Letter to the Editor

Insecticide Supply Chain Disruptions in Crisis Settings: An Overlooked Challenge for Vector Control Programs

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Dear Editor,

Vector control remains one of the most cost-effective public health interventions for reducing the burden of vector-borne diseases, including malaria, dengue, leishmaniasis, chikungunya and other emerging infections (1, 2). While the health impacts of crisis settings have been widely recognized, an equally important but often overlooked challenge is the disruption of insecticide supply chains required to sustain effective vector control programs (3).

Modern vector control relies on the continuous availability of insecticides for indoor residual spraying (IRS), insecticide-treated nets (ITNs), larviciding and emergency outbreak response (1, 3). In crisis settings, multiple factors, including disruptions in manufacturing, transportation, international trade, customs procedures, storage and distribution, can compromise the timely delivery of these essential commodities. Infrastructure damage, workforce shortages, fuel limitations, interrupted procurement systems and logistical constraints may further reduce access to insecticides where they are needed most (4, 5).

Interruptions in insecticide availability may delay or reduce vector control operations, decrease intervention coverage and increase reliance on substandard, expired, or unregistered products. Such circumstances can compromise disease prevention efforts and may also contribute to the emergence and spread of insecticide resistance through inappropriate product selection, inconsistent application schedules, or inadequate rotation of insecticide classes (6).

Beyond the immediate interruption of vector control activities, crisis settings expose fundamental vulnerabilities in health commodity supply systems. Recent evidence indicates that resilient supply chains depend on diversified procurement pathways, strategic stockpiling, multiple sourcing, robust inventory management and flexible logistics. When these components are disrupted, shortages of essential public health commodities become increasingly likely, undermining disease prevention and emergency response activities. Despite the growing emphasis on supply chain resilience within global health, insecticides have received considerably less attention than medicines, vaccines and other essential health commodities (7, 8).

For this discussion, "crisis settings" include pandemics, natural disasters, armed conflicts, prolonged humanitarian emergencies and major economic or trade disruptions. Although these crises differ in their causes, they may similarly disrupt the manufacturing, procurement, transportation, customs clearance, storage and distribution of insecticides and other vector-control commodities (4)

These challenges are particularly important in regions where vector-borne diseases are en-

demic and public health systems are already under strain. Population displacement, temporary shelters, inadequate sanitation, environmental changes and interruptions in surveillance programs create favorable conditions for vector proliferation, while shortages of insecticides reduce the capacity to implement timely and effective vector control interventions (4). Together, these factors may increase the likelihood of disease outbreaks and hinder progress toward disease elimination goals.

The COVID-19 pandemic provides a clear example of these vulnerabilities. WHO reported that only about 72% of ITNs planned for distribution in 2020 reached target communities by the end of the year. In Western Kenya, a planned mass ITN distribution campaign was delayed by 10 months, highlighting the need for contingency planning to maintain vector-control activities during crises (9, 10)

Recent assessments of national vector control programs have also highlighted persistent operational gaps in procurement systems, entomological capacity, insecticide management, surveillance and workforce preparedness, particularly in resource-limited settings. These weaknesses may become substantially more pronounced during crisis situations, when supply chain disruptions coincide with increased risks of vector-borne disease transmission. Strengthening insecticide supply chains should therefore be regarded as a core component of resilient vector control systems rather than solely a procurement issue (11).

Despite these risks, the resilience of insecticide supply chains has received relatively limited attention within emergency preparedness and global health security frameworks. Emergency preparedness strategies frequently prioritize medicines, vaccines, food and water supplies, whereas vector control commodities often receive comparatively little attention despite their indispensable role in preventing disease transmission (3, 5).

Strengthening supply-chain resilience requires coordinated action by multiple stakeholders. National vector-control programmes and ministries of health should incorporate insecticide requirements into emergency preparedness plans and maintain contingency stocks. WHO and international organizations can provide technical guidance and coordination, while donors, procurement agencies, manufacturers and humanitarian organizations should support diversified sourcing, flexible procurement and emergency distribution mechanisms (12, 13)

We therefore encourage international health organizations, governments, humanitarian agencies, donors and public health stakeholders to recognize insecticides as essential public health commodities during crisis settings. Establishing regional strategic stockpiles, promoting diversified manufacturing and procurement pathways, implementing multi-source procurement strategies, strengthening inventory management systems, enhancing supply chain resilience and improving international logistical coordination should become integral components of emergency preparedness planning (7, 8). Preparedness plans should also include alternative suppliers and transport routes, minimum contingency stocks and predefined procedures for emergency procurement and distribution. In addition, future research should investigate how interruptions in insecticide availability influence vector populations, disease transmission dynamics, insecticide resistance and the long-term sustainability of vector control programs under crisis conditions.

Strengthening the resilience of insecticide supply systems during crisis settings will improve preparedness, ensure continuity of vector control interventions and help reduce the burden of vector-borne diseases among vulnerable populations. Recognizing this overlooked challenge is essential for building more resilient public health systems capable of maintaining effective vector control during future crises.

Conflict of Interest statement

The authors declare that there are no conflicts of interest.

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