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for every child

TIME IS RUNNING OUT

Technical Note on Antimicrobial Resistance

"Antimicrobial resistance threatens child survival and health. Children need access to effective lifesaving medicines to protect them from dangerous infectious. But we must also prevent the spread of resistant pathogens by promoting the rational use of drugs, immunizing every child and ensuring access to clean water and sanitation.

Lives are at stake: there is not time to wait."

Henrietta H. Fore, Executive Director, UNICEF

Cover photo: Alexandre Costa (UNICEF/2019/Costa)
Layout and design: Jiawen Elyssa Liu

We wish to acknowledge the invaluable contributions by various staff members in Regional and Country offices, Supply Division (SD), Division of Communication (DOC), Data, Analytics, Planning and Monitoring (DAPM) Division, Office of Emergency Programmes (EMOPS), and Programme Division (PD) in New York Headquarters, particularly Health, Immunization, HIV/AIDS, Nutrition, Water, Sanitation and Hygiene (WASH), Public Health Emergencies, and Communication for Development (C4D) teams. We also wish to thank ReAct for its contributions to improve this document.

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Acronyms

AIDS	Acquired immune deficiency syndrome
AMR	Antimicrobial resistance
ARI	Acute respiratory infection
AWaRe	Access, watch, reserve categorization of antibiotics
C4D	Communication for development
DFID	Department of International Development
DOC	Division of communication
DRP	Data, Research and Policy
EMOPS	Office of Emergency Programmes
FAO	Food and Agriculture Organization
Gavi	Gavi, the Vaccine Alliance
GDF	Global Drug Facility
HCF	Health care facility
Hib	Haemophilus influenzae type b
HIC	High income country
HIV	Human immunodeficiency virus
HPV	Human papilloma virus
iCCM	Integrated community case management
IDA	International development association
IHR	International health regulations
INMCI	Integrated management of newborn and childhood illness
IRDB	International Bank for Reconstruction and Development
JICA	Japan International Cooperation Agency
LMIC	Low and middle income countries
MDR-TB	Multidrug-resistant Tuberculosis
Men	Meningitis vaccine
OIE	World Organization for Animal Health
PCV	Pneumococcal conjugate vaccine
PD	Program division
Penta	Pentavalent vaccine provides protection to a child from Diphtheria, Pertussis, Tetanus, Hepatitis B and Hib.
PEPFAR	U.S. President's Emergency Plan for AIDS Relief
PMTCT	Prevention of mother to child transmission
PrEP	Pre-exposure antiretroviral prophylaxis
Rota	Rotavirus vaccine
RR-TB	Rifampicin-resistant Tuberculosis
SD	Supply division
SDG	Sustainable development goals
TB	Tuberculosis
UN	United Nations
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
WASH	Water, sanitation and hygiene
WHO	World Health Organization
XDR-TB	Extensively drug-resistant
YF	Yellow fever

Executive Summary

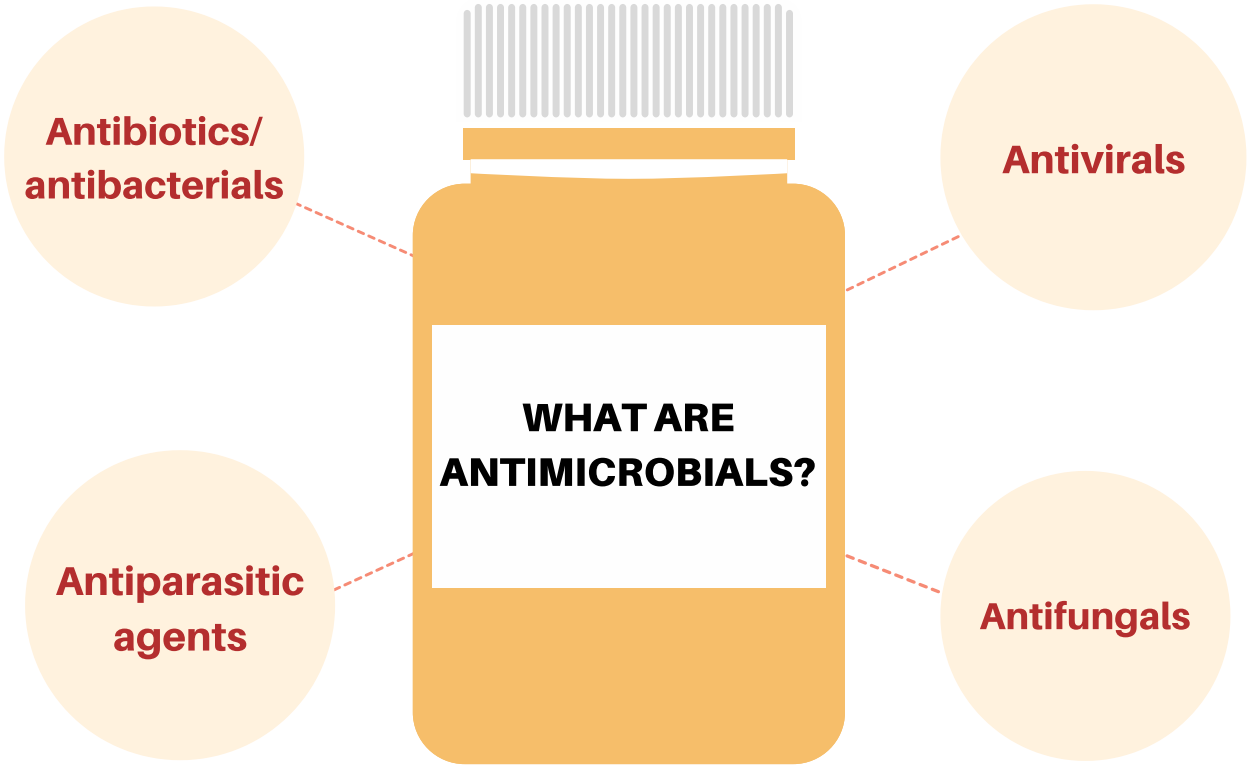
Antimicrobial resistance (AMR), the process by which microbes develop resistance to the antimicrobial drugs commonly used to treat infections, is the underlying cause of drug-resistant infections. In the absence of effective antimicrobial drugs, common infectious diseases are more difficult to treat and individuals remain sick for a longer time. This increases the costs of hospitalization and treatment, the risk of spreading the disease, and the risk of death. The emergence and spread of AMR is occurring at an alarming rate with current estimates indicating that at least 700,000 people die worldwide each year due to drug-resistant infections, which is expected to rise to 10 million deaths globally by 2050.[1] AMR is further aggravated by the fact that the emergence and spread of drug resistance far outpaces the rate at which new drugs, capable of thwarting infections, are being developed. Common diseases, such as urinary tract infections, respiratory tract infections, and sexually transmitted diseases are becoming untreatable, lifesaving medical procedures are becoming more dangerous due to the risk of infections with drug-resistant pathogens, and food security is threatened by drug resistance in agriculture.

The urgency of tackling AMR was recently highlighted by the World Health Organization (WHO) through inclusion of AMR in the list of the ten major threats to global health in 2019.[2] This was followed by a report recently published by the United Nations Ad hoc Interagency Coordination Group (IACG) on Antimicrobial Resistance warning that AMR could cause catastrophic damage to the global economy and force up to 24 million people into extreme poverty by 2030.[3]

It is paramount that stakeholders across sectors – from governments, international organizations and donor agencies to the private sector, academia, professional organizations and civil society – recognize their responsibility and engage in measures to mitigate the impact of AMR on human, animal and environmental health through a coordinated, multisectoral and interdisciplinary One Health[3] approach.

AMR is perhaps the greatest threat to child survival and health of this generation. This technical note reflects UNICEF's response to this growing threat and identifies AMR-specific and AMR-sensitive actions in three priority areas: (1) reducing the incidence of infection; (2) promoting access to, and optimal use of, antimicrobial agents; and (3) increasing awareness and understanding of AMR. Using this framework, each section outlines how different divisions and sections within UNICEF can strengthen ongoing efforts as well as engage in new efforts to maximise child survival, growth and development. It is important to recognize that many existing efforts already contribute to these priority areas and contribute to reaching goal areas 1, 4 and 5 of the Strategic Plan 2018 – 2020. To engage in new efforts and ensure sustainable work on AMR, it will be necessary to strengthen institutional capacities relevant for AMR such as developing skills and competencies of teams around AMR, ensuring minimum level of human resource capacity in key country offices, and investing appropriately on the implementation of programmes at scale that can lead to improve policy and programming around AMR. UNICEF's expertise across various sectors and disciplines relevant for AMR will allow the organization to pursue a multisectoral response to AMR on a global scale.

[1] O'Neill, J. (2016) Tackling Drug-Resistant Infections Globally: Final Report and Recommendations. Retrieved from https://amr-review.org/sites/default/files/160525_Final%20paper_with%20cover.pdf
[2] World Health Organization. (2019) Ten threats to global health in 2019. Retrieved from https://www.who.int/emergencies/ten-threats-to-global-health-in-2019
[3] Interagency Coordination Group on Antimicrobial Resistance (2019.) No time to wait: securing the future from drug-resistant infections. Retrieved from https://www.who.int/antimicrobial-resistance/interagency-coordination-group/final-report/en/
[4] One Health is a collaborative, multisectoral and transdisciplinary approach implemented at the local, regional, national, and global levels whose goal is to achieve optimal health outcomes by recognizing the interconnection between people, animals, plants, and their shared environment.



What is the purpose of this technical note?

This technical note takes a critical look at the serious and growing global threat of AMR to child survival, growth and development, maps UNICEF's existing programmes which have direct (AMR-specific) and indirect (AMR-sensitive) impact on the response to AMR and identifies potential areas for future engagement where UNICEF has comparative advantage in the global AMR response.

Who should read this technical note?

The note is intended for use at multiple levels within UNICEF, including country, regional and global levels, and across divisions and sections. It serves to inform UNICEF's internal initiatives, programming and activities, as well as external engagement with governments and other partners and organizations concerned by the rapid spread and devastating implications of AMR for children.

Box 1. Antimicrobial resistance (AMR) in children

AMR is a natural process that has been accelerated by the incorrect use of antimicrobial drugs, which include antibiotics, (i.e., drugs used against bacterial diseases such as pneumonia and typhoid fever), antivirals (e.g., antiretroviral drugs used to treat HIV infections), antiparasitic drugs (e.g., antimalarials), and fungicides (e.g., drugs used to treat yeast infections). Resistance to antiretrovirals, antimalarials, TB drugs, and fungicides represents a significant threat to global health and multidrug resistance threatens to reverse the gains made in the fight against these major infections, which are prevalent among children. In addition, antibiotic resistance in bacteria is rapidly increasing and has reached alarming levels worldwide, rendering several classes of antibiotics useless to combat common infections, including numerous diseases associated with high morbidity and mortality in children, such as diarrhoea, pneumonia and neonatal sepsis. The inappropriate use of antibiotics in food-producing animals and other aspects of agriculture and aquaculture also contributes to the emergence of resistant bacteria and their spread to humans through the food chain.

- Artemisinin-based combination therapies are recommended by the World Health Organization (WHO) as the first- and second-line treatment for uncomplicated Plasmodium falciparum malaria as well as for chloroquine-resistant Plasmodium vivax malaria. Artemisinin resistance has been spreading in the Greater Mekong Sub-region and poses a real threat to other malaria-endemic regions[5] as there is currently no alternative antimalarial drug with the same level of efficacy and tolerability.[6]

- WHO estimated that 558,000 people worldwide in 2017 developed TB that was resistant to rifampicin (RR-TB), the most effective first line drug, and 82 per cent of these had multidrug-resistant TB (MDR-TB).[7] Only 25 per cent of the estimated 558,000 people who developed MDR/RR-TB in 2017 were enrolled on treatment with a second line regimen. Among cases of MDR-TB in 2017, 8.5 per cent were estimated to have extensively drug-resistant TB (XDR-TB). An estimated 100,000 children are exposed to XDR-TB annually, 2 million to MDR-TB, and 5 million to RR-TB.[8]

- One out of every two infants newly diagnosed with HIV is infected with a virus already harbouring resistance to efavirenz or nevirapine, the most commonly used first-line antiretroviral (ARV) drugs.[9] Resistance to first-line ARVs may be as high as 63.7 per cent in infants diagnosed with HIV.[10] HIV drug resistance among people starting or restarting antiretroviral therapy has been increasing annually after the roll-out of antiretroviral therapy.[9]

- Antibiotic-resistant bacterial infections disproportionally affect children.[11] Forty per cent of deaths globally among children under 5 years of age and neonates were caused by diseases whose treatment is directly affected by AMR in 2016.[12]

- In addition to antibiotic resistance, the lack of access to effective antibiotics remains a serious challenge in low-resource settings. Studies show that more children die from lack of access to antibiotics than from resistant infections.[13] In 2016, many of the estimated 6.3 million deaths among children under 5 years old were caused by infectious diseases which could have been averted by increased access to antibiotics.[12]

[5] Global Malaria Program. (2018) Artemisinin resistance and artemisinin-based combination therapy efficacy. Retrieved from https://apps.who.int/iris/bitstream/handle/10665/274362/WHO-CDS-GMP-2018.18-eng.pdf?ua=1
[6] World Health Organization. (n.d) Strategy for Malaria Elimination in the Greater Mekong Subregion (2015 – 2030). Retrieved from https://apps.who.int/iris/rest/bitstreams/923075/retrieve
[7] World Health Organization. (2018) Global Tuberculosis Report. Retrieved from https://www.who.int/tb/publications/global_report/en/
[8] Dodd, P., Sismanidis, C., Seddon, J. (2016) Global burden of drug-resistant tuberculosis in children : a mathematical modelling study. Retrieved from https://www.thelancet.com/journals/laninf/article/PIIS1473-3099(16)30132-3/fulltext
[9] World Health Organization. (2018) Global Action Plan on HIV Drug Resistance 2017-2021 : 2018 progress report. Retrieved from https://www.who.int/hiv/pub/drugresistance/gap-hivdr-progress2018/en/
[10] World Health Organization, United States Centers for Disease Control and Prevention, The Global Fund to Fight AIDS, Tuberculosis and Malaria. (2017) HIV drug resistance report 2017. Retrieved from https://www.who.int/hiv/pub/drugresistance/hivdr-report-2017/en/
[11] Cassini, A., Hogberg, L., Plachouras, D., Quattrocchi, A., Hoxha, A., Simonsen, G., Colomb-Cotinat, M., Kretzschmar, M., Devleesschauwer, B., (2018) Attributable deaths and disability-adjusted life-years caused by infections with antibiotic-resistant bacteria in the EU and the European Economic Area in 2015 : a population-lvel modelling analysis. Retrieved from https://www.thelancet.com/journals/laninf/article/PIIS1473-3099(18)30605-4/fulltext#%20
[12] UN Inter-agency Group for Child Mortality Estimation (2018) Levels & Trends in Child Mortality. Retrieved from https://childmortality.org/wp-content/uploads/2018/12/UN-IGME-Child-Mortality-Report-2018.pdf
[13] Laxminarayan, R., Bhutta, Z. (2016) Antimicrobial resistance – a threat to neonate survival. Retrieved from https://www.thelancet.com/journals/langlo/article/PIIS2214-109X(16)30221-2/fulltext

AMR represents a severe threat to child survival, growth and development. AMR has the potential to undo the gains achieved by UNICEF and the global health community in recent years. Children are particularly vulnerable as their immune systems are not fully developed and are therefore more susceptible to diseases caused by drug-resistant microbes present in their environment and the people, animals and food to which they are exposed.

Children in low-resource settings with limited access to services face an even greater risk, as poor sanitary conditions, poor hygiene practices and inadequate infection control promote the spread of AMR. Further complicating this situation is limited research and data providing insights into the impact of AMR on children. It is crucial that children are not left behind in the global AMR response, which must explicitly address the specific needs and vulnerabilities of children.

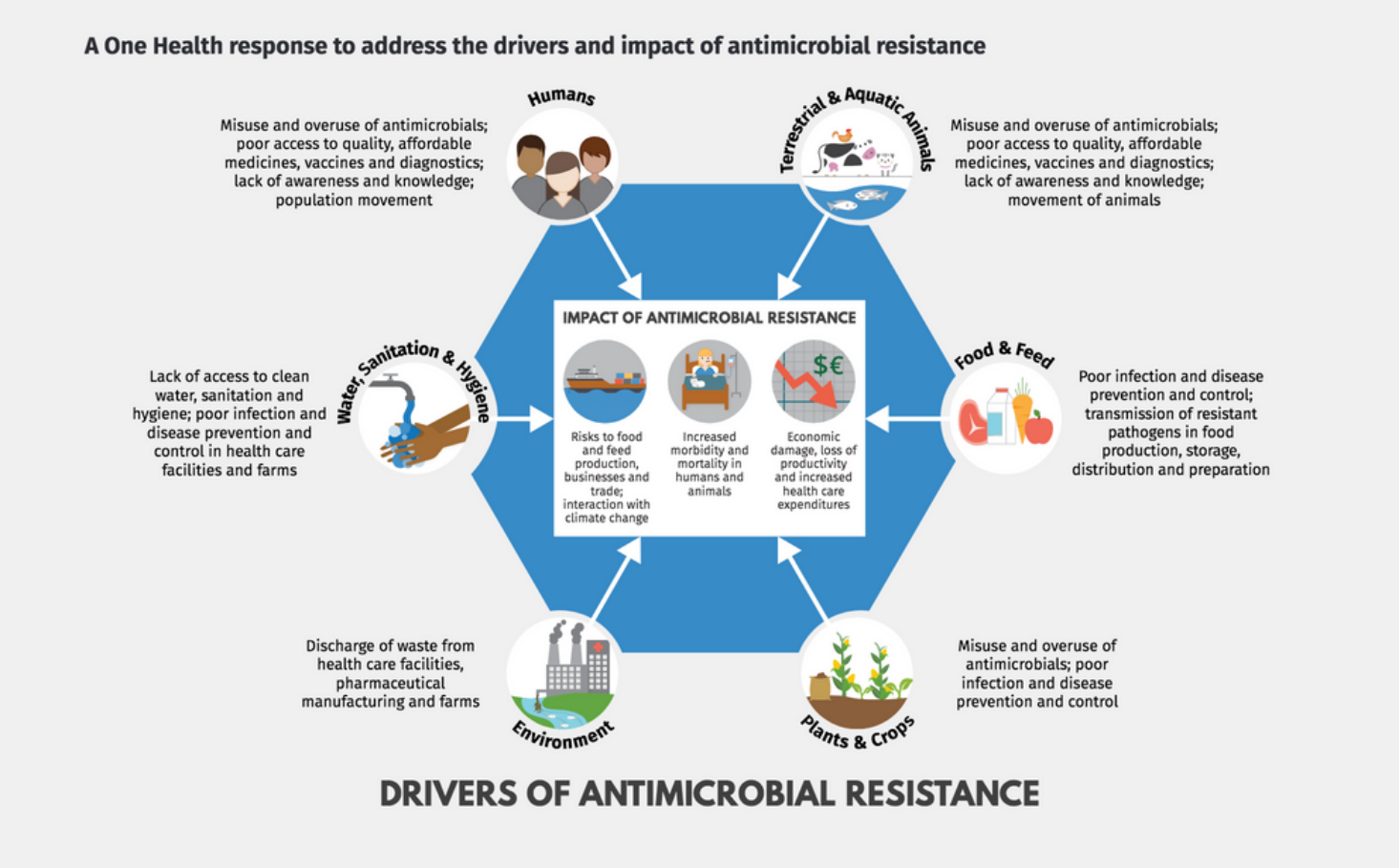


Figure 1. Drivers of Antimicrobial Resistance (AMR).[16] AMR is driven by a variety of factors across sectors. An effective response to contain the spread of AMR requires a coordinated intersectoral and multidisciplinary approach.

Excessive use is often driven by irrational prescribing, over-the-counter sales without prescriptions, and frequent unnecessary or inappropriate use (e.g., use of antibiotics against viral infections). However, it is important that the AMR response does not focus only on restricting access to antimicrobials. Access to antimicrobial drugs remains a serious challenge in low-resource settings where lack of access to antimicrobials is responsible for more deaths among children than drug-resistance. [15]

The access versus excess dilemma must be directly addressed in the global response to AMR by taking regional and national differences into account. If access to antibiotics is restricted without considering such differences, mortality among children in low- and middle-income countries (LMICs) will likely increase. It falls under UNICEF's mandate to protect the rights of children in the global AMR response by ensuring access to antimicrobials for those who need them while preventing the excessive use among those who do not need antimicrobials.

AMR is a complex and multifaceted problem that requires a coordinated, intersectoral and interdisciplinary response from UNICEF. At the frontline of the AMR response are country offices, which play a critical role in strengthening national capacities to protect children from the growing threat of AMR. Various sections and divisions at the national, regional and headquarters levels have a role to play in the response to AMR and need to work in coordination. AMR directly involves the work of Supply Division (SD), Division of Communication (DOC), Data, Research and Policy (DRP) Division, Office of Emergency Programmes (EMOPS), and Programme Division (PD), particularly Health, Immunization, HIV/AIDS, Nutrition, Water, Sanitation and Hygiene (WASH), Public Health Emergencies, and Communication for Development (C4D) teams. All are already engaged in activities directly or indirectly related to AMR, even where these activities are not explicitly labelled as such. This technical note identifies strategic areas where UNICEF is already implementing activities that contribute to the global response to AMR and outlines priority actions and activities to protect children against AMR. The implementation of such activities will position UNICEF as a global leader in the prevention and treatment of drug-resistant infections among children.

[14] World Health Organization. (n.d.) Resolutions on antimicrobial use and resistance. Retrieved from https://www.who.int/drugresistance/AMR_DC_Resolutions/en/
[15] Laxminarayan, R. (2015) Global antibiotic consumption 2000 to 2010 : an analysis of national pharmaceutical sales data. Retrieved from https://www.thelancet.com/journals/laninf/article/PIIS1473-3099(14)70780-7/fulltext
[16] World Health Organization (2019) NO TIME TO WAIT : Securing the future from drug-resistant infections. Retrieved from https://www.who.int/antimicrobial-resistance/interagency-coordination-group/final-report/en/

Box 2. Impact of AMR on achieving the Sustainable Development Goals (SDGs)[17]

AMR seriously jeopardizes the achievement of several of the SDGs:

- SDG 3: Losing effective antimicrobial drugs would seriously compromise the achievement of several targets for both communicable diseases (e.g., pneumonia, sepsis), conditions associated with non-communicable diseases (e.g., complications of diabetes) and lifesaving medical procedures (e.g., surgery, cancer treatment, organ transplantation, complicated deliveries, treatment of preterm babies).

- SDG 2: The misuse of antibiotics in agriculture, particularly food-producing animals, threatens the food security and the livelihood of farmers.

- SDG 8: Economic growth is strongly linked to the achievement of many of the SDGs and can be undermined by AMR through increased treatment costs which use up limited resources and decrease economic productivity through increased morbidity and mortality.

- SDG 5 and SDG 10: Like most infectious diseases, AMR impacts different groups differently. The impact of drug-resistant infections on socially and economically vulnerable individuals and groups – including women, children, migrants and refugees – risks exacerbating existing inequalities within societies.

- SDG 6, SDG 14 and SDG 15: Resistant bacteria can contaminate soil and water sources used by humans and animals and spread into the environment through untreated waste or sewage, or through wastewater treatment facilities that are incapable of removing them from the wastewater.

Incorporating a systems approach to keep antimicrobial drugs effective for treating infectious diseases in both humans and animals will be critical to achieving the SDGs.

[17] ReAct Group (2019) When the Drugs Don't Work : Antibiotic Resistance as a Global Development Problem. Retrieved from https://www.reactgroup.org/wp-content/uploads/2019/02/When-the-Drugs-Don%E2%80%99t-Work-Antibiotic-Resistance-as-a-Global-Development-Problem-Feb-2019.pdf

HARNESSING UNICEF'S STRENGTHS FOR THE GLOBAL RESPONSE TO AMR

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Many solutions are required to stem the tide of AMR, spanning disciplines and sectors under a One Health approach. Building on its core values and commitments, UNICEF can add significant value to the global AMR response by strengthening programmes that can mitigate the impact of AMR on child survival, growth and development.

Box 3. AMR in the context of International Health Regulations (IHR)

The International Health Regulations (IHR) is an instrument of international law, binding on 196 States Parties, which defines the rights and obligations of countries to report certain disease outbreaks and public health events. IHR also defines procedures for the declaration of a public health emergency of international concern (PHEIC) and issuance of corresponding temporary recommendations.

- The Public Health Emergencies team is coordinating with PD programme sections, EMOPS, health system strengthening, and regional and country offices on strengthening UNICEF's support to health security at country level by supporting member states to achieve compliance with IHR. Consultations with the aforementioned stakeholders identified four areas to increase engagement and alignment with IHR's monitoring and evaluation framework: (a) immunization (including stock pre-positioning), (b) emergency preparedness, (c) emergency response operations, and (d) risk communication. Compliance with IHR now includes measures to prevent the spread of AMR, given the threat it represents to global health security. Accordingly, two regional offices (ESARO and WCARO) have also included AMR as a priority area. UNICEF headquarters will assist regional and country offices to support member states in achieving compliance with IHR.

UNICEF has the capacity to pursue a global, multi-sectoral response to drug-resistant infections. UNICEF is present in 192 countries and territories as a leading voice and advocate for children at both national and sub-national levels, supporting governments to reach the most vulnerable and marginalized populations, especially in challenging environments and hard-to-reach communities. UNICEF is a trusted partner with a strong reputation for expertise across sectors and disciplines. These comparative advantages will allow UNICEF to pursue a multi-sectoral response to AMR.

Country Offices are at the fore front of UNICEF's work and will play a critical role in the response to AMR. Each country office carries out UNICEF's mission through a unique programme of cooperation developed with the host government. Going forward, situation reports produced at the beginning of the programme cycle should include a situation analysis of AMR in each country to identify AMR-specific and AMR-sensitive areas of work which UNICEF can support at the national level. The analysis should also uncover potential areas for future engagement where UNICEF has a comparative advantage in the national AMR response. The situation report informs the development of a five-year programme which should include practical ways to mitigate the impact of AMR on children and women. Countries which have recently completed this process without considering AMR should consider a desk review of the programme of cooperation, national action plan on AMR (where available), and national action plan for health security (where available) which countries have developed to accelerate the implementation of IHR core capacities. This desk review should identify AMR-specific and AMR-sensitive activities linked to child survival, growth and development that UNICEF can support. Country offices should also assist governments in prioritizing investments for implementation of national action plans on AMR [18] and advocate for inclusion of AMR-related activities in national plans and budgets.

Regional offices provide guidance and technical assistance to country offices to strengthen the AMR response. This includes, but it is not limited to:

- Technical assistance and information-sharing: Support implementation of the recommendations made in this technical note, collect and analyse results, and share information and lessons learned with other countries in each region and across the organization.
- Leadership: Identify areas of common concern among countries and facilitate collective solutions (e.g., data gathering and analysis of drug-resistance levels and drug consumption in children, facilitation of procurement of quality -assured antimicrobials through SD, support national campaigns to raise awareness of AMR and promote rational drug use).
- Coordination: cooperate with stakeholders across sectors as well as regional institutions and programmes to ensure that AMR activities are integrated across partners, sectors and programmes, taking into account global, regional and national priorities.

Programme Division can provide global strategic and technical direction on AMR; enhance global sectoral and cross cutting capacity related to AMR; influence global policy relating to AMR; provide technical assistance on addressing AMR to UNICEF country and field offices; shape internal AMR policy and practice through evidence capture, generation and dissemination; manage UNICEF's engagement in key global AMR programme partnerships. The Health, Immunization, HIV/AIDS, Nutrition, WASH, and C4D sections of Programme Division will play an important role in UNICEF's response to AMR.

[18] World Health Organization. (n.d.) Resolutions on antimicrobial use and resistance. Retrieved from https://www.who.int/drugresistance/AMR_DC_Resolutions/en/

Division of Communication can leverage its extensive reach and network to raise awareness, educate and advocate around AMR issues affecting children on a global scale, reaching millions of people through multiple approaches and channels, including traditional and social media, and building an enabling environment for advocacy with decision makers and national governments to strengthen policies and regulations related to AMR.

Division of Data, Research and Policy can play a key role in monitoring the spread of AMR by supporting surveillance efforts, monitoring the progress of multi-sectoral efforts to address AMR and contributing analytical support to UNICEF's response to AMR, particularly programmatic and communication efforts.

Supply Division is a global leader in the procurement and supply of quality vaccines, medicines, diagnostics and commodities to support disease prevention, diagnosis and treatment. Supply Division can work to shape markets for diagnostics and antimicrobials and engage with the industry sector to improve availability, affordability, acceptability and quality of diagnostics and antimicrobials.

Finally, **UNICEF has strong networks and strategic partnerships with UN partners, academics and research institutions** to develop, gather and analyse evidence that can inform policy on paediatric AMR.

Three main priority areas shape UNICEF's existing and future areas of engagement:

1. Reducing incidence of infection;
2. Promoting access to, and optimal use of, antimicrobials; and
3. Increasing awareness and understanding of AMR.

The following section outlines how different sectors in UNICEF can strengthen ongoing efforts, while engaging in new efforts under the umbrella of these three areas. These areas of work contribute to reaching goal areas 1, 4 and 5 of the Strategic Plan 2018 – 2020. [19] It is important to recognize that many of our existing efforts already contribute directly to the outcomes of these goals. To engage in new efforts and ensure sustainable work on AMR, it will be necessary to strengthen institutional capacities relevant for AMR such as developing skills and competencies of teams around AMR, ensuring minimum level of human resource capacity in key country offices, and investing appropriately on the implementation of programmes at scale that can lead to improve policy and programming around AMR.

[19] Laxminarayan, R. (2015) Global antibiotic consumption 2000 to 2010 : an analysis of national pharmaceutical sales data. Retrieved from https://www.thelancet.com/journals/laninf/article/PIIS1473-3099(14)70780-7/fulltext

UNICEF/UNI45471/Pirozzi

1. REDUCING THE INCIDENCE OF INFECTION

1.1 WASH

UNICEF's newborn care and quality improvement programming efforts are largely centred around improving WASH infrastructure and supplies in medical facilities and building the capacity of healthcare providers to invest in infection prevention and control as a first step to minimizing infections and preventing disease that could lead to inappropriate and unnecessary antibiotic use. UNICEF has strong partnerships with WHO and other key stakeholders to promote and advocate for increased investments in WASH infrastructure and supplies in healthcare facilities (HCFs).

Ongoing efforts

- Supporting improvements in water quality which can significantly lower the burden of childhood diarrhoeal diseases thereby reducing antibiotic consumption.
- Supporting governments to strengthen their capacities in formulation of WASH policy and practice to translate global guidance and strategies on WASH in HCFs into action across sectors.
- Improving monitoring systems by integrating WASH indicators into the health management information systems.
- Supporting development of national standards, programmatic approaches, and implementation strategies to improve the quality of WASH in HCFs.
- Improving WASH infrastructure and services in HCFs, contributing to a reduction in health facility-acquired infections.
- Supporting development of tools and quality improvement strategies to improve infection prevention and control in HCFs.
- Building capacity of healthcare providers to implement infection prevention and control as a first step to minimizing infections that could lead to inappropriate antibiotic use.
- Scaling up WASH service provision by campaigning for WASH in HCFs through Every Child Alive campaign as well as advocacy and communication materials for WASH in HCFs.
- Developing investment cases to support the scaling-up of WASH services in HCFs.
- Increasing efforts to promote hand-washing in HCFs, schools and communities, thereby preventing the spread of facility- and community-acquired infections.

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Opportunities

- Strengthen coordination and collaboration among stakeholders to improve WASH in HCFs following the UN Secretary General's Call to Action for WASH in HCFs which called on the UN family to play a collective role and for Member States to act on improving WASH in HCFs.
- Support Ministries of Health to commit to greater leadership, investment, and tracking of WASH commitments following the World Health Assembly (WHA) Resolution on WASH in HCFs. [20]
- Support further improvements in WASH services in HCFs by using global standards, core indicators and questions for monitoring WASH in HCFs, the WASH facilities improvement tool (WASHFIT), [21] and other available tools.
- Support evidence generation, advocacy and resource mobilization efforts to improve WASH in HCFs by using the WHO/UNICEF Joint Monitoring Programme Global Baseline Report for WASH in HCFs [22] and guidance provided in Practical Steps to Achieve Universal Access to Quality Care for WASH in HCFs.


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[20] World Health Organization (2015) Antimicrobial resistane national action plans. Retrieved from https://www.who.int/antimicrobial-resistance/national-action-plans/en/
[21] UNICEF, Division of Communication (2018) UNICEF Strategic Plan 2018-2021 Executive Summary. Retrieved from https://www.unicef.org/publications/files/UNICEF_Strategic_Plan_2018-2021.pdf
[22] World Health Organization (2019) Water, sanitation, and hygiene in health care facilities. Retrieved from http://apps.who.int/gb/ebwha/pdf_files/EB144/B144_CONF2Rev1-en.pdf

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1.2 C4D

C4D strategies can promote changes in behaviour that result in more rational use of antimicrobials, based on an understanding of the factors that drive the inappropriate use of antimicrobial drugs. UNICEF's ongoing C4D efforts focus on preventive practices such as vaccination, hygiene promotion, timely care-seeking, adequate nutrition and broader efforts around HIV, TB and malaria prevention, as well as curative practices such as rational drug use, adherence to, and completion of, treatments.

Ongoing efforts

- Implementing behavioural change strategies which are critical to promoting the use and maintenance of WASH infrastructure.
- Promoting the adoption of key hygiene behaviours (e.g., handwashing) in HCFs, schools and communities.
- Promoting uptake and completion of routine immunization and community acceptance of new vaccines.
- Promoting adherence to completion of antibiotic treatment for diseases such as acute respiratory infection, TB, etc.

Opportunities

- Understand the beliefs and values, the psychosocial and cultural triggers that drive antibiotic consumption and how to broaden access to quality-assured, essential antibiotics in low-resource settings.
- Support the response to adverse events following immunization to mitigate negative perceptions towards vaccination and ensure vaccine acceptance and immunization coverage.
- Integrate education and behavioural change approaches to promote appropriate use and stewardship of antimicrobial drugs at facility level.
- Coordinate public education and behaviour change around rational use of antibiotics, with particular focus on educating children and young people.
- Organize advocacy and behaviour change campaigns among service providers on rational use of antimicrobial drugs done jointly with WHO, FAO, OIE and other partners.
- Apply new behaviour change tools such as behavioural insights to addressing AMR.
- Strengthen the interpersonal communication skills of health providers and other relevant providers (e.g. pharmacists) to promote rational use of antibiotics.
- Strengthen the capacity of governments, civil society organizations and community level partners to promote rational use of antibiotics.
- Leverage C4D platforms (e.g., faith-based, community, social media/digital) as well as collaboration with relevant private sector partners (e.g. media) to promote rational use of antibiotics and preventive behaviours.

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1.3 Health

Immunization is one of the most successful and cost-effective interventions for preventing infections, the treatment of which often involves the inappropriate use of antimicrobials. UNICEF is a longstanding champion of equitable immunization coverage and is the world's largest buyer of childhood vaccines.

UNICEF supports governments with the cost and delivery of vaccines to children, introduction of new vaccines, and investments in supply chains.

Ongoing efforts

- Supporting financing and equitable immunization coverage through procurement of childhood vaccines.
- Increasing the equitable coverage of all vaccines to prevent infectious diseases that could lead to inappropriate or excessive antimicrobial use.
- Supporting governments to meet the cost of procurement cost and delivery of vaccines to children, to promote uptake of new and underused vaccines (e.g., PCV, HPV, Rota, YF, Men, Measles 2nd dose), and to make investments in supply chains.
- Supporting countries experiencing vaccine-preventable disease outbreaks and during humanitarian responses.
- Strengthening sustainability of immunization programmes.
- Endorsing the systematic and exclusive use of auto-disable syringes for the delivery of vaccines and reuse prevention syringes for the reconstitution of vaccines during routine immunization services and mass vaccination campaigns.

Opportunities

- Strengthen the use of global and country level evidence for monitoring, planning and implementation of vaccination programmes.
- Strengthen implementation research aimed at increasing access to, and uptake of, vaccination, reducing inequities, and achieving national and global coverage targets.
- Tailor vaccination services to meet the needs of different communities and population groups.
- Strengthen community linkages and involvement in vaccination service provision.
- Support introduction of new vaccines (e.g., PCV and Rota) while enhancing systems to deliver traditional vaccines (e.g., Hib/Penta, measles and rotavirus, diphtheria, pertussis, tetanus and meningitis, typhoid) to reduce the burden of disease and consequent antimicrobial use.
- Support supplementary immunization campaigns and outbreak response.
- Improve affordability of vaccines through pooled procurement services, market shaping, and efforts to reduce vaccine costs by Supply Division, especially for middle income countries.
- Leverage Gavi, Bill & Melinda Gates Foundation and US Centers for Disease Control investments, together with other collaborations, to enhance the contribution of immunization to addressing AMR (e.g., advocating for resources in Gavi 5.0).

1.3 Health

Child and Community Health delivers a suite of multi-sectoral integrated programmes ranging from immunization and nutritional supplementation to the prevention and management of key causes of child morbidity and mortality.

Ongoing efforts

- Supporting scale up of integrated management of newborn and childhood illness (IMNCI) in health facilities and integrated community case management (iCCM) to reduce major causes of child mortality (due to pneumonia, diarrhoea, malaria, severe acute malnutrition, newborn infections and other causes such as tuberculosis and HIV).
- Supporting evidence generation and dissemination around innovative approaches to improve the diagnosis and care of infectious diseases including pneumonia, HIV, malaria in the context of fever management as well as early infant diagnosis of HIV to guide appropriate diagnosis and rational use of drugs.

Opportunities

- Conduct a review to identify key drivers of inappropriate antimicrobial consumption, the role of supply chain and distribution, non-physicians as competent antibiotic prescribers, the degree to which promotive and preventative interventions reduce the need for antibiotics, and effective methods for implementing stewardship programs in LMICs that do not restrict antibiotics from children who need them.
- Support private sector providers to ensure adherence to management and treatment guidelines, recognizing the increased availability and uptake of private services across regions.
- Encourage national health authorities, including regulators, to ensure that national guidelines and essential medicines lists are aligned with WHO recommendations, notably the "AWaRe" (Access, Watch, Reserve) categorization of antibiotics [23] in the Essential Medicines List for Children. [24, 25]

An effective response to AMR must be supported by appropriate investments in health systems, including appropriate policies, levels of funding, governance, human resources, procurement and supplies management, and data and information management.

[23] World Health Organization (2018) Classifying antibiotics in the WHO Essential Medicines List for optimal use – be AWaRe. Retrieved from http://apps.who.int/medicinedocs/documents/s23413en/s23413en.pdf
[24] World Health Organization (2017) 20th Essential Medicines List. Retrieved from https://www.who.int/medicines/news/2017/20th_essential_med-list/en/
[25] World Health Organization (2017) WHO Model List of Essential Medicines for Children. Retrieved from https://www.who.int/medicines/publications/essentialmedicines/6th_EMLc2017.pdf?ua=1

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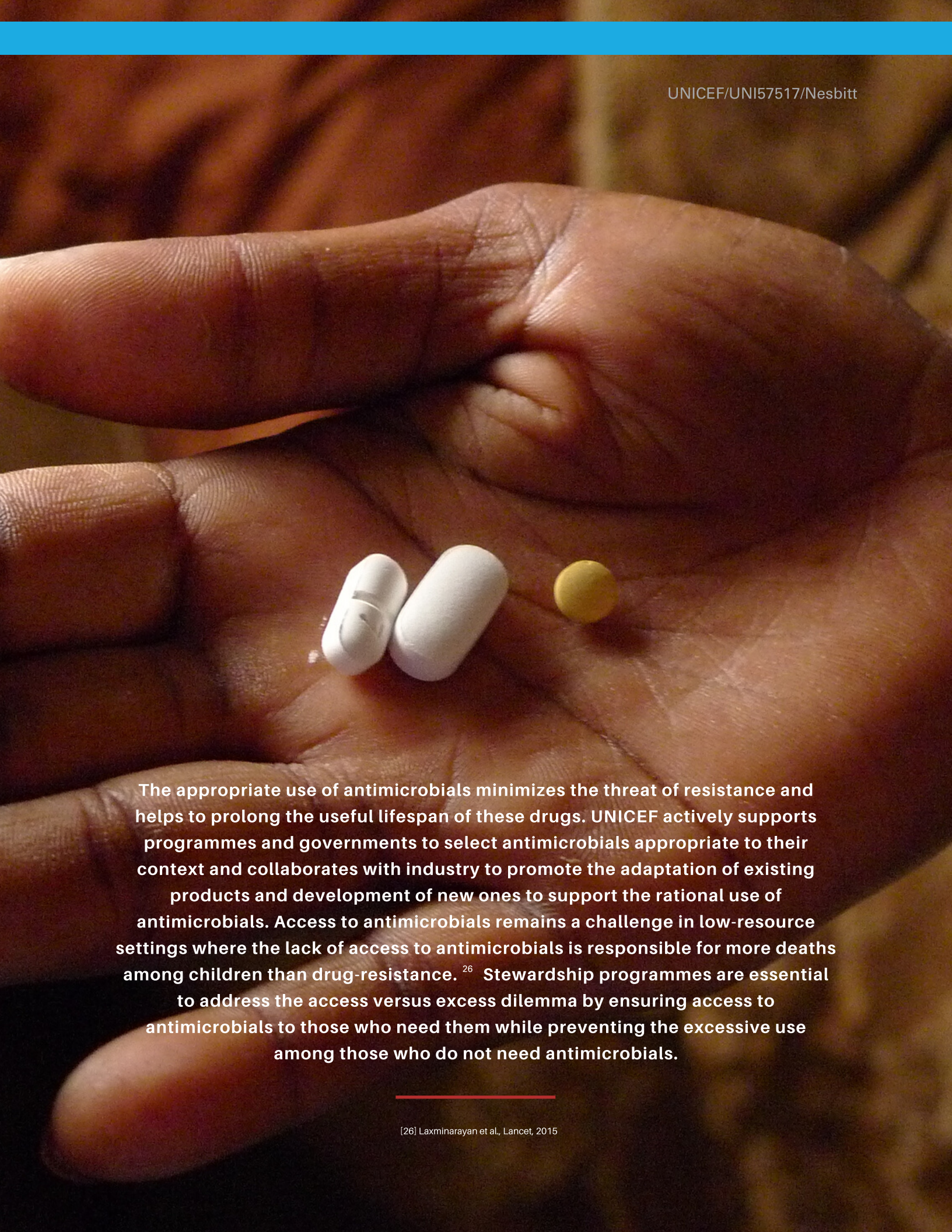
2. PROMOTING ACCESS TO AND OPTIMAL USE OF ANTIMICROBIAL AGENTS



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The appropriate use of antimicrobials minimizes the threat of resistance and helps to prolong the useful lifespan of these drugs. UNICEF actively supports programmes and governments to select antimicrobials appropriate to their context and collaborates with industry to promote the adaptation of existing products and development of new ones to support the rational use of antimicrobials. Access to antimicrobials remains a challenge in low-resource settings where the lack of access to antimicrobials is responsible for more deaths among children than drug-resistance. [26] Stewardship programmes are essential to address the access versus excess dilemma by ensuring access to antimicrobials to those who need them while preventing the excessive use among those who do not need antimicrobials.

[26] Laxminarayan et al., Lancet, 2015

2.1 Supply Division

Ongoing efforts

Development and procurement of antimicrobials

- Supporting product selection, procurement and delivery to the frontline of quality-assured essential diagnostics and antimicrobials for childhood conditions.
- Working with industry to encourage development of products and packaging adaptations, including paediatric formulations, that respond to the unmet needs of children and promote appropriate use of antimicrobials.
- Working with industry and partners to address market failures that lead to shortages of antimicrobials.

Improved diagnosis of childhood illness

- Supporting development and scale-up of diagnostics (e.g., rapid diagnostic tests, acute respiratory infection diagnostic aids) to improve diagnosis and guide clinical management of childhood illness, which encourages more rational use of antimicrobials both in community and facility levels.
- Working towards improved access to diagnostics and medicines for several conditions with emerging or existing antimicrobial drug resistance.

Opportunities

- Facilitate collaborations with developers and suppliers of products for prevention, diagnosis and treatment of infectious diseases affected by AMR.
- Ensure availability of quality assured diagnostics and antimicrobials through UNICEF's procurement mechanism.
- Support introduction and scale up of new products (e.g., vaccines, diagnostics) in LMICs appropriate for low-resource settings and paediatric formulations of new antimicrobials, as they become available.
- Coordinate with other pooled procurement and/or funding mechanisms (e.g., GDF, The Global Fund, USAID, PEPFAR) to improve access to antimicrobials for those who need them while supporting policies, regulatory frameworks, supply chain and programmatic interventions to prevent their irrational use.
- Work with industry and partners to ensure supply security, access to and preservation of existing antibiotics through development of healthy markets, promoting stewardship, public health oriented marketing and distribution practices, and adaptations of packaging and instruction materials to facilitate rational use.
- Encourage industry to ensure responsible disposal of antibiotic manufacturing waste, including through UNICEF's procurement mechanisms and upgrades to manufacturing facilities.
- Advocate for appropriate disposal and waste management of contaminated waste and antimicrobials at health facility level.
- Support procurement, introduction and scale up of new portable devices and technologies (e.g., infrared scanners) for detection of low standard and counterfeit antimicrobials.
- Incentivize development of innovative point-of-care AMR diagnostic technologies.

2.2 HIV/AIDS

The HIV and AIDS programme is dedicated to preventing and treating HIV among women, children, and adolescents, especially the most marginalized. The programme is focused on eliminating mother-to-child transmission of HIV, closing the treatment gap between mothers and children and preventing HIV in adolescents – including through the use of pre-exposure antiretroviral prophylaxis (PrEP). All of these interventions have an impact on the emergence and spread of resistance to antimicrobials including antiretroviral drugs and drugs used to treat opportunistic infections (e.g., fungicides, antibiotics), which will jeopardize the scale up of antiretroviral therapy and options to treat opportunistic infections, respectively.

Ongoing efforts

- Supporting the scaling up of national delivery of lifelong antiretroviral treatment to pregnant and lactating women living with HIV for the prevention of mother to child transmission (PMTCT) of HIV, in order to eliminate new HIV infections among children.
- Accelerating access to virologic HIV testing in infants by introducing innovative point-of-care HIV diagnostic technologies and strengthening auxiliary health and laboratory systems that support point-of-care technologies.
- Improving access to drug adherence counselling and viral load monitoring in children, adolescents and mothers in order to prevent and detect treatment failure early and thereby minimize the development of HIV drug-resistance.
- Facilitating timely transition to second-line treatment regimens upon detection of treatment failure to preserve existing antiretrovirals and prevent the spread of HIV drug resistant strains.
- Promoting use of child-friendly formulations of lopinavir and Dolutegravir in order to decrease use of Nevirapine in infants due to high levels of resistance.
- Promoting increased access to adolescent-friendly therapies that promote adherence and reduce the emergence of HIV drug resistance.
- Working with industry regulators and policy makers to ensure that there is a pipeline of new antiretroviral drugs which provide better options for children and adolescents.

Opportunities

- Engage partners, including civil society, to implement country-level communication strategies to improve understanding and awareness of the risk of HIV drug resistance at all levels.
- Strengthen awareness of the risk of HIV drug resistance among health-care workers and improve quality of ART service delivery to prevent emergence of resistance. [27]

[27] World Health Organization (2017). Adapted from Global Action Plan on HIV Drug Resistance 2017-2021. Retrieved from https://apps.who.int/iris/bitstream/handle/10665/255883/9789241512848-eng.pdf?sequence=1

- Build HIV drug resistance language into all relevant technical material, guidance documents and tools.Support adoption of service delivery models within a “treat all” strategy to ensure uninterrupted ARV drug supply, and maximize retention in care and adherence to treatment, particularly in vulnerable groups such as adolescents, pregnant and breastfeeding women, and key populations.
- Support the expansion of coverage, quality and use of viral load testing, including the roll out of point-of-care diagnostic technologies, and strengthen literacy of health-care workers on how to interpret viral load results.
- Support country participation in HIV drug resistance testing programmes for control and surveillance of HIV drug resistance.
- Support demand creation for viral load testing and drug resistance testing (where applicable) among people living with HIV, families and nongovernmental organizations, and ensure clinicians and programmes respond to this demand.

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2.3 Health

Expanding access to antimicrobials and diagnostics: Access to antimicrobials and diagnostics remains a serious challenge in low-resource settings. Many more children die in LMICs from lack of access to antimicrobials than from drug-resistant infections. Weak diagnostic capacity leads to inappropriate use of such drugs and the subsequent emergence and spread of AMR.

Ongoing efforts

- Advocating for an effective enabling environment for child health, including supportive policies (such as allowing treatment at the community level, and seeking to achieve universal health coverage), improved technical and governance capacity, financing mechanisms, and community mobilization.
- Promoting investments in human resources for health and expanding coverage of institutionalized community health programmes that promote the appropriate use of quality-assured medicines through implementation of IMNCI/iCCM guidelines.
- Supporting efforts to close major gaps in case-detection, prevention and treatment for childhood TB and drug-resistant TB through decentralized service delivery models and integrated, child- and family-centred approaches.
- Collaborating closely with WHO and partners to promote the rapid uptake of new, child-friendly treatments for TB and drug-resistant TB, and to ensure that research and development efforts target the needs of children.
- Coordinating efforts to promote appropriate management of malaria cases, from appropriate diagnosis of malaria to improved administration of antimalarials and antibiotics within the context of holistic management of the febrile child at community level.

Opportunities

- Support national governments to strengthen their community health systems, including capacity building of community health workers to deliver an integrated package of preventive, promotive and basic curative services.
- Scale up iCCM, including in emergency and humanitarian settings.
- Support capacity building to improve quality of care (e.g., proper use of diagnostics, changes in prescribing practices and patient flow within health facilities through stewardship committees).
- Support quality improvements to IMNCI implementation.
- Improve supply chain performance to ensure availability of drugs and commodities at the frontline.
- Improving the rational use of antimicrobial drugs.

- Support local adaptation of the Essential Medicines List for Children [28, 29] and stewardship programmes that apply the AWaRe categorization of antibiotics [30] to ensure access to antibiotics in the Access category but prevent the excessive use of Watch and Reserve antibiotics throughout the healthcare delivery system.
- Provide technical support for development and implementation of national AMR action plans, linking them as appropriate to maternal, newborn and child health programmes and ensuring these are prioritized in both surveillance and policy changes.
- Support national governments to set up AMR surveillance sentinel sites to monitor the magnitude of the problem and inform appropriate and timely interventions.
- Evaluate interventions aimed at decreasing inappropriate use and improving the rational use of antimicrobial drugs.

[28] World Health Organization (2017) 20th Essential Medicines List. Retrieved from https://www.who.int/medicines/news/2017/20th_essential_med-list/en/
[29] World Health Organization (2017) WHO Model List of Essential Medicines for Children. Retrieved from https://www.who.int/medicines/publications/essentialmedicines/6th_EMLc2017.pdf?ua=1
[30] World Health Organization (2018) Classifying antibiotics in the WHO Essential Medicines List for optimal use – be AWaRe. Retrieved from http://apps.who.int/medicinedocs/documents/s23413en/s23413en.pdf

3. INCREASING AWARENESS AND UNDERSTANDING OF AMR

UNICEF/UNI137359/Nesbitt

3.1 C4D and DOC

Improving awareness and understanding of AMR through effective communication, education and training is necessary to catalyse social engagement and positive behavioural change.

Ongoing efforts

- Supporting preventive practices such as vaccination, hygiene promotion, timely care-seeking, adequate nutrition and specific efforts around HIV, TB and malaria prevention, as well as curative practices such as rational drug use, adherence to and completion of treatments.

Opportunities

- Develop a global advocacy and communication strategy to increase awareness of AMR and achieve policy and programmatic change.
- Develop an internal AMR communications strategy to catalyse institutional momentum, which paves the way for increased collaboration, campaigns and funding.
- Support large scale national and sub-national public health education on rational use of antibiotics, especially in countries where antimicrobial drugs are widely prescribed or available over the counter.
- Support education of communities and families about the consequences of AMR, self-medication and irrational drug use.
- Support community level actions to generate demand for quality services by community health workers and at primary care facilities.
- Engage health care providers to increase awareness of AMR in paediatric populations and promote optimal drug use.
- Engage community health workers and other community-based agents in supporting rational drug use.
- Ensure that country-level efforts are tailored to national contexts (e.g., increasing appropriate access to antimicrobials in LMICs, increasing regulation to restrict inappropriate access to antimicrobials in high-income countries).
- Develop an AMR communications package that is easily accessible and shareable by country and regional offices that includes succinct key messages, talking points, priority actions, scientific knowledge and impactful data.

AMR Financing

In spite of mounting evidence on the impact of AMR, multiple calls for action, and extensive guidance on interventions to combat AMR, funding has remained inadequate at all levels. Additional resources are essential to support global governance and technical collaboration, increase awareness of AMR, develop and implement national action plans on AMR, accelerate country level capacity building, implement programmatic interventions, foster research and development, and ensure access to new and existing vaccines, diagnostics and antimicrobial drugs. In addition to being one of the most serious threats to global health of this generation, AMR is also an economic and security threat which cannot be contained without additional resources.

Governments, industry, donors, aid agencies, international financial institutions, implementing partners, non-governmental organizations, civil society organizations and other relevant stakeholders should continue to work together to identify opportunities for adequate and sustainable global, national and local mechanisms to finance a long-term response to AMR.

AMR is relevant to a wide variety of global financing mechanisms and significant funding is already allocated to support AMR-sensitive activities (e.g., vaccination, hand washing in HCFs). A lot more can be done within the existing health and sustainable development architecture to review financing portfolios, health policies and strategies, and development priorities and programmes through an AMR lens. For example, WASH, health systems strengthening, immunization, nutrition, education, HIV/AIDS, communication and advocacy have established funding streams that could be leveraged to strengthen activities relevant to AMR. Likewise, the universal health coverage (UHC) framework provides a range of opportunities to reinforce AMR prevention and mitigation efforts. UHC can serve as an enabling platform to advance the AMR response through expanded coverage of vaccination, preventative care and hygiene measures that reduce the burden of disease and demand for antimicrobials. UHC can also improve health professional training and antibiotic stewardship, access to quality medicines, and surveillance, all of which contribute to the rational use of antimicrobials.

Given the intersectoral and multidisciplinary nature of AMR, it must be tackled on multiple fronts using various channels and through activities implemented at different levels. This complexity creates funding opportunities across various sectors, from public and private sources. For example, since AMR affects a broad spectrum of infectious diseases that could cause outbreaks with epidemic and pandemic potential, funds may be raised for AMR-related activities through public health emergency preparedness (PHEP) and global health security agenda (GHSA) [31] frameworks. Countries may be able to leverage AMR investments by voluntarily participating in the WHO's Joint External Evaluation (JEE) [32] to assess their capacity to prevent, detect and rapidly respond to public health risks, which are required for compliance with International Health Regulations (IHR, 2005). Under the legally binding IHR, countries are obliged to develop and maintain minimum capacities in specific areas that offer a global health security risk, including AMR.

[31] Global Health Security Agenda (2019). Retrieved from https://www.ghsagenda.org/
[32] Global Health Security Agenda (2019). Assessments & JEE. Retrieved from https://www.ghsagenda.org/assessments

Other potential sources of funding include:

- The US President's Emergency Fund for AIDS Relief (PEPFAR) supports HIV programmes in LMICs as well as programming for other health conditions such as TB diagnosis, prevention and treatment in the context of HIV. [33]
- The Global Fund [34] and Unitaid [35] have a vital interest in preventing the emergence and spread of AMR as it represents a serious threat to the prevention, control and treatment of HIV, TB and Malaria.
- Gavi's support to strengthening health and immunization systems is critical to preventing infections whose treatment could involve the unnecessary and inappropriate use of antimicrobials. [36]
- The Fleming Fund supports LMICs to improve laboratory capacity for detection and surveillance of AMR. [37]
- The Global Financing Facility for Women, Children and Adolescents (GFF) helps governments in LMICs prioritize and finance activities to support the health and nutrition of their populations. [38] The GFF Trust Fund acts as a catalyst for financing to significantly mobilize additional domestic resources alongside World Bank financing (IDA [39] and IBRD [40]), aligned with external, private sector and concessional financing. [41] The World Bank has committed to placing greater emphasis on AMR in its work on health systems emergency preparedness and resilience. In particular, the World Bank's International Working Group on Financing Preparedness has called on national governments to incorporate the private sector into their emergency preparedness strategies, including private investments in mitigating the impact of AMR if their business contributes directly or indirectly to it. [42]
- The World Bank Human Capital Initiative, [43] which promotes rapid progress towards a world in which all children arrive in school well-nourished and ready to learn, can expect to attain real learning in the classroom, and are able to enter the job market as healthy, skilled, and productive adults.
- Other bilateral aid agencies that support AMR-related initiatives include the United Kingdom's Department of International Development (DFID) [44] and the Japan International Cooperation Agency (JICA). [45]

[33] The United States President's Emergency Plan for AIDS Relief (n.d) Countries. Retrieved from https://www.pepfar.gov/countries/
[34] The Global Fund (2019) Focus On Global Health Security. Retrieved from https://www.theglobalfund.org/media/7318/publication_globalhealthsecurity_focuson_en.pdf
[35] UnitAid (2019) UNITAID's work in AMR. Retrieved from https://unitaid.org/assets/Unitaid-AMR-factsheet-2017.pdf
[36] GAVI (n.d.) Health system and immunisation strenghtening. Retrieved from https://www.gavi.org/support/hss/
[37] The Fleming Fund (2019). Retrieved from organizational website https://www.flemingfund.org/
[38] Global Financing Facility Introduction. Retrieved from https://www.globalfinancingfacility.org/introduction
[39] International Development Association Introduction. Retrieved from http://ida.worldbank.org/about/what-is-ida
[40] The World Bank Introduction. Retrieved from https://www.worldbank.org/en/who-we-are/ibrd
[41] World Bank Group Finances. Retrieved from https://financesapp.worldbank.org/en/summaries/ibrd-ida/
[42] The World Bank (2017) Drug-Resistant Infections : A Threat to Our Economic Future. Retrieved from http://www.worldbank.org/en/topic/health/publication/drug-resistant-infections-a-threat-to-our-economic-future
[43] The World Bank (2018) The Human Capital Project. Retrieved from http://pubdocs.worldbank.org/en/228051531311025044/HCI-Sept-2018-website.pdf
[44] Independent Commission for Aid Impact (2018) The UK aid response to global health threats. Retrieved from https://icai.independent.gov.uk/wp-content/uploads/GHT-review_final.pdf
[45] JICA (2013) JICA's Operation in Health Sector – Present and Future. Retrieved from https://www.jica.go.jp/english/our_work/thematic_issues/health/c8h0vm00005zn19g-att/position_paper.pdf

To increase funding for AMR-related activities at the national level, governments and their development partners, including multisectoral development banks, need to understand the financial implications of AMR-related activities. As a starting point, governments need to map the prevalence and types of AMR (e.g., diseases and antimicrobial drugs affected), as well as morbidity and mortality attributed to AMR, and estimate the cost of tackling AMR and what can be achieved. [46] This information can be used to apply an AMR lens to domestic budgets and current sources of international health and development funding to identify opportunities that can have a direct and indirect impact on AMR. To engage ministries of finance and ensure AMR is included in national budgets and planning cycles, national AMR investment cases should include costing of national AMR plans, highlight costs of inaction, outline what can be achieved and the corresponding return on investment, and emphasize the impact of AMR on achieving the SDGs (Box 2).

UNICEF country offices should support governments in assessing and prioritizing investment needs for implementation of national action plans on AMR [47] and advocate for governments to make their own financial commitments to AMR targets by including AMR-related activities in national plans and budgets. To increase sustainability, AMR activities and funding should be integrated into broader health and development programmes and finance mechanisms (e.g., health systems strengthening).

The IACG has emphasized the need for increased investment in the global response to AMR. [48] It has urged existing and future financing mechanisms for human, animal and plant health, food production and the environment, to give AMR greater priority in their resource allocations. The IACG also emphasizes that efforts to leverage resources within existing funding mechanisms must be supported by effective global, regional and national governance and coordination mechanisms to help direct limited resources to agreed priorities and goals across the One Health spectrum. UNICEF should advocate for stronger governance mechanisms at all levels of the AMR response and ensure strong coordination with other stakeholders to maximize the impact of interventions aimed at addressing the growing threat of AMR in children.

[46] ReAct Group (2018) Antimicrobial resistance and sustainable development : A planetary threat but a financing orphan. Retrieved from https://www.reactgroup.org/wp-content/uploads/2018/12/Antimicrobial-resistance-and-sustainable-development-A-planetary-threat-but-a-financing-orphan-ReAct-DHF-December-2018.pdf

[47] World Health Organization (2015) Antimicrobial resistane national action plans. Retrieved from https://www.who.int/antimicrobial-resistance/national-action-plans/en/

[48] World Health Organization (2019) UN Interagency Coordination Group (IACG) on Antimicrobial Resistance. Retrieved from https://www.who.int/antimicrobial-resistance/interagency-coordination-group/en/

UNICEF's Role in the Global Response to Antimicrobial Resistance:
Identifying Current Efforts and Scope for Future Action

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for every child

Reduce incidence of infection

Preventing the spread of disease reduces the incidence of infections and minimises the need for antimicrobial agents.

WASH | C4D | Health

Community acquired infections:
This is done through creating a healthy environment and reduced exposure to pathogens, assisted births and clean deliveries, early and exclusive breastfeeding and appropriate complementary feeding practices, and immunization.

UNICEF has expertise and programming related to all of these critical aspects of disease prevention and control.

Facility acquired infections:
UNICEF's newborn care and quality improvement efforts are largely centred around strengthening WASH infrastructure in healthcare facilities and building the capacity of healthcare providers to rely on infection control as an alternative to inappropriate antibiotic use.

Currently, rates of hospital infection and routine use of antibiotics are monitored within sick newborn care units to gauge progress in quality of care.

Additionally, behaviour change strategies are a key component of UNICEF's C4D interventions to promote the use and maintenance of WASH infrastructure and the adoption of key hygiene behaviours such as handwashing, in facilities and communities.

Immunization:
UNICEF is a longstanding champion of equitable immunization coverage and is the world's largest buyer of childhood vaccines. UNICEF supports governments with the cost and delivery of vaccines to children, introduction of new vaccines, and investments in supply chains. Immunization, one of the most successful and cost-effective interventions for promoting child health and survival, can prevent infections and reduce the need for antimicrobials.

Community Health:
UNICEF delivers multi-sectoral integrated programming to deliver a suite of life-saving interventions for children, ranging from immunization and nutritional supplementation to the prevention and management of key causes of child morbidity and mortality to immunization to nut ritional supplementation.

UN
ICEF supports the scale up of integrated ma agement of childhood illness (IMCI) in health fa ilities and Integrated Community Case Ma agement (iCCM) to reduce major causes of ch ld mortality

Next steps

Improve collaboration with developers and suppliers of products for the prevention, diagnosis and treatment of infectious diseases. This includes developing new products (vaccines, diagnostics appropriate for low-resource settings and pediatric formulations of new antimicrobials) and ensuring that when they are brought to market, LMICs have access to them.

Expand access to antimicrobials to those who need them while preventing excess and irrational use, support national governments to strengthen their community health systems. In addition, UNICEF will redouble its focus on hand-washing in HCFs to prevent the spread of facility-acquired infections.

Promote access to and optimal use of antimicrobials

Access remains a serious challenge in low-resource settings. Many more children die in LMICs from lack of access to antimicrobials than from drug resistance.

SD | HIV/AIDS | Health

Expanding access to antimicrobials:
UNICEF advocates for an effective enabling environment for child health, including supportive policies (such as allowing treatment at the community level, and universal health coverage); improved technical and governance capacity; financing mechanisms; and community mobilization.

UNICEF promotes investments in human resou rces for health and is involved in global effor ts to expand coverage of institutionalised commu nity health programmes that promote the appro priate use of quality-assured medicines, throu gh ensuring implementation fidelity of IMCI/ ICCM guidelines. And UNICEF supports the procu rement and delivery of essential medicines, inclu ding life-saving antibiotics and antimalarials, for c hildhood conditions down to the frontline.

Development and procurement of antimicrobials:
UNICEF also engages with the pharmaceutical industry to develop child-friendly drug delivery mechanisms, supporting the selection of easy-to-use formulations. The reduction in complexity of dosing and reduction in pill (or liquid) burden promotes adherence to a full course, which improves treatment adherence and reduces the emergence and spread of drug-resistance.

UNICEF is involved in the procurement of antimicrobials such as paediatric antiretrovirals (ARVs) and Amoxicillin dispersible tablets on behalf of over 30 and 45 countries, respectively. UNICEF works with suppliers to encourage product and packaging adaptations, including paediatric formulations, that respond to the unmet needs of children and promote appropriate use of antimicrobials.

Improved diagnosis of childhood illness:
UNICEF supports the development and scale-up of tools to improve diagnosis and targeted treatment of childhood illness. For example, the use of Rapid Diagnostic Tests (RDTs) and acute respiratory infection timers helps health workers to differentiate between malaria and pneumonia and guide clinical management. The development of improved fever diagnostic tools, promoted by UNICEF, will enable differentiation between viral, bacterial/mycobacterial infections.

Such innovations will enable more appropriate management and rational use of drugs both in the community and at facility level. However, the availability of diagnostics needs to be accompanied by supervision, capacity building and overall attention to quality of care. For example, diagnostics may not change prescribing practices unless accompanied by training and changes in patient flow within health facilities.

UNICEF advocates for improved access to diagnostics and treatment for several conditions with emerging or existing drug resistance, for example:

HIV

- Scaling up national programmes for the prevention of mother to child transmission to eliminate new HIV infections among children.
- Acclerating access to innovative point-of-care HIV diagnostic technologies for early infant diagnosis and viral load testing.

Tuberculosis

- Closing major gaps in case-detection, prevention and treatment for childhood TB and drug-resistant TB through decentralised service delivery models and integrated, child- and family-centred approaches.
- Promotes the rapid uptake of new, child-friendly treatments for TB and drug-resistant TB.
- Promote R&D efforts that target the needs of children.

Malaria

- Promoting appropriate management of malaria cases, starting with appropriate diagnosis of malaria infection.
- Supporting the improved administration of antimalarials and antibiotics within the context of holistic management of the febrile child at community level.

Increase awareness & understanding

Improving awareness through effective communication, education and training is necessary to catalyse social engagement and positive behavioural change.

C4D | DOC

UNICEF's ongoing C4D work focuses on preventive practices such as vaccination, hygiene promotion, timely care-seeking, adequate nutrition and specific efforts around HIV, TB and malaria prevention, as well as curative practices such as rational drug use, adherence to and completion of treatments.

Next steps

Support large scale national and sub-national public health education on rational use of antibiotics, especially in countries where drugs could be easily purchased over the counter at local pharmacies or are widely prescribed. This would be a multi-pronged C4D strategy.

Develop a global advocacy and communication strategy around increasing awareness of AMR amongst decision makers, service providers and the wider public. Communications efforts around AMR will be developed with concrete advocacy objectives to achieve tangible programmatic and policy change. An internal communications strategy is also crucial to catalyse institutional momentum, which paves the way for increased collaboration, campaigns and funding.

Speak with a clear voice (through global AMR response coordination mechanisms and to the general public) to ensure that country level efforts are tailored to national contexts.

Engage in country level support to the implementation of national AMR action plans.

Through operational and implementation research, UNICEF will assess country programming to identify, for example, the key drivers of inappropriate antimicrobial consumption, the role of supply chain and distribution, non physicians as competent antibiotic prescribers, the degree to which preventative interventions (e.g. immunisation) reduce the need for antibiotics, and effective methods for implementing stewardship programs in LMICs that do not restrict antibiotics from children who need them.

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