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Review Article

Transforming Global Health: Evidence-Based Intervention and Strategies for Communicable Disease Control – A Review

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A B S T R A C T

Communicable diseases continue to pose a significant threat to global health, particularly in resource-limited settings where socioeconomic disparities exacerbate vulnerability. Although substantial progress has been achieved through immunisation programmes and targeted public health interventions, persistent inequalities and emerging challenges such as the COVID-19 pandemic underscore the need for sustained and adaptive strategies. This narrative review synthesises current evidence on effective approaches for communicable disease prevention and control, with a focus on health system strengthening, community-driven interventions, and innovative technologies. The review highlights the role of robust surveillance systems, mobile health solutions, community health workers, and integrated service delivery in improving disease outcomes. It also explores the utility of the One Health framework in addressing zoonotic threats and emphasises behaviour-focused interventions in managing waterborne and foodborne diseases. Strengthening cross-sectoral collaboration, addressing social and environmental determinants, and fostering leadership within affected populations are identified as critical components of sustainable disease control. This comprehensive and adaptive approach supports global health equity goals, advocating for innovation, long-term investment, and political commitment to build resilient health systems and advance the elimination of communicable diseases. Furthermore, the integration of innovative, community co-designed digital health strategies offers a promising pathway to strengthen disease control efforts and accelerate the elimination of communicable diseases.

Keywords: Communicable Diseases, Global Health, Disease Control Strategies, Surveillance System

Introduction

Communicable diseases remain a formidable global health challenge, particularly in low- and middle-income countries, where they continue to account for a substantial proportion of morbidity and mortality. Despite the notable progress achieved through medical advancements and public health interventions, diseases such as HIV/AIDS, tuberculosis (TB), malaria, viral hepatitis, and neglected tropical diseases (NTDs) collectively result in over four million deaths annually, underscoring the urgent need for sustained control efforts and continuous programme evaluation.[1] Immunisation programmes have played a critical role in reducing mortality from vaccine-preventable diseases, particularly among children. The Expanded Programme on Immunisation (EPI), for instance, has been instrumental in saving an estimated 154 million lives, 146 million of which were children under the age of five, thus reaffirming the immense potential of widespread vaccination in controlling communicable diseases.[2] Building on such successes, the World Health Organisation's Global Health Sector Strategies (GHSS) for 2022–2030 outline ambitious goals, such as reducing new HIV infections to 0.05 per 1000 uninfected individuals by 2025 and 0.025 by 2030, as part of broader efforts to eliminate HIV, viral hepatitis, and sexually transmitted infections as public health threats.[3] Nevertheless, achieving these targets is complicated by persistent regional and socioeconomic disparities. In 2019 alone, Communicable, Maternal, Neonatal, and Nutritional Diseases (CMNNDs) were responsible for approximately 10.2 million deaths and 669 million disability-adjusted life years (DALYs), with the heaviest burden borne by low-income populations.4 The COVID-19 the pandemic further exposed the fragility of global health systems, disproportionately impacting marginalised groups and disrupting essential services. At the same time, it spurred innovations in health delivery and renewed global focus on the foundational role of health in achieving social and economic stability.[5] Community-based interventions (CBIs) have increasingly emerged as effective strategies in addressing these disparities. For example, Brazil's deployment of community health workers (CHWs), who now serve over 60 million people, illustrates the scalability of localised, grassroots health initiatives.[6] The global health agenda, as articulated in the Millennium Development Goals (MDGs) and continued through the Sustainable Development Goals (SDGs), has further prioritised the elimination of preventable child deaths (target 3.2) and the end of epidemics related to major communicable diseases (target 3.3). Support from global partnerships such as the Global Fund, PEPFAR, GAVI, and initiatives by the Bill & Melinda Gates Foundation has driven collective progress through funding, advocacy, and policy alignment.[7] Diversified community-based strategies ranging from screening and socio-economic support to vector control, health education, digital health technologies, and CHW capacity building have shown effectiveness across a spectrum of diseases, including TB, diarrhoea, dengue, influenza, and hepatitis B and C. Although the bundling of interventions enhances overall impact, it remains challenging to isolate the efficacy of individual components within these complex, integrated approaches.[8] While meaningful progress has been made, the fight against communicable diseases is far from over. Future success hinges on the adoption of context-sensitive, evidence-based strategies that strengthen health systems, address underlying social determinants, and adapt to emerging challenges. The continued integration of innovation, community engagement, and robust monitoring mechanisms will be critical to sustaining momentum and achieving global health equity. This review aims to synthesise current evidence on effective interventions and innovative approaches in controlling communicable diseases. Through a narrative lens, it explores key strategies including health system strengthening, community-based interventions, digital health innovations, and cross-sectoral collaborations. By examining successes and identifying gaps, the review seeks to suggest actionable insights toward achieving global health equity and resilience in the face of evolving challenges.

Airborne Disease: Strengthening Infection Control and Community-Based Strategies

Airborne infection control (AIC) remains a cornerstone in preventing the spread of healthcare-acquired infections (HCAIs), particularly in settings where ventilation is inadequate and the risk of transmission of airborne pathogens, such as Mycobacterium tuberculosis and the SARS-CoV-2 virus, is high. The COVID-19 pandemic has further emphasised the urgency of strengthening infection control practices across all levels of healthcare. In response, several facilities have implemented annual infection control (IC) training for diverse healthcare cadres, including housekeeping staff, medical officers, nurses, and laboratory technicians, while simultaneously encouraging respiratory symptomatic patients to adhere to cough etiquette. The provision of N95 masks, face shields, and the establishment of dedicated sputum collection areas, particularly under the KAYAKALP initiative, have served as vital facilitators. Nevertheless, infrastructural limitations, funding delays, and poor patient compliance continue to challenge the successful implementation of AIC strategies, especially in outpatient settings that lack adequate segregation mechanisms.[9] Healthcare-acquired infections (HCAIs) have emerged as a significant contributor to morbidity and mortality among both hospitalised patients and healthcare workers (HCWs). The burden is particularly evident in tuberculosis (TB) infection rates among healthcare staff, where a study reported TB incidence at 2.32% in secondary

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healthcare facilities and 0.35% in tertiary centres, with nursing personnel being disproportionately affected. The challenges in implementing effective AIC strategies are often attributable to systemic inefficiencies and individual-level barriers. Alarmingly, many health facilities fall short of full implementation of infection control protocols, pointing to a critical need for strengthened surveillance systems, particularly passive surveillance of TB among healthcare workers.[10] Numerous studies echo these findings, describing inadequate TB infection prevention and control (IPC) measures that perpetuate high-risk settings for nosocomial TB transmission. One illustrative case demonstrated how IPC interventions at the district level evolved through adaptive strategies, including TB triage and occupational health services. These changes were reinforced by cultural shifts within healthcare teams regarding the perceived value of IPC. Nonetheless, the COVID-19 pandemic disrupted this synergy, competing for resources and attention rather than complementing existing TB IPC measures. Still, the crisis offers a unique opportunity to repurpose the organisational narratives and infrastructure developed for COVID-19 IPC toward strengthening.[11] At the primary care level, awareness and practice of AIC among healthcare providers and TB patients were significantly improved through multifaceted intervention packages. These included supportive supervision, HCP training, and patient education, demonstrating that structured and context-sensitive approaches can lead to meaningful improvements in AIC compliance.[12] Yet, in high TB-burden settings, the operationalisation of WHO's 2009 TB IPC guidelines has often faltered. Despite formal adoption, limited contextual adaptation, insufficient isolation space, PPE shortages, inadequate training, and the discomfort associated with prolonged N95 mask usage continue to hamper effective implementation.[13] To supplement traditional AIC strategies, technological innovations such as portable air cleaners (PACs) have gained attention for their ability to reduce airborne pathogen loads, especially in closed environments. Scientific assessments show that PACs are most effective when strategically positioned near the source of infection, ideally within three metres, highlighting the need for evidence-based placement and deployment guidelines.[14] Complementarily, the integration of computational fluid dynamics (CFD) and air virus detection technologies has exposed deficiencies in air renewal systems. Targeted maintenance interventions based on these insights have led to improved airflow and decreased airborne transmission risks.[15] Beyond facility-based interventions, community engagement has emerged as a pivotal dimension in TB prevention. Empowering communities to co-create and participate in TB care initiatives enhances healthcare system responsiveness and enables a more grounded understanding of disease-related barriers from the patient's perspective.[16] Community-led TB initiatives have notably doubled the notification rate of pulmonary TB-positive (PTB+) cases in intervention zones compared to control groups, demonstrating the effectiveness of decentralised, patient-centred models.[17] In parallel, the integration of digital adherence technologies (DATs) has introduced promising avenues to improve TB treatment compliance. Through real-time monitoring and interactive feedback systems, DATs can address longstanding adherence challenges, although their success is highly dependent on proper rollout strategies and user engagement.[18] Similarly, preventive therapy for household contacts (HHCs) of TB patients has shown encouraging results in India, with a study noting high treatment initiation (98%) and completion rates (77%).[19] However, implementation barriers remain, especially in urban centers like Delhi, where drug procurement issues, budgetary constraints, human resource shortages, and inadequate training have hampered scale-up efforts.[20] Community-based models of TB care, including electronic medication monitors, SMS-based adherence reminders, and direct observation by family members or community health workers, offer scalable, cost-effective solutions that enhance clinical outcomes while reducing systemic burdens. Evaluations consistently highlight these interventions as efficient, convenient, and patient-friendly alternatives to conventional facility-based care.[21] Despite progress, significant gaps remain in ensuring equitable, comprehensive, and sustained implementation of both preventive therapy and broader TB IPC measures, emphasising the need for continuous innovation, policy support, and health system strengthening.[20] Despite evident progress, the implementation of AIC measures and TB preventive strategies still requires systemic refinement across multiple domains. Therefore, the integration of robust infrastructure, adaptive policy frameworks, technological innovations, and community-driven efforts remains essential for comprehensive and sustainable airborne infection control.

Vector-Borne Disease: Integrated Surveillance and Targeted Engagement

The resurgence and intensified spread of mosquito-borne diseases in Southeast Asia over recent decades, including dengue, chikungunya, and Japanese encephalitis (JE), has presented an escalating public health concern. These arboviral infections not only share clinical similarities but also overlap in their vector ecology, which is largely influenced by the region's sustained high temperatures and favourable environmental conditions for vector proliferation. The integration of Geographical Information Systems (GIS) has emerged as a pivotal tool in tracking disease and vector distribution dynamics, thus enhancing epidemic prediction and guiding targeted interventions.[22] Similarly, diagnostic complexities have increased due to the co-circulation of

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arboviruses like Zika virus (ZIKV), chikungunya virus (CHIKV), and dengue virus (DENV), as demonstrated in a Paraguayan study that implemented multiplex real-time RT-PCR (rRT-PCR) testing. The study revealed that relying solely on DENV NS1 tests would have missed several co-infections, thereby underlining the need for robust diagnostic tools to inform outbreak responses.[23] Given the resurgence of Chikungunya and the emergence of the Mayaro virus, global attention has turned toward preventive innovations. Immuno-informatics approaches have successfully identified B and T cell epitopes from the Chikungunya virus that also exhibit homology with the Mayaro virus, indicating the feasibility of peptide-based vaccine candidates with substantial global population coverage. These predicted epitopes demonstrated promising interactions with human leukocyte antigen (HLA) alleles in molecular docking studies, reinforcing their vaccine potential.[24] However, vaccine development must go hand in hand with localised disease control efforts. Studies have shown that integrating disease surveillance with prompt vector control and transmission reduction measures—such as isolating symptomatic cases—can significantly curb chikungunya outbreaks when case detection is timely.[25] Community engagement plays a critical role in sustaining vector control activities. One intervention demonstrated that involving communities not only improved participation in vector source reduction but also enhanced intersectoral coordination, resulting in more effective public health actions.[26] The WHO-endorsed Integrated Vector Management (IVM) approach has been adopted as the principal strategy for combating vector-borne diseases (VBDs). While many VBD-endemic countries lack a comprehensive IVM policy, Uganda serves as a model for evidence-based IVM execution. Despite progress, operational challenges such as insecticide resistance management and vector surveillance persist.[27] In combating Aedes-borne diseases, community-based health education has yielded sustainable outcomes. Educational interventions through campaigns, workshops, and training have led to significant reductions in Aedes mosquito populations in schools and communities, reinforcing the effectiveness of integrated strategies involving community mobilisation.[28] Latin America and the Caribbean have shown success with integrated approaches involving biological control, environmental management, and education, which proved more sustainable than chemical-only interventions.[29] Multimodal interventions have also demonstrated efficacy in malaria prevention. Combinations of insecticide-treated nets (ITNs), indoor residual spraying (IRS), topical repellents, and housing improvements significantly reduced mosquito biting rates and malaria transmission compared to single-method approaches.[30] Community-based delivery models have shown success in increasing coverage and reducing malaria burden, although concerns remain regarding overdiagnosis and potential drug resistance.[31] Effective malaria the control hinges on adaptive programme management, rooted in evidence-based strategies, robust surveillance, and sufficient funding and human resources.[32] School-based educational initiatives have also proven effective by fostering the participation of teachers, parents, and communities in malaria elimination efforts.[33] In India, government-led initiatives like the distribution of long-lasting insecticidal nets (LLINs) have achieved near-universal coverage in selected areas, such as Meghalaya, with residents generally accepting and using the nets appropriately. However, other interventions like IRS faced resistance, highlighting the need for culturally sensitive implementation strategies.[34] Broadly, integrated prevention methods, educational initiatives, community participation, and supportive supervision have improved outcomes, though persistent challenges in community acceptance and implementation logistics underscore the need for continued adaptation. Further, community-based dengue prevention interventions in urban poor areas revealed statistically significant improvements in knowledge, attitudes, and practices (KAP), alongside reductions in the house index (HI), indicating successful behaviour change and environmental management.[35] However, ecosystem-centred community participation programmes sometimes showed a paradoxical outcome—reduced larval indices but no corresponding drop in dengue incidence—underscoring the complexity of vector-disease dynamics.[36] A cost-effectiveness analysis of decentralised dengue screening in Tamil Nadu supported the economic feasibility of such models, emphasising the need to balance economic, logistical, and human resource considerations in policy design.[35] Yet, India's dengue surveillance system continues to face systemic weaknesses, including underreporting, poor data integration, and inadequate private sector involvement, limiting the country's capacity to respond to outbreaks in a timely and coordinated manner.[37] The fight against mosquito-borne diseases in Southeast Asia and other endemic regions demands a multifaceted approach that combines technological innovation, community engagement, integrated vector management, and robust surveillance infrastructure. While significant strides have been made through localised interventions and policy frameworks, sustained success hinges on adaptive implementation, stakeholder collaboration, and continued investment in both research and grassroots mobilisation to effectively break the cycle of transmission and reduce disease burden.

Water-Borne Disease: Promoting WASH Practices and Typhoid Vaccination

Community-based interventions aimed at promoting safe water, sanitation, and hygiene (WASH) practices have gained global attention as cost-effective strategies to reduce waterborne diseases. One such approach has been the

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use of Community Health Worker (CHW) programmes, which are often deployed to initiate behavioural change at the grassroots level. CHW-led interventions found that while these programmes were effective in raising awareness about drinking water contamination, the change in actual hygiene and sanitation practices within the village communities was not significantly different compared to control groups. This outcome highlights a critical challenge in public health promotion—awareness alone does not always result in sustained behavioural change unless reinforced by enabling support systems, infrastructure, or incentives.38 Expanding on this, targeted interventions such as the CHoBI7 programme, developed for cholera patients and their families, have demonstrated greater promise. Implemented at the hospital level, the CHoBI7 intervention significantly reduced symptomatic cholera among household contacts during the critical one-week high-risk period following a cholera case diagnosis. More importantly, this initiative resulted in lasting improvements in handwashing practices with soap and the quality of stored drinking water, which persisted up to 12 months after the intervention, illustrating the potential for structured, behaviour-focused programmes to achieve long-term health outcomes.[39] These findings align with a broader consensus that the risk of diarrhoeal diseases can be significantly reduced through a combination of hand hygiene, safe drinking water, and proper excreta disposal. This reinforces the need for integrated, community-level interventions rather than isolated awareness campaigns, especially in high-risk, low-resource settings.[40] In the face of increasing antimicrobial resistance, these preventative strategies become even more vital—particularly in controlling diseases like typhoid fever, which remains a major public health threat in countries such as India. Although a highly efficacious typhoid conjugate vaccine (TCV), prequalified by the World Health Organisation in 2017, has been available since 2013, large-scale adoption remains inconsistent. In India, the first public-sector TCV campaign, conducted in July–August 2018, achieved a 71% administrative coverage, particularly targeting slums and low-income areas. The campaign, executed over weekends and public holidays, represents a successful model for urban immunisation in resource-limited environments.[41] Similarly, in Zimbabwe, the Ministry of Health and Child Care conducted a mass typhoid vaccination campaign between August 2018 and February 2019. Of the 1,967 suspected and confirmed cases, 75% originated from the nine densely populated suburbs targeted in the campaign, which achieved rapid and high coverage using the recently approved TCV.[42] Evidence from a cluster-randomised trial in India further supports the effectiveness of combining typhoid vaccination with modest improvements in household WASH infrastructure. The study found that Vi polysaccharide (ViPS) vaccination alone significantly reduced typhoid incidence, and this effect remained consistent irrespective of the household's sanitation and hygiene status, suggesting the potential standalone utility of vaccination, even in environments where WASH improvements are minimal.[43] The value of timely vaccination was also demonstrated in the post-disaster context of Nepal, where a pre-emptive TCV campaign was launched following the 2015 earthquake. Implemented among children residing in temporary shelters in the Bhaktapur district, the campaign emphasised both rapid response and the need to evaluate vaccine effectiveness in emergency settings.[44] Nevertheless, despite these promising strategies, significant gaps remain in the prevention and control of typhoid and other waterborne enteric diseases. Comprehensive control measures must encompass early diagnosis, robust surveillance, widespread vaccination, and infrastructural investments in sanitation and hygiene. However, persistent challenges in diagnostics, inconsistent surveillance practices, and barriers in vaccine deployment hinder progress. These issues highlight the pressing need for a coordinated policy framework that integrates public health, community engagement, and health system strengthening.[45] Addressing water- and hygiene-related diseases like cholera and typhoid requires more than isolated efforts. A multidimensional strategy combining education, vaccination, infrastructure, and policy is essential. While CHW programmes and awareness campaigns lay foundational knowledge, their effectiveness is amplified when paired with structured, behaviour-driven interventions like CHoBI7 and targeted vaccination campaigns. The interplay between sanitation, vaccination, and health system preparedness defines the trajectory of disease control. Moving forward, sustainable solutions must embrace this integrative approach, prioritising both immediate protection and long-term resilience in vulnerable communities.

Foodborne Disease: Advancing Safety Frameworks and Surveillance Systems

The burden of foodborne diseases remains a critical public health concern globally, prompting nations to devolve comprehensive systems for surveillance and prevention. In the United States, a significant milestone was marked with the enactment of the Food Safety Modernisation Act (FSMA) in 2011, under which the Centres for Disease Control and Prevention (CDC) established the Integrated Food Safety Centres of Excellence (IFS CoEs). These centres have since played a pivotal role in strengthening national foodborne disease surveillance and outbreak response systems. Through an array of initiatives developing over 70 workforces training programmes, tools, and resources, they have bolstered public health capacity across states. Additionally, the centres have supported more than 50 outbreak technical assistance requests annually, mentored public health students, and

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responded dynamically to evolving challenges, including the adoption of new laboratory diagnostic technologies and navigating disruptions during the COVID-19 pandemic.46 Similarly, India has initiated tailored responses to address its own food safety challenges, particularly in regions like Northeast India, which report a high incidence of foodborne infections. The Indian Council of Medical Research (ICMR), recognising the critical gap in systematic disease tracking, launched the Sentinel Surveillance Network for Foodborne Pathogens, known as ICMR-FoodNet. This integrated laboratory surveillance network operates at the interface of humans, animals, and the environment, aligning with the One Health framework, and is dedicated to monitoring enteric pathogens. The objective is to reduce the national burden of foodborne illnesses by generating reliable data that can inform timely interventions.[47] In tandem with surveillance strengthening, the regulatory landscape in India has undergone transformation to meet the demands of modern food safety governance. The Food Safety and Standards Authority of India (FSSAI) has developed a robust, competency-based training curriculum for food safety regulators. This initiative was critical to bridge the 'service gap' created by the implementation of the newer Food Safety and Standards (FSS) Act. The curriculum equips food safety officers not only to execute food safety strategies and oversee monitoring and surveillance activities in their jurisdictions but also to function as effective educators, empowering food business operators and handlers with essential knowledge and practices.[48] Together, these coordinated efforts across different contexts underscore the global recognition of food safety as a priority public health agenda. From institutionalising training and mentoring under the IFS CoEs in the U.S. to setting up pathogen surveillance networks and capacity-building programmes in India, each measure reflects the importance of a multi-pronged, integrative approach. Moving forward, fostering intersectoral collaboration and continually adapting to new scientific developments will be key to mitigating the impact of foodborne illnesses and safeguarding public health.

Zoonotic Disease: One Health Approach in Action

The One Health (OH) approach emphasising the intrinsic connection between human, animal, and environmental health, has emerged as a cornerstone in the fight against zoonotic diseases. Its efficacy lies in multisectoral collaboration, where animal and human public health sectors work together toward shared health goals. Evidence from global rabies prevention programmes underscores this collaborative strength; comprehensive, cross-sectoral interventions have been shown to yield more rapid and impactful outcomes in humans than standalone post-exposure prophylaxis (PEP) programmes. This highlights the importance of joint strategies that go beyond reactive health measures.[49] Effective control efforts must begin with strategic planning and disease prioritisation. Tools like the One Health Zoonotic Disease Prioritisation (OHZDP) process and the One Health Systems Mapping and Analysis Resource Toolkit™ (OH-SMART™) have been instrumental in supporting countries to establish such foundational strategies. The integration of these tools ensures continuity in planning, enhances coordination, and fosters in-country leadership through professional development and cross-sectoral engagement.[50] Importantly, these preparatory actions must be undertaken before the emergence of new zoonotic threats. Building effective mechanisms for coordination, especially between the human, animal, and environmental health sectors, enables timely surveillance, efficient data sharing, and swift joint responses to outbreaks, thereby fortifying global health security.[51] Despite increasing international emphasis, One Health remains at an evolving stage in several countries, including India. The Government of India has taken commendable steps to address challenges such as antimicrobial resistance, zoonotic spillovers, and food safety using the OH lens. However, the practical implementation of this framework faces substantial bottlenecks. These include the absence of a dedicated legal mandate for OH initiatives, fragmented coordination among public and private stakeholders, insufficient animal disease surveillance, weak inter-sectoral data sharing systems, and limited financial resources. To move forward, it is imperative to establish systematic zoonotic disease surveillance, promote regulated antibiotic usage across sectors, develop a centralised zoonotic registry, and foster networks encompassing academia, research, pharmaceutical industries, and implementation partners from diverse sectors.[52] A compelling model for One Health in action is the Bohol Rabies Prevention and Elimination Project (BRPEP) in the Philippines. Through a multifaceted strategy that included dog population control, mass vaccination, improved bite management, expanded veterinary diagnostics, and community education, including school-based awareness modules, the province eliminated both dog and human rabies within three years. This success showcases how intersectoral collaboration and community empowerment can yield transformative results.[53] In alignment with the global 'Zero by 30' campaign to eliminate dog-mediated human rabies deaths by 2030, international agencies now advocate for Integrated Bite Case Management (IBCM) within the One Health framework.[53] A key challenge in sustaining rabies elimination lies in the high cost of PEP, especially in areas where dog rabies is under control. For example, in regions where annual bite incidences exceed 300 per 100,000 population, substantial resources (over $142,000 for a population of 1.3 million in 2013) are spent on PEP. This calls for more sustainable approaches like IBCM, which ensures that PEP is administered only to

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those truly at risk, thereby optimising both health outcomes and resource use.[54] Vietnam offers another illustrative case, where the implementation of IBCM has markedly improved rabies surveillance and detection. The country reported 79 laboratory-confirmed rabid animals following the adoption of IBCM, significantly more than in previous years. Additionally, Vietnam transitioned from paper-based surveillance to a mobile application-based system, enabling timely and effective data sharing with local and international stakeholders. Such digital innovations further enhance the agility and responsiveness of rabies control programmes.[55] Nevertheless, substantial challenges persist, especially in resource-limited settings. In India, modelling studies suggest that maintaining a canine vaccination coverage of at least 70% for over two decades is essential for achieving sustainable rabies control. However, the cost of implementing such a dog vaccination campaign is estimated to be three to ten times higher than human PEP, posing a significant economic barrier to long-term programme success.[56] The One Health approach offers a transformative framework for addressing zoonotic diseases, combining the strengths of human, animal, and environmental health systems. While success stories from countries like the Philippines and Vietnam validate its potential, its effective implementation, particularly in developing countries like India, requires overcoming institutional, financial, and logistical hurdles. Moving forward, embedding One Health into national health policy, backed by legal mandates and sustainable financing, will be critical to curb zoonoses and enhance global health resilience.

Sexually Transmitted and Blood-Borne Disease: Integrating Services for HIV and Hepatitis Care

The integration of HIV care with primary health care (PHC) platforms presents a strategic avenue to achieve the global ambition of ending AIDS by 2030. As the epidemic evolves, the focus has shifted from vertical, disease-specific programming to a more holistic, person-centred approach that aligns HIV services with PHC. This shift not only enhances sustainability but also improves health outcomes at the population level. Key pillars of successful integration include differentiated service delivery tailored to individual needs, community-based interventions that expand service reach, and a robust, well-supported health workforce. Financing mechanisms also play a critical role, with coordinated investments needed from host governments, multilateral stakeholders, NGOs, the private sector, and development banks. Importantly, programmatic flexibility from international donors and active involvement of civil society and local communities are necessary to contextualise and sustain integration efforts.[57] Evidence consistently shows that integration of HIV services with general health care improves a range of critical outcomes. Notably, services that combine HIV testing and counselling with ART initiation and long-term care have resulted in improved ART coverage, reduced time to treatment initiation, higher retention in care, and enhanced viral suppression. These gains underscore the added value of integrated service models not only for individual health but also for the resilience of health systems.[58] Among these models, community-based programmes have emerged as cost-effective, scalable, and sustainable strategies to bolster ART adherence and retention. Such initiatives shift certain responsibilities from overburdened clinical settings to community and paraprofessional staff, thereby reducing healthcare costs and logistical burdens such as transportation.[59] Moreover, the incorporation of HIV care into primary care settings has demonstrated significant improvements in patient satisfaction, particularly in domains of accessibility and perceived quality of care, without compromising other aspects of satisfaction.[60] Nonetheless, disparities in HIV incidence and mortality remain, particularly among vulnerable and marginalised groups. This necessitates more nuanced and inclusive strategies. Frameworks from the field of implementation science, such as RE-AIM (Reach, Effectiveness/Efficacy, Adoption, Implementation, Maintenance) and the Evidence Integration Triangle, provide valuable tools for bridging research and practice. These models promote participatory, adaptive interventions within multilevel contexts, thereby facilitating faster and more effective integration of HIV programmes into routine health systems.[61] The integration paradigm extends beyond HIV to encompass related comorbidities, such as substance use disorders. Opioid Substitution Therapy (OST), implemented in regions across Asia, Eastern Europe, Australia, and Iran, has proven to reduce injection-related HIV transmission. Among HIV-infected individuals, OST is associated with increased ART initiation, better adherence, and improved virologic outcomes. These integrated interventions are vital in addressing the complex, overlapping needs of populations living with both HIV and substance use disorders.[62] Similarly, integrating care for viral hepatitis, particularly hepatitis B (HBV) and hepatitis C (HCV), into community and primary care settings has shown significant promise. Expanding HBV testing through decentralised, health care provider (HCP)-led educational initiatives, supported by multicomponent strategies, has increased testing uptake and linkage to care.[63] With simplified diagnostic and treatment algorithms now available, HCV management no longer requires specialist oversight alone. Engaging primary care providers increases the reach of diagnosis and treatment efforts, helping move toward HCV elimination. However, persistent barriers such as prescriber restrictions and limited screening coverage must be addressed. Universal screening, including outside traditional clinical settings, alongside policies promoting equitable access to HCV care, is essential. Advocacy for

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policy shifts such as making HCV screening a quality-of-care metric and relaxing prescription restrictions is also critical to expanding treatment capacity.[64] In the Indian context, a decentralised HBV diagnostic intervention in Tamil Nadu highlighted both the cost-effectiveness and life-saving potential of community-level HBV testing and early intervention. The study demonstrated that early treatment and vaccination for those testing negative could significantly reduce out-of-pocket healthcare expenditures and prevent disease progression.[65] Community-led hepatitis models that offer same-day "test and treat" services for HCV and peer-supported HBV vaccination cascades have proven effective and feasible. These models leverage existing infrastructure diagnostics, vaccines, and national hepatitis programmes and are adaptable for replication in other countries progressing toward viral hepatitis elimination goals.[66] Moreover, Micro-elimination strategies, which focus on specific population segments, present a targeted and efficient approach to achieving elimination. By concentrating efforts on defined communities, such as people who inject drugs, incarcerated individuals, or those living with HIV, interventions can be delivered more swiftly and with greater impact, accelerating progress toward broader public health objectives.[67] Integrating HIV and hepatitis services into primary and community-based care platforms offers a powerful, person-centred, and sustainable pathway to achieving global elimination targets. The evidence underscores that integration improves health outcomes, enhances system efficiency, and empowers communities. However, successful implementation hinges on cross-sector collaboration, strategic financing, flexible policies, and ongoing engagement with community stakeholders. Bridging the gap between research and practice through implementation science frameworks and leveraging decentralised models will be key in addressing entrenched disparities and ensuring no one is left behind in the global health agenda.

Neglected Tropical Disease: Bridging Gaps in Care Through Evidence and Community-Led Action

India's Kala-azar Elimination Programme (KAEP) stands as a model of how sustained political will, structured implementation, and cross-sectoral collaboration can steer public health success. The programme's achievements have been underpinned by robust political commitment and intensified action across endemic regions. One of KAEP's strategic strengths was its emphasis on accountability and real-time course correction through regular independent assessments conducted by expert teams, coordinated in collaboration with the World Health Organisation (WHO). These evaluations allowed for timely identification of implementation gaps and ensured fidelity to national elimination goals.68 Crucially, the KAEP was characterised by coordinated partnerships. An annual joint work plan developed with input from stakeholders, including national and local health authorities, donors, and technical partners, ensured alignment of activities. Regular monthly reporting and coordination meetings further streamlined efforts, minimised duplication, and reinforced transparency and mutual accountability.[68] At the core of the programme's success is the understanding of visceral leishmaniasis as a neglected tropical disease with severe consequences if left untreated. VL presents a formidable public health challenge. Globally, an estimated 50,000 to 90,000 new VL cases occur annually, with over 90% of cases concentrated in just ten countries. Recognising this burden, India, along with its regional counterparts, adopted implementation research (IR) as a dynamic and iterative component of the KAEP. Decisions regarding diagnostic tools, treatment modalities, case detection strategies, and vector management were shaped by real-time evidence and adapted in response to emerging field-level challenges. Importantly, the continuous dialogue between researchers, programme managers, and field implementers promoted an environment where scientific findings were rapidly translated into policy and practice. This synergistic model has yielded measurable outcomes. In Nepal, for instance, collaborative regional efforts and IR-informed programming have led to a 90% reduction in VL cases compared to baseline figures from 2005.[69] Such milestones underscore the transformative power of responsive health systems that are both evidence-based and community-inclusive. Complementing these biomedical and systems-level strategies, technological integration has emerged as a key facilitator in disease control. Indonesia's experience with leprosy management offers valuable insights. The integration of an e-Leprosy framework into primary healthcare centres significantly improved patient adherence by utilising digital reminders, thus demonstrating how simple technological tools can enhance patient compliance and optimise treatment outcomes.[70] Community engagement has also proven vital in tackling stigmatised diseases like leprosy. In Brazil, the deployment of trained community health agents to recognise early signs and symptoms of Hansen's disease within their own neighbourhoods has strengthened early detection efforts. These agents not only improved case referral rates but also played a crucial role in raising awareness and combating stigma through community-led education.[71] India's National Leprosy Eradication Programme (NLEP) has mirrored similar successes by embedding community involvement at the heart of its strategy. Through targeted training initiatives, community members were equipped to identify leprosy symptoms, deliver health education, and share personal stories to break down stigma. These inclusive efforts significantly improved case reporting and helped bridge the trust deficit between

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healthcare providers and underserved populations.[71] India's experience with the KAEP and NLEP reflects the multifaceted nature of disease elimination, requiring not only strong political and technical frameworks but also deeply embedded community participation and responsive use of research and technology. These integrated strategies serve as a blueprint for tackling other neglected diseases, emphasising that when communities, health systems, and policy frameworks work in harmony, elimination goals become both achievable and sustainable.

Surface-Contact Disease: Behavioural Insights for Improved Infection Control

Infection control within hospital environments remains a cornerstone of patient safety, with increasing emphasis on environmental hygiene to mitigate the transmission of healthcare-associated pathogens. Recent strategies have focused on enhanced cleaning protocols targeting high-touch surfaces, which are known reservoirs for pathogens like methicillin-resistant Staphylococcus aureus (MRSA). One study demonstrated that intensified daily cleaning of clinical equipment and frequently touched surfaces both in patient rooms and at nurses' stations led to a substantial reduction in MRSA contamination compared to baseline levels. These findings underscore the tangible benefits of augmenting routine cleaning regimens to limit microbial persistence and potential cross-transmission within clinical settings.[72] Beyond conventional surface disinfection, a more nuanced understanding of human behaviour, particularly touch patterns, has informed the evolution of infection control strategies. A compelling case study investigating norovirus transmission revealed that while surface disinfection contributed to lowering environmental contamination, the most impactful intervention involved modifying human touch behaviour specifically reducing self-contact with mucous membranes. The study showed significant reductions not only in contaminated surfaces but also in pathogen transfer to fingertips, highlighting the critical role of behavioural interventions in interrupting transmission chains.[73] However, while behavioural controls show promise, their implementation poses considerable challenges in real-world settings, where consistent adherence is difficult to achieve. Therefore, surface disinfection remains indispensable as a complementary measure, especially in the context of persistent pathogens like norovirus that can survive on surfaces for extended periods. Combining rigorous environmental cleaning with behavioural strategies tailored to human touch patterns offers a comprehensive defence against pathogen transmission in healthcare facilities. Integrating insights from microbiological surveillance with behavioural science can enhance the efficacy of infection prevention efforts, ultimately fostering safer hospital environments for patients and healthcare workers alike.

Strengthening Surveillance and Community Engagement to Control Communicable Diseases

The Global Health Sector Strategies (GHSS) of the World Health Organisation (WHO) outline a comprehensive blueprint to reduce the burden of communicable diseases, particularly in low- and lower-middle-income countries. The strategy is framed around five key strategic directions: delivering high-quality, evidence-based, people-centred services; optimising systems, sectors, and partnerships for impact; generating and utilising data to drive informed action; engaging empowered communities and civil society; and fostering innovations for greater impact 3 These directions collectively emphasise the importance of an integrated approach that merges health system strengthening with active community participation and responsive surveillance mechanisms. Community engagement (CE) has emerged as a cornerstone in this endeavour, particularly in settings where health infrastructure is constrained. The pivotal role CE has played in reducing neonatal mortality through participatory women's groups, reducing HIV and other sexually transmitted infections through empowerment programmes among marginalised communities, and lowering malaria incidence and infant diarrhoea via community health worker interventions. The success of these interventions is often attributed to their ability to reshape social norms, build community cohesion, and empower populations to take collective action. Effectiveness is strongly linked to factors such as the breadth of population coverage, the degree of shared leadership, and the extent to which communities exercise control over intervention outcomes.[74] While CE drives behavioural and social change, the foundation of successful communicable disease control also depends on robust health surveillance systems. Surveillance systems are particularly vital in the context of disease elimination, where infections cluster in subpopulations and targeted action becomes increasingly important. The Elimination Initiative promotes a life-course, person-centred approach to communicable disease prevention, structured around four critical dimensions: preventing new infections, ending mortality and morbidity, preventing disability, and enhancing service delivery. This is supported by action lines focused on integrating health systems, improving surveillance infrastructure, addressing social and environmental determinants, and reinforcing governance and financial stewardship. These determinants, ranging from safe water and sanitation to housing, education, poverty, and climate change, represent the interconnected ecosystem within which communicable diseases flourish or decline.5 India offers a notable example of progress in integrated surveillance through its Integrated Disease Surveillance Programme (IDSP). Leveraging modern information and communication technologies, the IDSP connects state,

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district, and institutional nodes through terrestrial and satellite networks to ensure swift data transmission, outbreak monitoring, and real-time learning. The platform includes a 24x7 call centre and a media monitoring unit to capture early warning signals capabilities that proved highly effective during the 2009 H1N1 outbreak.[75] Similarly, during the 2019 Kumbh Mela in Prayagraj, the deployment of Indicator-Based Surveillance (IBS) and Event-Based Surveillance (EBS) systems provided critical data for timely risk identification and public health response, illustrating the value of integrated systems in mass gathering contexts.76 In humanitarian emergencies, where health systems are strained or disrupted, communicable disease surveillance assumes even greater urgency. Emergencies often amplify transmission due to overcrowding, poor hygiene, inadequate water supply, and environmental disruption. In such conditions, surveillance systems are vital for rapid assessment and disease control. Though implementation may be hindered by limited infrastructure and governance, there have been successful examples, such as WHO's Early Warning Alert and Response System (EWARS) in a Box, which supports rapid deployment and function in emergency settings.[77] Establishing a national communicable disease surveillance system (NCDSS) requires coordinated leadership, clear protocols, efficient communication infrastructure, and standardized datasets to ensure timely and reliable information exchange.[78] The epidemiological dynamics of communicable diseases are shaped by the interplay between pathogen, host, and environment. Epidemics often emerge when this balance is disrupted by natural disasters, poor sanitation, or climate change, creating favourable conditions for rapid spread. In these moments, a prompt, organised response involving rapid Assessment, outbreak control, and disease management are critical. Setting up designated camps and surveillance units becomes essential to halt transmission and manage the health impact.[79] The intersection of community engagement, real-time surveillance, and responsive health systems forms the base of successful communicable disease control. As the global health landscape continues to evolve under the pressures of emerging infections, environmental shifts, and demographic transitions, a coordinated approach rooted in local empowerment and supported by technological infrastructure offers the most sustainable path forward to eliminate and control communicable diseases across vulnerable regions.

Table 1.WHO Best Practices for Surveillance of Infection Prevention and Control

Surveillance Element	National Level Practices	Facility Level Practices
Planning	Assign responsible authorities and define national goals, objectives, and resource allocation for HAI surveillance. Standardise case definitions, select facilities for surveillance, and define surveillance methods and types of HAIs to monitor. Set timelines and promote data sharing and training across facilities to enhance learning and consistency.	Identify responsible personnel, define goals, and allocate resources in line with national strategies. Apply national case definitions, select priority HAIs, and align methods with national standards. Follow national timelines and foster collaboration through staff meetings, webinars, and internal communication channels.
Data Collection	Develop standardised data collection protocols, tools, and a national surveillance database. Define responsibilities, ensure data quality, and provide continuous training for facilities. Establish structured reporting systems and ensure legal and ethical compliance.	Follow national data protocols, assign responsible staff, and build facility-level surveillance database. Identify data sources, ensure high data quality, and regularly report in the national format. Train IPC/surveillance staff and ensure ethical compliance with national standards.
Data Analysis	Conduct national-level analysis of HAI data regularly (at least annually) and identify standardised indicators. Train data analysts to ensure skilled interpretation and use of surveillance findings.	Perform regular data analysis (monthly or quarterly) focusing on facility-specific indicators and outcomes. Equip facility analysts with basic analytical tools and skills to interpret and act on HAI data.

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Interpretation of Data	Contextualize HAI data within national health trends and benchmark against international standards. Analyse infection patterns and aetiology to guide IPC recommendations aligned with national policies.	Interpret HAI data in the context of the facility's environment, involving frontline staff and benchmarking with peer facilities. Monitor trends to assess intervention impact and adjust IPC strategies based on facility-level guidelines.
Communication	Develop a national communication plan, identify stakeholders, and prepare national HAI reports for dissemination. Share data through meetings, webinars, and public platforms (while protecting confidentiality).	Create a facility-specific communication plan, identify key internal stakeholders, and generate summary reports. Share results via regular meetings and distribute reports promptly to promote informed IPC actions.
Monitoring and Evaluation	Conduct regular reviews of system performance, including facility adherence, timeliness, and effectiveness of data use. Update surveillance systems with new practices, evaluate HAI impact, share findings with stakeholders, and use results for future planning.	Periodically assess adherence to surveillance protocols and evaluate impact on HAI reduction. Use evaluation outcomes to improve system performance, integrate best practices, and guide future planning efforts.

Table 1 summarises key practices based on the World Health Organisation (WHO) guidelines for the control of communicable diseases.80 These strategies are derived from WHO's core components of infection prevention and control (IPC) programmes at both national and acute health care facility levels. These strategies, when effectively implemented, contribute significantly to the control and prevention of communicable diseases within healthcare settings and the broader community.80 The control and elimination of communicable diseases will depend increasingly on adaptive, integrated strategies that prioritise both technological advancement and community empowerment. Strengthening real-time, interoperable surveillance systems, especially at sub-national levels, must be prioritised to ensure rapid outbreak detection and response. Greater investment is needed in digital health innovations, including mobile-based reporting, artificial intelligence-driven forecasting, and interoperable platforms that integrate disease data across regions and sectors. At the same time, sustained community engagement must evolve from passive participation to active leadership, with communities co-designing interventions, driving behavioural change, and ensuring accountability. Addressing the social and environmental determinants of health, such as housing, sanitation, education, and climate resilience, should be central to any long-term strategy. Lastly, building cross-sectoral partnerships and fostering political will at all levels will be essential to advance health equity, reduce disease burden, and move decisively toward the goal of communicable disease elimination in a changing global health landscape.

Conclusion

Communicable diseases persist as a significant global health challenge, particularly in resource-constrained settings. Effective control and eventual elimination necessitate an integrated and adaptive approach. This includes robust surveillance systems, community-driven strategies, and innovative interventions like the use of predictive analytics and artificial intelligence (AI) for hyper-localised disease control. Leveraging AI to analyse real-time data from wearable health devices, environmental sensors, and social determinants offers a promising frontier in predicting outbreaks and optimising resource allocation. Strengthening health systems through evidence-based strategies, addressing the social and environmental determinants of health, and fostering cross-sectoral collaboration remain critical. Moreover, integrating digital health tools co-designed with communities can improve adoption rates and enhance the cultural relevance of interventions. Active leadership from affected populations and leveraging advancements in technology, such as community-centred digital health platforms and mobile applications, can significantly improve responsiveness and efficacy. The fight against communicable diseases evolves; coordinated efforts, long-term investment, and unwavering political commitment will remain pivotal. By maintaining momentum and embracing innovation, the global health community can advance health equity and resilience, particularly among vulnerable populations. These strategies not only respond to present-day challenges but also build a framework for sustainable disease control in the future.

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