policies in Southeast Sulawesi (31,32).

To the author's knowledge, there has been no research analyzing the factors of SMILE implementation in South Konawe Regency. This study aims to analyze the influence of communication, resources, disposition, and bureaucratic structure on the implementation of the SMILE application in supporting NHI services at community health centers in South Konawe Regency. The results are expected to serve as a reference for the Health Office in strengthening guidance, supervision, and feedback, so that SMILE functions as a logistics control tool that ensures the availability of medicines, vaccines, and consumable medical materials for NHI participants.

2 METHODS

This study is an analytical analytical observational study with a cross-sectional design, conducted across all 26 community health centers in South Konawe Regency, Southeast Sulawesi, from October to November 2026. The population consists of all pharmacists, pharmaceutical technical staff, and immunization officers appointed as SMILE persons in charge (PJ). With total sampling, 52 respondents (two people per community health center) who have used SMILE for at least three months were included.

Data were collected through a self-filled Google Form questionnaire with a Likert scale of 1–4 (strongly disagree to strongly agree for independent variables; never always for implementation within the last three months). The instruments consisted of communication (12 items), resources (14 items), disposition (12 items), bureaucratic structure (8 items), and SMILE implementation (13 items covering recording, timeliness, accuracy, and monitoring). All 59 items were valid ($r = 0.384–0.889 > r$ table 0.273) and reliable (Cronbach's alpha 0.791–0.946); reliability was estimated on the research data because reliability is a characteristic of the score in a particular sample (33). The questionnaire data was supplemented with direct observation at each community health center regarding the suitability of physical stock with SMILE stock, recording activities, stock opname compliance, response time, and temperature monitoring on the SMILE dashboard (34)

Scores were categorized as good or poor using class intervals for descriptive and bivariate analysis, while regression used continuous scores. Bivariate analysis used Chi-square or Fisher's exact test if the expected value was less than 5, with Cramér's V and Spearman correlation as measures of relationship strength. Multivariate analysis used multiple linear regression (enter method) at $\alpha = 5\%$ (two-sided), after classical assumption tests of normality, linearity, multicollinearity, and heteroscedasticity (35). Inference was retested using robust standard error (HC3), cluster standard error per community health center, and bootstrapping (2,000 repeat samples, BCa 95%). The conformity of questionnaire scores with observation results was assessed using Spearman correlation at the community health center level (n = 26). Ethical approval was obtained from the Health Research Ethics Commission before data collection.

3 RESULTS AND DISCUSSION

Table 1: The Relationship Between Communication and SMILE Implementation at Community Health Centers in South Konawe Regency in 2026

Communication	SMILE Implementation: Good		SMILE Implementation: Insufficient		Total		p-value
	n	%	n	%	n	%	
Good	45	95,7	2	4,3	47	100	< 0.001
Less	1	20,0	4	80,0	5	100	
Total	46	88,5	6	11,5	52	100	

Source: Primary Data, 2026

Based on Table 1, out of 47 respondents (100%) who rated communication good, 45 respondents (95.7%) performed SMILE well and 2 respondents (4.3%) less well. Of the 5 respondents (100%) who rated communication as lacking, only

1 respondent (20.0%) performed SMILE well and 4 respondents (80.0%) were less good. There were two cells with expected values less than 5 (smallest 0.58), so Fisher's exact test (two-sided) was used with a p< result of 0.001. This indicates a significant relationship between communication and SMILE implementation, with a strong correlation strength (Cramér's V = 0.699) and moderate Spearman correlation at a continuous score (ρ = 0.525).

Communication is the first prerequisite for implementation, as implementers must know what to do, why, and when (27). Communication includes transmitting policy information from the Health Office to the Acting Governor, clarity of technical guidelines and input deadlines, as well as consistency between SMILE regulations and other reporting needs. Communication was rated good by 90.4% of respondents, the highest proportion among the four variables.

However, after controlling for other variables, communication did not have a significant effect (Subchapter 3.5). These findings differ from studies that placed communication as the most influential factor or found significant partial influence (36) ,37) . In Ethiopia, only 34.4% of immunization managers received written feedback, making communication a weak point of the vaccine logistics system there (38). This difference indicates that the role of communication depends on the extent to which communication remains a constraint at the research site.

(39,40) Several explanations can be proposed. First, the assessment tends to be uniformly high (average 37.98 out of 48); all respondents stated clear input time limits, and 96.2% received periodic feedback. Supportive supervision and routine data feedback are known to improve the quality and utilization of health data. Second, communication is highly correlated with resources (r = 0.77) and bureaucratic structure (r = 0.68), so its unique contribution is only 2.2%; path analysis elsewhere also shows some influence of communication through resources (41) . Third, SMILE is an administrative implementation with low ambiguity, because its objectives, types of transactions, and deadlines have been standardized in technical guidelines (34,42) . Thus, communication appears to act as a lower threshold: when poor, implementation is almost always disrupted (4 out of 5 respondents), but improvements above adequate levels only add little.

This does not mean communication is unimportant. As many as 26.9% of respondents still cannot fulfill logistics reports from SMILE without duplicate manual reports, even though repeated reporting in different formats lowers data quality and adds workload (43) . The Health Office needs to maintain consistency in reporting regulations and ensure information reaches new Lead Officers through training and mentoring.

Table 2: The Relationship Between Resources and SMILE Implementation at Community Health Centers in South Konawe Regency in 2026

Resources	SMILE Implementation: Good		SMILE Implementation: Insufficient		Total		p-value
	n	%	n	%	n	%	
Good	38	95,0	2	5,0	40	100	0,021
Less	8	66,7	4	33,3	12	100	
Total	46	88,5	6	11,5	52	100	

Source: Primary Data, 2026

Based on Table 2, out of 40 respondents (100%) with good resources, 38 respondents (95.0%) implemented SMILE well and 2 respondents (5.0%) did poorly. Of the 12 respondents (100%) with insufficient resources, 8 respondents (66.7%) implemented SMILE well and 4 respondents (33.3%) did poorly. There were two cells with expected values less than 5 (smallest 1.38), so Fisher's exact test was used with a result of p = 0.021. There was a significant relationship between resources and SMILE implementation, with a weak strength in category data (Cramér's V = 0.374) and a strong Spearman correlation in continuous scores (ρ = 0.602).

Resources are the adequacy of staff, information, authority, and facilities; clear orders will not be carried out if the implementers do not have the means (27) . In SMILE, resources include Acting Officials and substitute officers, official appointments, equipment, internet network, and operational cost support. Resources have the lowest proportion of good assessments (76.9%), and resource shortages are indeed evident: only 48.1% have substitute officers, 88.5% hold other duties, and only 13.5% state that the community health center provides adequate equipment

In the multivariate model, resources do not have a significant effect (Subchapter 3.5), in line with previous research which also found no partial effect of resources (37) . This condition aligns with the concept of design-reality gaps and previous findings about power shortages and power outages as obstacles to SMILE (4 ,14) . Electronic medical records

at a community health center continue to operate despite limited IT personnel, training, and networks, supported by clear SOPs and task divisions (44 ,45). In Ethiopia, mismatches between physical and electronic stocks are related to workload and labor shortages, and limitations in equipment, electricity supply, and trained personnel hinder the management of the vaccine cold chain (46) . In Padang City, limitations in devices, networks, and human resources also pose a major challenge to the readiness of electronic medical records at community health centers. (47)

The insignificant influence of resources is likely because resources have the highest correlation with bureaucratic structure (r = 0.83) and the highest VIF (5.022), so their unique contribution is almost zero (0.01%); replacement officers and official appointment are close to handover procedures within the bureaucratic structure. Shortcomings are also evenly distributed, for example personal phone use by all PJs, so good and poor implementation are not distinguished. Resources may also be necessary requirements, which are not captured by additive linear regression. Official appointment of PJ and substitute officers, provision of devices, and internet quota support from operational budgets remain necessary(48).

Table 3: The Relationship Between Disposition and SMILE Implementation at Community Health Centers in South Konawe Regency in 2026

Disposition	SMILE Implementation: Good		SMILE Implementation: Insufficient		Total		p-value
	n	%	n	%	n	%	
Good	39	95,1	2	4,9	41	100	0,014
Less	7	63,6	4	36,4	11	100	
Total	46	88,5	6	11,5	52	100	

Source: Primary Data, 2026

Based on Table 3, out of 41 respondents (100%) with good disposition, 39 respondents (95.1%) implemented SMILE well and 2 respondents (4.9%) did poorly. Of the 11 respondents (100%) with poor disposition, 7 respondents (63.6%) performed SMILE well and 4 respondents (36.4%) did poorly. There were two cells with expected values less than 5 (smallest 1.27), so Fisher's exact test was used with a result p = 0.014. There was a significant relationship between disposition and SMILE implementation, with a moderate strength of correlation (Cramér's V = 0.402) and moderate Spearman correlation (ρ = 0.434), the weakest among the four variables.

Disposition is the attitude of the implementer towards the policy; the implementer who understands and supports the policy will implement it according to the purpose (27) . Disposition is assessed through support for SMILE, officer placement, and incentives. In mandatory policies like SMILE, disposition is not seen in whether the application is used or not, but in the quality of its use.

After controlling for other variables, disposition did not have a significant effect, and the negative coefficient was not significant (Subchapter 3.5). This finding differs from the finding that attitude and perception are related to recording performance in the ASIK (49) application and that disposition has the greatest direct influence on the smoke-free area policy (41) . However, the same path study shows that the bureaucratic structure strongly shapes disposition (β = 0.610), in line with the loss of bivariate relationships in this study after the bureaucratic structure was controlled. Compliance with the smoke-free area policy depends on individual attitudes, while SMILE recording is a mandatory administrative task dependent on procedures.

Several explanations can be proposed. First, the positive attitudes were almost uniform: 90.4% supported the SMILE policy, 90.4% felt the application was easy to use, and 94.2% were willing to learn new features, similar to positive attitudes toward electronic medical records elsewhere (44) . Second, self-reported attitudes were vulnerable to social preference bias, and perceived usefulness and ease of use were less strongly predictive of acceptance when system use was mandatory (50) . Third, the weak dimensions were organizational: incentives (average 2.67 out of 4; only 53.8% reported awards) and staff placement (2.76 out of 4). Healthcare worker motivation is shaped by recognition, management support, and work facilities, not just personal attitudes, and staff may support policies but feel powerless to implement them when workloads and procedures are not supportive. The dual burden of manual and digital record-keeping, previously seen as a disposition issue, thus stems from an unconsolidated reporting framework. Disposition development should focus on awards, inclusion of SMILE records in performance assessments, and placement according to competencies (51 ,52 ,53).

3.1 The Relationship Between Bureaucratic Structure and the Implementation of SMILE at Community Health Centers in South Konawe Regency in 2026

Table 4: The Relationship Between Bureaucratic Structure and SMILE Implementation at Health Centers in South Konawe Regency in 2026

Bureaucratic structure	SMILE Implementation: Good		SMILE Implementation: Insufficient		Total		p-value
	n	%	n	%	n	%	
Good	42	97,7	1	2,3	43	100	< 0.001
Less	4	44,4	5	55,6	9	100	
Total	46	88,5	6	11,5	52	100	

Source: Primary Data, 2026

Based on Table 4, out of 43 respondents (100%) with good bureaucratic structure, 42 respondents (97.7%) implemented SMILE well and only 1 respondent (2.3%) did poorly. Of the 9 respondents (100%) with poor bureaucratic structure, 4 respondents (44.4%) implemented SMILE well and 5 respondents (55.6%) less well. There were two cells with expected values less than 5 (lowest 1.04), so Fisher's exact test was used with a p< result of 0.001. There is a significant relationship between bureaucratic structure and SMILE implementation, with a strong correlation strength (Cramér's V = 0.630) and the strongest Spearman correlation among the four variables (ρ = 0.633).

Bureaucratic structure is the organization of implementers, which includes standard operating procedures (SOP) and fragmentation of responsibilities between units; implementation can be hindered even if clear orders, sufficient resources, and willing implementers are present (27) . In SMILE, the bureaucratic structure includes SOPs for written recording, handover during the change of PJ, clear division of tasks, and coordination between community health centers, immunization managers, and the District Pharmacy Installation.

(37) This relationship persists in the multivariate model (Subchapter 3.5). These findings are consistent with research that found bureaucratic structure including variables with partial influence, with coordination as a barrier to SMILE and a one-stop policy as support, with SOPs and division of tasks as the backbone of electronic medical record success, as well as poor facility management and weak organizational support as the main challenges to the drug logistics information system in Ethiopia (14, 44,54).

SMILE is an administrative implementation whose success mainly depends on the work of the implementing organization (42). The organization coordinates work through standardization of work processes (55) ; community health centers that have written SOPs and handover still keep records of anyone holding the position. The SOP dimension is the main weak point (average 2.72 out of 4): only 61.5% reported written SOPs and 63.5% handover mechanisms, whereas 42.3% served as Lead Officials for 12 months or less and 63.5% were only appointed verbally. Fragmentation was relatively good (average 3.17 out of 4), and all respondents rated coordination with the District Pharmacy Installation as good. The SMILE flow connects community health centers, immunization managers, and District Pharmacy Installations in sequential dependencies (requests, verification, delivery, confirmation) that require strong coordination; Implementation in such a multi-organizational structure relies on a structure that connects the involved units (56 ,57).

3.2 The Influence of Communication, Resources, Disposition, and Bureaucratic Structure on the Implementation of SMILE at Community Health Centers in South Konawe Regency in 2026

Based on Table 5, the multiple linear regression model is feasible (F = 9.186; p < 0.001) and explains 39.1% of the variation in SMILE implementation (adjusted R^2 = 0.391). With other variables controlled, only bureaucratic structure has a positive and significant effect (B = 0.691; β = 0.558; p = 0.008). Every one-point increase in bureaucratic structure score is associated with a 0.69-point increase in implementation score. Communication (p = 0.183), resources (p = 0.922), and disposition (p = 0.423) have no significant effect, and their confidence intervals cover zero. The negative coefficient of disposition is not significant and is suspected to be due to the suppression effect of high correlation between variables, so it is not interpreted. These findings persisted with robust standard error HC3 (p = 0.008), cluster standard error per community health center (p = 0.010), bootstrap (BCa 95% 0.250 to 1.248), and Bonferroni correction (α = 0.0125) did not change any decisions. Residuals were normally distributed based on the Shapiro-Wilk test (p = 0.100) and linear relationships (deviation from linearity p > 0.05; Ramsey RESET p = 0.207). All VIF were below 10 (2.495–5.022), although resources exceeded the stricter limit of 5. Heteroscedasticity was found in the bureaucratic structure (Glejser p = 0.004), which has been addressed with robust standard error.

Bureaucratic structure is the dominant variable, with the largest beta and unique contribution of 9.2% to implementation variance (f^2 = 0.164, moderate effect), far above communication (2.2%), disposition (0.8%), and resources (0.01%). Most R^2 is a shared contribution, as the four variables correlate with each other (r = 0.58–0.83). This supports Edwards III's proposition that all four factors interact and together determine implementation (27) , and is consistent with previous findings that the model is simultaneously strong but not all variables are partially significant (37).

Table 5: Multiple Linear Regression Analysis Results of Policy Implementation Factors on SMILE Implementation at Community Health Centers in South Konawe Regency in 2026 (n = 52)

Variable	B	Std. error	β	t	p	95% IK for B	p (HC3)	IK BCa 95% (boot strap)
constant	20,117	3,781	–	5,32	< 0.001	12,511 to 27,724	–	–
Communication (X1)	0,188	0,139	0,233	1,35	0,183	−0.092 to 0.467	0,163	−0.059 to 0.444
Resources (X2)	0,018	0,180	0,024	0,10	0,922	−0.344 to 0.379	0,919	−0.380 to 0.309
Disposition (X3)	−0.119	0,148	−0.141	−0.81	0,423	−0.417 to 0.178	0,463	−0.386 to 0.214
Bureaucratic structure (X4)	0,691	0,249	0,558	2,78	0,008	0.190 to 1.191	0,008	0.250 to 1.248

Explanation: R^2 = 0.439; adjusted R^2 = 0.391; F = 9.186; p < 0.001; bold = significant at α = 5%. Source: Primary Data, 2026

Adjusted R^2 of 39.1% means 60.9% of the variation is explained by factors outside the model. Edwards III's theory was born before the digital era; technological factors such as system and service quality, human–organization–technology fit, context complexity, and usage habits were not measured, even though 36.5% of respondents reported unstable, weak, or nonexistent signals. "Influence" in this study is understood as a predictive contribution to cross-sectional data, not a cause-and-effect relationship (58, 59, 60, 61)

3.3 Implementation of SMILE Based on Observation and Its Relevance for NHI Services

Table 6: Spearman Correlation between Questionnaire Implementation Scores and Observation Results at South Konawe District Health Centers in 2026 (n = 26)

Observation element	Average (SD)	Questionnaire comparison	ρ	p
Stock accuracy (%)	36,5 (17,2)	Total score	0,582	0,002
		Accuracy dimensions	0,800	< 0.001
Recording activity (days)	30,5 (14,5)	Total score	0,294	0,144
		Recording dimensions	0,463	0,017
Stock opname compliance (score)	19,6 (0,9)	Total score	0,291	0,150
Response time (days)	60,3 (24,5)	Total score	−0.637	< 0.001
		Timeliness dimension	−0.605	0,001

Note: temperature monitoring is available at all community health centers and therefore cannot be tested. Source: Primary Data and Observation, 2026

Observation also strengthens and corrects the description of the questionnaire. Based on the questionnaire, 88.5% of respondents implemented SMILE well, but the average stock accuracy was only 36.5%, and 21 out of 26 community health centers (80.8%) had accuracy below 50% (range 10–80%). This figure is lower than the accuracy of stock cards at 63.8% (54), vaccine inventory accuracy of 58.3% (38) , and electronic stock accuracy of 70.6% (45) in Ethiopia, although measurement methods differ. In Indonesia, discrepancies between physical stock and records are also a major problem in medicine management at community health centers (62) , and weak inventory control practices are related to stock discrepancies elsewhere. Distorted stock information can be exaggerated at the upstream level of the supply chain, causing oversupply or shortages at the district level. (63, 64)

Nevertheless, the questionnaire responses do not contradict the observation results (Table 6). Community health centers with higher implementation scores have better stock accuracy (ρ = 0.582) and shorter response times (ρ = −0.637), and the accuracy dimension correlates very strongly with the accuracy of the observed stock results (ρ = 0.800). Thus, the questionnaire is valid for ranking community health centers, but the "good" category is too broad to reflect the actual data quality.

The recording pattern aligns with the preliminary study: 92.3% complete input before the deadline, but only 71.2% input data on the transaction day, and only 30.8% state that SMILE stock often or always matches physical stock. Time-constrained frontline bureaucrats tend to develop work simplification (65); in SMILE, this takes the form of input delays, so the advantage of real-time monitoring is lost (21) . In the context of NHI, inaccurate stock data can lead to inaccurate drug planning, and the resulting drug shortages can lead to referrals that can actually be handled at PHCS (22) .

Practically, these findings lead to improvements in the bureaucratic structure: the standard SOP for SMILE recording requires input on transaction day, periodic stock opname, and handover during PJ changes, accompanied by appointment of PJ and replacement officers through decrees and periodic verification of physical stock against system stock with feedback per community health center. Training for new and untrained PJs as well as network support for remote community health centers also need to be considered, although their effects were not tested in this study.

4 CONCLUSION

Based on the results of the study on the influence of communication, resources, disposition, and bureaucratic structure on the implementation of the SMILE application in supporting NHI services at health centers in South Konawe Regency, it can be concluded that the four factors together have a significant effect, in terms of predictive contribution, on the implementation of SMILE ($F = 9.186$; $p < 0.001$; adjusted $R^2 = 0.391$). Bureaucratic structure has a positive and significant effect and is the most dominant factor ($B = 0.691$; $\beta = 0.558$; $p = 0.008$), while communication, resources, and disposition do not have a significant effect after controlling for other variables. The average accuracy of the observed stock results is only 36.5%. Therefore, the Health Office is advised to establish a standard SOP for SMILE recording that includes input on transaction day, periodic stock opname, and handover procedures, requiring the appointment of Acting Officials and replacement officers through a decree, as well as regularly verifying physical stock and system stock with feedback to the community health centers. Further research is recommended to involve more community health centers or districts, technology and context variables, path analysis or structural equation modeling, as well as longitudinal or mixed-methods design.

STATEMENTS ON COMPLIANCE WITH ETHICAL STANDARDS

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Disclosure of conflict of interest

There is no conflict of interest that needs to be disclosed.

Statement of ethical approval

This research has received approval from the Health Research Ethics Commission. Before data collection, all participants were given explanations about the research objectives and procedures. Participation is voluntary, anonymity and confidentiality are maintained, and participants can withdraw at any time without consequences.

Statement of informed consent

Informed consent was obtained from all participants involved in this study.

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