

# Chapter 9

## Neglected Tropical Diseases: A Biosocial Perspective



Abhiruchi Galhotra and Abhisek Mishra

**Abstract** Neglected tropical diseases (NTDs) are a medically diverse group of communicable diseases that prevail in tropical and subtropical climates, globally. The World Health Organization has identified 18 diseases as NTDs. These diseases flourish under conditions of poverty and filth, where housing is substandard, drinking water is unsafe, sanitation is poor, insect vectors are rampant, and there is restricted or nearly nonexistent access to health care. NTDs are disablers rather than killers and are a proxy for poverty and disadvantage. The biological and medical diversity of NTDs signifies the fact that their control or elimination strategies also need to be very diverse. There is a necessity of multiple approaches and techniques for control and elimination, which include specialized drugs, preventive chemotherapy, mass drug administration, and vector control (which limit or eradicate insects, e.g., flies and bugs, which transmit the infectious pathogens). Despite an encouraging progress to tackle the menace of NTDs, a large number of people still need high-quality free treatments, care, and much more. There is a need to build capacity of health-care providers in order to sustain implementation of efficient control programs.

**Keywords** Neglected tropical diseases (NTDs) · Poverty · Social stigma · Sustainable Development Goals (SDGs)

### 9.1 What Are NTDs?

Neglected tropical diseases (NTDs) are a medically diverse group of communicable diseases that prevail in tropical and subtropical climates. Globally, these diseases affect more than one billion people and cost developing economies billions of dollars every year (Molyneux 2010; Hotez et al. 2009). The various international

---

A. Galhotra (✉)

Department of Community and Family Medicine, All India Institute of Medical Sciences, Raipur, India

A. Mishra

Department of Community and Family Medicine, All India Institute of Medical Sciences, Patna, India

agencies have defined the NTDs differently. The World Health Organization (WHO) defines NTDs as “Chronically endemic and epidemic-prone tropical diseases,” which have an exceptionally large negative impact on the lives of poor populations and remain critically neglected in the global public health agenda (WHO 2007). According to the Global Network for Neglected Tropical Diseases (2017), NTDs are defined as follows: “The neglected tropical diseases are a group of 13 parasitic and bacterial infections that affect over 1.4 billion individuals, majority of whom live on less than US \$1.25 per day.” The Public Library of Science Neglected Tropical Diseases defines NTDs as “a group of poverty-promoting chronic infectious diseases, which primarily occur in rural areas and poor urban areas of low-income and middle-income countries” (Madon et al. 2014). They are poverty-promoting because of their impact on child health and development, pregnancy, and worker productivity as well as their stigmatizing features. According to the United States Agency for International Development, “These diseases disproportionately impact the poor and rural populations, who lack access to safe water, sanitation, and essential medicines” (Armah et al. 2015). They (NTDs) cause disorder and disability, compromise children’s mental and physical development, and result in blindness and severe disfigurement.

The World Health Organization (WHO) has identified 18 diseases as NTDs, viz., Buruli ulcer, Chagas disease, dengue and chikungunya, dracunculiasis (Guinea worm disease), echinococcosis, foodborne trematodiases, human African trypanosomiasis (sleeping sickness), leishmaniasis, leprosy, lymphatic filariasis, onchocerciasis (river blindness), rabies, schistosomiasis, soil-transmitted helminthes, taeniasis/cysticercosis, trachoma, yaws (endemic treponematoses), and mycetoma. Geographical overlap patterns between the highest-prevalence NTDs (soil-transmitted helminths, schistosomiasis, onchocerciasis and lymphatic filariasis, and trachoma), and malaria, HIV are seen, exhibiting a high degree of coinfection. New evidence highlights that NTDs can affect the disease progression of HIV and AIDS, tuberculosis (TB), and malaria. A complex combination of epidemiological, immunological, and clinical factors sums up to these interactions and add to a worsening prognosis for people affected by HIV/AIDS, TB, and malaria. Soil-transmitted helminthic infections have had a long hidden contributing effect on the AIDS epidemic (Simon 2016).

**Dengue:** A viral infection where mosquito acts as a vector causing flu-like illness that may develop into severe dengue and have deadly consequences.

**Rabies:** A preventable viral illness transmitted to humans through the bites of infected canines, which is perpetually deadly once symptoms develop.

**Trachoma:** An infection caused by *Chlamydia*, transmitted through direct contact with infectious eye or nasal discharge or through indirect contact with unsafe living conditions and hygiene practices, which, if left untreated, causes irreversible corneal opacities and blindness.

**Buruli ulcer:** Mycobacterial skin infection often debilitating causing severe destruction of the skin, bone, and soft tissue.

**Yaws:** A chronic bacterial infection which affects mainly the skin and bone, caused by a bacteria.

**Leprosy:** A complex disease caused by bacterial infection primarily affecting the skin, peripheral nerves, mucosa of the upper respiratory tract, and eyes.

**Chagas disease:** A life-threatening disease transmitted to humans through contact with vector insects (triatomine bugs), ingestion of contaminated food, infected blood transfusions, congenital transmission, organ transplantation, and laboratory accidents.

**Human African trypanosomiasis (sleeping sickness):** A parasitic illness spread by the bites of tsetse flies which is nearly 100% fatal without prompt diagnosis and treatment to prevent the parasitic invasion into the central nervous system.

**Leishmaniasis:** A disease transmitted through the bites of infected female sandflies, which in its most severe (visceral) form invades the internal body parts and in its most common (cutaneous) form causes ulcers on face, disfiguring scars, and disability.

**Taeniasis and neurocysticercosis:** This disease is caused by adult tapeworms in human intestines; cysticercosis results when humans ingest tapeworm eggs which hatch as larvae in host tissues.

**Dracunculiasis (Guinea worm disease):** A nematode infection transmitted solely by drinking water contaminated with parasite-infected water.

**Echinococcosis:** This infection is due to the larval stages of tapeworms which later form pathogenic cysts in humans and transmitted following ingestion of eggs predominately shed in the feces of dogs and wild animals.

**Foodborne trematodiasis:** Consumption of fish, vegetables, and crustaceans contaminated with larval parasites causes it.

**Lymphatic filariasis:** Infection transmitted by mosquitoes which causes abnormal enlargement of appendages and genitals due to blockade of lymphatic flow. The adult worms inhabit and reproduce in the lymphatic system.

**Onchocerciasis (river blindness):** Infected blackflies transmit this infection. Some of the symptoms are severe itching and eye lesions, as the adult worm produces larvae leading to visual impairment and permanent blindness.

**Schistosomiasis:** This trematodal disease is transmitted to human when larval forms are released by freshwater snails which penetrate human skin during contact with infested water.

**Soil-transmitted helminthiasis:** These nematode infections are transmitted through soil contaminated by human feces. They cause anemia, vitamin A deficiency, stunted growth, malnutrition, intestinal obstruction, and impaired development.

**Mycetoma:** A chronic, progressively destructive inflammatory skin ailment which commonly affects the lower limbs. Infection is thought to be caused by the inoculation, through a thorn prick or skin damage, of fungi or bacteria into the subcutaneous tissue.

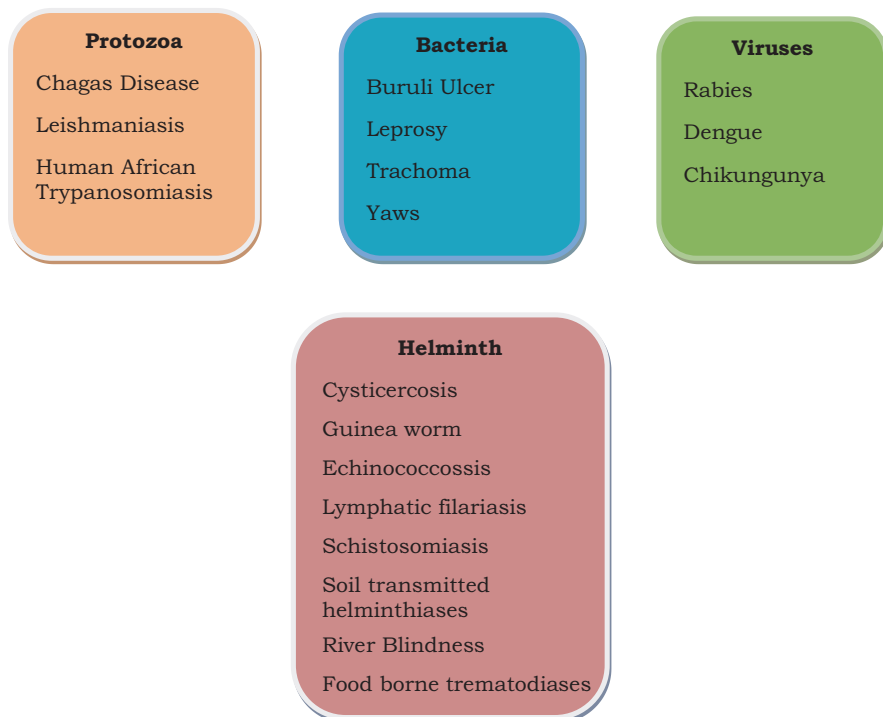
The 10th meeting of the Strategic and Technical Advisory Group (in 2017) for Neglected Tropical Diseases received proposals for the addition of diseases, and, pursuant to the required procedures, chromoblastomycosis, other deep mycoses, scabies and other ectoparasites, and snakebite envenoming have been added to the NTD portfolio.

The transmission patterns of NTDs are also diverse and can take place via:

- Flies, fomites (e.g., skin cells, hair, clothing, or bedding), and fingers (trachoma)
- Mosquitoes (dengue fever and filariasis)
- Tsetse flies (sleeping sickness)
- Sandflies (leishmaniasis)
- Blackflies (onchocerciasis)
- Snails, which release infective larvae into water, which, in turn, penetrate human skin (e.g., schistosomiasis)
- Feco-oral route (e.g., soil-transmitted helminths) or via food products

## 9.2 Who Is Affected by NTDs?

Individuals living in poverty, without adequate sanitation, and in proximity with infectious vectors, domestic animals, and livestock are chiefly affected. These diseases grow vigorously under conditions of poverty and filth, where housing is sub-standard, drinking water is unsafe, sanitation is poor, insect vectors are rampant, and access to health care is restricted or nonexistent (Feasey and Wansbrough-Jones 2010). Neglected tropical diseases cause immense human suffering and death. NTDs are a serious deterrent to poverty reduction and socioeconomic development (Fig. 9.1).



**Fig. 9.1** Infectious agents responsible for NTDs

Globally, 149 nations and territories are affected by at least one NTD. There is a high potential for NTD risk globally, as over 40% of the human population (about three billion people) currently live in the tropics. There is additionally a high potential for an increase in NTD prevalence, particularly, in the absence of enhanced public health efforts (Gubler 2002; Dujardin et al. 2008). These diseases kill an estimated 534,000 individuals worldwide every year (Neglected Tropical Disease WHO 2009). NTDs are a noteworthy reason of disease burden, resulting in approximately 57 million years of life lost due to premature disability and death. Individuals are often afflicted with more than one parasite or infection. Treatment cost for most NTD mass drug administration programs is estimated at less than US 50 cents per person per year (Neglected Tropical Diseases-Fast facts CDC 2017. para 1).

### 9.3 Why the Term Neglected for These Diseases?

NTDs are a proxy for poverty and disadvantage (World Bank Report 2012). The neglected tropical diseases have their hotbeds in the places left farthest behind by financial advance, where substandard housing, lack of access to safe and clean drinking water and sanitation, chronic hunger, filthy environments, and abundant insects and other vectors contribute to their efficient transmission (Hotez et al. 2009).

The NTDS have a strong presence in rural, remote, vulnerable, and marginalized populations. They are found most in populations who have limited access to sustainable, adequate, and affordable water supply and sanitation facilities. The poor territories, therefore, endure the maximum burden of multiple NTDs at any given time (WHO 2015). HIV, malaria, and tuberculosis have been in focus because of their higher mortality. There has been an underestimation of the contribution of NTDs to mortality due to the asymptomatic and long incubation period that is characteristic of many of these diseases and a lack of interest in developing (nonprofitable) treatments by pharmaceutical companies. Therefore, the term neglected is used for these diseases. Historically, the NTDs have been connected with witchcraft and other beliefs such as bad behavior, and these diseases are seen as divine punishment. The NTDs usually result in stigma, silence, and hiding, with people usually resorting to traditional healers and other forms of informal treatments and self-treatment.

### 9.4 What Differentiates NTDs from Non-neglected Diseases?

It is a fact that NTDs are disablers instead of killers. NTD infections are co-endemic; an individual might be infected with more than one NTD in addition to other diseases such as HIV, tuberculosis, and malaria. For example, the parasitic infection with schistosomiasis increases susceptibility in females to HIV infection. This parasite also saps micronutrients and iron from developing children to stunt their

growth, thereby contributing to increased absenteeism in schools. Lymphatic filariasis (a chronic helminth parasitic infection) causes severe swelling (lymphedema) in populations affected, rendering them socially stigmatized and unfit to work. Various other NTDs can be portrayed by chronic disabilities, increased susceptibility to infectious and noninfectious diseases, social stigma, and an economic burden on the individual, the family, and the country (Cotton 2014; Perera et al. 2007; Weiss 2008).

This biological and medical diversity of NTDs signifies the fact that the control or elimination strategies also need to be very diverse. They require different approaches and strategies for control/elimination, which include specialized medicines, preventive chemotherapy, mass drug administration, and vector control (which limit or eradicate insects, e.g., flies and bugs, that transmit the infectious pathogens).

## 9.5 Why Are NTDs Receiving Increased International Recognition?

As the NTDs have wide range of medical signs and symptoms and transmission patterns, it is challenging to concentrate the world's attention on these very diverse diseases which required an equally diverse range of different interventions. Though medically diverse, NTDs have certain characteristics in common, and some of them are given below:

- They affect the poorest of poor – those with limited access to safe and clean drinking water, proper sanitation, and even basic health services.
- High-income groups are rarely affected.
- Most of NTDs are chronic, gradually progressive conditions which become worse if undetected and untreated and cause an irreversible damage.
- They cause severe pain, agony and lifelong disabilities, with long-term consequences for the person and their caregivers.
- People with NTDs are often stigmatized and excluded from society, which might affect their psychological well-being (Molyneux 2013).

Therefore, by recognizing what NTDs have in common, and grouping them together under the NTD “brand,” it became conceivable to convince the concerned parties for an international action. This was supported by good evidence: that addressing NTDs is cost-effective in terms of economic rates of returns on investment of health dollars, leading to “More health, for more people, for fewer dollars.” Further, the NTDs have a social and economic impact, which, in turn, has significant bearing on equity, equality, and development issues. These issues fall within the mandate of development organizations accordingly justifying both technical and financial support (Molyneux 2004).

## 9.6 The Social and Economic Impact of NTDs

It is now well accepted fact that prevalence of NTDs is a strong and effective indicator of poverty. These diseases are an after effect of destitution, and they thus contribute to further poverty in affected people (Durrheim et al. 2004; WHO 2012). The social and economic impacts of NTDs are:

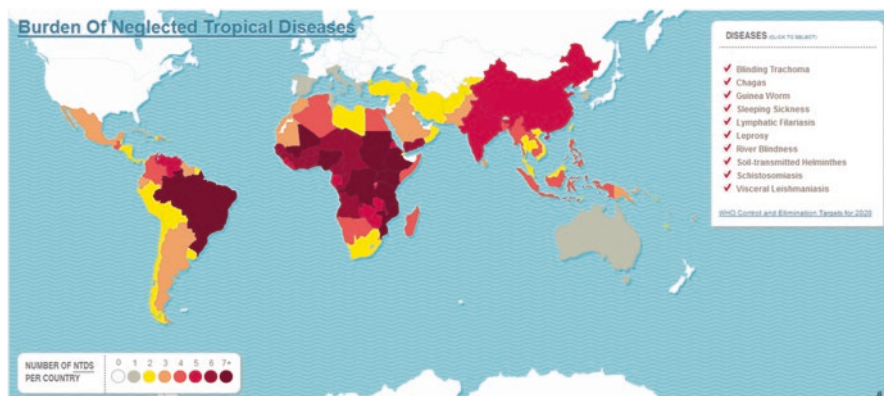
- Loss of ability to undertake traditional farming practices, which is the main source of livelihood in rural areas, especially those thriving on agrarian economy.
- Loss of capacity to play an economic and social role(s) within the family and community.
- Due to lack of awareness and inaccessibility of proper treatment for NTDs, people usually go in for inappropriate treatment (e.g., traditional healers), which augments the cycle of poor health and poverty.
- Losses of educational opportunities, as children are compelled to act as caregivers for their parents, which creates a generation of people with little or no education.
- Poor mental health of the patient and the caregiver, particularly chronic depression.
- Women typically tend to have poorer access to health care than men (Courtright and Lewallen 2009). When women become ill, they are less able to do work such as growing vegetables, fetching water and fuel, providing care for older people and children, and ensuring that family members wash their hands or wear shoes which reduce the transmission of NTDs. Hence, the impact of NTDs on the unpaid work provided by women in the community is difficult to quantify/measure.

## 9.7 How to Reduce the Burden of NTDs?

WHO recommends an integrated approach to overcoming the global impact of NTDs through following five interventions:

- Innovative and intensified disease management
- Preventive chemotherapy
- Vector ecology and management
- Veterinary public health services
- Provision of safe water, sanitation, and hygiene

There is a need to coordinate and bolster approaches and strategies to enhance access to interventions for the prevention, diagnosis, treatment, care, control, elimination, and eradication of NTDs, including zoonotic diseases to all those in need. Further, there is a need to strengthen and maintain national control programs with clearly defined responsibilities in order to coordinate essential functions such as situation analysis, strategic planning, budgeting, prevention, diagnosis, treatment,



**Fig. 9.2** Burden of Neglected Tropical Diseases globally. (Source -<https://neglectedtropicaldiseases.wordpress.com/category/uncategorized/page/2/>)

surveillance, and capacity building, timely distribution of medicines, and supervision of tasks at all levels of the national health systems. The results are more effective when these approaches are combined and delivered locally (Neglected Tropical Diseases 2017) (Fig. 9.2).

## 9.8 What Is Being Done to Control NTDs?

The first NTD global partner meeting was convened by WHO in 2007, with commitments from member states to donate large quantities of high-quality medicines to suppress common tropical parasitic and bacterial infections. Since 2007, various local and international partners have worked alongside ministries of health in endemic countries to deliver quality-assured medicines and provide individuals with care and long-term management. In 2012, partners embraced a WHO NTD roadmap, which committed additional support and resources to eliminate ten of the most common NTDs (WHO 2012).

The first WHO report on NTDs (2010) set the scene by exhibiting proof for how these interventions had produced results. The second report (2013) assessed the progress made in deploying them and detailed the obstacles to their implementation (WHO 2013). The third report (Investing to overcome the global impact of neglected tropical diseases) analyzed for the first time the investments needed (finances needed) to accomplish the targets of the targets of the WHO Roadmap on NTDs and universal coverage against NTDs. WHO's fourth global report on neglected tropical diseases – Integrating neglected tropical diseases into global health and



**Table 9.1** Major milestones regarding steps taken by WHO for the elimination of NTDs

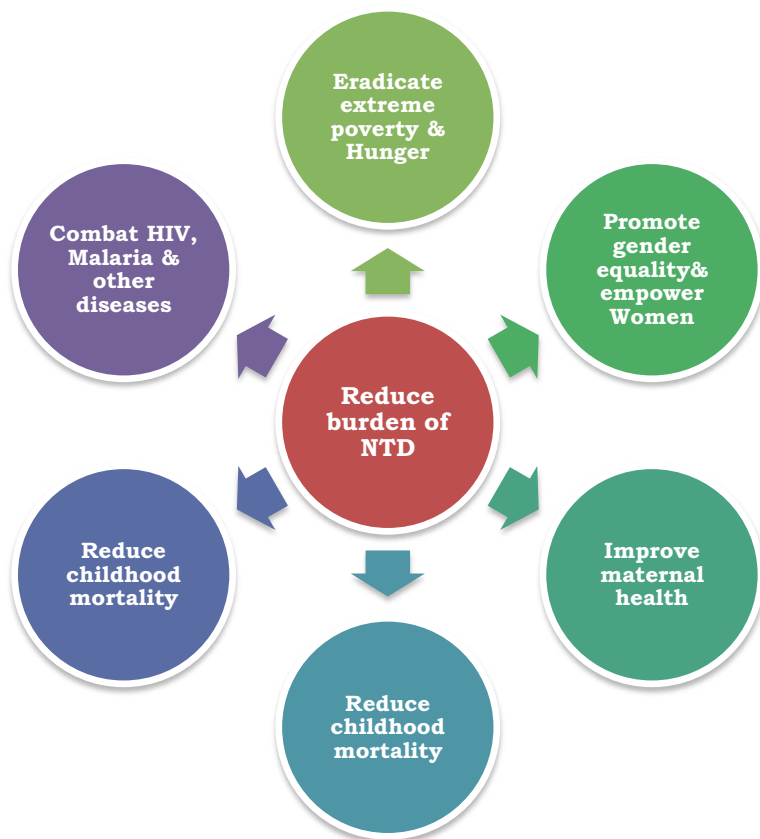
<b>2017</b> – WHO hosts 2nd Global Partners Meeting amid unprecedented progress. Pledges of more than US\$ 800 million dollars are made over the next 5–7 years to accelerate the elimination and eradication of NTDs
<b>2015</b> – NTD interventions reach almost a billion of the poorest people
<b>2013</b> – WHO’s decision-making body – the World Health Assembly – passes Resolution 66.12 calling on countries to accelerate interventions to eliminate NTDs
<b>2012</b> – WHO publishes the NTD Roadmap with 2015 and 2020 targets. Inspired by the Roadmap, partners endorse the London Declaration which committed renewed support to eliminating 10 NTDs
<b>2010</b> – WHO publishes its first global NTD report, triggering renewed and additional medicine and in-kind donations
<b>2008</b> – WHO publishes its Global Plan to Combat Neglected Tropical Diseases 2008–2015
<b>2007</b> – WHO hosts the first Global Partners’ Meeting, heralding a close multi-stakeholder collaboration

development – was launched to celebrate “Collaborate. Accelerate. Eliminate” in April 2017 (“Uniting to Combat” 2016). Due to limited financial resources, ineffective surveillance, disruptive conflicts, and other barriers to access the needed health services, the NTD programs continue to struggle. The need of the hour is integrated approaches (coordinated methodologies) for simplification, cost-effectiveness, and streamlined efficiency (“World Health assembly adopts resolution on NTDs” 2013) (Table 9.1).

## 9.9 NTDs and Sustainable Development Goals (SDGs)

NTDs have wide cross-cutting and cross-sectoral linkages and effects. An effort to mitigate the impact of NTDs provides a chance to mitigate poverty and to have a direct bearing on the achievements of SDGs. The NTDs have the greatest relevance for SDG 3 (the Health Goal). NTDs influence and are influenced by many of other developmental areas covered in the agenda 2030.

The SDG 1 targets the ending of poverty in all its forms everywhere; NTD programs can go a long way toward achieving that target as NTDs are considered as proxy indicators of poverty and disadvantage. The SDG 2 (Zero Hunger), 4 (Quality Education), 6 (Clean Water and Sanitation), 11 (Sustainable Cities and Communities), and 17 (Partnerships for the Goals) are in consonance with the NTD programs. Therefore it is important to integrate the NTD control programs into the broader health systems, based on principles of Universal Health Coverage which is the focus of SDG health agenda (Fig. 9.3).



**Fig. 9.3** Integrated approach to overcome the impact of NTDs through five interventions as per WHO

## 9.10 Conclusions

NTDs handicap, incapacitate, and propagate cycles of poverty, school dropouts, parents out of work, and dampening hope of any chance of an economic future. Medical interventions alone cannot solve the problem of NTDs. A broader attack on the social, environmental, and economic determinants of health is needed. Ignorance is the primary fight that must be fought in this war. Community engagement has a noteworthy potential to create grassroots demand for treatment and reduce stigma because these diseases are so deeply feared by affected populations. Despite an encouraging progress to tackle the menace of NTDs, millions of people still need free high-quality treatments, and millions more still need care and treatment. There is a need to build capacity of health-care providers in order to sustain implementation of efficient control programs. Strengthened epidemiological

surveillance systems should be in place for effective monitoring and evaluation of the programs. The health systems need to develop beyond the health center for the successful integration of NTDs into the mainstream health care. The financial resources should be coordinated through effective plans and budgets at national and district levels. To succeed in the elimination of NTDs, we need to look beyond mass drug administration to the removal of the primary risk factors for NTDs (i.e., poverty and exposure) by ensuring access to safe and clean drinking water, basic sanitation, improvement in vector control, integration of the NTDs into poverty reduction schemes and vice versa, and building stronger and equitable health systems in endemic areas.

## References

- Armah FA, Quansah R, Luginaah I, Chuenpagdee R, Hambati H, Campbell G (2015) Historical perspective and risk of multiple neglected tropical diseases in coastal Tanzania: compositional and contextual determinants of disease risk. *PLoS Negl Trop Dis* 9:e0003939
- Cotton R (2014) Neglected tropical diseases: progress and challenges for the post 2015 development era: special edition on infectious disease. Retrieved from [sitn.hms.harvard.edu/flash/special-edition-on-infectiousdisease/2014/neglected-tropical-diseases](http://sitn.hms.harvard.edu/flash/special-edition-on-infectiousdisease/2014/neglected-tropical-diseases). Progress and challenges
- Courtright P, Lewallen S (2009) Why are we addressing gender issues in vision loss? *Community Eye Health J* 22:17–19
- Dujardin J-C, Campino L, Cañavate C, Dedet J-P, Gradoni L, Soteriadou K et al (2008) Spread of vectorborne diseases and neglect of Leishmaniasis. *Eur J Emerg Infect Dis* 14:1013–1018
- Durrheim DN, Wynd S, Liese B, Gyapong JO (2004) Lymphatic filariasis endemicity: an indicator of poverty? *Trop Med Int Health* 8:43–45
- Feasey N, Wansbrough-Jones M, Mabey DCW, Solomon AW (2010) Neglected tropical diseases. *Br Med Bull* 93:179–200. Retrieving from <https://doi.org/10.1093/bmb/ldp046>
- Global Network for Neglected Tropical Diseases (2017) About neglected tropical diseases. Retrieved from <http://gnntdc.sabin.org/about-ntds>
- Gubler DJ (2002) Epidemic dengue/dengue hemorrhagic fever as a public health, social and economic problem in the 21st century. *Trends Microbiol* 10:100–103
- Hotez PJ, Fenwick A, Savioli L, Molyneux DH (2009) Rescuing the bottom billion through control of neglected tropical diseases. *Lancet* 373:1570–1575. Retrieved from [https://doi.org/10.1016/S0140-6736\(09\)60233-6](https://doi.org/10.1016/S0140-6736(09)60233-6)
- Madon S, Amaguru JO, Malecela MN, Michael E (2014) Can mobile phones help control neglected tropical diseases? Experiences from Tanzania. *Soc Sci Med* 102:103–110 pmid:24565147
- Molyneux DH (2004) “Neglected” diseases but unrecognized successes-challenges and opportunities for infectious disease control. *Lancet* 364:380–383
- Molyneux DH (2010) Neglected tropical diseases-beyond the tipping point? *Lancet* 375:3–4
- Molyneux D (2013) Neglected tropical diseases. *Community Eye Health J* 26:21–24
- Neglected tropical Diseases Definition in Public Library of Sciences (PLOS) Neglected Tropical Diseases (2017) Retrieved from <http://www.plosntds.org/static/scope.action>
- Neglected tropical Diseases Fast Facts-Centers for Disease Control and Prevention (2017) Retrieved from <https://www.cdc.gov/globalhealth/ntd/fastfacts.html>
- Neglected Tropical Diseases. World Health Organization (2017) Neglected tropical diseases. (n.d.) in neglected tropical diseases WHO report on neglected tropical diseases. Retrieved from [http://www.who.int/neglected\\_diseases/en/](http://www.who.int/neglected_diseases/en/)
- Perera M, Whitehead M, Molyneux D, Weerasooriya M, Gunatilleke G (2007) Neglected patients with a neglected disease? A qualitative study of lymphatic filariasis. *PLoS Negl Trop Dis* 1:e128

- Simon GG (2016) Impacts of neglected tropical disease on incidence and progression of HIV/AIDS, tuberculosis, and malaria: scientific links. *Int J Infect Dis* 42:54–57
- Uniting to combat neglected tropical disease (2016) Reaching the unreached. Fourth progress report of the London declaration. Retrieved from <http://unitingtocombatntds.org/report/fourth-report-reaching-unreached>
- Uniting to Combat Neglected Tropical Diseases: Translating the London Declaration into Action (2012) Meeting report. The World Bank, Washington, DC Retrieved from [www.unitingtocombatntds.org](http://www.unitingtocombatntds.org)
- Weiss MG (2008) Stigma and the social burden of neglected tropical diseases. *PLoS Negl Trop Dis* 2:e237
- World Health Organization (2012) Accelerating work to overcome the global impact of neglected tropical diseases: a roadmap for implementation. Geneva. Retrieved from [www.who.int/neglected\\_diseases/NTD\\_RoadMap\\_2012\\_Fullversion.pdf](http://www.who.int/neglected_diseases/NTD_RoadMap_2012_Fullversion.pdf)
- World Health Organization (2013) Sustaining the drive to overcome the Global impact of Neglected tropical diseases, Second WHO Report on NTDs, Geneva. Retrieved from [www.who.int/iris/bitstream/10665/77950/1/9789241564540\\_eng.pdf](http://www.who.int/iris/bitstream/10665/77950/1/9789241564540_eng.pdf).
- World Health Organization (2015) Water, Sanitation and Hygiene for accelerating and sustaining progress on Neglected Tropical Diseases-A global strategy, 2015–2020, Geneva, Switzerland. Retrieved from [http://www.who.int/water\\_sanitation\\_health/publications/wash-and-ntd-strategy/en/](http://www.who.int/water_sanitation_health/publications/wash-and-ntd-strategy/en/)
- World Health Organization (2017a) Neglected tropical diseases. Summary. Retrieved from [http://www.who.int/neglected\\_diseases/diseases/summary/en/](http://www.who.int/neglected_diseases/diseases/summary/en/)
- World Health Organization (2017b) Neglected tropical diseases – gravis learning agenda drives change for rabies. Retrieved from [http://www.who.int/neglected\\_diseases/zoonoses/en/](http://www.who.int/neglected_diseases/zoonoses/en/)
- World Health Organization (2017c) Integrating neglected tropical diseases into global health and development: fourth WHO report on neglected tropical diseases. Executive summary. Geneva. Retrieved from [http://www.who.int/neglected\\_diseases/resources/9789241565448/en/](http://www.who.int/neglected_diseases/resources/9789241565448/en/)
- World Health Organization (2017d) Neglected tropical diseases – world health assembly approves comprehensive global approach against vector borne diseases. Retrieved from [http://www.who.int/neglected\\_diseases/vector\\_ecology/en/](http://www.who.int/neglected_diseases/vector_ecology/en/)
- World Health Organization Neglected Tropical Diseases-Neglected tropical diseases Hidden success, Emerging opportunities (2009) World Health Organization, Geneva. Available at [www.who.int/neglected\\_diseases/diseases/NTD\\_Report\\_APPMG.pdf](http://www.who.int/neglected_diseases/diseases/NTD_Report_APPMG.pdf)
- World Health Organization Neglected Tropical Diseases-world health assembly adopts resolution on Neglected Tropical Diseases (2013) Retrieved from [www.who.int/neglected\\_diseases/WHA\\_66\\_seventh\\_day\\_resolution\\_adopted/en/](http://www.who.int/neglected_diseases/WHA_66_seventh_day_resolution_adopted/en/)
- World Health Organization WHO-Global plan to combat neglected tropical diseases 2008–2015 (2007) World Health Organization, Geneva. Available at [whqlibdoc.who.int/hq/2007/WHO\\_CDS\\_NTD\\_2007.3\\_eng.pdf](http://whqlibdoc.who.int/hq/2007/WHO_CDS_NTD_2007.3_eng.pdf)