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Urban–Rural Cultural Contexts and Community-Based Vector Surveillance: Social Dimensions of Dengue Prevention through Larval Monitoring Cadres in Indonesia

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ABSTRACT

Community-based disease prevention initiatives are deeply embedded within local cultural, social, and spatial contexts. In dengue-endemic countries such as Indonesia, larval monitoring cadres (Juru Pemantau Jentik) play a pivotal role not only as technical health volunteers but also as community actors navigating diverse social norms, collective practices, and institutional structures. This study examines how urban and rural socio-cultural contexts shape the perceptions, performance, and enabling conditions of larval monitoring cadres in dengue prevention efforts. Using a comparative cross-sectional design, quantitative data were collected from cadres operating in an urban sub-district (Kemayoran, Jakarta) and a rural sub-district (Kresek, Banten). Guided by the PRECEDE–PROCEED framework, the analysis assessed predisposing, enabling, and reinforcing factors influencing cadre performance. Descriptive statistics and Fisher's Exact Test were employed to identify differences between urban and rural settings. The findings reveal statistically significant disparities in cadre performance and perceived enabling factors across urban and rural contexts. Urban cadres demonstrated higher performance levels, supported by stronger institutional facilitation and programmatic resources, whereas rural cadres operated within more limited structural support despite strong community embeddedness. These differences reflect not merely technical gaps, but broader socio-cultural and structural variations related to patterns of community participation, social capital, and local governance. This study contributes to interdisciplinary debates on culture and social change by demonstrating how public health interventions function as sites of social negotiation, where cultural norms, spatial inequality, and institutional arrangements intersect. By reframing community-based dengue prevention as a socio-cultural process rather than a purely technical endeavor, the article offers insights for culturally responsive health governance and sustainable community empowerment in the Global South.

Keywords: culture and health; social change; urban–rural disparity; community participation; dengue prevention; Indonesia

INTRODUCTION

Despite national prevention programs such as 3M Plus and larviciding, dengue remains persistent and, in many settings, continues to intensify—suggesting that technical and programmatic measures may be insufficient when they are not aligned with everyday practices and local contexts (Illahika et al., 2022; Ramadhani, 2021). This urgency is reflected in the rising burden reported in early 2024: 43,271 infections and 343 deaths by March, increasing to 60,296 cases and 455 deaths by the end of the same month (Kementerian Kesehatan RI, 2024). WHO reporting

on the dominance of the DENV-3 serotype also indicates an evolving epidemiological landscape that demands strengthened prevention systems (WHO Indonesia, 2024).

Beyond biomedical transmission, dengue outbreaks are shaped by social and environmental conditions that structure daily life. Limited public awareness, behavioral challenges, and urbanization processes that foster mosquito breeding environments remain major drivers of persistent transmission (Ernawati et al., 2020; Jakobsen et al., 2019). Vector ecology intersects with social space: Aedes mosquitoes' indoor and outdoor resting habits can complicate control measures when domestic and neighborhood environments are conducive (Paiman et al., 2023), while dense water storage practices may expand breeding opportunities in ways that reflect routine household arrangements (Emeribe et al., 2021). In addition, socioeconomic disparities influence vulnerability and the distribution of risk, including higher urban dengue incidence associated with unequal living conditions (Ernawati et al., 2021; Ghamba et al., 2023).

Accordingly, community-based interventions become critical arenas where public health efforts meet lived community practices. In Indonesia, these efforts are strengthened by the role of Community Health Workers (CHWs)—particularly larval monitoring volunteers—who conduct household larvae surveillance, educate the community, and report findings to health facilities, functioning as intermediaries between institutional programs and everyday prevention practices (Arsin et al., 2023; Maharsi et al., 2020; Susanna et al., 2020). However, cadre effectiveness is shaped not only by technical responsibilities but also by social conditions such as public perception, individual motivation, and the extent of institutional support that enables sustained engagement (Illahika et al., 2022).

Prior research suggests that active community involvement enhances dengue prevention outcomes (Lachyan et al., 2020; Maharsi et al., 2020). and that innovations—particularly digital health applications—may strengthen participation, coordination, and service efficiency (Ernawati, et al., 2021; Ernawati et al., 2022). Evidence also underscores that knowledge, attitudes, and social support are central drivers of behavioral change for dengue control (Ernawati, et al., 2021; Guad et al., 2021). These insights imply that sustained prevention requires collaboration between governmental systems and community initiatives, including mechanisms that support cadres and community engagement over time (Arsin et al., 2023a; Lestari et al., 2020).

Yet, although community participation has been widely discussed, relatively few studies have systematically compared cadre performance and perceptions across rural and urban settings using a 021structured and multidimensional approach. This gap matters because rural and urban environments differ not only in infrastructure and access, but also in social arrangements that may shape participation, trust, and the routine feasibility of prevention practices. To address this gap, the present study applies the PRECEDE–PROCEED model as an evaluative framework linking program outcomes to predisposing factors (e.g., knowledge and attitudes), enabling factors (e.g., resources and institutional support), and reinforcing factors (e.g., encouragement from family and community) (Green & Kreuter, 2005)

This study compares the perceptions, performance, enabling and inhibiting factors, and perceived monitoring effectiveness of larval monitoring cadres in Kresek (rural) and Kemayoran (urban). The findings are expected to inform more equitable, context-sensitive strengthening of community-based dengue prevention programs, particularly in resource-limited settings.

METHODS

This study employed a cross-sectional comparative design to examine differences in perceptions, performance, and enabling conditions of larval monitoring cadres across urban and rural contexts; therefore, findings indicate associations and group differences rather than causal effects.

The study was conducted in two subdistricts representing distinct socio-spatial settings—Kemayoran Subdistrict, Jakarta (urban) and Kresek Subdistrict, Banten (rural)—and involved larval monitoring cadres (Community Health Workers/CHWs) actively engaged in dengue prevention activities. Participants were selected purposively due to access to active cadres and the absence of a complete community-level sampling frame. A total of 60 respondents were included, comprising 30 cadres from each subdistrict, with eligibility criteria including active service for at least six months and written informed consent.

Data were collected between December 2024 and January 2025 using a structured, self-administered questionnaire consisting of 60 closed-ended items measured on a five-point Likert scale, covering six subscales: cadre performance, role perception, enabling factors, perceived barriers, monitoring effectiveness, and support and capacity strengthening. Cadre performance was computed by aggregating Likert-scale items within the performance subscale using summed scores, where higher scores indicated better performance in routine larval monitoring, community engagement, and reporting activities. For interpretive clarity, performance scores were further classified into five categories (Excellent/Good/Fair/Poor/Very Poor) based on predefined score

thresholds. The instrument was adapted from established constructs in community-based dengue prevention research and reviewed by public health and social science experts to ensure content validity; a pilot test supported high internal consistency (Cronbach's $\alpha = 0.87$). Measures primarily relied on self-reported responses, while objective verification (e.g., logbooks or supervisor audits) was limited.

Data analysis proceeded in two stages: descriptive statistics were used to summarise key variables by frequencies and percentages, followed by bivariate analysis using Fisher's Exact Test to examine associations between sociodemographic factors, perceptions, enabling conditions, and cadre performance. Fisher's Exact Test was chosen due to the small sample size and low expected cell counts, and variables were recoded into binary (2×2) categories to enable valid comparisons and improve interpretability for Fisher's Exact Test.

RESULTS

This study involved 60 larva monitoring volunteers (Community Health Workers), consisting of 30 from the Kresek Subdistrict (rural area) and 30 from the Kemayoran Subdistrict (urban area). The analysis revealed significant performance, perception, barriers, support, and monitoring effectiveness differences.

Table 2. Frequency and Percentage Distribution of Sociodemographic Characteristics, Perception, Support, Barriers, and Community Health Workers Performance in Rural and Urban Areas

No	Variable	Category	Rural (n=30)	%	Urban (n=30)	%
1	Length of Service	≤ 5 years	22	73.33	10	33.33
		> 5 years	8	26.67	20	66.67
2	Age	20–29 years	4	13.33	2	6.67
		30–39 years	12	40	8	26.67
		40–49 years	10	33.34	10	33.33
		≥ 50 years	4	13.33	10	33.33
3	Education	Primary–Junior High	12	40	2	6.67
		Senior High School	16	53.33	24	80
		Tertiary Education	2	6.67	4	13.33
4	Employment	Unemployed	26	86.67	28	93.33
		Employed	4	13.33	2	6.67
5	Community Health Workers Performance	Excellent	0	0	28	93.33
		Good	0	0	2	6.67
		Fair	10	33.33	0	0
		Poor	6	20	0	0
		Very Poor	14	46.67	0	0
6	Community Health Workers Perception	Very Positive	6	20	2	6.67
		Positive	10	33.33	26	86.67
		Fairly Positive	10	33.33	2	6.66
		Negative	2	6.67	0	0
		Very Negative	2	6.67	0	0
7	Enabling Factors	Very Supportive	4	13.33	20	66.67
		Supportive	2	6.67	8	26.66
		Fairly Supportive	8	26.67	0	0
		Less Supportive	8	26.67	2	6.67
		Not Supportive	8	26.67	0	0
8	Barriers	Very Low	4	13.33	18	60
		Low	6	20	8	26.67
		Moderate	4	13.33	2	6.67
		High	8	26.67	2	6.66
		Very High	8	26.67	0	0
9	Support & Capacity Strengthening	Very Strong	2	6.67	10	33.33
		Strong	0	0	4	13.33
		Fair	8	26.66	6	20
		Weak	12	40	8	26.67
		Very Weak	8	26.67	2	6.67
10		Very Effective	2	6.67	14	46.67

	Monitoring Effectiveness	Effective	6	20	6	20
		Fairly Effective	4	13.33	2	6.66
		Less Effective	10	33.33	6	20
		Ineffective	8	26.67	2	6.67

Table 2 summarizes the distribution of sociodemographic characteristics, perceptions, support, barriers, and performance of Community Health Workers (CHWs) in rural and urban areas. Most rural CHWs had ≤5 years of service (73.33%), while urban CHWs had >5 years (66.67%). CHWs in both areas were generally aged 30–49. Urban CHWs had higher education levels, with 80% completing senior high school, compared to 40% of rural CHWs with only elementary or junior high education. Most CHWs were not formally employed.

Performance differences were notable: 93.33% of urban CHWs were rated "very good," while 46.67% of rural CHWs were rated "poor." Urban CHWs also had more positive perceptions (86.67%) and better support, whereas rural CHWs faced more barriers (53.34%). Larvae monitoring effectiveness was also significantly higher in urban areas.

The differences in performance and perception across settings are further illustrated in Figures 1 and 2, highlighting the stark contrasts between urban and rural cadres. These visuals complement the numerical distribution shown in Table 2.

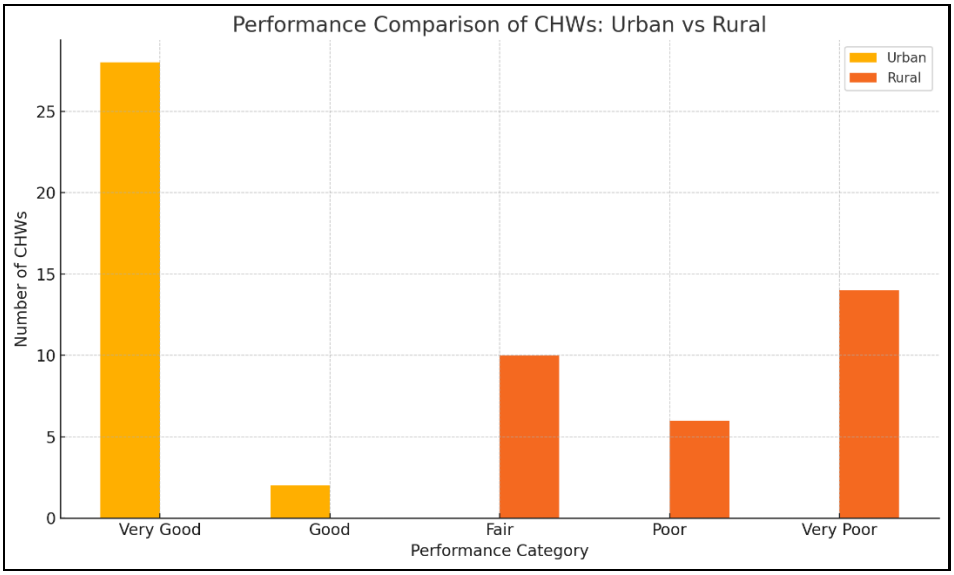

Figure 1. Comparison of CHWs' Performance in Urban and Rural Areas

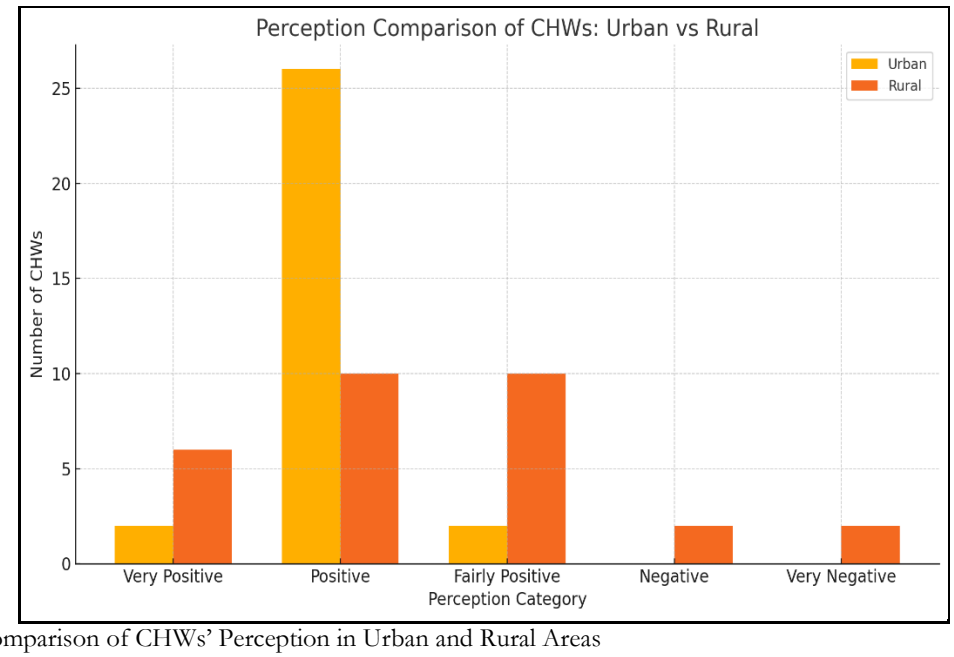

Figure 2. Comparison of CHWs' Perception in Urban and Rural Areas

Figures 1 and 2 visually compare CHWs' performance and perceptions across settings to further illustrate these disparities. Urban CHWs overwhelmingly demonstrated higher performance levels and more positive perceptions, while rural CHWs showed significant performance ratings and motivational outlook challenges.

Table 3. Cross-tabulation of Sociodemographic Variables, Perception, and Support Factors with Community Health Workers Performance by Urban and Rural Areas

		Urban Community Health Workers' Performance		Rural Community Health Workers Performance	
Variable	**Category**	**Good**	**Very Good**	**Fair**	**Poor/Very Poor**
Length of Service	> 5 years	2	18	2	5
	≤ 5 years	0	10	7	16
Age	20–39 years	0	10	5	13
	≥ 40 years	2	18	4	8
Education Level	Senior High School – University	2	26	5	12
	Elementary – Junior High School	0	2	4	9
Employment Status	Employed	2	0	0	4
	Unemployed	0	28	9	17
Community Health Workers Perception	Very Positive – Positive	0	28	3	13
	Fairly Positive – Not Positive	2	0	6	8
Supporting Factors	Very Supportive – Supportive	0	28	1	6
	Less Supportive	2	0	8	15
Perceived Barriers	Very Low – Low	0	26	6	9
	Moderate – High	2	2	3	12
Support & Capacity Building	Very Strong – Strong	0	14	1	2
	Fairly Strong – Very Weak	2	14	8	19
Monitoring Effectiveness	Very Effective – Effective	0	20	0	20
	Fairly Effective – Not Effective	2	8	4	6

Table 3 shows simplified and recategorized data from Table 1 to enable clearer cross-tabulation and bivariate analysis. Age and education were grouped into two categories (e.g., age: 20–39 and ≥40; education: elementary–junior high vs. senior high–university). Other variables—perception, enabling factors, barriers, support, and monitoring effectiveness—were recoded into binary categories to enhance statistical power and ensure valid chi-square analysis.

The results reveal that CHWs aged ≥40, with over five years of service and higher education, were more likely to perform excellently, especially in urban areas. Non-working CHWs also showed better performance. Positive perceptions, firm support, fewer barriers, and high monitoring effectiveness were significantly associated with improved CHW performance, particularly in urban settings.

Table 4. Comparison of Bivariate Test Results for Sociodemographic, Perception, and Environmental Variables on Community Health Workers Performance in Urban and Rural Areas

	p-value	
Variable	**Urban Area**	**Rural Area**
Duration of Service as Community Health Workers	0.5402	1.0000
Age	0.5402	1.0000
Education Level	1.0000	1.0000
Employment Status	0.0023	0.2874
Community Health Workers Perception	0.0023	0.2360
Supporting Factors	0.0138	0.3932
Barriers	0.3932	0.4270
Support and Capacity Strengthening	0.4851	1.0000
Monitoring Effectiveness	0.1034	0.1034

Bivariate analysis employed Fisher's Exact Test due to the small sample size and low expected cell counts, which did not meet the assumptions of the Chi-Square test. This test was appropriate for 2x2 categorical comparisons. As presented in Table 4, significant associations with CHW performance in urban areas were found for employment status ($p = 0.0023$), perception ($p = 0.0023$), and enabling factors ($p = 0.0138$). Notably, cadres who were unemployed demonstrated better performance than those employed ($p = 0.0023$), suggesting that greater time availability or flexibility may enhance their commitment and effectiveness.

Conversely, none of the examined variables showed significant associations with CHW performance in rural areas (all $p > 0.05$), indicating that unmeasured contextual factors—such as leadership support, geographical barriers, or sociocultural dynamics—may play a more dominant role. Furthermore, variables such as duration of service, age, education level, perceived barriers, support, and monitoring effectiveness were not significantly associated with performance in either setting.

DISCUSSION

Key Findings in Context

This study identifies strong urban–rural disparities in larval monitoring cadre performance, perceptions, enabling factors, barriers, and perceived monitoring effectiveness. Urban cadres (Kemayoran) were predominantly rated excellent and reported stronger enabling conditions and lower barriers, whereas rural cadres (Kresek) showed lower performance alongside weaker enabling support and higher perceived barriers. In bivariate analysis, cadre performance in urban settings was significantly associated with employment status, cadre perception, and enabling factors, while no measured variables were significantly associated with performance in rural settings. These results indicate that cadre effectiveness is shaped less by individual attributes alone and more by contextual and structural conditions that organize everyday prevention work.

Urban–rural Performance Differences as Social Context Effects

The performance gap can be read as an expression of social and institutional context. Urban settings typically provide denser institutional ecosystems and resources that facilitate sustained program routines, consistent with broader evidence on urban advantage in service access and organizational capacity (Li et al., 2020; Mueller et al., 2021). Rural cadres, despite operating in potentially cohesive community settings, appear constrained by limited enabling conditions. The absence of significant predictors in rural areas suggests that unmeasured contextual factors—such as logistical constraints, local leadership dynamics, and place-based access barriers—may outweigh individual-level determinants, aligning with research on structural drivers of rural health inequities (Li et al., 2020; Tadesse et al., 2023).

Enabling Factors as Cultural Infrastructure

Within PRECEDE–PROCEED, enabling factors (training, tools, supervision) provide the operational conditions for behavior change and program effectiveness (Green & Kreuter, 2005). In this study, enabling support was strongly linked to better performance in urban cadres, echoing findings that cadre performance depends on institutional facilitation and role-support systems (Illahika et al., 2022; Ludwick et al., 2018; Maharsi et al., 2020). Beyond "inputs," these enabling factors function as cultural infrastructure: they shape cadre legitimacy, stabilize routines, and make prevention work practically feasible in everyday settings. Where this infrastructure is uneven—as observed in the rural setting—community motivation alone may not translate into sustained monitoring performance.

Participation, Social Capital, and Everyday Feasibility

Prior studies emphasize that community participation strengthens dengue prevention (Arsin et al., 2023; Lachyan et al., 2020). The present findings nuance this by showing that participation and social embeddedness require structural reinforcement to become effective practice. Urban participation may be more institutionalized and program-driven; rural participation may be relationally stronger but structurally constrained. This resonates with evidence that behavioral change is shaped by knowledge, attitudes, and social support—yet remains contingent on enabling contexts that reduce barriers and sustain engagement (Ernawati, et al., 2021; Guad et al., 2021).

Cadres as Cultural Intermediaries

Larval monitoring cadres operate as intermediaries who translate formal dengue-control policies into household routines. Their effectiveness depends on how roles are perceived, how messages circulate, and how local arrangements shape compliance. The observed association between perception and performance in urban

settings supports the view that cadres' role meanings and motivation are program-critical, consistent with evidence linking motivation and supportive environments to cadre outcomes (Illahika et al., 2022b; Wijayanti et al., 2023). Where institutional reinforcement is weaker (as in the rural setting), cadre work may be less routinized and less sustainable despite social familiarity.

LIMITATIONS

This study has limitations. The cross-sectional comparative design identifies associations and group differences but does not support causal inference. Purposive sampling from two subdistricts may introduce selection bias and limits generalisability, and measures relied mainly on self-reported questionnaires with limited objective verification. Given the small sample and multiple bivariate tests, p-values should be interpreted cautiously; future studies should use larger samples and report effect sizes with confidence intervals.

POLICY IMPLICATIONS

Based on these findings, dengue prevention strengthening should prioritize context-sensitive governance rather than uniform program replication across settings. In urban areas, strategies may focus on maintaining high performance through structured supervision, recognition mechanisms, and scalable digital monitoring and feedback systems, consistent with evidence on health information systems and digital applications that improve monitoring efficiency (Ernawati et al., 2022; Joshi et al., 2020).

In rural areas, the priority is to reduce structural inequities by strengthening enabling conditions—localized training, supportive supervision, logistical facilitation, and deliberate engagement of community leadership to reinforce cadre legitimacy and sustain routine household monitoring. Such strategies align with the emphasis on community empowerment and sustained collaboration between institutional systems and community initiatives in dengue prevention (Arsin et al., 2023; Lestari et al., 2020).

CONCLUSION

This study demonstrates pronounced urban–rural disparities in larval monitoring cadre effectiveness. Urban cadres showed substantially higher performance, more positive perceptions, stronger enabling support, lower barriers, and higher perceived monitoring effectiveness than rural cadres. In urban settings, performance was significantly associated with employment status, cadre perception, and enabling factors, while no measured predictors were significant in rural settings—suggesting that place-based structural constraints and contextual dynamics may shape rural cadre effectiveness more strongly than individual-level factors.

By positioning larval monitoring not only as a technical public health task but also as a socially embedded practice, the study contributes to debates on how community-based interventions operate as sites where institutional arrangements, spatial inequality, and everyday routines intersect. Strengthening dengue prevention therefore requires culturally and contextually responsive strategies that treat cadres as community actors whose work depends on both social legitimacy and enabling infrastructure—particularly in resource-limited rural settings.

Institutional Review Board Statement

This study adhered to the Declaration of Helsinki and was approved by the Ethics Committee of Universitas YARSI (No. 368/KEP-UY/EA.20/XI/2024; 6 November 2024).

Informed Consent Statement

Written informed consent was obtained from all participants involved in the study.

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