DNDi
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Drugs for Neglected Diseases initiative (DNDi)

Briefing note for the 156th Session of the WHO Executive Board

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Overview

The Drugs for Neglected Diseases initiative (DNDi) is a not-for-profit research and development (R&D) organization, in official relations with the World Health Organization (WHO), that discovers, develops, and delivers new treatments for neglected patients. Since our creation in 2003 by public research institutions in Brazil, France, India, Kenya, and Malaysia, Médecins Sans Frontières (MSF), and WHO TDR, we have developed 13 new and improved treatments for six deadly diseases that have saved millions of lives – utilizing an alternative, collaborative, not-for-profit R&D model.

In partnership with WHO, DNDi jointly established the Global Antibiotic Research and Development Partnership (GARDP), now an independent organization playing an essential role in its work with Member States to deliver on the Global Action Plan on Antimicrobial Resistance. DNDi is also a member of the Global Accelerator for Paediatric Formulations Network (GAP-f), which promotes innovation of and access to quality, safe, efficacious, and affordable medicines for children.

This briefing note sets out DNDi's comments for consideration by the WHO Executive Board on the following agenda items:

- **Agenda item 6:** Universal health coverage
- **Agenda item 9:** Communicable diseases
- **Agenda item 14:** Global Strategy for Women's, Children's and Adolescents' Health
- **Agenda item 22:** Climate change and health

Agenda item 6: Universal Health Coverage

DNDi welcomes the Director General's Report on Universal Health Coverage (UHC). We ask Member States to take note of the following issues while preparing for the high-level meeting on UHC in 2027.

1. R&D can support achievement of UHC

Access to appropriate, affordable health tools is a key component of achieving UHC. Yet, despite some progress in recent decades, too many patients still lack access to adequate treatment, diagnostics, and vaccines – across numerous diseases.

The true test of UHC is the extent to which it reaches and addresses the needs of vulnerable populations – for example, communities affected by neglected tropical diseases (NTDs), a diverse group of 21 diseases that cause substantial illness for 1.62 billion people globally, mostly in vulnerable and marginalized communities. For many of these diseases, existing treatments are ineffective, unsafe, unavailable, or unaffordable. In some cases, treatments have never been developed at all. Too often, existing health tools for neglected diseases have serious limitations that hamper the provision of care, cause catastrophic health expenditure, and impede disease control and elimination. This is the case, for example, for mycetoma, leishmaniasis, Chagas disease, and onchocerciasis (river blindness). Countries are off track to meet the 90% reduction target for all NTDs by 2030.

Research and development can support UHC by delivering safe, effective, affordable health tools adapted to patient needs and **designed from the start to be used the at primary healthcare level, close to the affected communities – reducing the need for specialist intervention in hospital settings. This reduces complexity and cost, not only for patients and families but also for health systems.**

Oral treatments and simpler diagnostic tests are such examples. DNDi and its partners have developed the first all-oral treatment for sleeping sickness, which eliminates the need for systematic hospitalization and treatment requiring injections. DNDi and its partners have also developed safer and shorter treatments for visceral leishmaniasis using existing drugs. Previously, patients had to endure two painful daily injections and remain hospitalized for the full 17-day treatment period. Avoiding or limiting hospitalization can be critically important for vulnerable people, including those with NTDs, who are poor or otherwise marginalized. In many settings, all expenses related to hospitalization must be paid out of pocket, often representing a catastrophic expense that feeds vicious cycles of poverty. Household income lost from out-of-pocket health expenditures and lost wages due to NTDs is estimated to be at least USD 33 billion per year.[1] More needs to be done to address the missing health tools.

For diseases that are on the cusp of elimination, diagnostics and medicines that are specifically developed to reflect the requirements of a sustainable elimination programme will be critical to avoid backtracking on hard-won successes. These should be highly effective, safe, and suitable for deployment in remote areas with limited public health infrastructure.

[1] World Health Organization. Ending the neglect to attain the Sustainable Development Goals A rationale for continued investment in tackling neglected tropical diseases 2021–2030. Available from: https://iris.who.int/bitstream/handle/10665/363155/9789240052932-eng.pdf

Therefore, in addition to ensuring access to existing medicines, support for UHC must include support for medical innovation and the delivery of missing health tools needed to address unmet needs and ensure no one is left behind.

2. Integration and cross-cutting approaches are necessary across health priorities

People are often faced with multiple health challenges. For example, the risk of developing active visceral leishmaniasis is more than 100 times greater in people living with HIV. In addition to maximizing financing, **Member States should look for opportunities for synergies, shared services, and integration of R&D and access programmes across diseases** such as HIV, TB, and malaria and noncommunicable diseases such as diabetes, hypertension, and mental health conditions – for example, by developing better tools for testing and treatment programmes that bring transformational benefits for patients and health systems alike.

To prepare for and provide surge capacity to respond to pandemics, for example, much of the infrastructure that is needed for timely development and delivery of health tools for pandemics must be 'kept warm': supported, and therefore utilized, during inter-crisis periods. This includes clinical trial infrastructure, manufacturing capacity, and procurement mechanisms and platforms. COVID-19 research built on decades of investment in infectious disease R&D. The 2027 UNGA high-level meeting on UHC should reflect on the extent to which investments in pandemic preparedness and response and other disease areas can support UHC. This could include mutualizing manufacturing needs across disease areas, where feasible, and pooling demand and exploring common delivery and access mechanisms for health tools.

3. Achieving UHC through digital health

DNDi welcomes the focus on digital health technologies in achieving UHC. Digital technologies, such as AI, can have application for all elements of the health system, including the development of necessary health tools. As an organization that works to bring the best science to the most neglected, DNDi is collaborating with partners to apply new technologies to old diseases – for example, by partnering with Benevolent AI to identify a repurposed drug candidate that could be effective in treating dengue. AI can also be used to aid diagnosis of some NTDs. A project in Brazil has explored how 'deep-learning'-based AI can facilitate diagnosis of cutaneous leishmaniasis (CL) lesions and has the potential to differentiate CL from lesions caused by other skin diseases, thereby improving the provision of timely, appropriate treatment.[2]

Digital technologies, including AI and big data, hold great promise for efforts to accelerate the R&D process while reducing costs. But that promise is not guaranteed to be realized – especially for the most neglected. Attention is needed to ensure that successful technologies are not locked away for only certain populations' benefit – especially technologies that derive from publicly funded programmes.

Ensuring that digital technologies are truly transformative for all requires investment to generate missing data in neglected areas. It requires policies that encourage the creation of digital public goods, promote open collaboration and sharing, and allow for affordable and equitable access to new health tools.

[2] Leal JFC, Barroso DH, Trindade NS, Miranda VL, Gurgel-Gonçalves R. Automated Identification of Cutaneous Leishmaniasis Lesions Using Deep-Learning-Based Artificial Intelligence. Biomedicines. 2023 Dec 20;11(12):3598. Available from: https://doi.org/10.3390/biomedicines11123598

We urge Member States to:

- **Commit to sustainably invest in the development of effective health tools that can be used at the primary healthcare level** by supporting not-for-profit R&D models that centre on patient needs;
- **Identify opportunities for synergies, shared services, and integration of R&D and access programmes across disease areas,** including establishing mechanisms or modifying existing mechanisms to accelerate access and ensure that tools developed reach healthcare workers, communities, and patients;
- **Support policies to encourage the creation of digital public goods** that allow for equitable access and promote collaboration and sharing; and
- **Acknowledge the role R&D can play in supporting UHC by including R&D in national, regional, and global UHC action plans** and including monitoring the development of and access to health tools as part of national UHC action plan indicators and international UHC efforts or roadmaps.

Agenda item 9: Communicable diseases

Skin diseases

DNDi welcomes the draft resolution on 'Skin Diseases as A Global Public Health Priority' and supports its adoption. We ask Member States to consider the following issues when adopting the resolution.

1. The impact of skin neglected tropical diseases

Skin diseases are a leading contributor to the global burden of disease and are the fourth leading contributor to non-fatal disease burden worldwide.[3] Skin diseases rank among the top reasons for outpatient visits and often lead to long-term disability, stigmatization, and mental health issues. Overall, skin conditions are estimated to affect 1.8 billion people at any point in time.[4]

Out of all the skin diseases, over 10% are NTDs[5]. At the same time, skin disease NTDs (SNTDS) make up half of all NTDs[6] disproportionately impacting people in underserved communities in low- and middle-income countries. Four of the most debilitating neglected skin diseases – cutaneous leishmaniasis, post-kala-azar dermal leishmaniasis, river blindness, mycetoma and lymphatic filariasis– have particularly detrimental effects on affected communities.

Although rarely fatal, SNTDs have the potential to cause chronic ill health and long-term disability, resulting in a significant number of lost disability-adjusted life years.[7] They cause painful, disfiguring scars and can lead to disability and permanent deformities. SNTDs are particularly damaging because they are noticeable, rendering affected individuals vulnerable to discrimination. Diagnoses often occur too late for timely treatment at health facilities. Access to treatment is frequently hindered by a lack of nearby health facilities and by complex, lengthy treatments that require patients to spend extensive periods away from work and family. Most SNTDs cannot be prevented by mass drug administration (MDA) and require individual care and treatment.

Despite their severe toll, SNTDs remain underreported and under-researched. For a disease like mycetoma, the global burden remains unknown and largely unreported in endemic countries across Africa, Asia, Europe, and Latin America.

SNTDs can have significant mental health and social impacts on affected individuals and their families.[8] They affect individuals' emotional well-being, contributing to depression, anxiety, low self-esteem, and suicidal thoughts – and these often go unaddressed due to inadequate mental health support. Due to this, children may be unable to attend school. The visible symptoms of SNTDs lead to social stigma, with women being more likely to face exclusion and discrimination in communities and families. Women may experience intimate partner violence, social avoidance, and

[3] Alderton DL, Ackley C, Trueba ML. The psychosocial impacts of skin-neglected tropical diseases (SNTDs) as perceived by the affected persons: a systematic review. PLoS Negl Trop Dis. 2024;18(8):e0012391. Available from: https://doi.org/10.1371/journal.pntd.0012391

[4] World Health Organization. WHO first meeting on skin NTDs. Geneva: World Health Organization; 2023. Available from: https://iris.who.int/bitstream/handle/10665/376860/9789240091337-eng.pdf

[5] World Health Organization. WHO first global meeting on skin NTDs calls for greater efforts to address their burden. 2023. Available from: https://www.who.int/news/item/31-03-2023-who-first-global-meeting-on-skin-ntds-calls-for-greater-efforts-to-address-their-burden

[6] Ibid.

[7] World Health Organization. Ending the neglect to attain the sustainable development goals: a strategic framework for integrated control and management of skin-related neglected tropical diseases 2021–2030. Geneva: World Health Organization; 2020. Available from: https://www.who.int/publications/i/item/9789240051423

[8] Lancet Infect Dis. Mycetoma: a unique neglected tropical disease. Lancet Infect Dis. 2016;16:100-101. Available from: https://pubmed.ncbi.nlm.nih.gov/26738840/

abandonment by partners and relatives. Social stigma and physical discomfort associated with SNTDs can also limit employment opportunities for women and educational opportunities for girls.

2. R&D for missing health tools – focusing on the needs of the most neglected – supports universal health coverage

There are huge gaps in the health tools needed to effectively prevent, diagnose, and treat many SNTDs. Many treatments, should they exist at all, are decades old and toxic. Antifungal treatments for fungal mycetoma (eumycetoma) such as ketoconazole and itraconazole are among the few available treatments,[9] particularly in sub-Saharan Africa. These medications are costly, have limited effectiveness, and can cause serious side effects. In advanced cases, patients may face amputation or even death due to delayed or inadequate treatment. Medicines for cutaneous leishmaniasis are more than 60 years old, costly, and often require weeks of painful injections of toxic, heavy metal-based drugs that cause severe side effects.

The draft resolution urges Member States to promote research on skin diseases, in addition to encouraging international collaboration including with industry to achieve equitable access to treatments and diagnostics. This is encouraging. However, the needs of poor and marginalized people most often affected by SNTDs are often overlooked by the current biomedical R&D system, resulting in limited treatment options.

Progress in developing new health tools for neglected populations depends on sustainable investments in R&D and political leadership to drive such investment. Without specific interventions by governments, unmet medical needs linked to a lack of commercial return on innovation will not be addressed by the profit-driven biomedical R&D system. **Alternative financing mechanisms, partnership models, and incentives that do not depend on the profit-seeking model are needed to overcome urgent treatment gaps and meet the needs of the most vulnerable populations and should be promoted in the implementation of the resolution.**

Training healthcare workers to diagnose and treat or refer patients suffering from NTDs, such as leishmaniasis, is also essential for improving early detection and treatment in affected communities. As disease prevalence decreases, the expertise of healthcare professionals may also decline, increasing the risk of misdiagnosis and jeopardizing sustained progress toward the control and elimination of NTDs.

We urge Member States to:

- **Support the retention of research, innovation, and access elements** currently included in the draft resolution;
- **Commit to sustainably investing in R&D** for effective health tools to treat and diagnose SNTDs at the primary healthcare level;
- **Support the establishment and engagement of patient and community organizations, as referenced in the resolution,** to ensure that patient needs and perspectives are adequately reflected and integrated into R&D, healthcare strategies, and programme design and implementation;
- Support not-for-profit, collaborative, and open R&D models that centre on patient needs to achieve the resolution's aim to foster collaborations between international organizations, Member States, and industry;

- **Encourage research aimed at more accurately estimating the economic burden, mental health impact, and stigma** experienced by patients with SNTDs as a means of addressing mental and social issues highlighted in the resolution; and
- **Support community empowerment** through training of health extension workers to screen for SNTDs in communities for referral for management in health centres.

We urge the WHO to:

- **Continue to convene the Global Meeting on Skin NTDs**, scheduled for March 2025, to encourage continued collaboration and momentum towards the 2030 goals.

Agenda item 14: Global Strategy for Women's, Children's and Adolescents' Health

DNDi welcomes the report by the Director General on the 'Global Strategy for Women's, Children's and Adolescents' Health'. The report rightly acknowledges that 'commodities that are quality-assured are critical to provide high-quality and respectful maternal, newborn and child healthcare.'

DNDi would like to highlight the need for R&D of health tools to address the health requirements of populations whose specific medical needs are often neglected.

Members States have made a commitment to support R&D to address the unmet needs of children and pregnant and lactating women via the resolution 'Acceleration towards the Sustainable Development Goal targets for maternal health and child mortality in order to achieve SDG targets 3.1 and 3.2' adopted at WHA77. The resolution urges Member States to '*enable access to essential quality medicines for pregnant women, lactating women, mothers, newborns and children through accelerating implementation of the actions laid out in resolutions WHA69.20 (2016) and WHA75.8 (2022) and by promoting, supporting and financing accelerated investigation, development, manufacturing, registration and supply of age-appropriate, quality-assured formulations of medicines for diseases that affect mothers, newborns and children*.'

The resolution also calls on WHO to '*strengthen and expand collaborative efforts such as those promoted by WHO technical departments and the Global Accelerator for Paediatric Formulations (GAP-f) network for securing better access to medicines for children, including antiretroviral therapy for HIV and report to the Seventy-eighth World Health Assembly, and subsequently as appropriate, on progress achieved, remaining gaps and specific actions needed to further promote better access to age-appropriate, quality assured, affordable medicines and commodities for pregnant and lactating woman, and for maternal, adolescent, child and newborn health services.'*

1. Impact of poverty-related and neglected diseases on women and children

At least 1.2 billion children and adolescents <25 years – one in six people globally – are affected by one or more NTDs.[10] Children represent 34% of the 20 million DALYs that result from NTDs. Some NTDs disproportionately impact children, leading to profound and long-lasting harms, including premature death, disfigurement, stunted growth, chronic pain, and malnutrition. For example, in 2022, more than half of those infected with visceral leishmaniasis were less than 15 years old.[11] Children account for over a quarter of the new cases of Chagas disease,[12] and infants are at a higher risk of developing severe dengue. School-aged children are also at higher risk of schistosomiasis due to their involvement in activities such as swimming or fishing in infected waters. In children, schistosomiasis can lead to anaemia, stunting, and reduced cognitive abilities. **The impact of NTDs on children extends beyond health: they can impact cognitive development, prohibit school attendance, and lead to social stigma and mental health consequences.**

[10] A vote for childhood NTD elimination. Lancet Child Adolesc Health. 2024;8(3):180-181. Available from: https://www.thelancet.com/journals/lanchi/article/PIIS2352-4642(24)00022-1/fulltext

[11] World Health Organization. Global leishmaniasis surveillance, 2022: assessing trends over the past 10 years. Weekly Epidemiological Record. 2022;97(40):471-487. Available from: https://www.who.int/publications/i/item/who-wer9840-471-487

[12] World Health Organization. Chagas disease in Latin America: an epidemiological update based on 2010 estimates. Weekly Epidemiological Record. 2015;90(6):33-44. Available from: https://iris.who.int/handle/10665/242316

In some cases, NTDs affect women disproportionately as well. For example, dengue can cause severe complications that only affect women, such as vaginal bleeding. For pregnant women, dengue leads to a three-fold increase in maternal death. Dengue haemorrhagic fever increases the risk of maternal death by 450 times,[13] and overall, the disease increases maternal mortality to 15.9%.[14] In the Americas, Chagas disease is highly prevalent in women of childbearing age and pregnant women and can be transmitted from mother to child during pregnancy. Women who engage in domestic chores such as washing clothes are at a higher risk of developing female genital schistosomiasis due to contact with infested waters.

Social and cultural factors also exacerbate the disproportionate impact that NTDs have on women. For example, cutaneous leishmaniasis (CL), which manifests in the form of skin lesions and ulcers, places an outsized burden on women. Depending on the severity of the scars or disfiguring skin pathology, CL can lead to lasting social stigma that influences quality of life and psychological well-being.[15] In many contexts, women are more vulnerable to skin diseases and suffer greater social stigma than men.[16] Stigmatization can affect all aspects of women's lives, particularly interpersonal relationships, social activities, work capacity, and marriage.

2. The need to include underserved populations in research

The Director General's report finds that 64 countries are off track to meet the Global Strategy's neonatal mortality target, and 54 countries are off-track to meet the target for the under-five mortality rate. **Each year, millions of children's lives are cut short or debilitated by diseases that are largely treatable – but for which child-adapted treatment formulations are often not developed. Children's specific treatment needs have long been an afterthought in profit-driven drug development, given that they represent lower-volume markets.**[17,18] Medicines are generally first developed for adults, and the development of paediatric formulations starts only after, if at all. The needs of children living with HIV illustrate this neglect, where the development of optimal paediatric antiretroviral treatment formulations lagged 20 years behind that of adults. Despite the burden of NTDs in children, only 22 of the 47 medications available for NTDs are labelled for paediatric use.[19]

Children are excluded from the vast majority of clinical trials to assess the safety and efficacy of medicines and determine dosing. A 2019 study of clinical trials for neglected diseases found that across more than 360 late-stage clinical trials, only 17% included people younger than 18 years of age. **As a result, children are more often than not left without safe, effective medicines approved for paediatric use.** In addition, a lack of harmonized regulatory guidance for including paediatric populations in research also hinders drug development for children.

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[13] Paixao ES, Teixeira MG, Costa DN, Harron K, de Almeida MF, Barreto ML, et al. Dengue in pregnancy and maternal mortality: a cohort analysis using routine data. Sci Rep. 2018;8(1):9938. Available from: https://doi.org/10.1038/s41598-018-28387-w

[14] Brar R, Sikka P, Suri V, Singh MP, Suri V, Mohindra R, et al. Maternal and fetal outcomes of dengue fever in pregnancy: a large prospective and descriptive observational study. Arch Gynecol Obstet. 2021;304(1):51-58. Available from: https://doi.org/10.1007/s00404-020-05930-7

[15] Bennis I, De Brouwere V, Belrhiti Z, Sahibi H, Boelaert M. Psychosocial burden of localised cutaneous leishmaniasis: a scoping review. BMC Public Health. 2018;18:1236. Available from: https://doi.org/10.1186/s12889-018-5260-9

[16] Al-Kamel MA. Impact of leishmaniasis in women: a practical review with an update on my ISD-supported initiative to combat leishmaniasis in Yemen (ELYP). Int J Womens Dermatol. 2016 Jun 16;2(3):93-101. Available from: https://doi.org/10.1016/j.ijwd.2016.04.003

[17] US Food & Drug Administration. Drug Research and Children. 2016. Available from: https://www.fda.gov/drugs/information-consumers-and-patients-drugs/drug-research-and-children

[18] Watts G. WHO launches campaign to make drugs safer for children. BMJ. 2007 Dec 15;335(7633):1220. Available from: https://doi.org/10.1136/bmj.39423.581042.DB

[19] Rees CA, Hotez PJ, Monuteaux MC, Niescierenko M, Bourgeois FT. Neglected tropical diseases in children: an assessment of gaps in research prioritization. PLoS Negl Trop Dis. 2019;13(1):e0007111. Available from: https://journals.plos.org/plosntds/article?id=10.1371/journal.pntd.0007111

We welcome the ongoing work of the Global Accelerator for Paediatric Formulations Network (GAP-f), of which DNDi is a member, to address this unacceptable imbalance between the burden of disease for NTDs in children and the R&D dedicated to addressing their health needs. Via the Paediatric Drug Optimization (PADO) process, the initiative has prioritized a portfolio of the paediatric formulations that are most needed across several disease areas. To target research to address the specific needs of infants and children, the WHO has published these lists of priority paediatric formulation needs for HIV, TB, hepatitis C, antibiotics, and five NTDs. **Addressing these priorities requires political, technical, and financial support from Member States.** We congratulate GAP-f on developing a five-year strategy to be launched in May 2025, which will drive acceleration of the investigation, development, and introduction of better medicines for children.

Women's health continues to be underprioritized in R&D decision-making. Across disease areas, there are widespread knowledge gaps in understanding the impact of medicines on biological females, especially those who may become or are pregnant or who are lactating – often leading to exclusion from clinical trials due to concerns that drugs could have harmful impacts on foetuses.

A report from the Director General to WHA76 on the Global Strategy for Women's, Children's and Adolescents' Health 2016-2030 states that '…poor inclusion of women, children and adolescents in early COVID-19 research, testing and surveillance activities hampered a definitive understanding of the direct effects of COVID-19 on them.'

While health tools such as medicines, vaccines, and diagnostics offer the potential to reduce mortality and morbidity among women who may become or are pregnant or who are lactating, lack of data on the safety and efficacy of drugs and vaccines for this neglected group at the time of product approval limits women's access to safe and effective treatments, leading to preventable illness and death. Therefore, **proposals to ensure gender-responsive drug development – from the early phases of research – should be considered in implementation of the Global Strategy**.

We urge Member States to:

- **Encourage the rapid and coordinated development of age-appropriate treatment formulations** through public health-focused collaborations between academic institutions, key paediatric networks, product development partnerships, and public and private R&D organizations;
- **Support implementation of the GAP-f five-year strategy** to ensure that safe, effective, quality, and affordable paediatric formulations are developed and made available to children;
- **Support implementation of the resolution 'Acceleration towards the Sustainable Development Goal targets for maternal health and child mortality in order to achieve SDG targets 3.1 and 3.2';**
- **Support and implement strategies to include women** – including women of childbearing potential and pregnant and lactating women – **and children as soon as possible in the drug development process** to close evidence gaps and better meet their health needs when affected by poverty-related, neglected, and other diseases;
- **Ensure that regulatory requirements are streamlined and harmonized** to support the inclusion of groups currently underrepresented in research, including children and pregnant and lactating women, in a way that is ethical and appropriate;
- **Support research to understand sex- and gender-based barriers in accessing healthcare services,** including diagnosis and treatment, and promote interventions that address these barriers; and
- **Promote the collection, utilization, and reporting of sex- and age-disaggregated information** in ongoing and future programmes and research.

Agenda item 22: Climate change and health

We commend Member States and the WHO on the adoption of the resolution 'Climate Change and Health' at WHA77. We support the commitment made by Member States in the resolution 'to promote research and development to detect, prevent, test for, treat and respond to climate-sensitive diseases and health outcomes, and to support affected communities in their efforts to adapt to the impacts of climate change, by creating an enabling environment to facilitate equitable access to health tools by those hit hardest by climate-sensitive diseases and health impacts of climate change.'

While the Draft Global Plan of Action (GPoA) on Climate Change and Health focuses on many aspects of adaptation, mitigation, leadership, and advocacy, and reiterates Member States' commitment to responding to climate-sensitive diseases through research and development as an action area**, DNDi focuses its comments on why the development of health tools such as diagnostics, medicines, and vaccines must be prioritized within global and national adaptation efforts.**

The proportion of annual global deaths due to climate-sensitive diseases is estimated to be approximately 70%.[20] **Climate change-induced morbidity and mortality from infectious diseases are expected to rise globally.**

The most recent report of the Lancet Countdown on health and climate change states that changing climatic conditions are altering the transmission potential of many vector-borne infectious diseases and predicts, for example, that at the current rate of temperature rise, transmission potential for dengue will increase by 36–37% by 2050.[21]

Climate change is affecting the spread of infectious diseases in three ways: 1) the changing incidence and geographical spread of vector-borne and water-borne climate-sensitive infectious diseases due to changing temperatures and rainfall patterns, 2) climate-related migration, and 3) the increased risk of new emerging zoonotic diseases.[22] **Climate-sensitive diseases often disproportionately impact vulnerable populations, including children, pregnant women, those with pre-existing health conditions, and communities with limited resources and poor access to healthcare and proper hygiene and sanitation**.

Neglected tropical diseases (NTDs) affect 1.65 billion people, mostly in the least developed economies and most impoverished communities. A recent scoping review highlights that **many NTDs are likely to be climate-sensitive**. Nearly half (11 out of 25) of the vector- or water-borne diseases listed by the WHO that might be impacted by climate change are also classified as NTDs. The changing burden of climate-sensitive infectious diseases means that managing their impact requires increased and more thoroughly integrated strategic adaptation efforts.

In addition, while many diseases once labelled as 'tropical' are now leading to outbreaks worldwide – as illustrated by the recent emergence of dengue and other tropical diseases in areas such as the

[20] Intergovernmental Panel on Climate Change (IPCC). Climate change 2022: impacts, adaptation, and vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. 2022. Available from: https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_Chapter07.pdf

[21] The Lancet Countdown. The 2023 report of the Lancet Countdown on health and climate change: the imperative for a health-centred response in a world facing irreversible harms. Lancet Countdown. 2023 Nov. Available from: https://www.lancetcountdown.org/2023-report/

[22] The Lancet Infectious Diseases. Twin threats: climate change and zoonoses. Lancet Infect Dis. 2022 Dec 8;22(12):1777. Available from: https://doi.org/10.1016/S1473-3099(22)00817-9

United States[23] and Europe[24] and the re-emergence of dengue in Japan[25] – **countries in the Global South will continue to carry a disproportionate burden of the impacts of climate change on infectious diseases**. For example, the region of the Americas faced its largest outbreak of dengue, a climate-sensitive disease, last year. Dengue is also endemic in the Southeast Asia and Western Pacific regions.

1. Understanding the impact of climate change on infectious diseases, including NTDs

Examining existing literature on the effects of climate change on malaria and NTDs, the scoping review found that, while studies were available for some NTDs such as dengue, leishmaniasis, and chikungunya, for many NTDs, gaps remain in knowledge on how climate change may affect transmission, particularly for non-vector borne NTDs. Further research is needed to understand and establish the link between climate change and infectious diseases, including NTDs. This is vital for countries to be able to track the prevalence and transmission of diseases impacted by climate over time. Research to understand and predict the influence of climate change on pathogen survival and disease virulence, transmission, and spread should also be prioritized under WHO's Research for Action on Climate Change and Health (REACH) agenda.

2. Innovation as an adaptation strategy for climate-sensitive diseases

Health services and tools are needed to protect people from the impacts of climate variability and change. The IPCC report states that 'Climate-sensitive food-borne, water-borne, and vector-borne disease risks are projected to increase under all levels of warming without additional adaptation' and presents '…strengthening public health programs related to climate-sensitive diseases…' as an adaptation option from which human health will benefit. The report also suggests that effective adaptation options for vector-borne diseases could include integrated vector control, disease surveillance, early warning and response systems that can identify potential outbreaks, improvement in socioeconomic factors, and vaccine development. While these adaptation measures are important, they will not suffice. **Availability of and access to health tools to test and treat climate-sensitive diseases will also be vital to minimizing the impact of climate change, particularly on vulnerable communities, and to staying ahead of emerging challenges to prevent illness and save lives.**

For many climate-sensitive infectious diseases, inadequate investment in medical R&D threatens the world's ability to adapt to the effects of climate change on these diseases. Current tests and treatments for most climate-sensitive NTDs, when they exist at all, have serious limitations that hamper the provision of life-saving medical care and impede disease control and elimination efforts. While existing vaccines and vector control strategies are crucial tools, the lack of any specific treatment for dengue, for example, remains a critical challenge to countering the disease's rapidly increasing global impact. Appropriate treatments are urgently needed to prevent medical complications and progression to severe disease and to decrease the heavy burden dengue outbreaks place on public health systems. Medicines for cutaneous leishmaniasis are more than 60 years old, costly, and often require weeks of painful injections of toxic, heavy metal-based drugs that cause severe side effects.

[23] Hotez PJ. The rise of neglected tropical diseases in the "new Texas." PLoS Negl Trop Dis. 2018 Jan 18;12(1):e0005581. Available from: https://journals.plos.org/plosntds/article?id=10.1371/journal.pntd.0005581

[24] Naddaf M. Dengue is spreading in Europe: how worried should we be? Nature. 2023 Oct 31;621(7963):32-33. Available from: https://www.nature.com/articles/d41586-023-03407-6

[25] Wang X, Nishiura H. The epidemic risk of dengue fever in Japan: climate change and seasonality. Can J Infect Dis Med Microbiol. 2021 Oct;2021:9925742. Available from: https://pubmed.ncbi.nlm.nih.gov/34721747/

In addition, building climate-resilient health systems requires the development of environmentally sustainable products that are tailored to meet the specific needs of neglected populations, i.e., 'climate-smart' products that are adapted to often hot, humid conditions, that can be stored at room temperature and withstand power outages, and that are environmentally friendly to manufacture and dispose.

Responding to the rise and spread of climate-sensitive diseases requires an integrated approach that includes surveillance and monitoring, early warning systems, diagnostics, treatments, vaccines, and vector control tools.

3. Addressing inequities in access to innovation

DNDi supports the GPoA's reference to 'Create an enabling environment to facilitate equitable access to health tools by those hit hardest by climate-related health impacts'. Innovation alone is not enough: equitable access must be embedded into the innovation process from the start. The spread of infectious diseases to non-endemic regions may spur innovation and investment in developing health tools to respond to some climate-sensitive diseases, but **an enabling environment is needed to ensure that innovation does not remain a privilege of the rich. New health tools must reach populations in already burdened countries hardest hit by climate-sensitive infectious diseases.** Public policies are needed to shape the innovation ecosystem to ensure a focus on neglected populations in low-resource settings who are most affected by neglected tropical and infectious diseases, including by ensuring that there are conditions on public investments in R&D to ensure a focus on public health priorities and equitable access.

DNDi also supports the GPoA's proposal for action to ensure 'research in low- and middle-income countries is led or has significant engagement by researchers from the countries in which the research takes place to ensure localization and capacity-strengthening'. **It is important to ensure that endemic countries set the research priorities and agenda and that R&D capacity in the Global South is utilized and developed further.**

4. Monitoring progress in responding to climate-sensitive diseases

DNDi supports the GPoA's proposed action on developing an indicator framework. However, we suggest that **indicators on the progress of action on climate-sensitive infectious diseases are included as an essential component of the framework**. As part of the process for developing such indicators, we suggest that:

- Consultations should be held with countries that are highly endemic for climate-sensitive diseases, with communities that are impacted by them, and with organizations that have been involved in developing adaptation tools and strategies;
- The process for developing indicators should recognize that certain populations may be more vulnerable to climate-sensitive diseases and that, therefore, data must be comprehensive, inclusive, and representative of all population groups, including those that are historically marginalized or underrepresented; and
- Wherever possible, existing indicators for climate-sensitive disease, including those for NTDs, should be considered to minimize the reporting burden on countries.

We urge Member States to:

- **Support the inclusion and execution of proposed actions in the GPoA** related to 'Promote research and development to detect, prevent, test for, treat and respond to climate-sensitive

diseases and health outcomes, including those related to climate-forcing pollutants, and support affected communities in efforts to adapt to climate impacts' and 'Create an enabling environment to facilitate equitable access to health tools by those hit hardest by climate-related health impacts';

- **Invest in R&D for new tools to tackle infectious diseases**, particularly for those neglected by the market, **including through support for the WHO's development of the R&D blueprint for NTDs**;
- **Promote research to explore the connections between climate change and NTDs beyond vector-borne illnesses**, as well as the impacts of climate change on pathogen survival, disease virulence, transmission, and spread;
- **Support the development of indicators on climate-sensitive diseases as a part of the GPoA, WHO General Programme of Work (GPW14), and UAE-Belém Work Programme** (within the framework of the Global Goal on Adaptation); and
- **Ensure coherence between policy processes addressing climate and health** where actions aligned with the GPoA could be implemented. **Focusing a pilot project of the recently established G20 Coalition for Local and Regional Production, Innovation and Equitable Access on a neglected climate-sensitive disease** would be an approach that supports G20 countries' commitment to putting equity at the core of climate and health responses and recognize the importance of development of and equitable access to tools to test and treat these diseases.