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A Universal Health Care Lens on Tropical Infectious Diseases Research and Innovation

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A Universal Health Care Lens on Tropical Infectious Diseases Research and Innovation

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Abstract

This briefing paper identifies the knowledge and investment gap for Neglected Tropical Diseases (NTDs). This group of infectious diseases inequitably affects the poor, people living in the tropics, and people living in countries with suboptimal health system performance. The rise in non-communicable diseases will exacerbate both the vulnerability of people to NTDs as well as draw resources away from infectious diseases. The paper highlights some of the areas for research and innovation in health products for NTDs as well as implementation research to ensure the health system do reach those who need these interventions.

Setting the scene

Tropical diseases are still a burden

Neglected tropical diseases (NTDs) are a major health problem for the poor. They affect at least one billion people living on less than USD \$2 per day in the developing regions of Sub-Saharan Africa, Asia, and the Americas, including 400 million children, and cause significant illness and death.

The broader definition of NTDs includes three soil-transmitted helminth infections (ascariasis, hookworm, and trichuriasis), lymphatic filariasis, onchocerciasis, dracunculiasis, schistosomiasis, Chagas disease, human African trypanosomiasis, leishmaniasis, Buruli ulcer, leprosy, and trachoma, dengue fever, the treponematoses, leptospirosis, strongyloidiasis, foodborne trematodiasis, neurocysticercosis, scabies, and other tropical infections.

Many neglected diseases in neglected populations and major impacts

Most tropical infectious diseases, especially NTDs disproportionately affect those living in rural, remote and poor urban areas in low and middle-income countries, often with poor access to health care services, education, water and sanitation, and often minority and indigenous populations. Because of this, many call this group “the neglected diseases of neglected populations”.

Many NTDs through their chronic effect on a person’s health and often disabilities, exacerbate poverty of the individual and family. They can adversely affect child health and physical and cognitive development, pregnancy, school performance and worker productivity.

For many NTDs, there are no treatments or prevention options, or interventions may be prohibitively expensive or difficult to use in low-resource settings. Ultimately, in many communities this leads to “huge economic costs for the individual, household and society (Bhutta et al. 2014).

Global changes and infectious diseases

Daszak et al (2001) noted that changes in land use (e.g. agricultural production and intensity of production, urbanisation, loss of ecosystems), population density and location, climate changes, mobility of humans and international trade and travel are contributing to the emergence and reemergence of infectious diseases globally. They noted the “Complex interplay between the ecology and population biology of different hosts, vectors and changing environments may have surprising consequences for disease emergence” (Ibid pg.110) in humans, wildlife and domestic animals. Many involved in human, animal and ecosystem health now call for a One Health/Ecohealth approach to the prevention, identification and management, of these infections. This requires an intersectoral approach with a range of scientists including those who study human behaviour, agriculture, demography, wildlife ecologists, conservation biologists, environmental biologists, veterinarians and medical scientists, medical microbiologists and economists and active engagement with communities including indigenous communities.

This approach has also been called upon to address the continued issue of antimicrobial drug resistance. Similar drivers as well as irrational use on animal and human health and animal production mean this problem is accelerating in communities and health services globally. It is often under-recognised in under-resourced settings, as it is not monitored due to lack of surveillance networks, laboratory capacity and low cost and effective diagnostics. Increasingly is it contributing to a substantial number of excess deaths, especially among infants. Of particular note is the antimicrobial drug resistance occurring for tuberculosis, malaria, severe acute respiratory infections, and sepsis caused (Vernet et al 2014). WHO in 2014 noted that it has been estimated that for Thailand AMR causes more than 38,000 deaths and additional 3.2 million hospital days and costs the society US\$84.6-202.8 million in direct costs and more than US\$1.3 billion in indirect costs annually and that an estimated 214,000 neonatal sepsis deaths are attributable to resistant pathogens each year.

Increasingly, as the prevalence of non-communicable diseases increases in every country of the world, the overlap of infectious and non-communicable diseases and the synergies between these are being realised. The effects of various non-communicable diseases of risk factors such as **diabetes mellitus**, smoking, alcoholism, chronic lung diseases, cancer, immunosuppressive treatment, malnutrition, and tuberculosis have been described (Marais, B et al 2013). Many NCDs increase the vulnerability of people to infectious diseases and more complications for these infections. The usual focus of health systems on disease-specific approaches typically fails to address the need for and potential synergies in a more integrative approach to the control and management of non-communicable and communicable diseases.

There is a need for sustained and increased funding for basic and health systems research for these solutions and their scale up into health systems, in addition to the increased resources required to address these dual “epidemics” of infectious and non-communicable diseases.

What is the role of research and innovation to address these issues?

Present level of funding for these NTDs

It has been identified that there is an underinvestment in new or better vaccines, diagnostics, and therapeutics to address these NTDs. For example, of the 1,556 new drugs approved between 1975 and 2004, only 21 (1.3 percent) were targeted for tropical diseases and tuberculosis. Although the global landscape for neglected disease research and development (R&D) has improved in recent years, more needs to be done. The G-Finder report, a comprehensive survey of global investment into R&D for new products for neglected diseases found that just over \$2.5 billion was spent in 2007. It noted that nearly 80% of that was for the “big three” tropical and infectious diseases: HIV, malaria, and TB. The so-called commercial neglected diseases, such as dengue, pneumonia, meningitis, and the diarrhoeal diseases received the bulk of the remainder of the investment. The remaining neglected diseases each received less than 5% and five diseases (leprosy, Buruli ulcer, trachoma, rheumatic fever, and typhoid and paratyphoid fever – also called “Low or no commercial” diseases) each received less than \$10 million, or 0.4 percent of total global investment. Corporate social responsibility activities of many pharmaceutical companies are required to address the therapeutics and diagnostics availability gap in countries with NTDs. However, they are unlikely to be the sustainable solution to providing preventive and therapeutic interventions for all NTDs. Increasingly many of the emerging-economy biotechnology firms focus on developing cost-effective health products adapted to local conditions that are also appropriate for the needs of local, poorer markets. In this way, they are increasing their market share in emerging and developing countries by providing access to an increasing number of health products for poorer consumers whose needs have typically been ignored or neglected.

Across the NTDs R and D investment portfolio, diagnostics represent nearly half of the NTD products on the market and nearly 40% of those in development especially for point-of-care testing. However, there is an innovation need to ensure that these diagnostics are stable and highly reliable in rural or low-resource areas. Vaccines represent about 21% of the products on the market and more than half of the products in development and therapeutics represent about 28% of the NTDs products on the market. There is also an urgent need for R and D into vector control, as insecticide resistance spreads and increasingly vector borne diseases are major sources of ill health in the tropics.

However, there is concern that emerging-economy biotechnology companies may redirect their focus away from affordable products for NTDs towards more profitable Western markets, as they grow and become larger international players. Solutions suggested to address the neglect of R and D for NTDs as well as the preventing the move out the NTD markets by the emerging economy biotech companies include:

- That emerging-economy governments should consider adapting the U.S. orphan-drug model to provide incentives to their domestic firms to focus on neglected diseases;
- to use and strengthen capacities in disease-endemic countries via R&D networks built on North-South and South-South collaborations;

- Addressing the critical bottleneck for the Emerging economy biotech companies getting their products to distant markets where those products are needed by the poor. This includes the lack of expertise of understanding regulatory environments, assessing markets, positioning products (including pricing and competitive intelligence), identifying distribution channels (including details of the purchasing decision), accessing financing, and identifying international commercialization partners. (Frew et al 2009)

Universal health coverage

WHO (2015) recommends an integrated approach to overcoming the global impact of NTDs through five interventions: innovative and intensified disease management; preventive chemotherapy; vector ecology and management; veterinary public-health services; and the provision of safe water, sanitation and hygiene.

For the proportion of infectious diseases in LMICs are entirely avoidable or treatable with existing medicines or interventions which are also highly cost effective, and for any new products entering the market, the delivery of these essential goods to the affected populations has proven very difficult due to weak health systems and infrastructures. Effective delivery requires a range of “building blocks” to be in place and interoperable. For example, these include training health workers and their effective distribution, timely and targeted delivery of safe medicines and related commodities, accurate monitoring and evaluation with effective use of epidemiological, management and increasingly geospatial data, and providing feedback to the community. Health services implementation research is required in many locations to find the “best fit” of a health system for community needs, as well as supporting the efficient and cost-effective introduction or re-introduction of life saving health interventions. This may include the use of technologies such as e-Health and m-Health solutions for access to quality services, health worker supervision and health promotion delivery; as well as the role of drones and other “transportation” solutions to deliver health products to where they are required. The role of geospatial tools to support decision making on packages of care and for surveillance and response to outbreaks are increasingly being used especially in malaria and dengue.

Other factors impede access to acceptable and affordable health care including gender discrimination, low levels of female literacy, and lack of women empowerment, which can prevent women from seeking care for themselves and their children. Economic barriers including direct costs of care and medicines/tests, and indirect costs such as informal healthcare fees, opportunity costs of not working during care seeking, travel, food, and accommodation costs, all contribute to inequity in access to health care. There are also wide inequities in risks and vulnerabilities for poor health and access to and utilization of healthcare by wealth quintiles. For example poor children are more likely to be undernourished and therefore more at risks of infectious diseases (Bhutta et al 2014).

A WHO/World Bank framework for monitoring progress towards universal health coverage at country and global levels calls for two targets to be reached by 2030:

- a minimum of 80% essential health services coverage;
- 100% financial protection from out-of-pocket payments for health services (who 2015).

In 2015 WHO released a Roadmap for NTDs (WHO 2015). It estimated that excluding vector control, the investments required to meet the Roadmap's targets for 2015–2020 were an average of US\$ 750 million per year. The maintaining of that to 2030 was estimated to require an additional US\$ 460 million per year in investment as interventions are scaled down and diseases are eradicated, eliminated or controlled. The domestic investment target for universal coverage against NTDs represents well below 1% of domestic expenditure on health within the group of low- and middle-income countries for the period 2015–2030. After 2020 these domestic investment targets decrease in absolute (dollar) terms, as coverage targets are achieved and NTDs are controlled, eliminated or eradicated.

In conclusion.

In 2007 Bill Gates described the need for “creative capitalism” to address the health problems of the poor. Creative capitalism relies on global talent, and at the moment, much talent in the developing world is underutilized. (Frew et al 2009). WHO in 2014 stated “Good-quality research is integral to sustainable control of NTDs. Research must therefore remain an inherent part of the culture of control, even as some diseases move towards elimination and eradication” (WHO2014).

Research and innovation within affected countries, and increasingly by biotechnology companies in these countries must be encouraged, supported, nurtured and facilitated to bridge the neglect gap, and develop appropriate affordable and sustainable technology enhanced solutions to NTDs and health problems in the tropics that are delivered in strong health systems.

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