The Broken Lens: Antimicrobial Resistance in Humanitarian Settings

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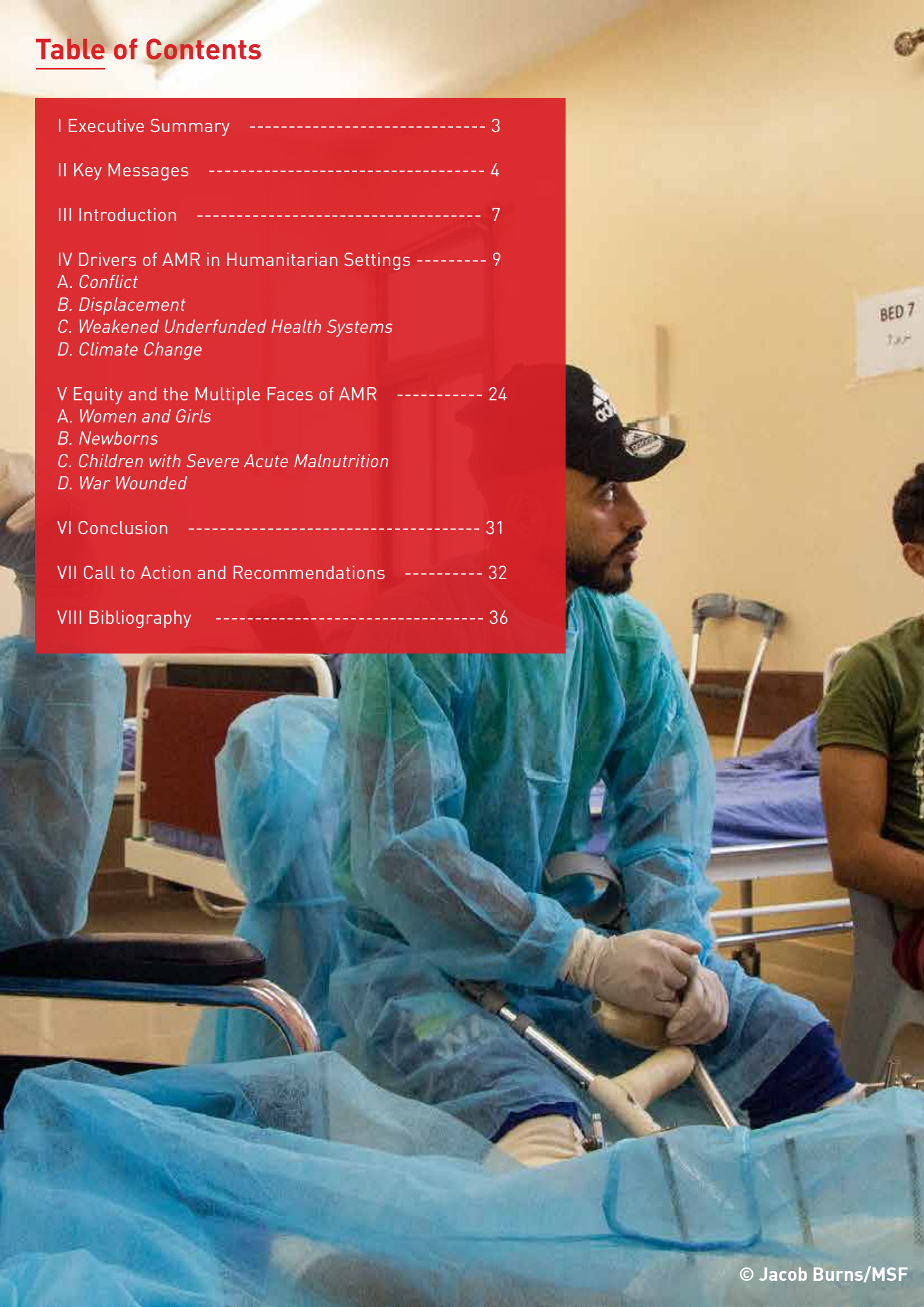

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List of Abbreviations

AMR	Antimicrobial Resistance
AMS	Antimicrobial Stewardship
AWaRe	Access, Watch, and Reserve, antibiotic classification tool
CDC	Centers for Disease Control and Prevention
EML	Essential Medicine List
ESBL	Extended-Spectrum Beta-Lactamases
GLASS	Global Antimicrobial Resistance and Use Surveillance System
IDP	Internally Displaced People
IPC	Infection Prevention and Control
MDR	Multi-Drug Resistant
MDROs	Multi-Drug Resistant Organisms
MRSA	Methicillin-Resistant Staphylococcus Aureus
MSF	Médecins Sans Frontières (Doctors Without Borders)
NAPs	National Action Plans
SSI	Surgical Site Infections
UHC	Universal Healthcare Coverage
UNHLM	United Nations High Level Meeting
SAM	Severe Acute Malnutrition
WASH	Water, Sanitation, and Hygiene
WHO	World Health Organization
XDR	Extensively Drug-Resistant (XDR)

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I. Executive Summary

We live in a time that is witnessing escalating humanitarian needs in the face of a diminishing response capacity. Antimicrobial Resistance (AMR) is fuelled by much of what drives humanitarian needs, conflict, climate change, displacement, infectious disease outbreaks and often overlapping politico-economic instability whilst simultaneously undermining the capacity to respond. The global failures to act now and to anticipate the consequences of our continued inaction in humanitarian settings will leave vulnerable populations to bear the burden for years to come.

Antimicrobial resistance poses a growing threat in humanitarian and low-resource settings, particularly in conflict-affected regions where fragile health systems, access barriers to healthcare, and environmental contamination amplify its impact. Since 2014, Médecins Sans Frontières (MSF) has made reducing the AMR burden a key priority, integrating it into its broader medical humanitarian efforts.

This report follows on from the second UN High-Level Meeting on Antimicrobial Resistance, held on September 26, 2024, which aimed to "review progress on global, regional, and national efforts to tackle antimicrobial resistance, identify gaps, and invest in sustainable solutions to strengthen and accelerate multisectoral progress, building a healthier world based on equity and leaving no one behind." While the new declaration acknowledges the significant gaps in addressing AMR in humanitarian and low-resource settings, there remains a lack of concrete, practical steps to translate these commitments into tangible actions.

Paving the way forward this report draws on nine operational case studies from Gaza, Afghanistan, Mozambique, North Syria, Ukraine, Sierra Leone, South Sudan, and Bangladesh. These case studies illustrate the critical drivers, challenges and consequences of AMR in a range of contexts where MSF works—conflict-affected regions, areas disproportionately impacted climate change, countries with underfunded health systems, and displaced populations. This report highlights the pressing need to develop a context-adapted approach to AMR for vulnerable groups such as newborns, malnourished children, those who have sustained trauma injuries, and women and girls living in humanitarian settings.

The key findings of this report emphasize the limited understanding we have of AMR in these settings due to a paucity of available data and research and inadequate microbiology services and infrastructure to inform the urgently needed context-specific interventions to effectively tackle AMR in these environments.

It highlights the fundamental role of equitable access to quality healthcare, water sanitation and hygiene (WASH), infection prevention and control (IPC), vaccines, antimicrobial stewardship and medical and laboratory supply chains, improved living conditions – particularly for those displaced, nutrition and consideration of AMR risk and the need for mitigation in all healthcare and non-healthcare associated policies. It stresses that discourses that focus only on the importance of controlling excess use of antibiotics miss a reality in humanitarian and low resource settings marked by lack of access to diagnostics, antibiotics, and healthcare more broadly.

This report then brings together the testimonies, evidence and analysis to propose concrete calls for actions that should be integrated within the upcoming AMR initiatives to ensure an effective equitable global response. These recommendations address critical areas such as accountability and governance, access to microbiology services, and antibiotics, improving the quality of healthcare through enhanced IPC and antimicrobial stewardship (AMS), achieving universal healthcare coverage, and increasing AMR financing.

In conclusion, the lens through which we view AMR in humanitarian settings is broken—we see neither the people whose lives are impacted by AMR or the burden it places on already stretched health systems. Gaps in policy, resources, and actions leaves responses fragmented. For these reasons MSF calls on the international community to translate global commitments to tangible actions for a truly global response that leaves no one behind.

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II. Key Messages

1. AMR compounds existing vulnerabilities for high-risk populations:

Vulnerable and at-risk groups, such as pregnant women, newborns, children under five - including malnourished children, and those who sustain conflict associated wounds face a heightened risk of acquiring an organism with AMR. In humanitarian settings, barriers to care result in infections that are increasingly resistant to treatment, resulting in preventable deaths, and morbidity. Addressing the needs of these groups must be at the forefront of AMR strategies to ensure equity and accountability in healthcare delivery.

2. AMR is deprioritized in humanitarian and low- resource settings:

In conflict-affected and low-resource settings, AMR is often overshadowed by what are perceived to be more urgent needs, despite antimicrobials being necessary for the treatment of bacterial infections which can cause pneumonia, meningitis and sepsis. Funding for AMR in humanitarian settings is woefully inadequate and national action plans are underfunded, adding financial strain on already stretched humanitarian responses. The systematic inclusion of humanitarian and low-resource settings in funding, research, and intervention strategies is the only way to slow the ever-widening AMR equity gap.

3. Severe gaps in surveillance compromise responses:

In many parts of the world, especially in conflict zones, we are "blind" to the true scope of AMR. This vast evidence gap must be addressed through expanding access to quality-assured diagnostics and surveillance as well as monitoring of antimicrobial use, and this must be backed by sustained financial and technical commitments. This will improve patient outcomes and support data-driven targeted responses to AMR in each context.

4. Alarming resistance rates and limited treatment options occur in humanitarian settings:

Despite scarce data, emerging evidence from humanitarian settings shows alarmingly high resistance rates to key antibiotics. The limited availability of last-line antibiotics and frequent shortages and stockouts of essential antibiotics leave many patients with untreatable infections and may lead to unnecessary use of broader spectrum antibiotics. Not only are antibiotics lacking, but those available are poorly regulated due to lack of AMS programs, with knock on effect on quality of care and patient safety.

5. Weak infection prevention strategies undermine responses:

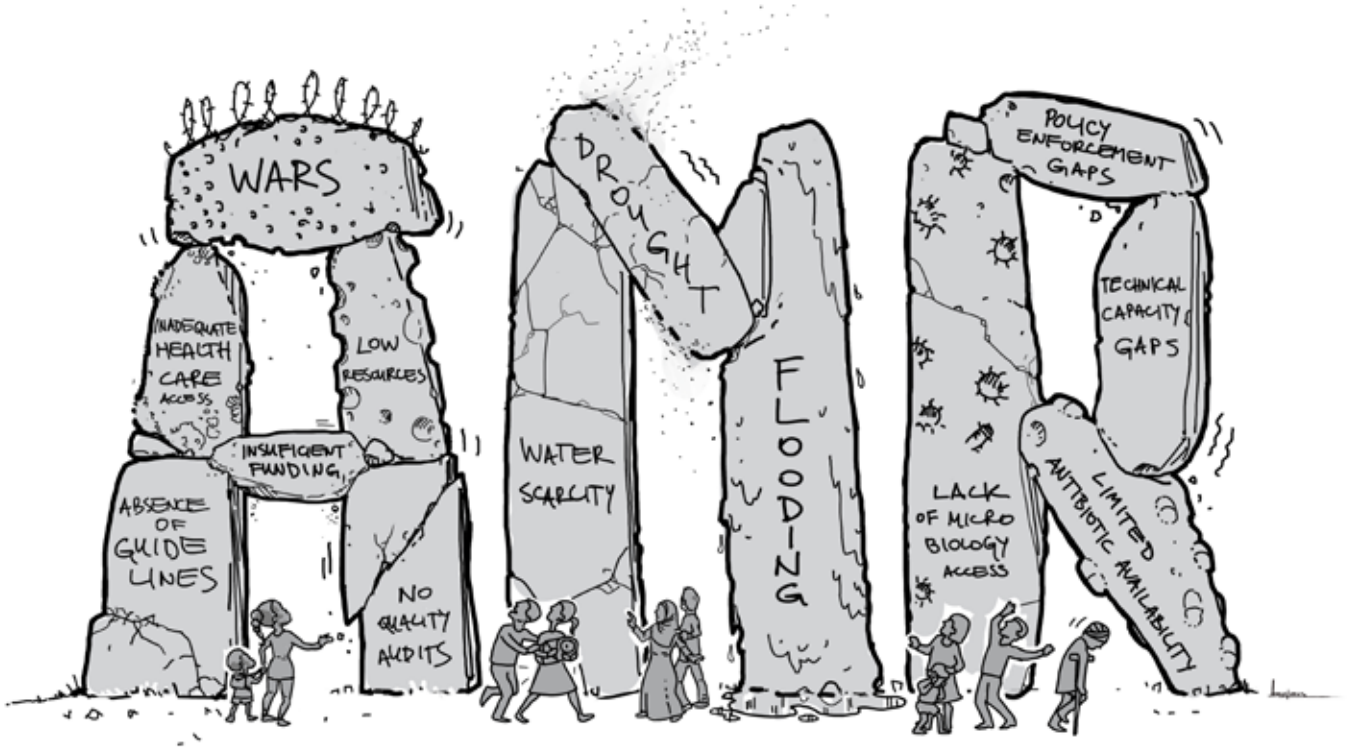
Strengthening IPC and antimicrobial stewardship (AMS) is crucial to reduce the spread of AMR in humanitarian contexts. Enhancing local capacity through capacity building of healthcare workers and reinforcing WASH and vaccination programs are critical foundations for a more sustainable AMR response. AMS and IPC initiatives often lack the resources and training needed to be fully effective, leaving healthcare systems vulnerable to healthcare associated infections (HAIs) and resistant infections.

6. The effects of known drivers of AMR such as Conflict and Climate Change need to be identified and mitigated:

The challenge of antimicrobial resistance is deeply intertwined with the effects of conflict, climate change and environmental contamination in humanitarian settings. In these settings access to care is often compromised, health needs are more severe, and environmental contamination accelerates the spread and development of AMR, making already vulnerable populations more susceptible to resistant infections.

7. A Global Roadmap inclusive of humanitarian settings is needed:

Governance structures must meaningfully include affected communities and civil society groups to ensure that AMR solutions are relevant, effective, equitable, and grounded in local realities including local capacities. A strategic roadmap is needed that bridges high-level commitments with National Action Plans by outlining indicators, accountability frameworks, and financial commitments to achieve targets.



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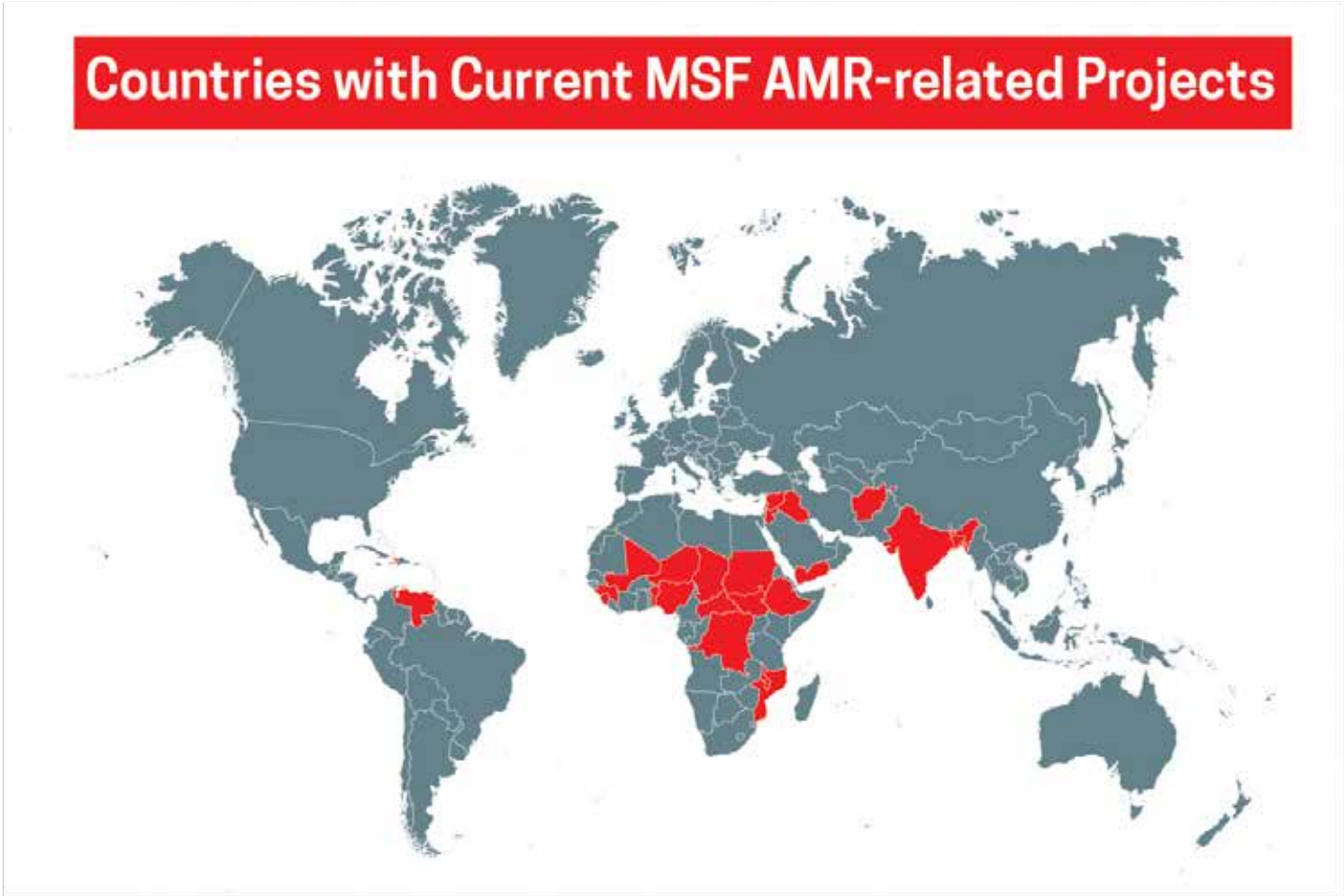

III. Introduction

Antimicrobial resistance (AMR) is one of the most significant global public health threats of our time, contributing to an estimated 4.71 million deaths associated with bacterial AMR, including 1.14 million deaths directly attributable to it. If current trends continue, the burden is forecasted to increase to 1.91 million attributable deaths and 8.22 million associated deaths in 2050, underscoring the need for urgent global action.[1] As AMR spreads, it's impact on humanitarian settings is increasingly being recognised.[2,3] In these settings, it frequently co-exists with the challenges of fragile health systems, conflict, displacement, and environmental stressors which further compound its impact.

Despite growing awareness of the dangers posed by AMR, the international community has yet to fully acknowledge and address the issue in the world's most vulnerable regions. In humanitarian settings, AMR is driven by the very conditions that define these crises. The resulting mortality and morbidity from AMR has a devastating human toll in these settings, where weakened health systems struggle to respond effectively.

Since the last UN High-Level Meeting (UNHLM) on AMR in 2016, progress in tackling the spread of resistance has faced numerous obstacles, particularly in low-resource and conflict-affected areas. A lack of financial and technical support perpetuates a vicious cycle, where limited information hampers effective prevention, detection, and response efforts, resulting in a persistent lack of visibility on the problem. The 2024 AMR UNHLM political declaration[4] is a step forward on many fronts. Newly introduced language acknowledges populations living in humanitarian settings and affected by armed conflict as especially vulnerable. Whether these commitments will mobilize action sufficiently, adequately, and equitably enough to address the needs of those bearing the burden of AMR remains to be seen.

As AMR continues to develop and spread, delayed action on these commitments puts lives at risk. MSF operates in more than 70 countries and has witnessed the disproportionate impact of AMR on different populations in many of those countries. With the rising rates of multi-drug-resistant organisms (MDROs) in many regions, there is an urgent need to develop targeted, locally informed AMR strategies that include long-term tangible support to healthcare and WASH infrastructure, medical supply chains, diagnostics, vaccination, infection prevention and control, and stewardship. Unfortunately, many actions are needed to successfully limit and manage the spread of AMR in humanitarian settings, but few actors are working on the topic or trying to meet these needs. As a global community working together, we can and must do more to prevent and slow the spread of AMR – wherever it may emerge.[5]

Since 2014, MSF has considered reducing the impact of AMR as an inherent – and vital – part of its medical humanitarian work. MSF has made significant progress in the prevention, detection, and response to AMR across projects, taking a multifaceted, context-adapted, operational experience-based, approach to AMR in hospitals.[6] This has resulted in the inclusion of water, sanitation, and hygiene (WASH) and infection prevention and control (IPC) in 137 projects globally, [7] antibiotic stewardship (AMS) programs in 46 projects,[7] and access to quality-assured microbiology in over 30 projects across 16 countries.

In addition to strategically reinforcing three pillars:1) IPC, 2) AMS, and 3) diagnostics and surveillance.
MSF's response to AMR is supported by responding to critical gaps in healthcare globally, focusing on inequitable access to quality healthcare, a significant driver of AMR, particularly in conflict-affected areas and low-resource settings.

This report addresses AMR stakeholders and decision makers, highlighting the disproportionate burden of AMR in humanitarian settings and examining the specific challenges faced in preventing, detecting, and responding to AMR in these complex environments. The report is based on a comprehensive literature review, analysis of data from MSF projects, and interviews with stakeholders in the countries where MSF operates. It delves into the interplay between the multidimensional nature of humanitarian settings and AMR and explores the broader implications of AMR on people's lives, and how this potentiates existing equity gaps in access to healthcare and resources.

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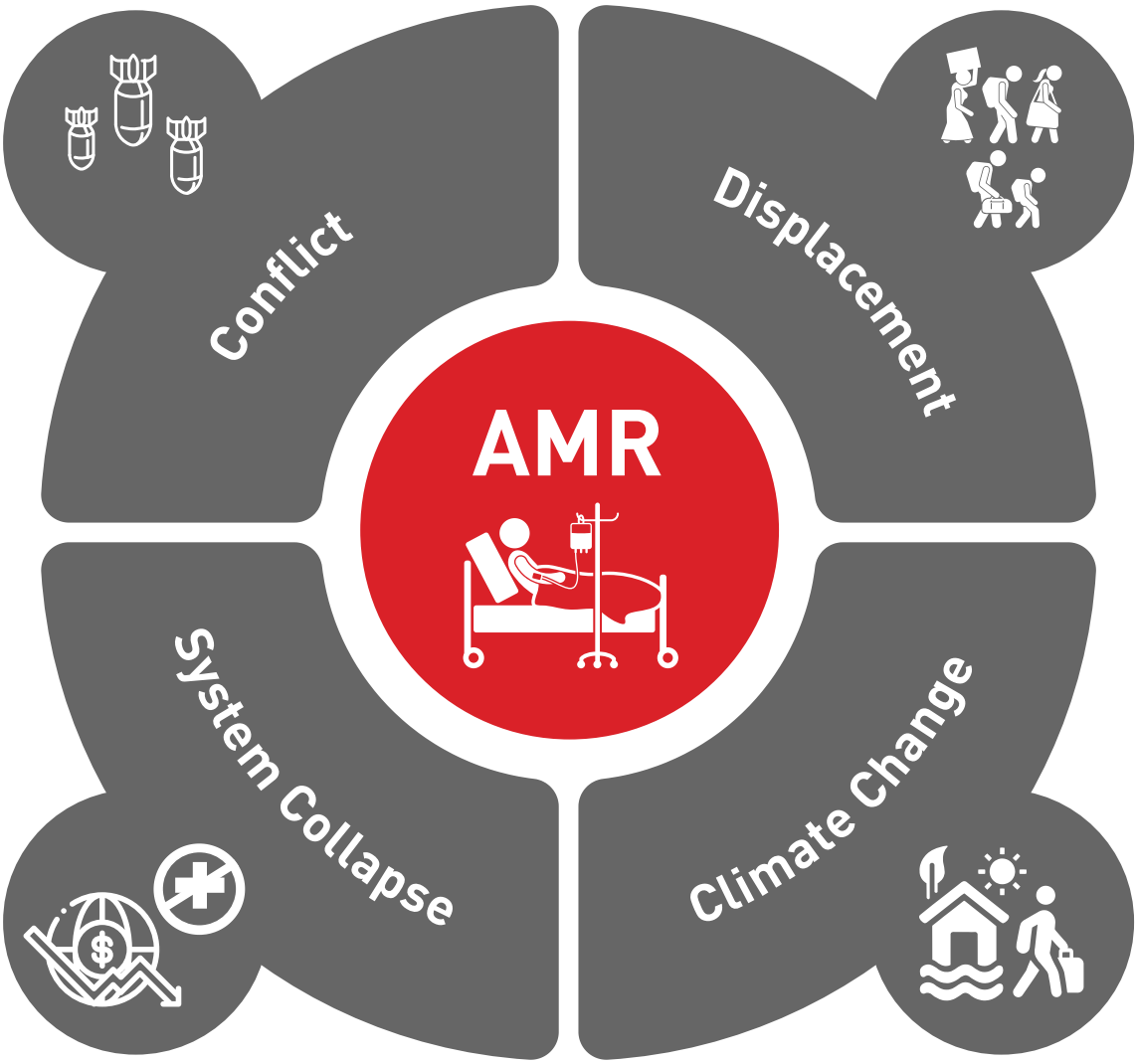
IV. Drivers of AMR in Humanitarian Settings

People living in humanitarian settings including those affected by conflict, epidemics, environmental instability and others are usually confronted with a very limited access to quality care including lack of diagnostic infrastructure for AMR as well as frequent supply chain ruptures of essential antimicrobials. The situation is compounded by a paucity of trained healthcare workers, poor vaccination coverage, food-insecurity and resultant malnutrition, environmental contamination, compromised WASH conditions and insufficient health system adaption to buffer shocks. In settings affected by conflict, epidemics and natural disaster, these drivers can be accentuated by destruction or overload of health facilities, brain drain of skilled staff, ongoing insecurity and a lack of health and humanitarian actors in the field, making it even harder to control in these settings.



A. Conflict

Conflict acts as a force multiplier for antimicrobial resistance (AMR). These settings, already destabilized by violence and displacement, often suffer from severely weakened health systems, inadequate medical supplies, a critical shortage of healthcare workers and fragmented governance.[9,10]

The destruction of healthcare infrastructure, combined with overwhelmed and overcrowded facilities, further undermines IPC practices and the prevention and control of outbreaks of multidrug-resistant organisms (MDROs). In countries like Afghanistan, bed occupancy rates in tertiary hospitals—including those in Kabul, Kunduz, and Khost—as noted by MSF can be exceptionally high, averaging at 150% and sometimes even exceeding these levels.

Conflict-affected settings may feature both antibiotic excess and conversely a lack of antibiotic access. In general, there are inadequate stewardship frameworks and training for healthcare workers, leading to inappropriate use of antibiotics. Insecure contexts can sometimes force trade-offs between the need for a rapid response and quality of care.[11] In North Syria, for example, MSF staff reported vancomycin being donated and distributed by some organizations without proper guidance, complicating stewardship efforts. MSF also opts at times for easily administered antibiotics, requiring less doses per day and less hospital visits, for example, when the context is insecure. WHO also opted for mass azithromycin distribution risking AMR to reduce childhood mortality.[12]

The dynamic nature of conflict-affected settings makes it difficult to have AMS models in place, as supply sources vary, referral networks are complex, and protocols vary across locations. To address this MSF supports doctors through the AMR Learning Initiative developed by the MSF Academy for Healthcare and the British Society of Antimicrobial Chemotherapy (BSAC), which trains and mentors healthcare professionals in IPC and AMS frameworks that can be adapted to context. Monitoring of AMS programs and advancing our understanding of how best to achieve systematic uptake of strategies is however needed in all settings.[13]

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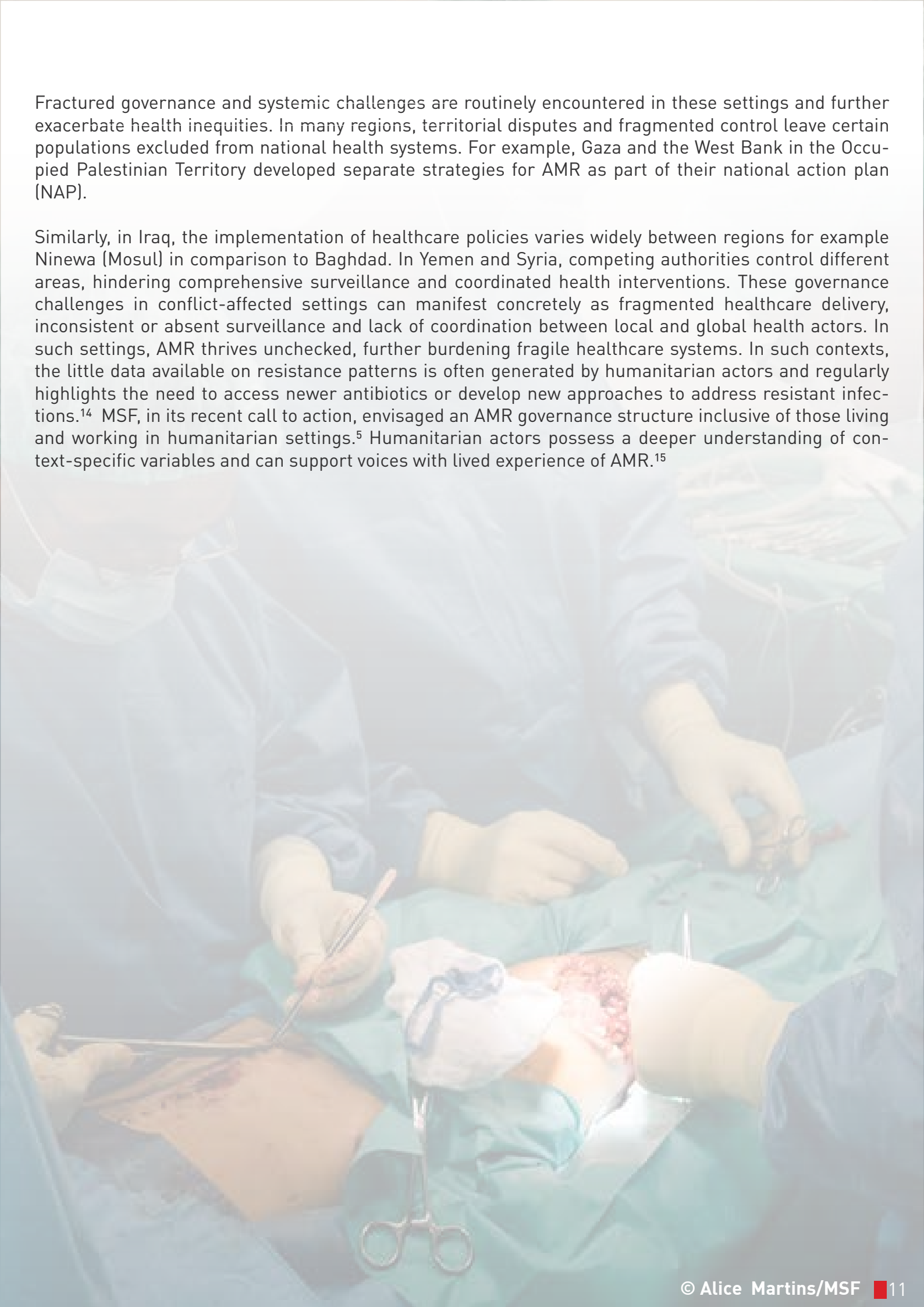
Fractured governance and systemic challenges are routinely encountered in these settings and further exacerbate health inequities. In many regions, territorial disputes and fragmented control leave certain populations excluded from national health systems. For example, Gaza and the West Bank in the Occupied Palestinian Territory developed separate strategies for AMR as part of their national action plan (NAP).

Similarly, in Iraq, the implementation of healthcare policies varies widely between regions for example Ninewa (Mosul) in comparison to Baghdad. In Yemen and Syria, competing authorities control different areas, hindering comprehensive surveillance and coordinated health interventions. These governance challenges in conflict-affected settings can manifest concretely as fragmented healthcare delivery, inconsistent or absent surveillance and lack of coordination between local and global health actors. In such settings, AMR thrives unchecked, further burdening fragile healthcare systems. In such contexts, the little data available on resistance patterns is often generated by humanitarian actors and regularly highlights the need to access newer antibiotics or develop new approaches to address resistant infections.[14] MSF, in its recent call to action, envisaged an AMR governance structure inclusive of those living and working in humanitarian settings.[5] Humanitarian actors possess a deeper understanding of context-specific variables and can support voices with lived experience of AMR.[15]



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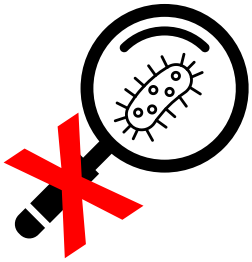
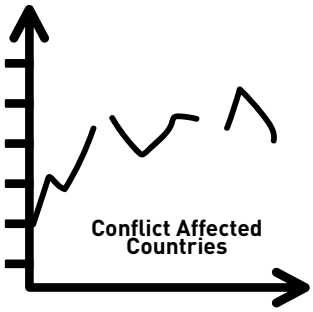
Poor access to microbiology and diagnostics



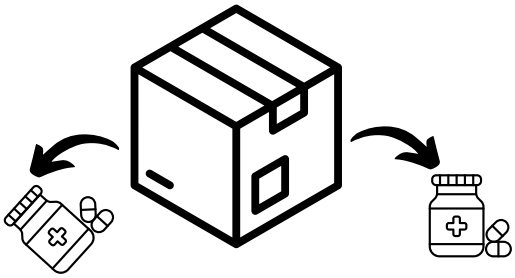
Limited visibility over a growing problem

Patchy Data



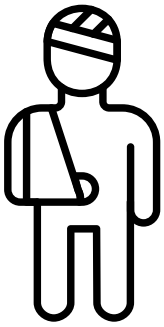
Poor forecasting, inadequate supply requests, and outdated essential lists

Lengthy registration processes, and absence of fast-track importation mechanisms



Mismatch between availability of antibiotics and needs

Access barriers to healthcare



Poor health outcomes but not seen linked to AMR, continued de-prioritization of AMR

AMR in Conflict Vicious Cycle

Case Study - AMR in Conflict: Perspectives from Gaza, Iraq, Syria, Yemen, and Afghanistan.

In Gaza prior to 7th October 2023, the lack of baseline data made preparing medical responses extremely challenging. Though the situation in Gaza had multiple risk factors for AMR, most surveillance sites reporting to GLASS were in the West Bank, leaving Gaza largely unrepresented. The few studies available point towards high rates of multidrug resistance. A review of isolates taken 6 months before and after the Great March of Return (GMR) protests (2018-2019) showed a staggering 300% increase in antibiotic resistance in bone and tissue cultures.[16] In 2018, MSF treated almost twice the number of patients it had the previous year in Gaza, reaching more than 8,000 people. This increase resulted in MSF tripling its surgical capacity to meet the staggering rise in the number of casualties from the GMR. The WHO verified that of the 7,951 people with gunshot wounds, 88% were limb injuries.[17] Medics on the ground reported that Israeli snipers were shooting demonstrators with a new kind of ammunition, referred to as "butterfly bullets" or "expansive ammunition"[18] which fracture on impact, inflicting lacerations in soft tissue, arteries, and bone. These injuries often require complex reconstructive operations, with a higher risk of resistant bone infections and amputations. The WHO reports that 1,200 of those injured in the GMR protests required specialized limb reconstruction treatment, costing up to 40,000 USD per patient.[17]
Many of MSF's patients required specialized care only available outside of Gaza in East Jerusalem or the West Bank, necessitating an Israeli permit. According to OCHA, of the 604 permits requested for those injured in the GMR, 17% were approved, 55% did not receive an answer in time to refer, and 17% were rejected.[19] In the few hospitals offering specialized care within Gaza, like at Al Awda hospital, intermittent electricity disrupted access to potable water and human and medical waste management, jeopardizing IPC and WASH mitigation measures. Cumulative MSF data from Gaza prior to 7th October 2023 conflict escalation showed that 60% of isolates taken from inpatients with osteomyelitis were multidrug resistant (MDR) including 65% of Staphylococcus aureus isolates being Methicillin-resistant Staphylococcus aureus (MRSA), and almost 25% of Enterobacteriaceae being resistant to carbapenem antibiotics.[20]

In Iraq and Syria, years of violence have crippled healthcare infrastructure and disrupted data collection. In 2021, large parts of Iraq, including Mosul, were left out of the national AMR strategy due to ongoing conflict. Although the Ministry of Health planned to expand surveillance sites participating in the national surveillance system, many were inaccessible, and quality assessments only self-reported, if conducted at all. This breakdown in surveillance creates a vicious cycle: the inability to track the spread of resistant pathogens leads to inadequate antibiotic procurement, which leads to a worsening healthcare crisis. In Syria, the collapse of the healthcare system similarly hampered surveillance efforts. The 2021 GLASS report listed only four surveillance sites in Syria, with little information on data quality or geographic coverage.[21] In some cases, the medical community has relied on data from Syrian refugees in neighboring countries, such as Jordan and Lebanon, to infer AMR trends in Syria. High rates of multidrug resistance, particularly Gram-negative organisms, have been noted amongst Syrian refugees when compared with local populations[22] particularly multidrug-resistant (MDR) Gram-negative infections complicating war-related injuries.[23,24] Or in some instances data can found in referral centres such as MSF's reconstructive surgical program in Jordan a high proportion (55.2%) of war wounded civilians from Iraq, Yemen and Syria with post-traumatic osteomyelitis were infected with organisms that were are resistant to first line antibiotics with this being particularly associated with patients who have had more than 3 surgeries.[25]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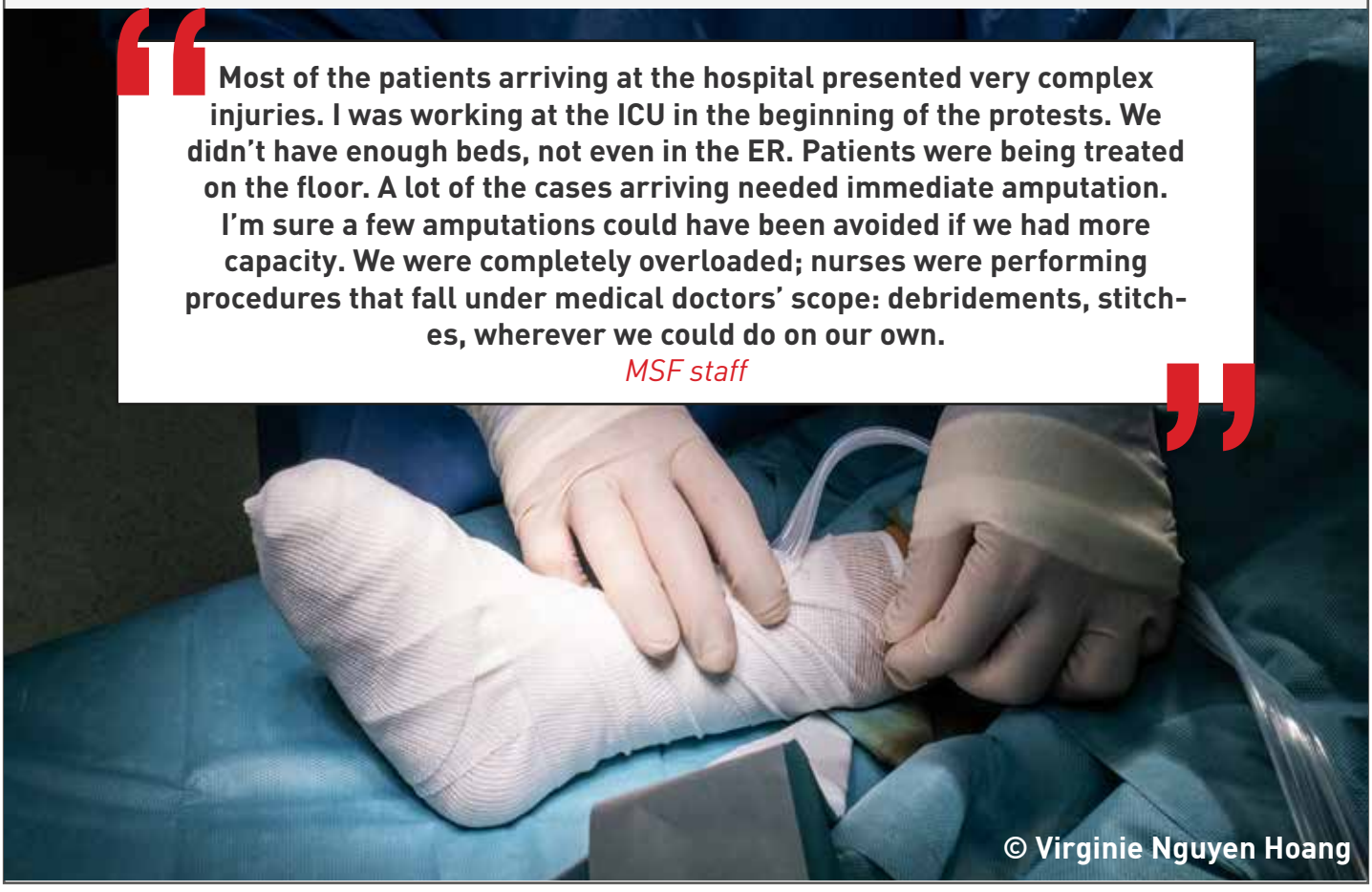
The limited data available often reveals emerging resistant pathogens, prompting the urgent need for a targeted approach to treatment and new antibiotics that are frequently unregistered and inaccessible in conflict-affected regions. In Afghanistan, stockouts of essential medicines in Ministry of Health facilities have risen alarmingly, from 24% in 2021 to 37% in 2022.[26] Antibiotics in the AWaRe "Watch" category, including vancomycin, ceftriaxone, fluoroquinolones, meropenem, and imipenem, annually experience shortages lasting up to 60 days. Even essential antibiotics like cefazolin, metronidazole, erythromycin, azithromycin, gentamicin, amikacin, and cefotaxime were frequently unavailable, leading to additional out-of-pocket costs for patients and increasing the risk of resistance through the use of broader spectrum antibiotics. With only 28% of hospitals having functional laboratories, the lack of microbiology services further complicates accurate diagnosis and treatment. Iraq faces similar challenges, with only 60% of medicines on Iraq's Essential Medicine List (EML) available in the public sector.[14] The outdated EML in Iraq, last revised in 2020, excludes crucial antibiotics needed for treating MDR infections in MSF trauma patients, over 80% of whom had at least one MDR infection during their hospital stay.[27] The antibiotics absent include carbapenems (meropenem, ertapenem), newer beta-lactams (+/- beta-lactamase inhibitors) targeting carbapenem-resistant gram-negative bacilli (e.g., ceftazidime/avibactam), polymyxins (colistin or polymyxin B) and others (tigecycline, teicoplanin and linezolid). The failure of local governments to update these lists annually based on resistance patterns, WHO EML updates and health needs leads to delays in importing drugs, consequently delaying treatment and contributing to an increased AMR burden. In Iraq, MSF faced challenges importing the antibiotics needed for the carbapenem resistant infections identified in the treatment of wounded patients in Mosul because they were not on Iraq's EML for which importation was permitted. Importing items outside of the EML can take up to 9 months and there was no fast-track process for importing life-saving drugs for patients impacted by the conflict.

Learning from experiences in these countries exemplifies the link between AMR and conflict and could support action beyond the Eastern Mediterranean region.



"Most of the patients arriving at the hospital presented very complex injuries. I was working at the ICU in the beginning of the protests. We didn't have enough beds, not even in the ER. Patients were being treated on the floor. A lot of the cases arriving needed immediate amputation. I'm sure a few amputations could have been avoided if we had more capacity. We were completely overloaded; nurses were performing procedures that fall under medical doctors' scope: debridements, stitches, wherever we could do on our own."

MSF staff

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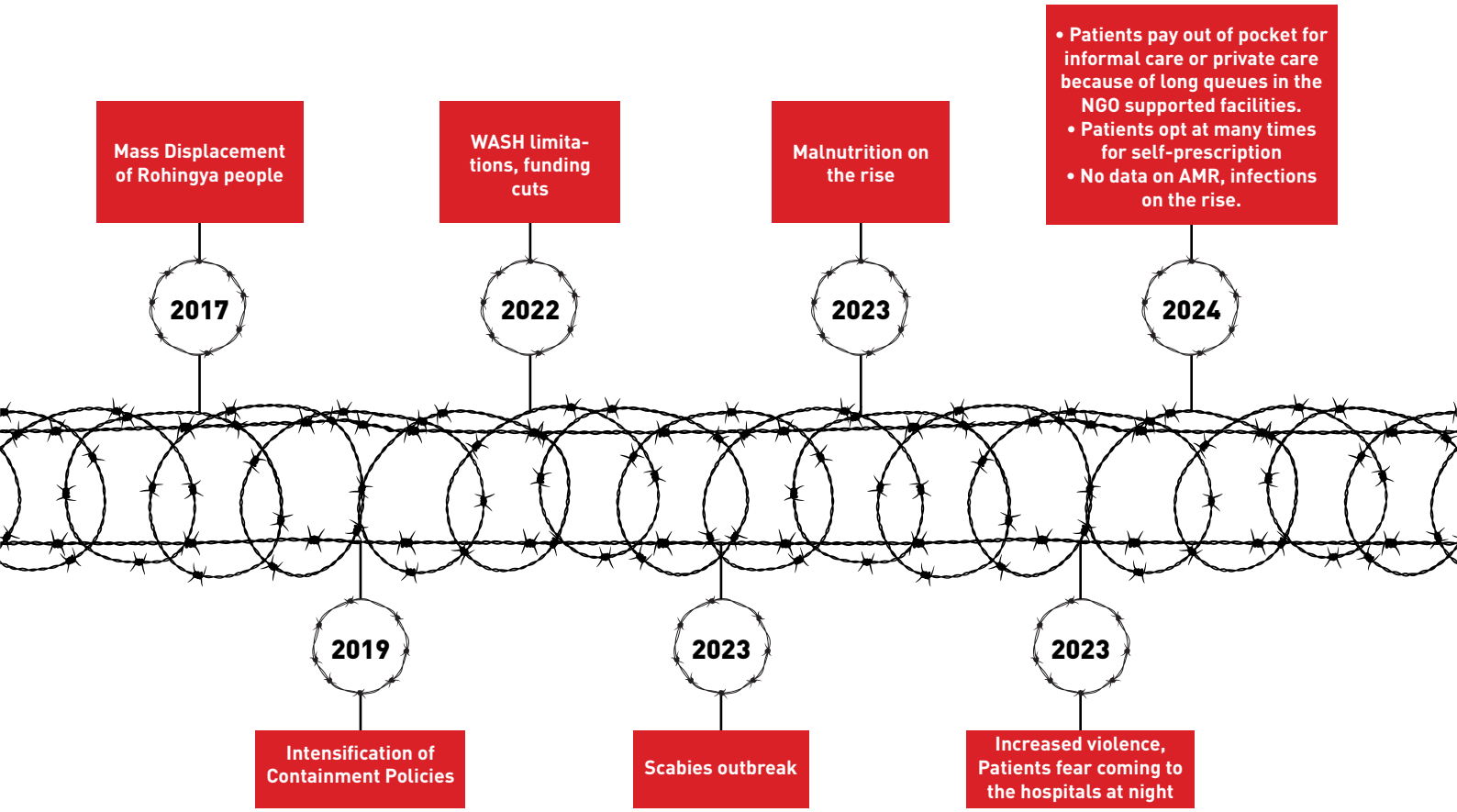
B. Displacement

Migration does not automatically make someone more vulnerable to AMR, but we see refugees, migrants, and displaced populations increasing exposed to AMR associated risks in the current context of limited access to health care combined with increasingly restrictive migration policies. They may suffer exclusion from health systems, be detained or contained, forced to live in overcrowded camps with deplorable living conditions, limited access to water and sanitation, and a high level of exposure to infectious diseases.[28] They face multiple barriers to access care, ranging from financial and administrative hurdles to discriminatory practice and institutional racism. Importantly, there can be a fear of criminalization, border enforcement, detention, and deportation, that can further discourage individuals from seeking necessary healthcare.

Displaced populations may lack access to essential antibiotics in the early stages of infection due to barriers within formal healthcare systems or weak supply chains. This lack of access drives many people towards informal care or self-medication, where antibiotics are often obtained without prescriptions, further contributing to the development and spread of AMR.[29]

The protracted crisis in contexts such as Cox's Bazar, Bangladesh, exemplifies how conflict related displacement, poor living conditions, and restrictive policies fuel the rise of AMR. Without improved access to healthcare, better infrastructure, and long-term policy reforms, the spread of drug-resistant infections will continue to threaten the health and lives of displaced populations. There is a need for the Global AMR community to critically engage on the intersects between migration and AMR and ensure space in the discourse to highlight broader areas of risk/vulnerability to understand how migration policies exacerbate vulnerability to AMR.



Case study: Displaced & Contained - Cox's Bazar, Bangladesh

In August 2017, Myanmar's military crackdown forced 688,000 Rohingya refugees into Cox's Bazar, Bangladesh. Seven years later, over 950,000 refugees remain confined in overcrowded camps with poor infrastructure. Cramped living spaces, frequent flooding, and limited access to clean water have created an environment ripe for the spread of antimicrobial resistance (AMR). WASH facilities are limited in the camps where Rohingya refugees live due to over-crowding and limited availability of surface and subsurface water. Recent studies found that 74% (n = 4,644)30 and 34.7% (n = 2,179)31 of drinking water samples collected from stored household sources respectively contained fecal coliforms and Escherichia coli.

From mid May to July 2024 MSF assessed 33 camps focusing on all water networks and found 49% were not chlorinated and 15% were over chlorinated, with only 35% receiving the correct amount. 44% were distributing water once a day for less than 2 hours. The results vary depending on the camp and on the service provider leading to huge inequity in supply for camp populations.[32] In addition the Lot Quality Assurance Sampling (LQAS) assessment carried out across 20 camps in 2023 found that less than 10% of latrines were in an acceptable sanitary condition, with most lacking available soap and water.[33]

These studies highlight the inadequacy of the water distribution to meet the drinking demand as well as how it hampers sanitation and hygiene practices. In addition to the poor WASH conditions, insufficient vaccination coverage[34] and increasing rates of severe acute malnutrition creates an additional at-risk group.[35] The living conditions in camps has raised multiple public health alerts. In May 2023, a Health Sector Survey found that nearly 40% of people in the Rohingya refugee camps in Bangladesh had scabies.[36] Scabies can be associated with secondary bacterial infections and increased antibiotic use, as well as being indicative of poor WASH conditions. MSF projects recently integrated access to diagnostic microbiology to support clinical care and to better understand the burden of AMR as isolates accumulate initial areas of concern in Kutupalong Hospital (supporting host and refugee populations) include neonates with gram negative sepsis and sepsis in children with severe acute malnutrition.

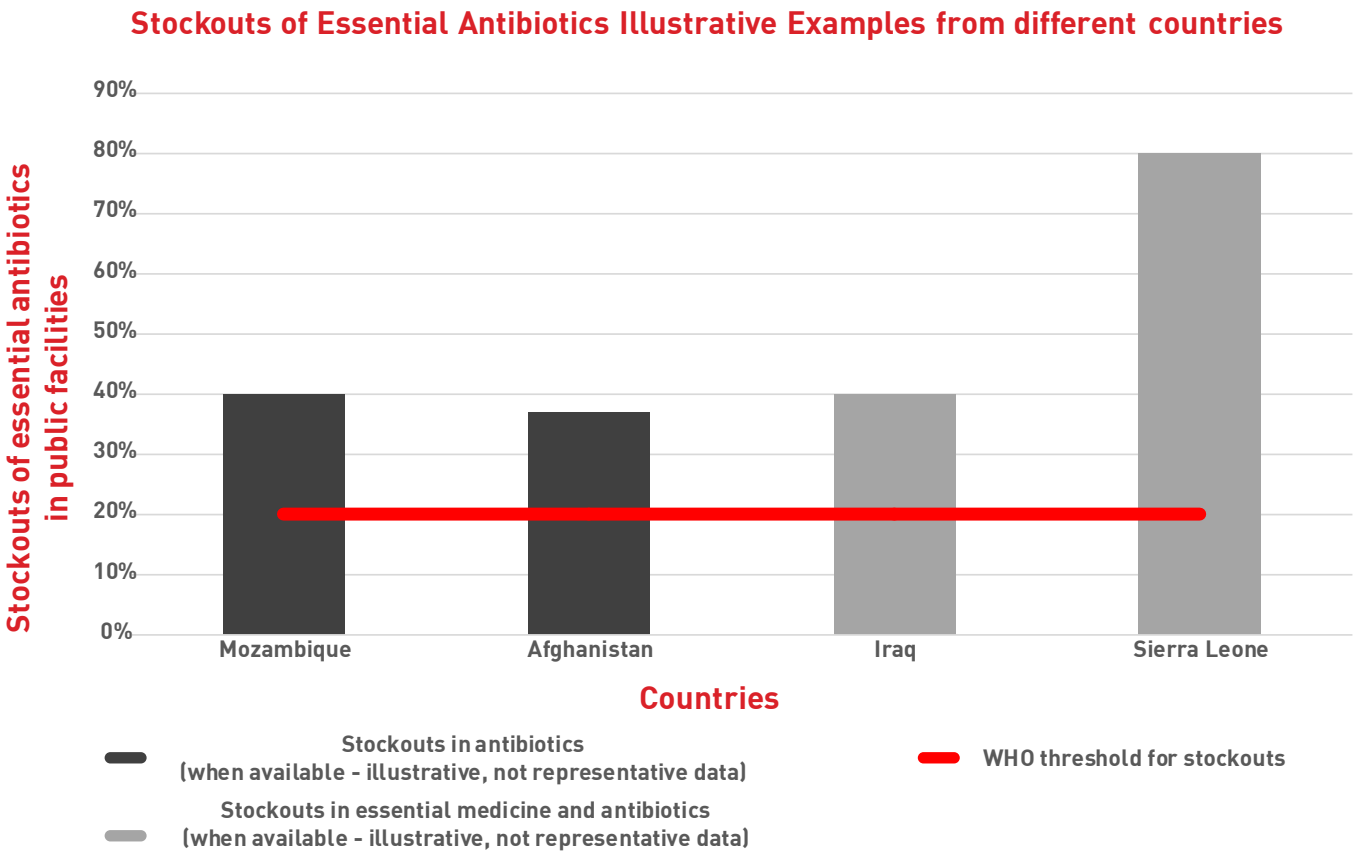
AMR in general is increasing in Bangladesh with challenges in healthcare and misuse/overuse of antimicrobials, posing a regional and global threat. Resistant pathogens are found in hospitals, community settings, farms, and the environment. Unethical pharmaceutical promotion and weak regulatory oversight all contribute to overuse.[37]

In Cox's Bazar, around half of the patients interviewed in MSF's community-based monitoring analysis reported paying for health services before coming to MSF. Approximately half visited a "quack" or a "pharmacist" of which there are numerous unlicensed ones in the camps and surrounding villages.[38] Nearly 90% of patients (1,315) interviewed in MSF facilities, and 73% of people (152) interviewed in the camps faced barriers to access health services, such as being held at checkpoints by the police, distance and lack of public transportation in the camps, and insufficient functioning primary healthcare centres. These delays have significant repercussions, with an estimated 45% of deaths in MSF's Kutupalong hospital from January to October 2022 thought to be related to delayed presentation at the health facility.[38] These restrictions prevent timely access to medical care, leaving infections untreated or improperly managed, which accelerates the development of drug-resistant bacteria. Living in unhygienic conditions, combined with patchy access to water, drives recurring infections that are often treated with untargeted antibiotics, further increasing the risk of AMR.

C. Weakened Underfunded Health Systems

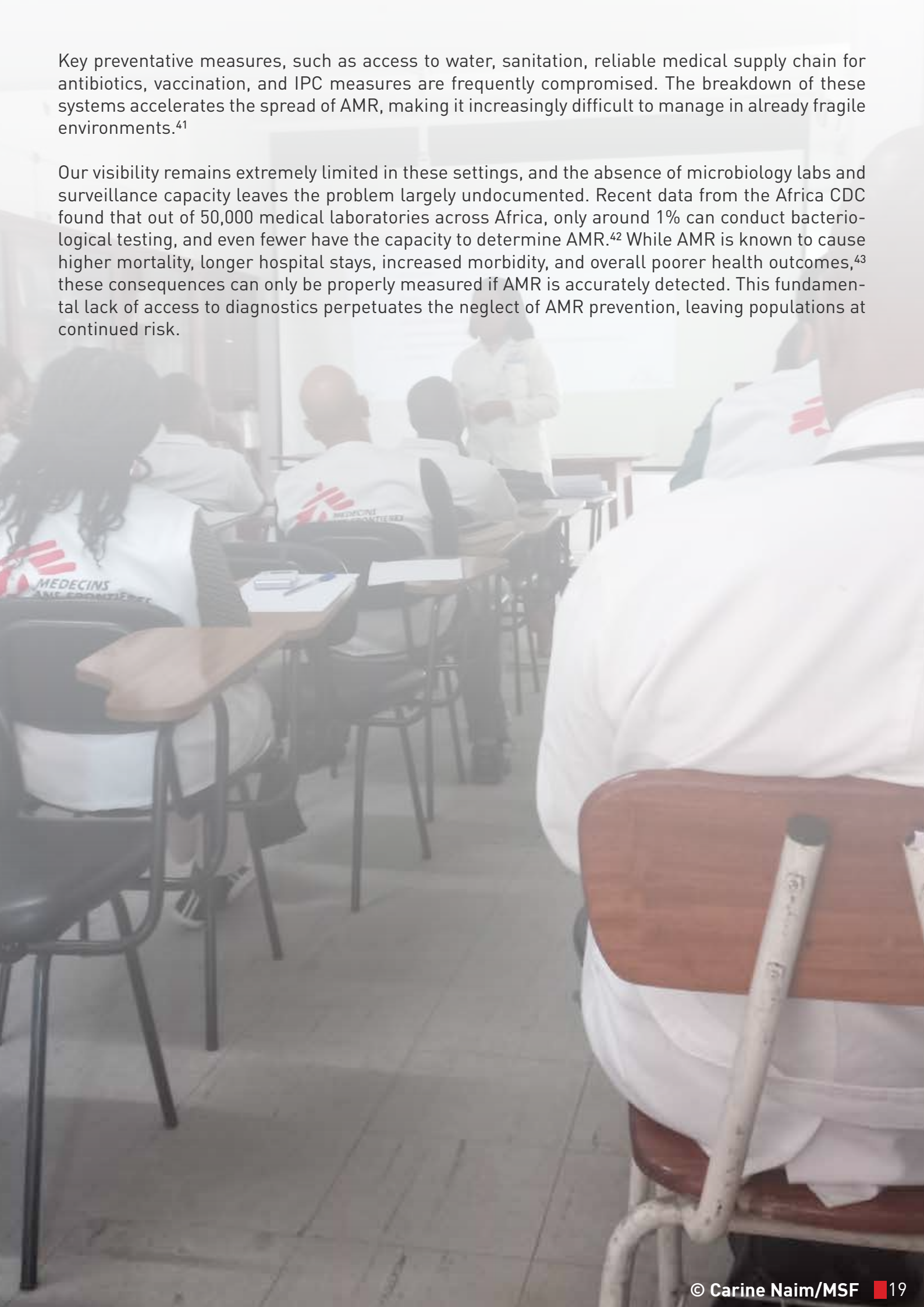
AMR disproportionately affects economically unstable countries with underfunded health systems, where the absence of dedicated budget lines for AMR-specific initiatives severely undermines efforts to prevent, detect, and manage resistance.

In Afghanistan, Mozambique, and in Syria, the worsening economic situation and weakened health-care system have led to dire shortages of antibiotics, diagnostic tools, and healthcare workers. Afghanistan's health system saw a 92% reduction in bilateral aid following the government change and economic sanctions in 2021, leading to a severe decline in access to healthcare services. Only 13% of the required health sector budget was achieved in 2023, leaving hospitals unable to meet patient needs.[39] The responsibility for AMR-related healthcare costs often falls on patients, as the insufficient national healthcare budget results in increased user fees. Patients face catastrophic health expenditures related to transportation to facilities, diagnostics, and treatment that can exceed 10% of a household's annual income. This financial burden forces many to delay or forgo treatment, further driving the spread of resistant infections. Similarly, in Syria only 60% of humanitarian funding appeals were met in 2023, with even lower numbers in 2024.[40] Additionally, in Mozambique the underfunded healthcare system, met with slow economic improvements due to the conflict in Cabo Delgado, leads to essential antibiotic stockouts and inadequate microbiology services.



Key preventative measures, such as access to water, sanitation, reliable medical supply chain for antibiotics, vaccination, and IPC measures are frequently compromised. The breakdown of these systems accelerates the spread of AMR, making it increasingly difficult to manage in already fragile environments.[41]

Our visibility remains extremely limited in these settings, and the absence of microbiology labs and surveillance capacity leaves the problem largely undocumented. Recent data from the Africa CDC found that out of 50,000 medical laboratories across Africa, only around 1% can conduct bacteriological testing, and even fewer have the capacity to determine AMR.[42] While AMR is known to cause higher mortality, longer hospital stays, increased morbidity, and overall poorer health outcomes,[43] these consequences can only be properly measured if AMR is accurately detected. This fundamental lack of access to diagnostics perpetuates the neglect of AMR prevention, leaving populations at continued risk.



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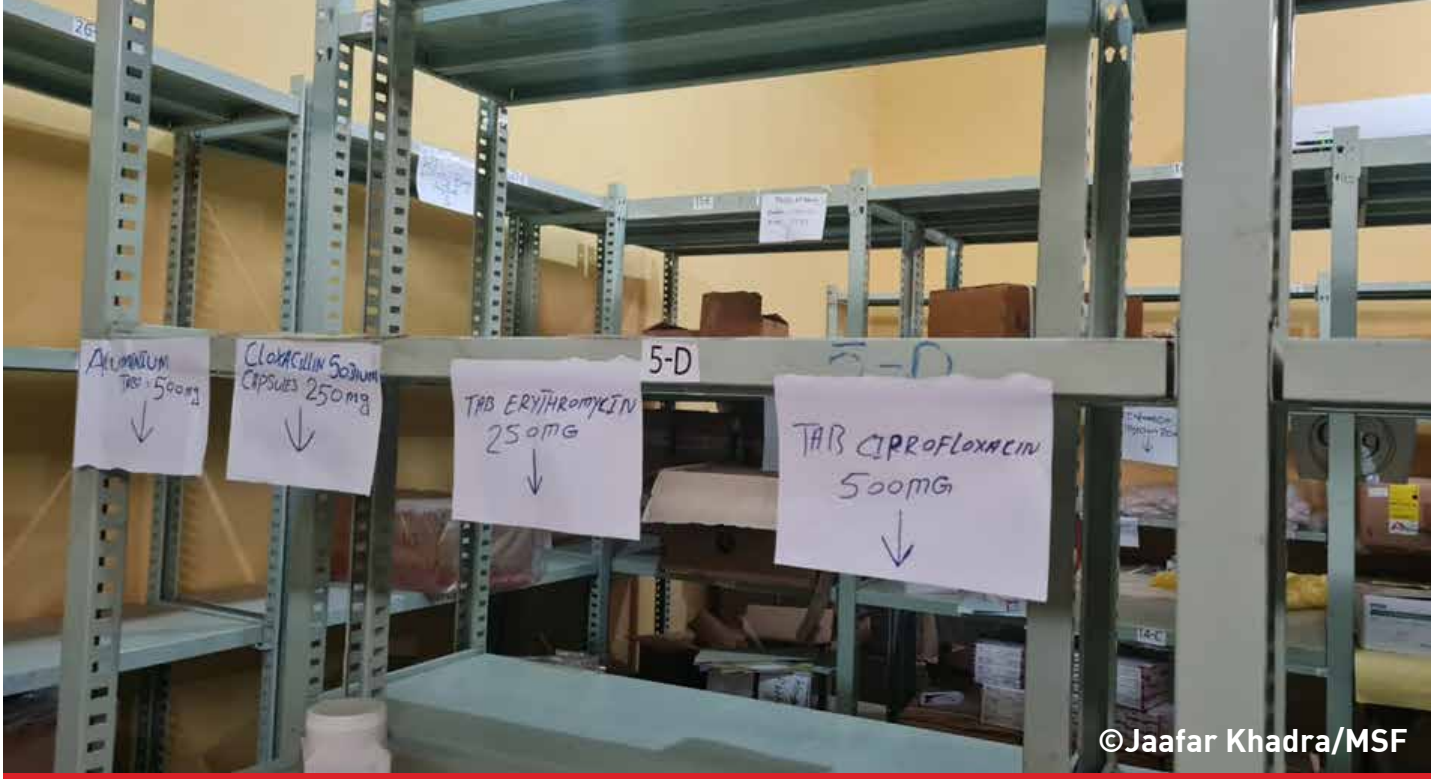

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Case Study - Mozambique and Sierra Leone - AMR in Economically Strained, Weak Healthcare Systems

Antimicrobial resistance (AMR) in countries like Mozambique and Sierra Leone has been historically deprioritized due to their focus on other pressing health crises and economic challenges. In Mozambique, economic instability and conflict[44] have negatively impacted Mozambique's health system where poverty rates reached 63% in 2020. Some central hospitals received as little as 16% of their required budget, leading to frequent stockouts of essential antibiotics, inadequate microbiology services, and poor-quality care.

With most health funding reliant on vertical international funding streams dedicated to HIV,[45] this casts a shadow over a growing, unrecognized AMR crisis.[46] Despite Mozambique's ongoing battle with one of the world's largest HIV epidemics,[47] AMR has emerged as a less visible but growing threat. Mozambique has the fourth highest AMR-attributed death toll in Africa, with an estimated 7,380 deaths directly linked to AMR and over 31,000 associated deaths annually.[48] This mortality rate is comparable to that caused by HIV and malaria,[41,47] but AMR continues to be overshadowed by other health priorities.

The lack of microbiology infrastructure is a critical barrier. Only three laboratories in Mozambique are equipped to conduct bacteriological testing, all supported by international actors. The Instituto Nacional de Saude (INS), the main surveillance laboratory, lacks a clinical mandate, meaning the data it collects is not used to guide treatment protocols. Surveillance capacity is further limited, with the WHO's GLASS system reporting only one operational surveillance site, and its data is rarely accessible. As a result, the true extent of AMR in Mozambique remains largely unknown.

Despite the lack of comprehensive surveillance, emerging data shows worrying resistance trends. At Beira Central Hospital, recent MOH's blood culture preliminary data provided by Beira MoH microbiology lab showed 92% resistance to ceftriaxone and 39% resistance to imipenem among Enterobacterales isolated, leaving many patients without effective treatment options. Making matters worse, essential antibiotics such as tigecycline, colistin, and other newer agents needed for the treatment of organisms resistant to carbapenems are not available in Mozambique, and hospitals frequently experience stockouts of critical drugs like imipenem, making it nearly impossible to treat resistant infections. Worryingly, MOH's data shows a 100% mortality rates among patients with carbapenem resistance.

> **MSF opened pandora's box, we had high mortality and failure treatment rates among neonates, but we were not aware of the resistance trends behind some of them.**
> *Pediatrician, Doctors with Africa, Mozambique*

It is not only drugs for resistant infections whose supply chain is compromised. A six-month MSF unpublished analysis of stock data at a government facility in Beira revealed a stockout rate of 40%, far exceeding the WHO's recommended limit of 20% for essential medicines.[49] These shortages often force healthcare providers to prescribe broader-spectrum antibiotics, further fuelling AMR. Frequent stockouts impose additional financial burdens on patients, who are often forced to purchase these medications elsewhere, delays and financial inability to do so potentially endangering lives.

In Sierra Leone, the findings are even more shocking and medicine stockouts even more severe. According to MSF's assessment in governmental facilities, essential medicine and medical equipment stockout rates sometimes reach up to 80%, but paper-based tools make it difficult to disaggregate data by antibiotics to fully quantify the antibiotic access gap.

In both countries, AMS and IPC programs are poorly implemented. Mozambique has made little progress in monitoring antibiotic use, and healthcare workers are often unaware of existing guidelines, which are outdated or non-existent. A recent point prevalence survey found that only 60% of patients receiving antibiotics had a clearly documented diagnosis, and only 28% of prescriptions followed hospital protocols. Without proper stewardship, inappropriate use of antibiotics continues to drive resistance. The lack of consistent access to water and proper IPC measures further compounds the problem. MSF reports that in many facilities, water pipes run dry for weeks, making it difficult to follow IPC protocols. IPC guidelines are outdated, and key IPC measures, such as isolation for patients with MDROs, are rarely followed due to limited capacity. Staff training in IPC is also severely lacking, and the use of corrosive chemicals like chlorine, which irritates patient's skin and damages equipment, remain standard practice. In Sierra Leone, the implementation of IPC practices is jeopardized by the lack of necessary equipment. According to an MSF assessment of both primary and secondary governmental facilities in Sierra Leone, shortages of IPC equipment such gloves, masks, and cleaning material, disinfectants, C-section sets, and blood bags were frequent. This results in the risk of using single-use items multiple times with risk of patient-to-patient transmission of organisms. Lack of access to safe water lies at the root of inadequate IPC practices, along with improper waste management.

> **HIV test is free, but the patient has to buy gloves, alcohol, gauze or a needle to draw blood, switchers, antibiotics, and anesthesia drug.**
> *IPC Advisor, MSF, Mozambique*

D. Climate Change

The challenge of AMR is deeply intertwined with climate change and environmental contamination, particularly in humanitarian settings, where the impacts of both are acutely felt. The negative impacts of climate change are accelerating the spread and development of AMR, making already vulnerable populations more susceptible to resistant infections.

The impacts of climate change on AMR are broad, ranging from water scarcity to extreme weather events, such as floods, which are becoming more frequent and severe. These events can incapacitate sewage and wastewater treatment facilities, leading to increased contamination of water sources with antibiotics and resistant microbes.[50] In humanitarian and low resource settings, where infrastructure is often weak or damaged, this contamination can quickly spread, especially within overcrowded living conditions, increasing the risk of infections caused by resistant pathogens. Many of the countries most vulnerable to the negative impacts of climate change are countries with a limited ability to adapt. This is particularly true in fragile and conflict-affected settings and humanitarian contexts, where people are more likely to reach the limits of their coping capacity, highlighting the importance of climate adaptation efforts in these settings.[51]

The rise in global temperatures is also linked to increased rates of AMR,[52,53] including through increased bacterial growth rates and increased horizontal gene transfer.[54] Higher temperatures may also affect heavy metal concentration in water and soil, leading to the possible co-selection of resistant organisms, as bacteria that are resistant to both antibiotics and heavy metals gain a competitive advantage. In warmer climates, bacteria may also evolve to survive more hostile environments, again potentially leading to a higher burden of infectious diseases.[54] This is particularly concerning in conflict zones and refugee camps, where access to healthcare is limited, and overcrowding further exacerbates the spread of resistant infections.

Climate change also influences AMR through its interaction with food insecurity and nutrition. In areas facing food shortages, the use of antibiotics in livestock as growth promoters increases, while malnutrition weakens immune systems leaving individuals more susceptible to infection. In humanitarian settings where regulations on antimicrobial use are often weak or unenforced both for humans and animals these impacts can go unchecked allowing resistant bacteria to proliferate. Addressing these challenges requires a transdisciplinary approach that recognizes the interplay between AMR and climate change. Anticipating risks and adapting healthcare and environmental services to to buffer these shocks will be critical in reducing the spread of AMR.

Case study: Conflict & Climate – Bentiu, South Sudan

Bentiu sits near the border with Sudan, on flood-affected plains. Floods have repeatedly devastated the region, where approximately 100,000 people live in an internally displaced persons (IDP) camp.[55] MSF's hospital provides critical secondary healthcare services for the host population and IDPs who face the compounding crises of conflict, displacement, and environmental instability.
The South Sudanese population already struggle to access basic healthcare especially for women, children, older persons and people with disabilities. Only 49% of the population live within an hour of health services. 22% of health facilities are considered fully functional and most are concentrated to urban areas.[56] Access is through a fragmented system with poor infrastructure, limited healthcare workers, and disrupted supply chains. The flooding further exacerbates the situation destroying infrastructure and limiting access to clean water, worsening sanitary conditions and increasing the likelihood of outbreaks and shifting the spread of infectious diseases. These conditions create an ideal breeding ground for AMR infections, particularly among vulnerable populations like children under five. Mortality for under 5 is 99 deaths per 1,000 live births, a scenario driven by a mix of malnutrition, poor access to potable water, inadequate sanitation, and infectious diseases, intensified by flooding.[57]

For years, the true burden of AMR in Bentiu has been hard to quantify due to the lack of diagnostic microbiology services. Treatment failures in newborn sepsis were frequent, but only with the introduction of IPC and AMS activities, followed by the establishment of a Mini-Lab and microbiology services in September 2023 was the extent of AMR clear. In a context where access to conventional laboratories was impossible, the Mini-Lab enabled MSF to deploy an all-in-one quality diagnostic unit adapted to low-resource settings, able to identify causative organisms for Serious Bacterial Infections and their sensitivity to antibiotics. [58]

Access to diagnostic microbiology enabled the confirmation of resistance to first-line antibiotics as a cause of treatment failures, making the need for AMR-specific interventions even more urgent. Specifically in treatment failure 40.5 % of Enterobacterales were ESBL positive and 13.5% Carbapenem resistant.[59]

The persistent flooding in Bentiu has likely played an important role in the spread of AMR by contaminating water sources with resistant bacteria. Stagnant floodwaters mix with human and animal waste, creating ideal conditions for the proliferation of resistant microbes. The resulting infections, compounded by overcrowded living conditions in the camp, are often treated with broad-spectrum antibiotics, further driving resistance. Poor water sanitation in the aftermath of flooding also contributes to recurring diarrheal diseases, exacerbating severe acute malnutrition in children under 5 who are then again more susceptible to infectious diseases.

To combat AMR in such an environment, MSF worked with project teams and local health workers to implement a comprehensive strategy that included training and mentoring clinicians, nurses, and laboratory technicians. This collaboration and adaptation to context helped roll out diagnostic services critical for accurately identifying and treating resistant infections.

In the long term, the microbiology lab also meets monitoring purposes. We will be able to provide epidemiology indicators for local antimicrobial resistance surveillance and monitor evolutions, predict patterns. The collected data will also be extremely valuable to detect hospital outbreaks and support improvement of infection prevention and control strategies in our facility.

MSF Mini-Lab supervisor in Bentiu, Unity State

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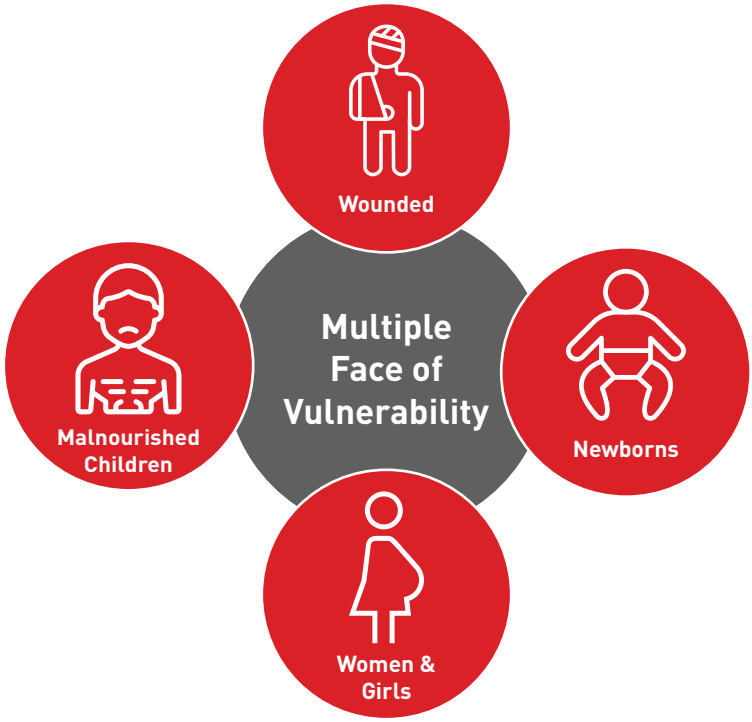
V. Equity and the Multiple Faces of AMR

Marginalized, excluded, persecuted and hard-to-reach populations are at greater risk of AMR. These vulnerable groups include women and girls, neonates, malnourished children, and patients who have sustained traumatic injuries.



A. Women and Girls

Women are particularly affected by AMR in humanitarian settings due to a range of factors. For example, in conflict-affected contexts there can be severe limits on access to health facilities, resulting in unsafe deliveries and poor maternal health outcomes.[60] An increase in Caesarean sections can be seen in conflict settings, as has been documented in Yemen and Syria.[61] In such places, insecurity can drive women to opt for scheduled deliveries to ensure safety and availability of healthcare personnel. The increase in Caesarean sections, however, comes with a higher risk of Surgical Site Infections (SSI), which are more prevalent in conflict-affected settings and more often involve multidrug-resistant (MDR) organisms, with infection rates ranging from 3-15%.[62]
In a 2011 study carried out by MSF across emergency obstetric programs in Burundi, DRC and Sierra Leone the SSI incidence was 7.3% with the median length of stay for women with SSIs being 21 days compared to 7 for those without SSIs. Harmful social policies in humanitarian settings, coupled with economic hardships, can also limit women's access to care.[63]

Afghanistan exemplifies these challenges, where restrictive social policies[64] limit women's education levels, and subsequently knowledge of infections and antibiotics. As well as resulting in a shortages of women healthcare workers, and restricted movement.[26] These factors impact on women's health-seeking behavior, affect their ability to reach a facility, and finally receive the needed quality care these delays[65] put women more at risk of complications including infections. In addition, for women and girls, there can be a tendency if conditions worsen to resort to self-prescription and over-the-counter remedies impacting AMR.[66]

In a MSF mixed-methods study in Afghanistan exploring the perceptions and attitudes toward antibiotics among patients in an outpatient department,[67] women reported using antibiotics after deliveries and during menstruation, driven by misconceptions that a woman's body is more susceptible to infections at this time. Expectations from patients prompted them to seek antibiotics from private drug stores, thus reducing the effectiveness of MSF guidelines.[68]

> **We are not near the health facility, and we cannot travel a long way without male relatives.**
> *Female caretaker, Kandahar* [24]

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As highlighted in the recent WHO guidance,[69] NAPs on AMR often overlook the influence of gender despite the growing evidence of differing exposure, susceptibility, prescribing practices, and health seeking behaviours. In humanitarian responses, there is a need to determine where gender equity can be promoted, and how best to identify and respond to differential needs of women, girls, men and boys.[69]

B. Newborns

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It is estimated one child under five dies nearly every two minutes directly because of AMR, with countless more deaths indirectly.[70] Barriers to accessing quality pre-natal care and safe deliveries in conflict zones and humanitarian settings impact not only maternal mortality and morbidity, but also the health of the child. These barriers impact on prevention and early identification of life-threatening infections such as neonatal sepsis, which is estimated to affect nearly 7 million children under one, causing over 550,000 annual neonatal deaths.[71] Globally, the highest neonatal mortality rates are concentrated in countries chronically affected by conflict.[72] In these areas, the limited capacity to diagnose and treat sepsis exacerbates the problem. The more MSF has been able to get snapshots of this problem through access to microbiology, the more they have observed alarmingly rates of gram-negative bacteria in treatment failure. Gram-negative bacteria such as Klebsiella pneumoniae, Acinetobacter baumannii and Escherichia coli in addition to Staphylococcus aureus are the most frequently reported cause of neonatal sepsis.[73] These infections are likely linked to environmental contamination and possible horizontal transmission.[74] This contrasts sharply with high-resource settings, where leading pathogens such as Streptococcus agalactiae (Group B Streptococcus) are more likely to be sensitive to first-line antibiotics. The difference in causative organisms and their resistance patterns has rendered standard first-line antibiotics, like ampicillin and gentamicin, at times ineffective in low-resource settings.[73] For example, in Central African Republic (CAR), neonatal mortality rate is one of the top ten highest globally.[75] Following an outbreak in 2017 of extended spectrum beta-lactamase producer Klebsiella pneumoniae in MSF supported Castor Maternity Hospital, a study in 2021 retrospectively investigated the resistance and found that 77.8% of confirmed gram-negative neonatal infections were no longer treatable with WHO recommended first line antibiotics, meaning the antibiotics needed were not routinely available in this context.[74]

These findings are even higher than regional studies, which found resistance to WHO recommended ß-lactams in 614 (68%) of 904 cases and resistance to aminoglycosides in 317 (27%) of 1176 cases.[77] In addition to lack of diagnostics and suitable therapeutics, teams highlighted a lack of support and training for IPC supervisors and/or limited availability of running water, along with fundamental challenges with the building infrastructure, including a bed occupancy rate of up to 160% and a lack of space for isolation/cohorting.

> **first line treatment is not enough. The outbreak resulted in 20 confirmed cases and 5 deaths. We put an action plan that includes routine blood culture implementation for neonates with neonatal infection and treatment failure.**

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C. Children with Severe Acute Malnutrition

In humanitarian settings, where severe pediatric sepsis and septic shock have a mortality rate of up to 40%,[78] malnutrition frequently complicates sepsis in children under 5. Worldwide childhood undernutrition contributes to more than 45% of mortality in this age group, the burden of which is concentrated in low resource settings.[79] For children with severe acute malnutrition (SAM), both gastroenteritis and acute respiratory infections are expected diseases and commonly evolve into bacteremia, especially by Gram-negative bacteria like Salmonella spp., Klebsiella pneumoniae and E. coli.[80] In hospitalized children with SAM, bacteremia has been found, in some settings, to affect 1 in 6 children with a mortality rate of approximately 30%.[81] However, community acquired bloodstream infections in children are poorly documented in Sub Saharan Africa and particularly in children with SAM and medical complications.

Since 2014, Zamfara state in northwest Nigeria has seen an increase in internal conflict leading to population displacement and it is currently going through an unprecedented rise in acute malnutrition. One out of every four children under the age of five is malnourished in the Shinkafi and Zurmi areas of Zamfara state, according to a mass screening conducted in June 2024.[82]

In 2018, MSF who at that time was working together with the Ministry of Health in the pediatric wards of Anka General Hospital in Zamfara state, a surveillance system for community and hospital acquired bloodstream infections in children was "established with the MoH". 35 % (n=82) of the children with severe sepsis died during their hospitalization, with most dying within 24 hours of admission. The mortality in the severe sepsis group of patients was significantly higher than the average mortality of pediatric patients in the hospital, which fluctuated between 4.3% and 13.9% per month. Within this cohort, children with severe acute malnutrition were significantly younger than those admitted to the general pediatric and the isolation ward and had a significantly higher mortality rate (49%. vs. 28%) during the study period.[83]

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D. War Wounded

First-line antibiotics are no longer effective in many conflict-affected contexts due to the pervasive impacts of multidrug resistant (MDR) bacteria. War wounds can be complex, open, deep, and in the case of limb injuries may require amputations, deep cleaning procedures or complex reconstructive surgery. Wounds are often contaminated with particles from the environment lodged on impact that increase the risk of AMR infections, including soil contaminated with bacteria and heavy metals due to conflict associated remnants of war[84] such as those reported in Ukraine[85] and Iraq.[86] This compounded by the practical difficulties of conducting skilled surgeries in a timely manner, the additional capacity required to provide quality trauma care in conflict-affected areas, and the long and often fragmented referral pathways, further reinforces a strong correlation between war-related injuries and increased AMR. Along this route, patients are treated according to different protocols, sometimes undergoing unwarranted surgeries such as early wound closure or surgical interventions in unclean environments, all of which have a negative impact on the incidence and microbiology of wound infection. This was seen for example in Ukraine,[85] where patient transfers included multiple stops and variations in treatment protocols.

AMR also exerts its own strain on the already fragmented health system with increased length of stay and greater likelihood of complications. In Iraq MSF through that patients who had more than one procedure performed per surgery had significantly increased odds of having at least one MDRO isolated compared to those who had one procedure.[27] The timing and the type of surgical management can also impact on the development of AMR infections.[87] Surgeons may have had limited exposure to war surgery, and this coupled with surges in trauma cases, and limited time to properly debride devitalized tissues, can result in tissue transforming into the perfect medium for bacteria proliferation. In addition, staff may need to discharge patients early to have space and capacity for others and if definitive care is not available in-country, transferring patients across borders can be extremely difficult, for example in Gaza.[88]

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These conditions, compounded by limited therapeutics and rarely available drug levels to optimize dosing, creates a breeding ground for high rates of MDR bacteria, as observed in Mosul, Iraq,[27,89] MSF found that 81% of admitted patients had at least one MDR infection, and 4.9% of cases were extensively drug-resistant (XDR).[27] This is significant because XDR bacteria require last-resort antibiotics, which are often unavailable in resource-limited settings newer antibiotics can lead to a 20-fold increase in costs for treatment compared to more commonly used antibiotics[90] in addition to previously cited access challenges. In Aden, Yemen, MSF reported similar rates, with 81.4% of Escherichia coli isolates and 77.4% of Klebsiella pneumoniae showing resistance to Extended-spectrum beta-lactamases (ESBL), and 72.6% of Staphylococcus aureus cases being MRSA-positive.[91] Whilst in ICRC's reconstructive surgical project in Tripoli, Syrian and Iraqi refugees treated for war-related trauma were found to have a high proportion of MDR in the samples taken from skin and soft tissues and bones, including resistant Enterobacterales (44.6%), MRSA (44.6%) and Pseudomonas aeruginosa (7.6%).[92] In war-torn Ukraine, recent evidence also highlights alarmingly high levels of resistance[2,93] and the 2024 WHO Public Health Situation Analysis Update for Ukraine highlights a recent survey in which 14% of HAIs among inpatients on surveyed wards with 50% of these being infected with organisms resistant to state-of-the- art broad-spectrum antibiotic.[94] These statistics underscore the critical need for urgent interventions to address the growing AMR threat in conflict-affected settings.

VI. Conclusion

Antimicrobial resistance (AMR) disproportionately impacts vulnerable populations, especially those in living in humanitarian settings, where health systems are already fragile. Conflict-affected populations, displaced persons, women, children, and people living in extreme poverty are at greater risk of AMR, facing severe health consequences due to limited access to care, diagnostics, and essential medications.

In these settings, the capacity to prevent, detect, and respond to AMR is critically low. There is an urgent need for concrete support to surveillance systems, diagnostic tools, healthcare worker training, and access to antimicrobials. WASH and vaccination play a crucial role in the prevention of resistant infections yet there remain critical gaps in humanitarian settings.

The scarcity of reliable data from these regions further exacerbates the problem and hinders context-adapted AMR interventions, planning and local target settings. To combat AMR effectively, global efforts must prioritize the most at-risk populations, ensuring that prevention and response in humanitarian settings are integrated into AMR strategies.

Equity considerations must translate into the inclusion of these vulnerable populations and the actors working with them into governance systems. Fundamentally. the international community must act now and do more to build resilient health systems, address critical gaps, and protect the most at-risk communities from the growing threat of AMR.

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VII. Call to Action and Recommendations

Since the 2016 AMR UNHLM[95] little progress has been made in bringing prevention, identification and response for AMR to people living in humanitarian settings. In the second-ever UNHLM on AMR, the recent political declaration[4] built on prior commitments and made advances, notably by recognizing conflict-affected and humanitarian settings as particularly vulnerable and calling for inclusion of civil society groups and humanitarian actors. However, the complex ecosystem in humanitarian settings challenges the realization of a coordinated global AMR response.

Towards addressing preventable deaths and suffering related to AMR, now, and in the future in humanitarian settings, we call upon global leaders, the quadripartite, UN member states, donors, multilateral agencies, and development and humanitarian actors to:

1. Bridge the gap between global political commitments and national plans through strong leadership and clear governance and accountability mechanisms

•**Translating global political commitments into effective immediate action on AMR:** Establishing an accountability framework under stronger governance from the quadripartite, capable of making global targets meaningful, transparent, and measurable including continuous quality improvement measures. Context-adapted indicators will be key to interpreting current global targets to humanitarian contexts. A roadmap such as those used in pediatric TB[96] and by the WHO Europe Region for AMR[97] could offer the possibility to adapt measures to different resource environments and allow the translation of global political commitments on targets to indicators that reflect access to care dimensions providing a gauge to inform action in humanitarian and low resource settings.[98]

•**Establishing a collaborative humanitarian framework:** Adapt existing plans such as national action plans, GLASS surveillance, the Independent Evidence Panel, and others to include a focused approach on vulnerable people living in humanitarian settings adding humanitarian actors to key platforms.

2. Implement and adapt AMR interventions to deliver quality care for people living in humanitarian and low resource settings by:

•**Recognizing access to quality care is key to fighting against the development and spread of AMR:** Stakeholders must look beyond silos to address barriers to accessing care recognizing that for people living in humanitarian and low resources settings universal health coverage is fundamental to prevention, detection and response of AMR and NAPs must match to both the needs and the context.

•**Increasing vaccination coverage in outbreak hotspots:** As well as supporting the global increase in access to vaccination there should be particular attention to areas with outbreaks and endemic levels of susceptible infectious diseases. As well as considering climate associated risk and outbreak potential in humanitarian settings.

•**Improving access to clear water, sanitation and hygiene in healthcare and at the community level for high-risk settings:** Ensuring access to clean water, proper sanitation, and hygiene facilities is crucial and particularly urgent in refugee camps and other areas hosting displaced populations.

•**Mainstreaming IPC and Antimicrobial Stewardship (AMS) adapted for humanitarian settings:** There is an urgent need to mainstream IPC and AMS into humanitarian interventions and adapt interventions to low-resource settings.

•**Improve identification and anticipation of AMR risks in humanitarian settings:** There should be the systematic identification of AMR risks and mitigation measures in humanitarian settings including in emergency responses and preparedness plans. As well as anticipation and adaption of future needs taking into account evolving health risks and challenges posed by climate change.

•**Upskilling healthcare workers to overcome the constraints of humanitarian settings:** upskilling existing resources on IPC, AMS and diagnostic microbiology in a way that matches the needs and the context. Retaining these capacities requires consideration of the working and living conditions of healthcare workers.

3. Reducing barriers to access for care by capitalizing in UHC commitments to ensure neglected populations are not left behind:

- **Leveraging UHC Commitments for AMR:** Efforts to increase access to quality care and tackle AMR should leverage previous commitments and current initiatives to ensure Universal Health Coverage (UHC). Country UHC plans should better identify AMR risks and put in place mitigation measures e.g. ensuring integration of IPC and AMS to reduce the burden, address delays in treatment, and support appropriate use of antibiotics.
- **Shifting from interventions designed around diseases to those based around People's needs:** People centered approaches, should aim to expand access to primary care services and community-based models to improve prevention, early detection of infections and supporting appropriate treatment.
- **Addressing barriers to care for those Displaced:** For displaced populations there must be a concerted effort to remove barriers to accessing healthcare whether they be administrative, physical or discriminatory ensuring distance and lack of transportation do not undermine efforts to include displaced people in efforts to prevent, identify and respond to AMR.
- **Enhancing Health System capacity to buffer shocks in humanitarian settings:** Mitigate financial barriers to healthcare in humanitarian contexts by eliminating user fees for essential healthcare services to avoid delays, exclusion and substandard care that could drive AMR.

4. Expanding and prioritize access to quality assured microbiology:

- **Ensuring prioritization of microbiology infrastructure in NAPs:** The current NAPs for AMR are wide reaching, aimed at tackling multiple dimensions of AMR. However, MSF has learnt from past experiences with HIV and TB that without visibility on the issue, political action can remain unrealized. Microbiology data is essential for improving clinical outcomes for patients with resistant infections and addressing the data dearth through surveillance data which in humanitarian crises can aid national decision making but also support other countries facing humanitarian crises to be better able to prepare and respond. Diagnostic microbiology already exists in the WHO High-priority Health services for Humanitarian response (H3 package).[99] However, this work should be complemented by guidance on quality assurance and needed protocols. The framework must also include approaches to gathering fragmented antibiotic use and AMR data, with guidance on how to strategically use such data to improve patient outcomes.
- **Fostering innovation in microbiology:** Access needs to be supported by innovations that look to support sustained access. Attention should be paid not only to novel technology but technology that brings people closer to pre-existing tools. MSF's experience with Antibiogo[1] has highlighted the potential to harness digital health tools to enhance diagnostic microbiology and build health workforce capacity.

[1] Antibiogo is a free digital health tool, open source and offline Android app that supports non-expert laboratory technicians measuring and interpreting antibiotic susceptibility tests (AST), to help doctors prescribe accurate antibiotics to their patients and to provide accurate results that can be used for surveillance purpose and ultimately support the update of empirical guidelines

5. Increase access to essential antimicrobials in humanitarian and low-resource settings:

•**Tracking the access gap and strengthening supply systems:** Frequent shortages of quality assured antibiotics, vaccines, and diagnostics are still one of the main access barriers in these settings. AMR initiatives must work on documenting the access gap with attention to humanitarian settings, strengthening medical supply systems, reinforcing quality assurance processes and ensuring updated, country-level essential medicine lists.
•**Ensuring equitable and safe access to antibiotics targeting multi-drug-resistant infections:** Encompassing procurement plans that match local cumulative antibiograms with guidance on adaption and if indicated the responsible introduction of targeted novel antibiotics with clear criteria, companion diagnostics, training, guidance and oversight, along with monitoring of clinical outcomes/adverse events.
•**Reducing cost to barriers novel antibiotics:** There must be a concerted effort to reduce the prohibitive costs of novel antibiotics and efforts made to safeguard future access, including investing in non-profit research and development initiatives, tying development to access conditions, and pooled procurement mechanisms. However, supporting R&D initiatives must be held in equal importance to strengthening the supply of existing antibiotics and not overshadow them.
•**Ensure last mile delivery of antimicrobials:** There needs to be comprehensive tackling of national and subnational bottlenecks including registration, importation, distribution, and financial barriers.

6. Expand financial support dedicated to drivers and responses to AMR:

•**Assessing the funding gap in humanitarian settings:** Assessments of uncovered needs must look both at priority areas within National action plans for AMR but also more broadly taking a people centered approach. Assessments should look to identify additional risks linked to humanitarian settings and anticipate emergency and climate-related response needs.
•**Two-pronged approach to funding:** In humanitarian contexts, crisis situations rapidly exhaust available domestic financial resources making international resources vital to any AMR efforts. A two-pronged approach for AMR should look to provide sufficient funding for priorities in humanitarian responses as well as provide additional financial resources to AMR prevention, identification, and response activities in humanitarian settings. The existing international resources to AMR globally are insufficient, fragmented, and not streamlined. Many needs and patients fall in-between the cracks of these fragmented initiatives.

People living in humanitarian and low resource settings remain almost invisible under the broken lens of global initiatives, and while the new political declaration on AMR declaration is a step towards a more equitable approach, if its commitments are not translated into concrete actions, the promise to leave no one behind will remain a hollow one.

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