AI-Based Optimization of Public Health Communication Strategies

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Abstract

In the bustling tea stalls of Chittagong and the endless scrolls of Dhaka's social media feeds, public health messages compete for the most precious currency of 2026: attention. Whether it is an advisory on a new vaccine, a dengue outbreak, or a heatwave warning, the challenge has shifted from mere dissemination to meaningful engagement. Historically, public health communication in Bangladesh followed a broadcast model: loudspeakers, radio spots, and billboard campaigns dominated the landscape.

Yet, as the country reaches 185 million cellular connections and over 60 million active social media users, this approach is increasingly inadequate. Simply "shouting louder" no longer ensures awareness or action. In a digital ecosystem where over 52% of content is now AI-assisted, the task is no longer to reach audiences—it is to reach them with messages that are trusted, relevant, and actionable.

Research in behavioral public health is turning to Artificial Intelligence (AI) to optimize communication strategies. AI allows for the analysis of engagement beyond vanity metrics like "likes" or "shares," focusing instead on depth of engagement and conversion into real-world action. Early 2025 data reveal pronounced demographic divergences in how Bangladeshis consume health information. Urban women, who are largely literate and tech-savvy, actively engage with digital platforms, while rural women—particularly those in low-income areas—have limited access, with only 51% interacting with online content effectively. Using clustering algorithms such as K-Means, researchers have identified three distinct trust clusters that reflect both technology access and information reliability. The first cluster, the "Skeptics," primarily rural and low-tech, rely on local, trusted human sources such as village doctors, imams, and community health workers. The second cluster, the "Autonomists," represents urban youth who actively leverage AI tools such as ChatGPT to cross-check health information before consulting professionals. The third cluster, the "Influenced," consists of mid-tech users who rely heavily on WhatsApp forwards and Facebook groups, rendering them particularly susceptible to misinformation and viral "health infodemics."

Micro-targeting is where AI transforms understanding into strategy. By mapping these clusters, AI models

can predict which communication channels and message formats will be most effective for each segment. For instance, maternal health information delivered via WhatsApp demonstrates 15.8% higher engagement among the poorest rural populations compared to conventional TV campaigns, which may fail to reach or resonate with these communities. Similarly, short animated videos or voice-based Interactive Voice Response (IVR) systems can be tailored to literacy levels, linguistic preferences, and cultural norms, maximizing impact at minimal cost. This targeted approach ensures that public health messaging is not only seen but understood and acted upon.

Misinformation remains a persistent threat to public health outcomes in Bangladesh. A single viral rumor about vaccine side effects can undo years of awareness campaigns and erode trust in the health system. In 2026, AI-driven Natural Language Processing (NLP) techniques are being deployed to create "digital immune systems" capable of detecting and mitigating misinformation in real-time. Predictive rumor tracking models monitor sentiment spikes on platforms such as TikTok, Facebook, and Instagram, forecasting a potential misinformation surge with up to 90.1% accuracy up to three days before it reaches critical mass. Coupled with a "pre-bunking" strategy, authorities can now disseminate evidence-based narratives that directly address underlying fears before misinformation spreads widely. This proactive approach moves beyond reactive debunking to prevention, strengthening resilience in public trust.

Digital trust, however, is contingent upon perceived transparency and authenticity. Research indicates that nearly half of Bangladeshis distrust health content perceived as "too robotic." Consequently, hybrid AI-human models are essential: AI generates data-driven insights and drafts, while trusted human voices—community leaders, health professionals, and influencers—deliver the messages. This balance preserves credibility while leveraging AI’s analytical power. Moreover, by contextualizing messaging culturally and linguistically, AI can translate complex medical information into local dialects such as Sylheti or Chatgaya without sacrificing clarity or tone, reinforcing engagement and legitimacy.

AI-based optimization also supports equity by ensuring that digital excellence reaches the last mile. For rural populations and marginalized communities, low-cost solutions are critical. Voice-IVR systems, optimized using AI for clarity, timing, and message sequencing, allow health authorities to provide personalized guidance on maternal and neonatal care at zero cost to millions. Similarly, text-based SMS campaigns, when tailored via AI to literacy and language levels, can nudge preventive behaviors—such as timely vaccinations or heatwave precautions—without requiring smartphone ownership. By integrating engagement analytics, AI enables measurement of actual behavioral impact rather than mere awareness. Metrics such as clinic visits, immunization uptake, and adherence to hygiene protocols can be directly correlated with message exposure, offering a more precise understanding of program effectiveness.

Beyond individual engagement, AI models facilitate systemic interventions in public health communication. By continuously analyzing the "digital pulse" of various districts, these systems can

identify emerging concerns, knowledge gaps, and regional variations in health literacy. For example, if an uptick in anxiety or misinformation is detected in a specific Upazila, targeted campaigns can be deployed immediately, using the most effective medium for that community. Real-time dashboards equip policymakers with actionable insights, enabling dynamic allocation of resources, rapid response to crises, and continuous refinement of messaging strategies.

The intersection of AI and public health is particularly vital for countering misinformation and ensuring resilience in communication strategies. AI models can detect subtle shifts in public sentiment, flag potentially harmful narratives, and suggest corrective measures before misinformation escalates. This capability is complemented by preemptive interventions, such as contextual messaging that addresses myths and cultural beliefs directly, and engagement with credible local figures who can amplify accurate information. By combining predictive analytics with culturally sensitive content delivery, AI strengthens both the reach and credibility of public health campaigns.

Furthermore, AI enables the evaluation of long-term outcomes in a way that traditional communication methods cannot. Moving beyond simplistic metrics of reach or impressions, models assess behavioral change—did a Facebook post lead to a measurable increase in antenatal visits? Did a voice message prompt adoption of preventive behaviors during a heatwave? These insights allow policymakers to fine-tune strategies in real-time, maximizing the return on investment in public health communication. The application of AI ensures that messaging is not only efficient but also equitable, reaching populations that were historically underserved.

Ethical and operational considerations are central to AI deployment in public health communication. Data privacy, informed consent, and the avoidance of surveillance-driven interventions are critical. AI is employed to analyze aggregated trends rather than individual behaviors, preserving anonymity while enabling meaningful insights. Transparency about the use of AI in message generation builds trust, and hybrid approaches ensure that human oversight maintains ethical and cultural appropriateness. By prioritizing ethical design, AI tools can expand reach without compromising integrity, ensuring that health communication remains inclusive and respectful.

In conclusion, public health communication in Bangladesh is evolving from a one-way broadcast into a precision-guided, data-driven dialogue. AI allows health authorities to understand the digital behavior, preferences, and trust profiles of diverse populations, enabling messages that are targeted, culturally sensitive, and actionable. From rumor preemption and micro-targeting to measuring behavioral outcomes and optimizing equity, AI transforms the challenge of reaching millions into a science of engagement. In 2026, the most effective public health strategy is not the loudest announcement but the most precise and trusted conversation. By leveraging AI ethically and intelligently, Bangladesh is poised to ensure that every citizen—whether in the urban centers, remote hill tracts, or riverine chars—receives the right health

message at the right time, ultimately safeguarding health, trust, and social equity across the nation.