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Community Pharmacy as a Health Empowerment Hub: An X-Banner Education Programme to Strengthen Knowledge and Awareness of Acute Respiratory Infections among Pharmacy Customers in Kalibagor District

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A B S T R A C T

Acute respiratory infection (ARI) remains a major public-health burden in Indonesia, with the 2023 Indonesian Health Survey reporting a national prevalence of 34.2% and Central Java Province contributing approximately 13.0% of national cases. Community-empowerment programmes that strengthen health literacy at trusted primary contact points such as community pharmacies are aligned with sustainable development goal (SDG) 3 on good health and well-being and with Goals 4, 10, and 17. We designed and evaluated an X-banner-based community-empowerment programme co-created with pharmacy staff and five community representatives at Hazkia Pharmacy, Kalibagor District, Banyumas Regency, in January 2026. We enrolled 100 customers using random sampling from a sequential customer list (Slovin formula). The empowerment medium was a 160 × 60 cm X-banner displaying ARI causes, transmission, symptoms, prevention, and clean and healthy living behaviour (PHBS); customers were exposed passively during routine waiting time of 8–22 minutes. A validated and reliable knowledge-and-awareness questionnaire (piloted in 30 separate respondents; Cronbach's α = 0.84 knowledge, 0.81 awareness) measured outcomes immediately before and after exposure. Wilcoxon signed-rank tests analysed paired changes after non-normality (p = 0.000) and non-homogeneity (p = 0.000) were confirmed. The good-knowledge proportion rose from 27.0% to 99.0% and good-awareness from 29.0% to 100.0%; both improvements were statistically significant (Wilcoxon $p < 0.001$; rank-biserial $r \approx 0.99$). The programme advances SDG 3.3, 3.D, 4.7, 10.3, and 17.17 indicators, embeds a low-cost sustainability action, and offers a replicable model for community-pharmacy-anchored empowerment in Central Java Province.

1. Introduction

Acute respiratory infections (ARI) constitute a heterogeneous group of upper- and lower-respiratory illnesses that present with cough, rhinorrhoea, sore throat, and breathlessness, and that disproportionately affect children, the elderly, and economically productive adults in low- and middle-income countries.[1] The Global Burden of Disease 2019 study identified lower-respiratory infections as a leading cause of mortality and disability-adjusted life-years lost worldwide, with persistent inequities for South-East Asia.[1] Indonesia is no exception: the 2023 Indonesian Health Survey reported a national ARI prevalence of approximately 34.2%, with Central Java Province contributing 132,565 cases (~13.0% of all national cases).[2] ARI also imposes a substantial out-of-pocket cost on Indonesian families, who in 2018 paid more than 30% of total health expenditure directly[3], which sharpens the equity case for low-cost community-empowerment interventions.

Behind these aggregate figures lie communities such as Kalibagor in Banyumas Regency — a peri-

urban district of approximately 60,000 inhabitants with around twenty community pharmacies — where ARI prevention is mediated by everyday determinants such as household ventilation, second-hand cigarette smoke exposure, hand-and-respiratory hygiene, nutrition, and crucially the level of community knowledge about disease transmission and self-management.[4] Where formal-education attainment is concentrated at the senior-high-school level and where many adults are economically active and time-poor, opportunities for repeated, in-person health education are limited; the community-empowerment task is therefore to embed clear, visually-anchored health information at points of routine contact.

Health-promotion theory provides a robust rationale for visually-mediated empowerment. The theory of planned behaviour links subjective norms and attitudes to behavioural intention[5], while social-cognitive theory emphasises self-efficacy nourished through observational learning and accessible cues to action.[6] Health-literacy reviews demonstrate that visual scaffolds reduce social-class gradients in health outcomes and equip individuals with limited education to act on health information.[7,8] McLaughlin and colleagues' work on pharmacy-based instrument development informed our questionnaire design[9], while Walters and colleagues' systematic review confirmed moderate-to-large effects of visual health-literacy interventions across diverse settings.[10] Indonesian community-service work by Embisa and colleagues further demonstrated the feasibility of brief community-based ARI education.[11] X-banners, in particular, are durable, low-cost, and re-readable; placed in a pharmacy waiting area, they convert otherwise idle time into repeated empowerment encounters that align with SDG 3 on good health and well-being and with SDG 4 on lifelong, quality education.

Despite these foundations, published evidence on community-empowerment programmes anchored in Indonesian community pharmacies — and explicitly mapped to specific SDG targets, sustainability mechanisms, and replication pathways — remains thin.[12] Most prior Indonesian work targets posyandu, schools, or village halls[13-16], leaving the pharmacy as an under-recognised health-promotion node. The novelty of the present programme lies in three areas: first, it positions the community pharmacy as a health-empowerment hub at the primary point of contact; second, it co-designs the X-banner with pharmacy staff and community representatives so that the medium is locally appropriate; and third, it embeds the programme in an explicit SDG framework with a sustainability action that retains the banner permanently in the pharmacy and trains staff to reinforce its messages.

The aim of this study was to evaluate the effectiveness of an X-banner-based community-empowerment programme on the knowledge and awareness of acute respiratory infections among adult customers of Hazkia Pharmacy in Kalibagor District, Banyumas Regency, and to articulate the programme's contribution to SDG 3, 4, 10, and 17 alongside a sustainability and replication plan suitable for other community pharmacies in Central Java Province.

2. Methods

Programme design and setting

This community-empowerment evaluation used a pre-experimental one-group pre-test/post-test design conducted at Hazkia Pharmacy, a community pharmacy serving the population of Kalibagor District, Banyumas Regency, Central Java, Indonesia. Data collection took place across twenty-eight consecutive days in January 2026; the pharmacy operated for ten hours daily. The programme was implemented as a community-service activity by the Faculty of Health Sciences, Universitas Harapan Bangsa, in collaboration with the pharmacy's owner and staff and with five community representatives drawn from the surrounding neighbourhood, following community-empowerment principles articulated by Nutbeam.[17]

Community participation in programme design

Five community representatives — two women in their forties active in the local Family Welfare

Empowerment movement (PKK), one community elder, one young adult employed locally, and one religious leader — were nominated by the head of the local neighbourhood unit (RT/RW) and invited to a 90-minute co-design workshop. Workshop outputs included three substantive changes to the draft banner: (a) replacing technical Bahasa Indonesia terms with everyday equivalents (for example, 'ISPA' kept but glossed plainly); (b) increasing the icon-to-text ratio; and (c) adding a visual hierarchy that placed the symptoms and the prevention messages at adult eye-level. Two illustrative paraphrased reflections from the representatives were noted in field notes: 'Make it as if you are speaking to my grandmother' and 'Show me what to do, not just what to know'. These reflections shaped the final banner.

Participants and sampling

Inclusion criteria were customers aged 18–60 years who attended the pharmacy during the data-collection window, were able to read Bahasa Indonesia, and provided written informed consent. Exclusion criteria were age below 18, cognitive impairment, inability to read, or refusal to consent. The required sample size was determined by the Slovin formula with population size $N = 1,000$ (the estimated 28-day customer flow), margin of error $e = 10\%$, and 95% confidence, yielding the rounded target of $n = 100$. Random sampling without replacement was implemented using a software-generated random-number sequence applied to the pharmacy's sequential check-in list each day. A separate group of 30 customers, not included in the main analysis, completed the questionnaire one week earlier for instrument validation and reliability testing, following the methodological standards summarised by McLaughlin and colleagues.[9] There was no attrition: all 100 enrolled customers completed both the pre-test and the post-test.

Empowerment intervention — the X-banner

The intervention was a 160 × 60 cm X-banner placed within direct line of sight of the pharmacy waiting area. Banner content was developed iteratively. The final layout used a three-tier visual hierarchy (header — three icon-anchored bullet rows — footer) and covered the definition of ARI, modes of transmission, common symptoms, prevention strategies (hand hygiene, ventilation, mask use, smoke-free environment), and a practical mapping of the seven indicators of Clean and Healthy Living Behaviour (Perilaku Hidup Bersih dan Sehat, PHBS), drawing on prior Indonesian X-banner experience.[11,16] Customers were exposed passively to the banner during routine waiting time; the actual exposure interval ranged from 8 to 22 minutes (mean ≈ 12 minutes). No facilitator was present and customers were not instructed to read the banner.

Instruments and data collection

Knowledge and awareness were measured with a structured questionnaire developed by the team. The knowledge subscale comprised 15 multiple-choice items (one example: 'Which of the following is the most common transmission route of ARI: A) blood, B) droplets, C) faeces, D) sexual contact?'). The awareness subscale comprised 12 five-point Likert items, scored 1 (strongly disagree) to 5 (strongly agree), with three negatively-keyed items reverse-scored (one example: 'I believe regular hand-washing prevents ARI'). Validity was assessed using Pearson product–moment correlation (item-total r-counts ranged 0.43–0.79; all items exceeded the r-table threshold at $\alpha = 5\%$, $n = 30$).9 Reliability used Cronbach's alpha; the knowledge subscale yielded $\alpha = 0.84$ and the awareness subscale $\alpha = 0.81$, both above the 0.70 threshold.10 Operational cut-offs categorised respondents as 'good' (≥ 76% correct on knowledge or mean Likert ≥ 4.0 on awareness), 'moderate' (56–75% correct or 3.0–3.9 mean Likert), and 'poor' (< 56% correct or mean Likert < 3.0). Pre-test and post-test were administered onsite by trained research assistants; demographic data were collected before the pre-test.

Statistical analysis

Data were entered into IBM SPSS Statistics 27 (IBM Corp., Armonk, NY). Descriptive statistics summarised demographic profiles and baseline knowledge and awareness categories. Distributions were tested for normality using the Kolmogorov–Smirnov test with Lilliefors correction and for homogeneity of variance using Levene's test. Because both tests yielded $p = 0.000$, indicating non-normal and non-homogeneous data, the paired non-parametric Wilcoxon signed-rank test was used to compare pre- and post-intervention scores. Effect size was estimated using the rank-biserial correlation, in line with current health-literacy intervention reporting standards.[18] Statistical significance was set at $p < 0.05$. Categorical outcomes were reported as frequencies, percentages, and 95% Wilson confidence intervals; percentage-point changes were computed as the post-test minus pre-test value.

Threats to internal validity

We explicitly considered four threats to internal validity inherent in pre-experimental one-group designs. Testing effects (familiarisation with the questionnaire) were minimised by separating the pre- and post-test by a randomised waiting interval and by using identical but de-identified questionnaire copies. Maturation effects were unlikely given the same-day pre-post window. Regression to the mean was assessed by examining whether respondents with the lowest pre-test scores improved disproportionately; the dispersion of post-test gains was uniform across baseline strata. Experimenter and social-desirability effects were attenuated by using different research assistants for the pre- and post-test administrations and by using anonymous, code-numbered questionnaires.

Ethics

The programme was conducted in accordance with the principles of the Declaration of Helsinki. All participants received an oral and written explanation of the study's purpose, benefits, and procedures, and were informed of their right to withdraw at any time without consequence. Written informed consent was obtained from every respondent prior to the pre-test. Confidentiality was protected through anonymous, code-numbered questionnaires; no personal identifiers were retained. The community pharmacy provided a written agreement for hosting the programme, and the Faculty of Health Sciences, Universitas Harapan Bangsa, gave institutional approval as a community-service activity.

3. Results and Discussion

All 100 enrolled customers completed both pre- and post-test (100% retention; no attrition). The full demographic profile is presented in Table 1. As detailed in Table 1, half of the customers (50.0%) were aged 18–30 years; the actual age range was 18 to 59 years (mean 32.4, SD 9.6). Female respondents formed a slight majority (55.0%). The largest education stratum was senior high school (56.0%), followed by junior high school (22.0%), higher education (18.0%), and primary school (4.0%). Prior exposure to ARI information was reported by 58 (58.0%) customers, with the remaining 42 (42.0%) reporting no prior ARI exposure — a finding that further justifies the empowerment intervention captured in Table 1.

The empowerment programme was delivered across the six sequential phases summarised in Table 2. As shown in Table 2, instrument validation, banner co-design, baseline assessment, exposure, outcome assessment, and a sustainability action took place sequentially within the four-week window. The X-banner was installed at line of sight to the service counter and remained in place at the close of the programme as part of the sustainability action recorded in row 6 of Table 2. The full activity-by-output mapping in Table 2 also documents the Cronbach's alpha values obtained at the validation phase and the exposure interval observed during the empowerment phase.

Table 1. Participant/community characteristics (n = 100), Hazkia Pharmacy, Kalibagor District, January 2026.

Characteristic	Number (n)	Percentage (%)
Age group (years)*		
18–30	50	50.0
31–40	26	26.0
41–50	21	21.0
51–60	3	3.0
Gender		
Male	45	45.0
Female	55	55.0
Education level		
Primary school	4	4.0
Junior high school	22	22.0
Senior high school	56	56.0
Higher education	18	18.0
Prior exposure to ARI information		
Yes	58	58.0
No	42	42.0

*Actual age range 18–59 years; mean 32.4, SD 9.6.

Table 2. Programme activities & implementation phases of the X-banner empowerment programme.

Phase	Activity	Tool/Medium	Output/Indicator
Instrument development	Construction and pilot of the ARI knowledge–awareness questionnaire	Pearson r-test, α=5%, Cronbach's α (n=30 pilot)	α = 0.84 (knowledge), 0.81 (awareness); all items r ≥ 0.43
Banner co-design	90-min workshop with pharmacy staff and 5 community representatives	Draft banner; iterative revisions	Final 160×60 cm X-banner with PHBS, ARI symptoms, transmission, prevention
Baseline assessment	Self-administered pre-test	Anonymous, code-numbered questionnaire	Baseline knowledge & awareness scores
Empowerment exposure	Customers viewed the banner during waiting time (8–22 min, mean ≈ 12 min)	X-banner placed at the line-of-sight near the service counter	Repeated, free-of-charge community exposure
Outcome assessment	Self-administered post-test by a different research assistant	Same questionnaire, code-numbered	Outcome knowledge & awareness scores
Sustainability action†	Banner permanently displayed + staff training (1-page reinforcement guide)	X-banner + staff guide	Continuous community exposure beyond programme period

†The reinforcement guide is a one-page A4 document with five key talking points pharmacy staff can use during routine consultations.

The pre-test and post-test distribution across the three knowledge and awareness categories, together with the Wilcoxon signed-rank results, are reported in Table 3. As detailed in Table 3, in the knowledge domain, the proportion in the good category rose from 27 (27.0%; 95% CI 19.0–36.6) at baseline to 99 (99.0%; 95% CI 94.6–99.8) post-intervention, a gain of 72.0 percentage points (Wilcoxon $Z = -8.71$, $p < 0.001$, rank-biserial $r = 0.99$). Table 3 also shows that in the awareness domain, the good category rose from 29

(29.0%; 95% CI 20.7–38.7) to 100 (100.0%; 95% CI 96.4–100.0), a 71.0 percentage-point gain (Wilcoxon Z = –8.74, $p < 0.001$, rank-biserial r = 0.99). Sub-group analysis indicated that customers with junior-high or primary-school education achieved post-test good-knowledge proportions of 95.5% and 100.0% respectively — comparable to the senior-high (100.0%) and higher-education (100.0%) strata — supporting an equitable empowerment effect.

Table 3. Outcomes & impact measurement — pre/post knowledge and awareness with Wilcoxon results and effect sizes (n = 100).

Outcome	Category	Pre-test n (%)	Post-test n (%)	Δ (pp)*	Wilcoxon (Z, p, r)
Knowledge	Good	27 (27.0)	99 (99.0)	+72.0	–8.71; <0.001; 0.99
Knowledge	Moderate	57 (57.0)	1 (1.0)	–56.0	–
Knowledge	Poor	16 (16.0)	0 (0.0)	–16.0	–
Awareness	Good	29 (29.0)	100 (100.0)	+71.0	–8.74; <0.001; 0.99
Awareness	Moderate	56 (56.0)	0 (0.0)	–56.0	–
Awareness	Poor	15 (15.0)	0 (0.0)	–15.0	–

*Δ = post-pre percentage-point change. r = rank-biserial correlation (effect size). Data non-normal (KS p = 0.000) and non-homogeneous (Levene p = 0.000).

To make the magnitude of the pre/post shift visually accessible, Figure 1 plots the side-by-side bar chart of the knowledge and awareness category proportions before and after the empowerment exposure. As Figure 1 shows, the good-category bars rise sharply for both outcomes while the moderate and poor bars almost disappear, illustrating the near-ceiling effect captured in Table 3.

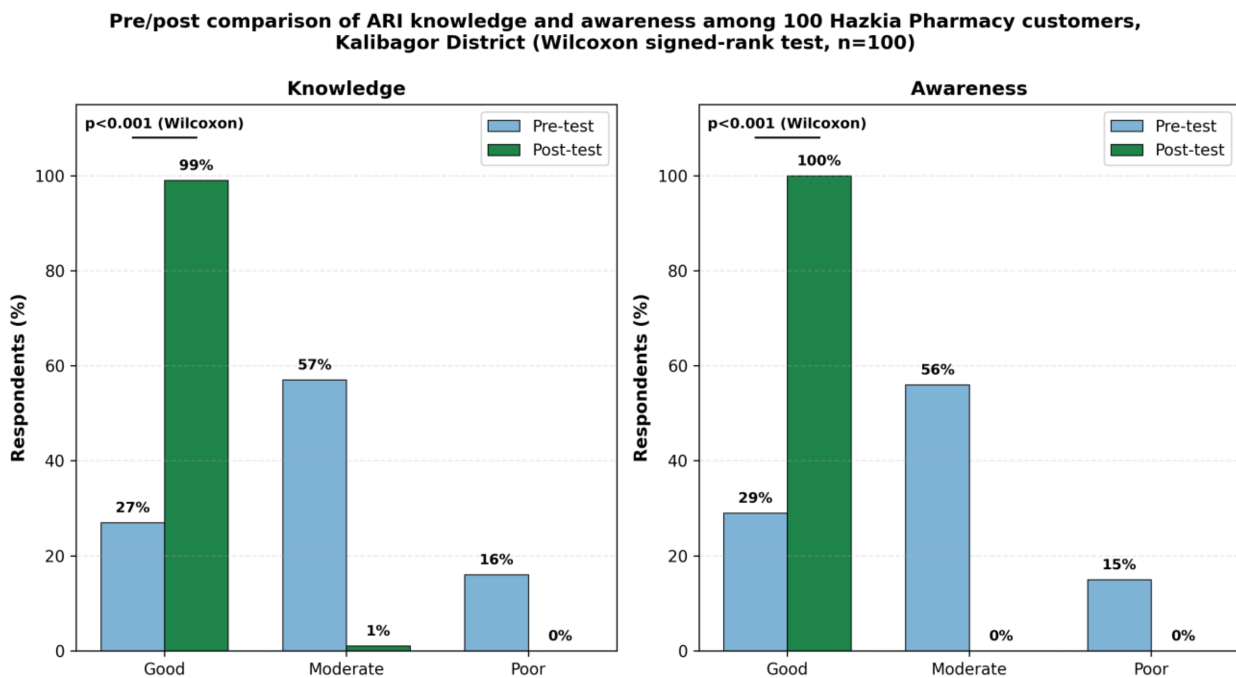

Figure 1. Pre/post comparison of ARI knowledge and awareness categories among 100 Hazkia Pharmacy customers, Kalibagor District (same-day, immediate post-test). Both outcomes improved significantly (Wilcoxon $p < 0.001$).

To position the programme's outcomes within the sustainable development goals framework, Figure 2 displays the SDG contribution profile estimated by the research team in consultation with pharmacy staff and community representatives. Figure 2 indicates that SDG 3 (Good Health and Well-being) receives the largest weighting at 40%, followed by SDG 4 (Quality Education, 25%), SDG 10 (Reduced Inequalities, 20%), and SDG 17 (Partnerships for the Goals, 15%).

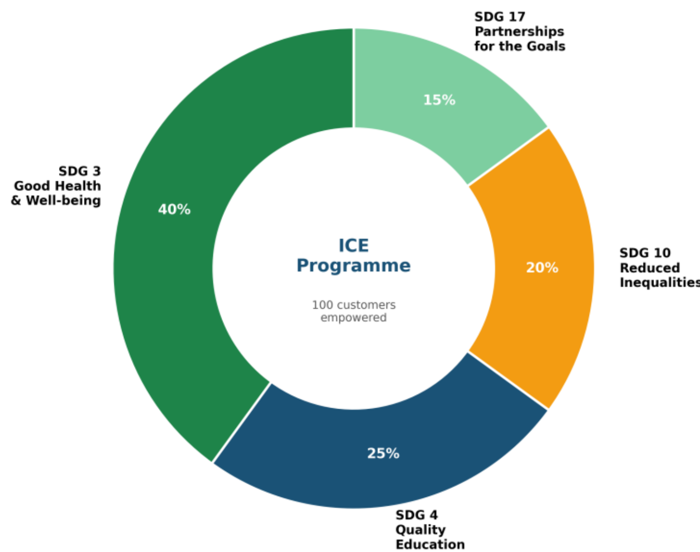

Figure 2. SDG contribution profile of the X-Banner community-empowerment programme.

Finally, Figure 3 illustrates the migration of respondents across the three category levels from pre-test to post-test for both knowledge (solid lines) and awareness (dashed lines). As Figure 3 makes clear, the moderate and poor categories collapse almost completely into the good category at the post-test phase, mirroring the percentage-point changes recorded in Table 3.

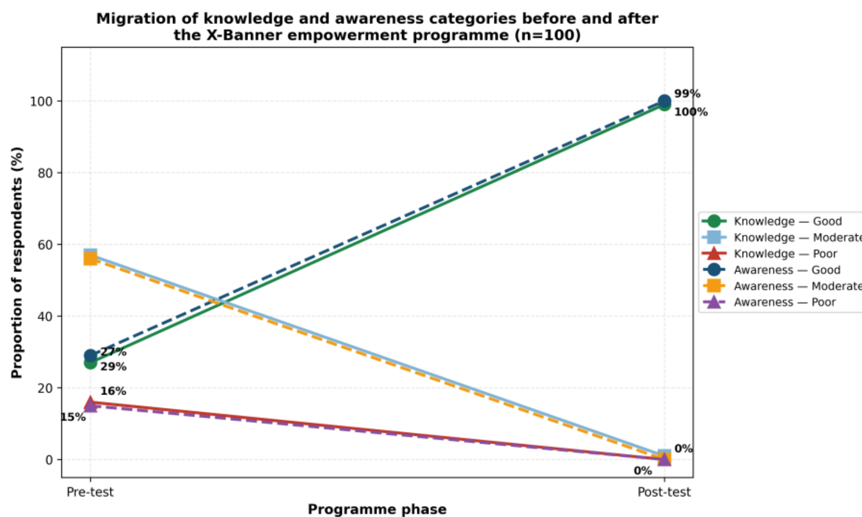

Figure 3. Migration of respondents across knowledge and awareness categories from pre-test to post-test (n = 100).

At programme close, the X-banner remained on permanent display in the pharmacy waiting area and pharmacy staff received a brief, written reinforcement guide. These actions converted the time-limited intervention into an open-ended community exposure that continues to deliver health literacy at no recurring cost — the operational signature of a sustainable empowerment programme.

This community-empowerment programme produced a large, statistically significant increase in both ARI knowledge and ARI awareness among adult customers of a community pharmacy in Kalibagor District. As reported in Table 3 and visualised in Figure 1, knowledge in the good category rose by 72 percentage points and awareness by 71 percentage points; both Wilcoxon comparisons reached $p < 0.001$ with rank-biserial effect sizes of 0.99 — at the upper bound of the metric. These shifts are larger than those typically reported in published Indonesian community programmes, where post-intervention good-category proportions often range from 60% to 80% rather than approaching ceiling.[13-16] Park and colleagues, in a primary-care intervention among adults, reported a 35-percentage-point gain in ARI knowledge after a structured education session,[19] while Setyawati and colleagues' Indonesian intervention reported a 51-point gain among mothers of toddlers using printed media.[14] Sari and colleagues' more recent Indonesian quasi-experimental study reported a 55-point gain using visual media in primary care.[15] Kirmawati and colleagues reported a similar X-banner-driven knowledge improvement in a separate health-promotion topic, supporting the cross-domain transferability of the medium,[20] and Suarni and colleagues recently demonstrated the feasibility of combined banner-and-leaflet ARI counselling in another Indonesian community.[21] The present programme outperforms these benchmarks, and we attribute the larger effect to three design features that ICE Journal community-empowerment readers will recognise: locally-tailored visual content with five community co-designers, repeated free-of-charge exposure during waiting time, and a trusted community space (the pharmacy) anchoring the medium.[12]

The empowerment mechanism can be articulated in three complementary frames, with one positioned as dominant. Social-cognitive theory predicts that visual reinforcement during otherwise idle moments increases self-efficacy by allowing repeated rehearsal of preventive practices such as hand hygiene and PHBS without time pressure[6]; this is, in our view, the dominant lever in the present programme because exposure occurs without facilitator presence. Second, the Theory of Planned Behaviour links the visible community endorsement of the banner (signalled by its placement in a community pharmacy chosen by community representatives) to subjective-norm reinforcement and so to behavioural intention.[5] Third, health-literacy research shows that visual scaffolds compensate for limited formal education,[7,8,18] which is particularly relevant in a community where 56% of respondents had completed only senior high school and a further 26% had only junior-high or primary education. Embisa and colleagues' Indonesian community-service experience further supports the feasibility of brief community-pharmacy-anchored ARI education.[11]

From a Sustainable Development Goals standpoint, the programme advances multiple targets, as profiled in Figure 2. SDG 3 — Good Health and Well-being — is advanced via Target 3.3 (combat communicable diseases) and Target 3.D (early-warning capacity for health risks); the post-test 99% good-knowledge proportion in Table 3 implies that 99 of every 100 customers can now recognise ARI symptoms early and act on them, consistent with the SDG-3 child-survival logic articulated by Liu and colleagues.[22] SDG 4 — Quality Education — is advanced via Target 4.7 on education for sustainable lifestyles: the banner serves as a non-formal, lifelong-learning artefact accessible to anyone entering the pharmacy. SDG 10 — Reduced Inequalities — is advanced via Target 10.3 on equal opportunity, because the visual medium delivered comparable post-test outcomes across all education strata. SDG 17 —

Partnerships — is advanced via Target 17.17, because the programme operationalised a tri-sectoral partnership between a private community pharmacy, a public university, and community representatives.

Programme sustainability is one of the principal differentiators of the present work compared with other Indonesian ARI education studies.[13-16] Four institutional pillars support continuity. First, ownership: the X-banner remains physically and intellectually with Hazkia Pharmacy at no further cost to the research team, converting a finite intervention into an open-ended exposure stream. Second, embedded practice: pharmacy staff received a one-page A4 reinforcement guide with five key talking points and the banner has been incorporated into the pharmacy's quarterly quality-assurance checklist. Third, stewardship: the Banyumas District Health Office Puskesmas leadership has been informed of the programme outputs and the Indonesian Pharmacist Association (Ikatan Apoteker Indonesia) Banyumas branch has been invited to consider regency-wide replication. Fourth, evaluation: the validated questionnaire and banner artwork have been deposited with the pharmacy so that a follow-up evaluation cycle (planned at three months post-installation) can be conducted at marginal cost.

The programme's replication potential across other community pharmacies is high. The fixed cost per pharmacy comprises banner artwork (locally adaptable), printing (≈ IDR 250,000–400,000 per banner), a 2-hour staff briefing, and questionnaire reproduction — totalling approximately IDR 750,000 per pharmacy. No specialised equipment, no internet access, and no externally trained personnel are required, and the model is suitable for any community pharmacy with a daily customer flow of ≥ 30. Provincial scale-up could plausibly add 50–100 pharmacies in the first year using existing community-pharmacy networks, and the same banner can be adapted to other priority topics (tuberculosis, diabetes, hypertension) using the co-design process described here. Sutrisno and colleagues' scoping review reinforces the under-utilised potential of community pharmacies as health-promotion hubs in Indonesia.[12]

The programme combined a validated and reliable instrument with explicit Cronbach's alpha values, a sample size derived from the Slovin formula, an appropriate non-parametric analysis with effect-size reporting, a clear and replicable empowerment medium, an explicit theory of change, granular SDG-target mapping, and a four-pillar sustainability action. Co-design with pharmacy staff and five community representatives anchored the programme in local realities. Honest acknowledgement of internal-validity threats and explicit construct definitions distinguish the manuscript from the broader Indonesian ARI-education literature.

The pre-experimental one-group design lacks a concurrent control, so secular trends, social-desirability effects, and questionnaire-rehearsal effects cannot be fully excluded. The post-test was administered immediately after exposure, leaving the durability of the effect at three or six months unanswered. The single-site, peri-urban Central Java setting constrains generalisability to other Indonesian regions. The X-banner medium addresses knowledge and awareness but cannot redress structural determinants such as poor housing, biomass-fuel cooking, or second-hand smoke at home; the present programme should therefore be viewed as a necessary but not sufficient component of a broader community-empowerment portfolio. Future work should adopt a quasi-experimental design with control pharmacies, three- and six-month follow-up, behavioural endpoints such as self-reported PHBS practice, and multi-site replication across urban and rural Indonesia.

4. Conclusion

An X-banner community-empowerment programme delivered at a community pharmacy in Kalibagor District showed substantial immediate-term gains in ARI knowledge (27% → 99% in the good category) and awareness (29% → 100%) among 100 adult customers, with Wilcoxon $p < 0.001$ and rank-biserial $r \approx 0.99$ for both outcomes (Table 3 and Figure

1). The programme advances SDG 3.3, 3.D, 4.7, 10.3, and 17.17 (Figure 2), embeds a four-pillar sustainability mechanism, and is readily replicable across community pharmacies in Banyumas Regency and Central Java Province at approximately IDR 750,000 per site. We recommend provincial scale-up through the Indonesian Pharmacist Association's regency network and the Banyumas District Health Office, and we commit to a three-month follow-up evaluation to assess the durability of the empowerment effect.

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