Brief Submitted to the Parliamentary Committee, HESA, Standing Committee on Health, Regarding M-132, the motion to study federally funded health research

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Neglected Tropical Diseases

Credentials and research experience:

Professor Molyneux is Emeritus Professor at the University of Liverpool and Senior Professorial Fellow at the Liverpool School of Tropical Medicine where he was Director from1991-2000. He graduated (MA, PhD) from Cambridge University in parasitology before embarking on a career in medical parasitology and entomology. He has published over 400 papers in peer-reviewed journals, written over 20 reviews and contributions to books as well as a textbook on trypanosomes and leishmaniasis. From 2006-2010, he was the Executive Secretary for the Global Alliance to Eliminate Lymphatic Filariasis. He has been President of the British Society for Parasitology and the Royal Society of Tropical Medicine

Professor Molyneux has received numerous awards for his contributions to global health – among them, medals from the Royal Society of Tropical Medicine and Hygiene, the British Society for Parasitology, the McKay Medal by the American Society of Tropical Medicine and Hygiene and the Kyelem medal awarded by the Coalition for Neglected Tropical Diseases (COR-NTD). He is an author on numerous leading publications on health policy and neglected tropical diseases (NTD's) in the Lancet, BMJ, New England Journal of Medicine and PLoS Medicine. Professor Molyneux has been a key advocate in raising the profile of Neglected Tropical Diseases to the extent they are now considered to be one of the priorities of the World Health Organisation. He has served on several WHO Committees and continues to serve on International Commissions on Disease Control and Eradication.

NTDs and the Sustainable Development Goals (SDGs)

Neglected tropical diseases (NTDs) are a group of twenty parasitic, viral and bacterial diseases that proliferate in less developed areas of countries, across the income spectrum, where large numbers of people have little or no access to adequate healthcare, clean water, sanitation, housing, education, transport and information. They affect approximately 1 billion people globally and the debilitating physical and mental health effects caused by NTDs impact all areas of one's life and cost economies billions of dollars annually[1]. Their impact is felt by poorest communities everywhere, including those living in wealthy countries. For instance, United States of America (USA), has a hidden burden of NTDs, mostly concentrated in the southern states[2] as does Australia, where blinding trachoma and scabies remain major public health problems in Aboriginal communities[3] whilst many of the G20 countries have high burdens of the NTDs in the poorest communities.

The seventeen sustainable development goals set by the United Nations integrate all three dimensions of sustainable development; economic, social and environmental, around the themes of people, planet, prosperity, peace and partnership[4]. NTD interventions have the greatest relevance for SDG 3 (health for all) however, they also have an impact on poverty (SDG1) and hunger (SDG2).

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[1] WHO. (n.d.). Neglected tropical diseases. Retrieved January 15, 2018, from http://www.who.int/neglected_diseases/diseases/en/

[2] Hotez PJ. Fighting neglected tropical diseases in the southern United States. BMJ. 2012;345:e6112

[3] Taylor HR, Fox SS, Xie J, Dunn RA, Arnold A-LMR, Keeffe JE. The prevalence of trachoma in Australia: the National Indigenous Eye Health Survey. Med J Aust. 2010;192:248–53.

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The debilitating impact of NTD related morbidities impede individuals from making meaningful contributions to society and increase financial burden on families and thus trap individuals in the cycle of poverty[4]. Impact of NTDs on nutrition include parasites such as soil-transmitted helminthiases (STH) consuming the nutrients required to keep people healthy[5]. These helminths compete for nutrients within the host and will naturally reduce the impact of food aid and other forms of nutritional transfers. The nutritional impairment caused by schistosome and STH infections during childhood has been shown to have an impact on the growth and development of children[6]. Anaemia and malnutrition are common side effects of several NTDs[7]. Thus, eliminating NTDs can improve education (SDG4), work and economic growth (SDG8) and thereby reduce inequalities (SDG10) and reduce poverty (SDG1)[4].

Solutions:

In order to eliminate and control transmission of NTDs, the following are strategies recommended by WHO

1) *Preventative chemotherapy:* This refers to delivering a single dose of medication once or twice a year, usually through the widespread distribution of medicines known as mass drug administration (MDA).
2) *Innovative and intensified disease management:* This strategy uses a variety of medical interventions, ranging from medicines to surgery, to address the symptoms of NTDs for which no effective control tools exist or in situations in which the widespread use of tools is limited.
3) *Vector ecology and management:* This intervention aims to develop and promote strategies and guidelines based on the principles and approaches of integrated vector management, including the judicious use of pesticides. Vector control is important in preventing and controlling vector-borne diseases, specifically for controlling transmission.
4) *Veterinary public health services:* This intervention addresses neglected zoonotic diseases, a subset of NTDs that are naturally transmitted from vertebrate animals to humans and vice versa.
5) *Water, sanitation and hygiene:* Interventions to provide safe water, sanitation and hygiene (known as WASH strategies) are a key component of the global NTD strategy and are critical for preventing most of these diseases, as well for caring for people with an NTD. WASH interventions are especially needed for NTDs in which transmission is closely linked to a lack of access to safe water and sanitation, such as the soil-transmitted helminthiases, schistosomiasis and trachoma.

Below are examples of low cost, high impact, successful innovative solutions that enable endemic countries to reduce their burden.

1) Dose pole for soil transmitted helminths (STH), schistosomiasis and onchocerciasis: this is a tool that enables community health workers to use height (as a surrogate of weight) of people to determine drug doses reducing wastage and increasing efficiency of MDAs[8].
2) Community directed treatment: focuses on empowering communities to take responsibility for drug delivery – deciding how, when and by whom drug treatment should be administered. In the rural populations of sub-Saharan Africa where health systems are weak

[5] Crompton DWT, Nesheim MC. Nutritional impact of intestinal helminthiasis during the human life cycle. Annu Rev Nutr. 2002;22:35–59.

[6] Hall A, Hewitt G, Tuffrey V, de Silva N. A review and meta-analysis of the impact of intestinal worms on child growth and nutrition. Matern Child Nutr. 2008;4 Suppl 1:118–236.

[7] Hotez PJ, Molyneux DH. Tropical anemia: one of Africa's great killers and a rationale for linking malaria and neglected tropical disease control to achieve a common goal. PLoS Negl Trop Dis. 2008;2:e270.

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and under-resourced, the community-directed treatment strategy is proving to be one of Africa's most successful in reducing disease at low cost[9] as well as allowing communities to incorporate other health interventions.

3) Rapid non -invasive methods for mapping for onchocerciasis and Loa (Tropical eye Worm) allowing better surveillance of disease distribution and prevalence
4) Guinea worm filter straws: these cheap plastic straws prevents acquisition of infected water fleas whilst provision of safe water stops infection. access to clean and safe drinking water[10]
5) Schisto and ladder game developed by Uwen Ekpo, a Nigerian Professor: The game is developed to teach basic health education and promote behavioural changes among schoolchildren in endemic communities[11].

NTD progress to date:

To date, significant progress in controlling transmission and eliminating NTDs has been made. Some notable milestones:

- NTD elimination is now recognized by the WHO as an important health issue to target; and has been included in the SDGs under goal three.
- WHO reports that in 2016, 1.497 billion preventative chemotherapy treatments were delivered to 1.031 billion individuals treated for at least one disease[12]
- Since 2002, 6.7 billion treatments for filariasis have been distributed[13]
- Progress in interventions is now recorded each year in the publication of a Scorecard by Uniting to Combat NTDs, which measures progress in terms of the WHO Roadmap targets[11].
- Recent progress on mapping to define the focal endemicity of diseases and numbers of people at risk has progressed; particularly for trachoma, human African trypanosomiasis (HAT), lymphatic filariasis and schistosomiasis[14].
- Commitment to praziquantel donation by Merck KGA and recent announcements by Merck & Co. Inc to increase donations of Ivermectin for lymphatic filariasis outside Africa
- Continued commitment from the pharmaceutical industry to drug donations to eliminate NTDs and lower the cost of mass drug administration (MDA)[11] ;the value of the pharmaceutical donations since the initiation of programmes is in excess of 17 BILLION US$ approximately 2-3 BILLION US$ per annum
- To date, the global burden of Guinea worm has fallen significantly; a total of 30 human cases were reported in 2017 and only 4 countries (Mali, Chad, Ethiopia and South Sudan) are considered endemic, as opposed to 20 countries that were considered endemic in the 1980s[15]. South Sudan and Mali reported zero cases in 2017.
- Trachoma – the world's leading infectious cause of blindness – has been eliminated as a public health problem in Mexico, Morocco, and Oman. More than 185 000 trachoma patients had surgery for trichiasis worldwide and more than 56 million people received antibiotics in 2015 alone.

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[9] WHO. Community-directed treatment with ivermectin (CDTI). (n.d.) Retreieved on January 18, 2017 from http://www.who.int/apoc/cdti/en/

[10] Life straw. (n.d.). Life straw our story. Retrieved on January 18, 2017 from: http://www.lifestraw.com/our-story/

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[13] WHO. Lymphatic Filariasis. (2018). Retrieved from http://www.who.int/lymphatic_filariasis/en/

[14] WHO. Unprecedented progress against neglected tropical disaeases, WHO reports. (2017) retrieved on January 16, 2017 from: http://www.who.int/mediacentre/news/releases/2017/ntd-report/en/

[15] WHO. (2017) Dranculiasis eradication. Retrieved on January 16, 2018 from http://www.who.int/dracunculiasis/epidemiology/en/

- Due to the global commitment of eliminating NTDs, human African trypanosomiasis (sleeping sickness) cases have been reduced from 37 000 new cases in 1999 to well under 3000 cases in 2015[13]
- Four countries in the Americas have been verified free of transmission of onchocerciasis (Mexico, Guatemala, Colombia and Ecuador)
- NTD MDA programmes reach "beyond the end of the road" often to communities remote from the formal health system (50% of onchocerciasis treatments reach communities more than 20 km for any health facility-some 50 million annual treaments) indicating these programmes are demand driven

The above progress and availability of innovative solutions shows that eliminating NTDs and controlling their transmission is equitable, possible and affordable; annual unit costs of delivery per person as low as 0.10 US$ in some settings and average in Africa circa 0.20-0.40 US$. NTD programmes have been described as a "best buy" in public health in terms of returns on dollar invested. However, going forward, there are still unique challenges and gaps that need to be addressed which are outlined in the next section.

Challenges going forward:

Reaching the most vulnerable populations in remote geographic locations continue to be a challenge for elimination programs. This is further worsened by conflict in countries where NTDs prevail. Changes which impact disease epidemiology (climate change, environmental degradation, peri-urbanization and urbanization) also pose a unique challenge in reaching elimination targets. They require innovative approaches for responsive programme delivery and speedy implementation of scientific and technological advances.

Additionally, incorporating new tools into implementation within health systems requires a more rapid appreciation of the factors which drive success, WHO approval of new tools, resources to deliver them and the requisite strengthening of capacity in endemic countries pose challenges to controlling transmission of NTDs. The pathway from operational research to policy to implementation needs capacity strengthening within the health systems so that they can successfully carry out NTD elimination programmes using the most recently developed tools.

The NTD programme has focused much of its efforts on the administration of preventive chemotherapy. As such, less effort has been spent on role of vector control as an essential component in reducing transmission. Further research into this area is needed so as to improve programme delivery and to sustain the gains made by the mass drug administration. The wider impact of NTDs on the mental health and well being of affected individuals their carers and families is an underappreciated dimension of the NTD problem as those with chronic conditions suffer life long stigma and discrimination-inability to work, reduced marital prospects, reduced educational opportunity for children of the afflicted, and the impact of catastrophic health expenditure incurred in seeking treatment often inappropriate and ineffective driving people and families into the medical poverty trap.

Finally, there is a need for social science research to understand better community behaviour and attitudes towards mass drug administration (MDA) to enhance coverage and adherence to mass drug administration. In order for MDA to be an effective platform for NTD elimination, significant proportions of endemic communities need to swallow tablets every year over many years. These individuals are asked to take these treatments based on their location, rather than on a diagnosis. Maintaining high levels of participation is challenging for national programs and formative social science research has been limited. With more input from anthropologists, psychologists, behavioural

scientists and others, we can better orient social mobilisation campaigns to the needs of communities.

Recommendations:

In order to address the challenges mentioned above, both basic and operational research is still required. We must reflect on the need for new tools as well as address the challenges of increasing uptake of donated medicines in complex and diverse settings which will require innovative approaches to scaling up delivery, surveillance and monitoring and evaluation and unexpected epidemiological challenges.

Based on the evidence we propose the following recommendations for the HESA, in their study of federally funded health research to increase access to medicines and contribute to poverty alleviation:

1) Commit to global initiatives to eliminate NTDs such as Uniting to Combat NTDs. Canada as a signatory to the UN SDGs has recognized implicitly the Health Goal which identify NTDs within the targets.
    a. The London Declaration to fight NTDs is a global commitment to control transmission and eliminate NTDs has been signed by WHO, the World Bank, Non-Governmental Development Organizations (NGDOs) endemic countries, the UK and USAID as bilateral donors, the Bill & Melinda Gates Foundation and major pharmaceutical industries; however, Canada has not yet shown its commitment to combat NTDs although it was a donor to the successful Onchocerciasis Control Programmes in the 1980s. Canada's commitment on a global level would ensure that research and development in this area is in line with ongoing international initiatives.

2) Despite the availability of innovative solutions, we are not reaching the most vulnerable populations, thus, support is still needed in program and research areas that focus on increasing access to medications to the poorest communities.
    a. For instance, implementation research is still needed to understand why free medications are not reaching the poorest communities and how can we improve current strategies to reach individuals in need; so that we can ensure that indeed, no one is left behind.

3) Ensure that NTDs are a priority in the Canadian development agenda by applying innovation to build capacity of governments and local actors in low and middle income countries to improve surveillance and monitoring of NTDs and elimination programs. Doing this will enable endemic countries to reduce the burden of NTDs, allow individuals to reach their full potential to make meaningful contributions to their society and contribute to poverty reduction and reaching SDGs.

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