A Study on behavioral Health Interventions for Neglected tropical diseases

What is missing in current health interventions?

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Abstract:

Aim: The aim of this paper is to provide a deeper understanding of the spread of NTDs but to also determine what is missing in the health interventions that are conducted in the countries affected by NTD.

Method and theory: The method used in this paper is the theory testing approach which is the Social Cognitive Theory. Development in the 1970s by A. Badura, it's based on the concept of interaction between personal, environmental and social factors.

Results: The results showed that both the previous research and today's health interventions lack the understanding of the roll social and personal factors play in the spread of NTD. They mainly target the environmental factors and medical. Therefore, the NTDs are still endemic despite the effort during many years.

Key words:

Health, intervention, SCT, behavioral health, NTD

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1. Introduction

1.1. Background:

Neglected Tropical Diseases (NTD) are a group of the most common diseases among the 2.7 billion poorest people in the world living on less than $ 2 (USD) per day.[1] They are largely eradicated in most developed countries. Despite the terrible suffering and permanent disabilities provoked by them, they are often less visible than other diseases and receive little attention from governments and are therefore often forgotten, which is the main reason why they are called "*neglected*". They persist exclusively in the poorest and most marginalized communities living in the tropics and subtropical. These diseases affect millions of people and kills ten thousand around the world. They are endemic where there is no safe water or satisfactory sanitation conditions, where housing conditions are deplorable and where access to health care is limited. Children and pregnant women are particularly vulnerable to neglected tropical diseases.[2]

There is no standard definition of neglected tropical diseases, and this group may vary depending on to classifications. Two approaches exist to define this term: the first is to emphasize negligence as the main characteristic, while the second approach is based on the common characteristics of diseases and their impact on poverty and development[3]

There are currently 17 major neglected tropical diseases, that can be prevented or eliminated for the most part. The list includes: *Dengue, Rabies, Dracunculiasis (guinea-worm disease)Trachoma, Lymphatic filariasis, Buruli ulcer, Leprosy, Chagas disease, Human African trypanosomiasis (sleeping sickness), Leishmaniasis, Taeniasis and neurocysticercosis, , Echinococcosis, Foodborne trematodiases, Onchocerciasis (river blindness), Schistosomiasis, Soil-transmitted helminthiases, Yaws, Mycetoma.* Primarily in

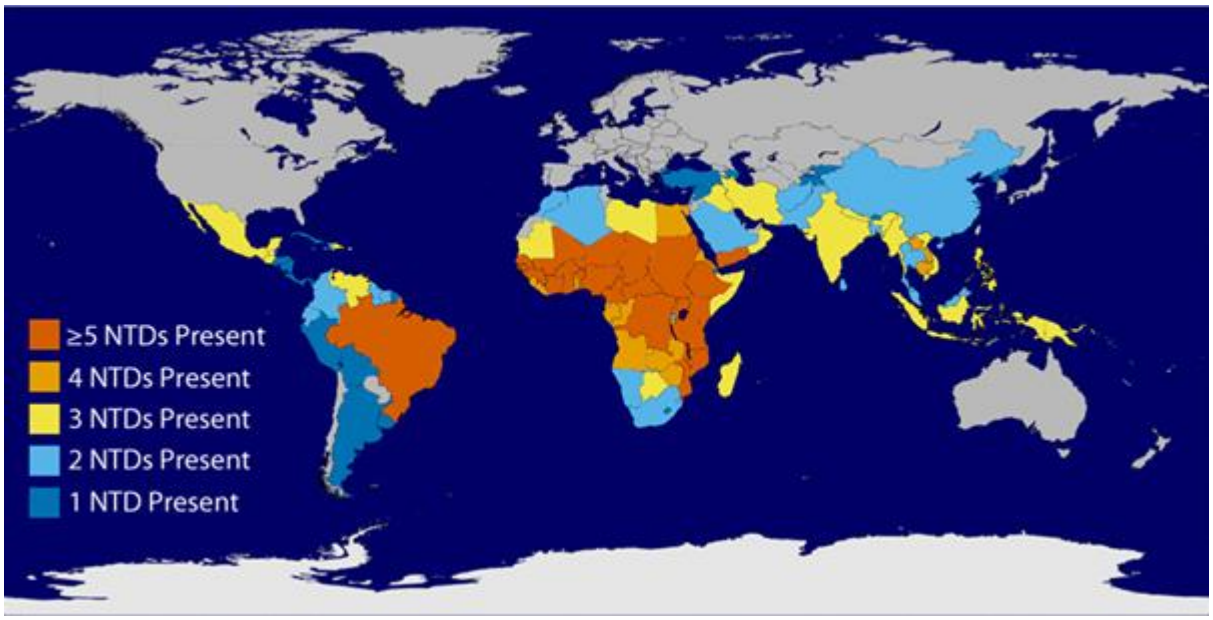
[1] Hotez PJ, Molyneux DH, Fenwick A, Kumaresan J, Sachs SE, Sachs JD, et al. Control of neglected tropical diseases. N. Engl. J. Med. 2007 sept
[2] Ibid
[3] Hotez PJ Ph.D. Forgotten People, Forgotten Diseases: The Neglected Tropical Diseases and Their Impact on Global Health and Development. 1er éd. ASM Press; 2008

deprived communities, resulting in intense physical pain, serious aesthetic damage and severe disability. Some are very lethal.[4]

There are simple and effective ways to fight on a large scale against a group of these diseases (*onchocerciasis, schistosomiasis, Soil-transmitted helminthiasis and Lymphatic filariasis*), but not against the second group (*Buruli ulcer, trypanosomiasis, Human and African Leishmaniases*). This second group requires strong community-based surveillance to enable early detection of cases and prompt treatment of patients, to prevent disability and death.[5]

In recent years, neglected tropical diseases have become more important but they still need to be given more attention by the international community. At the international level, there is renewed interest and a new impetus for the fight against NTDs, which has taken the form of major events such as the Declaration of London in January 2012[6] and the Accra Appeal for NTDs etc.

The following picture shows where NTD's a present in the world currently:



Source: Global Health – Division of Parasitic Diseases and Malaria: *Overlap of six of the common NTDs*

[4] David Molyneux (2013); Neglected tropical diseases

[5] Molyneux (2004) *"Neglected" diseases but unrecognised successes–challenges and opportunities for infectious disease control.*

[6] London declaration on NTD

1.2. Research problem

WHO estimates that neglected tropical diseases are endemic in 149 countries and territories that face at least one neglected tropical disease. A hundred countries (more than 70% of them) face at least two diseases. Other 30 countries face more than six simultaneous neglected tropical diseases, most of which have low-income economies or are in a humanitarian crisis.[7]

In other words, we have here 17 diseases that are killing poor people across the world. The core similarities they all have is poverty, inadequate water, food shortages, low socio-economic status and the access to health care facilities is limited.

Public health strategies developed to control the vast majority of NTDs involves the on medical care to infected individuals. Many NTDs are transmitted by insect vectors. The diseases also persist due to the existence of animal hosts. A disease control strategy is a method of eradication and / or treating infected animals. Thus, medical interventions are being used as well as vector-control interventions, these interventions have shown to have melioration. However, these diseases are still present and their burden remains the same throughout the years.[8] The strategies used so far by health organization had success in limiting the number of new cases. However, those 17 NTDs are endemic in 2017, one can't help but wonder if those interventions or strategies should be readapted and focus on targeting the underlying cause, mentioned earlier. Poverty, inadequate water, food shortages, and low socio-economic status contribute greatly.

According to P.J Hotez (2007), a number of NTDs negatively affect a person's economy as a consequence of their attenuate effect on the health in early childhood. For example, the soil-transmitted helminth infection and schistosomiasis debilitates children's growth, development.

There is limited research done on NTD and behavioural intervention but behavioural interventions has never been mentioned as a potential solution for NTD control.[9]

[7] WHO (2009); *Neglected tropical diseases, hidden successes, emerging opportunities*
[8] ibid
[9] Dieter Vanderelst (2010) *Quantifying the Lack of Scientific Interest in Neglected Tropical Diseases*

Despite all the effort, time and money invested, NTDs are still endemic and a burden to the development of populations.

1.3. Research questions

This leads to the following research question.

1. *What is lacking in today's health interventions when targeting NTDs?*
2. *Can the Behavioural health interventions be used in health interventions to promote health and maybe prevent NTD?*

1.4. Aim

The purpose of this paper is to provide a deeper understanding of the spread of NTDs but to also determine what is missing in the health interventions that are conducted in the countries affected by NTD. As mentioned before despite progress in important fields such as medical and technological, NTDs are still endemic in today's world. In this context, this paper will observe how behaviour change can be a solution to the spread of NTD and the effects of behavioural health interventions.

Behavioural interventions are interventions designed to influence the actions individuals take regarding their health. With behavioural interventions, in contrast to other efforts, the patient's behaviour is the key and the goal is to change it. As opposed to the regular interventions used for NTDs, behavioural interventions have seen great results when implemented for diseases like cardiovascular, obesity, etc.

1.5. Limitation

For this paper, it would have been ideal to be present in affected areas to collect the numbers and research. Because it isn't possible in this case, the results written in reports made by WHO and Médecins sans Frontieres are essential empirical material, since this papers first research question is about what is done today and what is lacking in health interventions. The authenticity of the reports can be questioned considering they are not reviewed for credibility when published but they will be conscientiously analysed. But since the main focus is on health interventions and how behavioural health interventions can be used in the fight against NTDs, previous scientific articles in those fields will be gathered and studied.

The second limitation this paper faces is the broadness of NTD's, as mentioned there are 17 spread all over the developing countries. Therefore, addressing to each of them will not be possible.

These diseases have been on the neglected list for a long period of time but the number of research is limited.

1.6. Disposition

In the section on *Method* is a review, description of the choice of method which is qualitative, and how this is used in the study.

The section *Theoretical framework* begins with a review of previous research. Theories of behavioural health interventions would describe how health and human behaviour work together, what mechanisms and incentives there are and how they affect the health outcome of a person. The selected theory in this paper is *Social Cognitive Theory.* This theory is presented in further section on *Theoretical framework.* In the section on *Material* is presented the study's selection of empirical material, if the material is sufficiently broad to answer research questions in a credible way and any problems with the material selection. The *empirical study* will describe behavioural health interventions and how it can be used in health intervention for NTDs. The section *Theoretical analysis* is divided based on the analysis tools the theory SCT offers, where the material is analysed using theories. In the

conclusion, I discuss the findings and my thoughts on the outcome. I will also outline my recommendations for future research since NTD is still a problem today and it needs more attention worldwide.

2. Method

The method was chosen to facilitate the response of the selected research questions and the explanation of the scientific problems presented. In order to achieve the purpose of this paper, the methodological tools will be a theory testing method of Social Cognitive Theory of Albert Bandura with various scientific texts and reports from relevant actors to analyse latent content.

2.1 Method discussion

This method helps to create a deeper understanding of the underlying causes of the phenomenon or event being investigated. The theory testing approach assumes a theory already designed to determine whether this theory may correspond to parts of reality which in this case is health interventions. This approach has as its starting point to verify or falsify SCT with the data collected. This method, I believe, is best the suited in this paper. I will conduct an analysis between the theory and the collected material.

The material is the previous research from such fields as Social Cognitive Theory (SCT), behavioural interventions and NTD. In order to achieve the purpose of this paper, I will also use secondary data previously collected and documented such as the rapports made from

Médecins sans Frontieres, WHO and other reports that present the disease's prevalence in the countries where it is endemic from the last 5-10 years.

By doing so it will be easier to see the development made so far to prevent and control the diseases. What has been implemented, were they successful but also if and how behavioural health interventions can be used. Therefore, earlier research will help answer the essay research issues previously mentioned.

Social Cognitive Theory will be an analysis tool for the thesis if the health interventions should be more adapted to change behaviour rather than just enforcing medical help.

With the scientific articles, I intend on analysing and eventually, capably answer the research questions. They all bring relevant information on NTD, Behavioural health interventions and SCT. The data was mainly collected using keywords which were; *NTD, SCT, health intervention, behavioural interventions, WHO* and *Médecins sans Frontieres*. The results were peer-reviewed and health intervention data collected in fields.

The study assumes an approach, whose interest lies in describing how the NTD are controlled as well as explaining if behavioural health approach can be a solution to the endemic.

The chosen method is a result of the limitations this paper faces. As mentioned before the data on this subject is limited and reports from interventions are always questionable since they are not reviewed for credibility. To properly answer the first research question, I will gather data on the methods used to control NTDs as well as data on the success reported from behavioural health interventions and from there answer the second research question. I will analyse the findings to conclude if behavioural health interventions can be used in health interventions to promote health and maybe prevent NTD.

3. Theoretical framework

Although the burden of NTDs has declined worldwide, they remain a major public health problem and an impediment to development in developing countries. NTDs continue to afflict the poorest and most marginalized populations, with communities having limited access to health care, education and other resources.

Paul Collier described the women and children as being disproportionately affected by these devastating diseases; Women are often victims of stigma following the distorting manifestations of NTDs while children who are often infected in the early years of childhood are likely to suffer the consequences of NTDs on their development which also decrease their quality of life and productivity in adulthood.[10]

Depending on the disease, the number of people at risk for NTD in the world ranges from tens of millions, for example for Chagas' disease and sleeping sickness, to several billion for intestinal helminthiasis[11]. Despite the existence of cost-effective and cost-effective interventions for lymphatic filariasis, onchocerciasis or intestinal helminth infections[12], their prevalence may still be as high as several tens or even hundreds of millions of people, as is the case for schistosomiasis[13]

In a research paper done by Feasey N., in 2010, he discussed the noticeable improvements in NTD control such as the decline in Leprosy and onchocerciasis. But argued that the burden of NTDs is present, solution such as educating patients and rehabilitation must follow medicinal treatment.[14]

The determinants of health are personal, social, economic and environmental factors that determine the health status of individuals or populations. They are multiple and interact with one another[15]. Health promotion targets all potentially modifiable determinants of health, not only those related to individuals' actions, such as health behaviours and lifestyles, but also factors such as income and Social status, schooling, employment and working conditions,

[10] Collier, Paul; *The bottom billion. Why the poorest countries are failing and what can be done about it*
[11] Hotez PJ, Molyneux DH, Fenwick A, Kumaresan J, Ehrlich Sachs S, Sachs JD, Savioli L. Control of neglected tropical diseases.
[12] Who (2010), *Working to overcome the global impact of neglected tropical diseases*
[13] Collier P. (2007); *The bottom billion. Why the poorest countries are failling and what can be done about it*
[14] Feasey N, Wansbrough-Jones M, Mabey DC, Solomon AW. Neglected tropical diseases.
[15] Marmot, Micheal (2005), *Social determinants of health inequalities*

access to appropriate health services and physical environments. Combined, these elements create different living conditions that have effects on health.

P. Hotez and A. Fenwick both argued the success in behavioural health interventions when used to help with obesity, cardiovascular diseases, by introducing how bad smoking is and promoting physical exercises. These kinds of interventions have common core foundation and that is education. Through education they hope to change behaviours and promote health which can sometimes fail.[16]

The most successful health programs and initiatives are established on an understanding of health behaviour and the circumstances in which they appear. Therefore, measures to improve health behaviour best outlined with an understanding of applicable theories of behavioural changes and the ability to operate them skilfully.[17]

Research is done in NTD and behavioural intervention but behavioural interventions has never been mentioned as a potential solution for NTD control[18].

3.1. Social Cognitive theory

Social Cognitive Theory (SCT) which was made popular in the late 1970s when Alfred Bandura suggested that learning through personal experience alone is too challenging and perhaps dangerous. SCT goes beyond basic behavioural concepts that suggests that by doing something, we assume changes in behaviour. Bandura suggests that one must see, understand, and ascribe value and experience to develop behaviours[19].

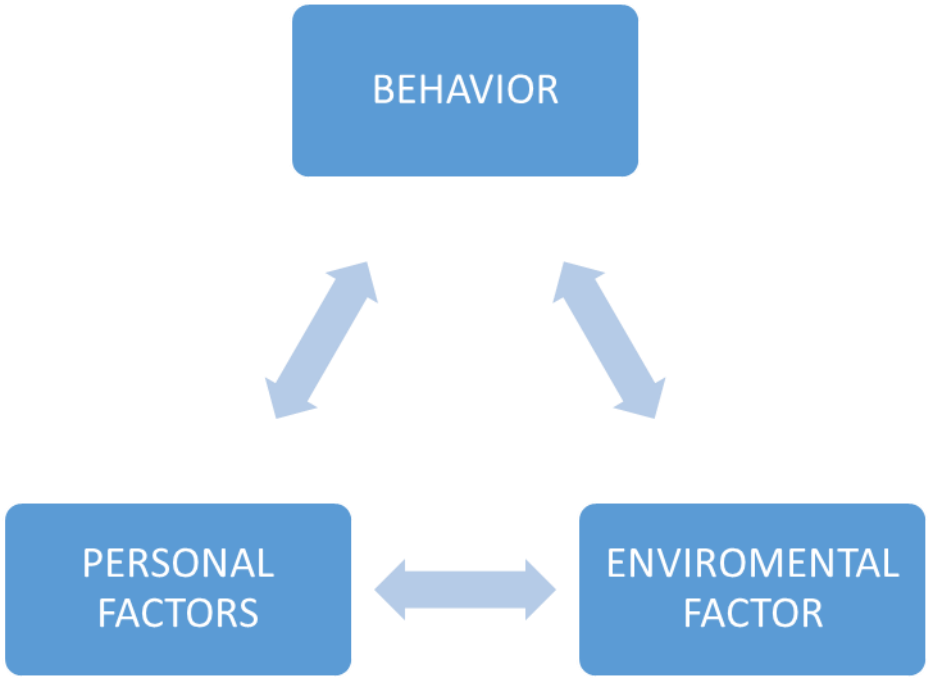
Seen from the SCT's perspective, human nature is defined by an enormous aptitude that can be shaped by direct and speculative experience[20].

For Bandura, an individual's beliefs about his or her ability to successfully complete a task or set of tasks are among the main mechanisms for regulating behaviour[21].

[16] Peter J Hotez, Alan Fenwick (2009); *rescuing the bottom billion through control of neglected tropical diseases*
[17] Karen Glanz and Donald B. Bishop (2010); *The Role of Behavioral Science Theory in Development and Implementation of Public Health Interventions*
[18] Smedley BD, Syme SL, *Promoting health: intervention strategies from social and behavioral research.*
[19] Bandura, A. *Social foundations of thought & action, A social cognitive theory.* Englewood Cliffs, N.J.: Prentice-Hall, cop. 1986 sid.18-22
[20] Ibid

SCT has key parts related to individual behaviour change include: symbolizing capability, forethought capability, and capability, self-regulatory and self-reflective capability. Every component values the human capabilities to evolve from personal experience or the environment. By putting emphasis on the assumption that a person has command over and can change a behaviour[22].

According to Bandura, most patterns of human behaviour are created by personal experience and retained in neutral codes in the brain, rather than being provided ready-made by inborn register.[23]



The scheme of reciprocal determinisms in Bandura's theory

Thus, in this view, the influence of the environment on behaviour remains essential, but in contrast to what is found in behavioural theory of learning.

For Bandura, humans do not only respond to stimuli, they interpret[24]. Bandura cited several examples showing that the effect of the situation on the behaviour (reinforcement) becomes

[21] ibid
[22] Ibid
[23] Ibid
[24] Bandura A. (1999), *Social Cognitive theory: An agentic perspective*

truly significant only when the subject becomes aware of this reinforcement. But this model of triadic and reciprocal causality does not imply that each of the three factors intervenes with the same force in a given situation and that the three factors are concerned at the same time. The bi-directionality of influence also means that people are both product and producers of their environment[25]

SCT gives a foundation for comprehension, anticipation and changing of human behaviour[26]. Therefore, for this paper, with the use of the Social cognitive theory which provides guidelines to how human behaviour can be changed by a range of factors e.g. the environment, biology, understanding and experience etc.

[25] Wood, R. E., & Bandura, A. (1989). *Impact of conceptions of ability on self-regulatory mechanisms and complex decision making.*
[26] ibid.

4. Findings

Source: Centers for Disease Control 2014. 7 Neglected Tropical diseases

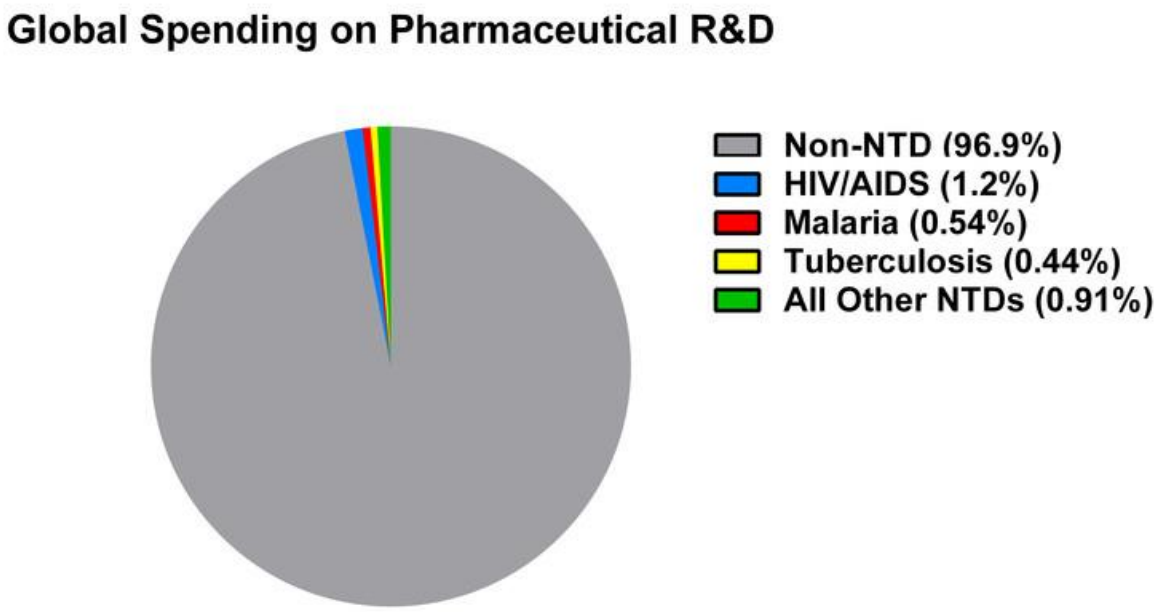
4.1. The impact of NTD

The impact of these diseases is of course very unequally distributed among the world's population. For the majority of infectious diseases, the highest rates of morbidity and mortality are observed in developing countries, particularly those in the tropics. Among the factors explaining this heterogeneity, differences in socio-economic status between populations have long been emphasized[27]. Not only do infectious diseases affect the poorest populations, but they often contribute to their poverty[28], and thus place themselves as

[27] David Molyneux (2013); Neglected tropical diseases
[28] Peter J. Hotez (2008); Tropical Diseases Research: Thirty Years and Counting

additional obstacles to the development of countries that are already the least rich[29]. Nevertheless, man's vulnerability to infectious diseases seems destined to remain a global concern.

4.2. What is done today to control NTD



2008 Global Expenditures. Data from: Moran M. Global Funding of New Products for Neglected Tropical Diseases.

In 1999, the NGO Médecins Sans Frontières (MSF) echoed the lack of willingness on the part of pharmaceutical companies to do research on new drugs, but also to produce large quantities of existing drugs[30].

Similarly, in 2001, WHO found that only 5% of Research & Development expenditures on health were devoted to the problems of 95% of the world's population. At the same time, developing countries, which is 76% of the world's population, account for only 20% of the world's drug consumption, and this tends to drop[31].

Thanks to the money received by the Nobel Peace Prize in 1999, MSF forms a "Working Group on Medicines for Neglected Diseases". This led to the creation in Geneva in 2003 of

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[29] David Molyneux (2013); Neglected tropical diseases
[30] MSF (2009); *Experience Treating The Most Neglected of the Neglected Tropical Diseases*
[31] WHO (2002); Report of the WHO Commission on Macroeconomics and Health

the *Drugs for Neglected Diseases initiative* (DNDi), the *Medicines for Neglected Diseases initiative*[32]

This initiative is in collaboration with the WHO TDR Program (the *Special Programme for Research and Training in Tropical Diseases*), which aims to help support the fight against diseases in poor countries[33]. The funding comes from various governments, mostly European, Médecins Sans Frontières, and philanthropic organizations[34].

The medicines needed to treat NTDs are on WHO's list of "*Essential Medicines*" and the pharmaceutical companies make them available free of charge to populations who need them through donation programs.[35] These programs, as well as the increasing commitment of countries to NTD control and the implementation of innovative approaches to drug delivery (e.g. through community-directed interventions or school health programs) have made it possible to treat on a large scale certain NTDs; (*Trachoma, onchocerciasis, lymphatic filariasis, helminthiases, and schistosomiasis*)[36]. As part of what are now known as mass drug distribution (MDA) programs. Community-directed treatment has been developed and promoted as the preferred method of administering drugs on a large scale, particularly in Africa. Communities assume responsibility for the collection, provision and reporting of drug use.[37]

The fight against neglected tropical diseases has already achieved notable successes. There are treatments or medications that are particularly effective, such as the use of **antibiotics** (*Rifampicin, Streptomycin, Benzathine penicillin G, Dapsone and Clofazimine*) against Buruli ulcer, yaws and leprosy, or of **Anthelmintics** (*Ivermectin, Albendazole, Diethylcarbamazine,*) against lymphatic filariasis, and even a vaccine against rabies[38]. Some neglected tropical diseases have long been the subject of specific control programs, and there are also opportunities for simultaneous control of many of these diseases[39]. The administration of Ivermectin acts for example against several helminthiases, such as onchocerciasis, lymphatic filariasis or intestinal helminthiasis.[40]

[32] DNDi (2014) An Innovative Approach to R&D for neglected patients
[33] Special Programme for Research and Training in Tropical Diseases (TDR)
[34] ibid
[35] WHO *Model List of Essential Medicines*
[36] ibid
[37] WHO (2010) Consensus modelling evidence to support the design of mass drug administration programmes
[38] WHO (2010); *working to overcome the global impact of neglected tropical diseases*
[39] ibid
[40] Hotez PJ (2006). *The "biblical diseases" and U.S. vaccine diplomacy. Brown World Affairs*

In a report published on 19 April, WHO lists the progress made. By 2015, nearly one billion people - 62.9% of those who needed them - received preventive chemotherapy for at least one of these diseases. Of these, 556 million received chemotherapy for lymphatic filariasis. This disease is caused by a nematode worm, whose larvae are transmitted by mosquito bites. It can lead to *elephantiasis*, a considerable increase in the volume of a limb or a part of the body.[41]

In addition, some 119 million people - 64% of those who needed them - received treatment (*ivermectin*) for onchocerciasis. In addition, trachoma, a bacterial eye infection, the leading cause of blindness worldwide, has ceased to be a public health problem in Oman, Morocco and Mexico. More than 56 million people received antibiotic treatment in 2015[42].

4.2.1 Control strategies for different NTD

Abbreviations:

Sch= schistosomiasis, **Den** = dengue, **Ech** = echinococcosis, **Onc** = onchocerciasis, **S** = Soil-transmitted helminthiases, **Ch** = disease Chagas, **SL** = sleeping sickness, **Lei** = Leishmaniosis. **Ra** = Rabies

Control strategy	**NTD**
Human habitat management (e.g. water sanitation)	Ch, Den, Sch, SL
Treatment or vaccination of intermediate hosts	Ech
Control of vectors or intermediate hosts	Ch, Den, Sch, SL, Lei, Onc
Treatment or vaccine of definitive non-human host	Ech, Lei, Ra, Sch, SL
Control of non-human hosts	Ch, Ech, Lei, Ra, SL
Education, preventive campaign	Den, Ech, Sch

[41] Who (2017); *Integrating neglected tropical diseases in global health and development*
[42] ibid

Surveillance, treatment of human hosts	Ch, S, Lei, Onc, Sch, SL
Human host vaccine	Den, S, Lei, Sch

4.2.2. The control of vectors or intermediate hosts.

It is a strategy studied for each of the diseases whose transmission makes use of vectors or intermediate hosts, except for echinococcosis. It's about one of the most studied strategies for schistosomiasis where it most often corresponds to the use of *molluscicides,* killing gastropods as an intermediate host at certain immature stages of the pathogen.[43]

It is also a highly studied strategy for dengue, onchocerciasis, Chagas disease and sleeping sickness. In the case of the last three, this strategy corresponds mostly to the use of insecticides. In the case of dengue, it may also be insecticide, but also the introduction of sterile individuals into mosquito populations. Echinococcosis is an exception to host control. But there are results for another control strategy targeting these intermediate hosts: *vaccination of sheep*.[44]

4.2.3. Chemoprophylaxis

It is used for people at risk of trematodiases, filariasis, onchocerciasis, schistosomiasis, geohelminthiases, trachoma, and rabies. Of the 124 countries requiring chemoprevention, 40 need them for 3 diseases, and 33 of these countries are in Africa. According to WHO figures published in 2010, 1.9 billion people require preventive treatment, 55% for one or two diseases and 45% for 3 or more diseases.[45]

In 2014, 70 countries submitted to the WHO a request for donation of drugs for chemoprophylaxis. The application concerned albendazole, diethylcarbamazine, mebendazole, praziquantel and ivermectin[46].

[43] R. SlootwegE. A. MalekF. S. McCullough (1994); *The biological control of snail intermediate hosts of schistosomiasis by fish*
[44]Joanne P. Webster (2013); The contribution of mass drug administration to global health: past, present and future
[45] WHO (2014); *Working to overcome the global impact of neglected tropical diseases*
[46] Ibid

Global coverage of chemoprophylaxis is expected to increase significantly in the coming years as drug donations increase, national action plans for integrated treatment administration in all regions are developed, and national governments are strengthening measures to overcome diseases.[47]

4.2.4. Water sanitation and hygiene

Access to safe drinking water and sanitation for all is a major and global issue for peace, the economy and public health. Water and sanitation are two complementary areas in the fight against many diseases. Indeed, if drinking water is a source of life, an unhealthy environment is a source of health risks[48]. To prevent the spread of diseases, it is essential to link water, sanitation, hygiene practices and public health. Access to water, preservation, good management are made the basic conditions for any sustainable development.

In 1990: 2.3 billion people had access to improved water supplies (to the home, public fountain, protected dug well, protected source, rainwater tank) compared to 4.2 billion people today, according to the United Nations 2015 report[49]. However, between 1990 and 2010, 780 million people remained without clean water and sanitation. A review published in 2011 concluded that reducing the prevalence of soil-transmitted helminths is associated with improved sanitation.[50]

4.2.5 Control and treatment of animal hosts.

There are also control strategies targeting definitive non-human hosts except for intestinal helminthiasis. Treatment and / or vaccination of these hosts is a highly studied strategy for rabies and echinococcosis, which is logical since they are two diseases of which man contributes little or very little to transmission, and since in the case of echinococcosis man is an intermediate host. Control of these non-human hosts is also highly studied for leishmaniasis[51]. As for rabies, it is usually a control of the populations of dogs by massive euthanasia, or by euthanasia limited to the infected individuals. Intestinal helminthiases are

[47] Laura Gillini (2017); *Global practices in regard to implementation of preventive measures for leprosy*
[48] D.D. Mara Water (2003); *sanitation and hygiene for the health of developing nations*
[49]WHO (2015); Water for a Sustainable world
[50] Luciene Mascarini-Serra (2011); Prevention of Soil-transmitted Helminth Infection
[51] Tim K. Mackey (2014); Emerging and Reemerging Neglected Tropical Diseases: a Review of Key Characteristics, Risk Factors, and the Policy and Innovation Environment

an exception here despite the existence of definitive non-human hosts (dog, cat) for some of the pathogens. This is nevertheless consistent with the fact that these hosts are not the targets of control strategies commonly used to control this disease.[52]

4.3. Interactions between neglected tropical diseases and other infectious diseases.

Many neglected tropical diseases have overlapping distribution areas that also correspond to those of the three major infectious diseases affecting humans. For example, in some areas, a high proportion of populations have to cope with poly-parasitism, particularly co-infections with helminths and a number of micro-parasites, including pathogens responsible for malaria or AIDS[53]. Although the effects of these mixed infections are still poorly understood, they seem to increase the morbidity of some NTDs and those of the three main infectious diseases. In Africa, for example, severe anemia has been observed in people suffering from malaria, intestinal helminth infections and / or schistosomiasis, as well as in people with a single disease[54]. Due to the ability of some pathogens to affect the human immune system, these mixed infections may also increase the susceptibility of patients to other pathogens[55]. People with helminth infections are more likely to be co-infected with malaria or the AIDS virus[56].

4.4. Why behavioral change and interventions

Many personal, social and environmental factors have an impact on behaviour. Most of them fall in three categories

1) Individual: beliefs, knowledge, attitudes, skills, genetics
2) Social: interactions with other people (friends, family and community)

[52] Ibid
[53] Hotez PJ (2006). The "biblical diseases" and U.S. vaccine diplomacy. Brown World Affairs
[54] Nicholas Midzi (2010); Distribution of Schistosomiasis and Soil Transmitted Helminthiasis in Zimbabwe: Towards a National Plan of Action for Control and Elimination
[55] ibid
[56] M BROWN, (2006); Helminths and HIV infection: epidemiological observations on immunological hypotheses

3) Environmental: space where the individual lives in, the economy, the workplace, and proximity infrastructure, and broader factors, such as the economy (prices, for example) and technology.[57]

A complex set of societal and biological factors must be taken into account if one is to tackle behaviour which leads to diseases.

Behavioural change is generally more effective if interventions are combined over a long period of time and modified according to the impact measured. Interventions targeting only factors at the individual, regardless of social and environmental impacts mentioned above, will probably not be effective. An ecological approach "that identifies and targets the factors that influence the behaviour of the person.[58]

Behavioural interventions attempt to motivate individuals and groups to change their behaviours through a range of approaches based on education, peer support, skills development and community interventions.[59]

However, since human behaviour is complex, it can be difficult to achieve long-term behavioural change on a large scale[60]. Although the acknowledged importance of behaviour change and the extensive research around this topic, there is no consensus on how best to support certain behaviours. Models and theories need to be used and reported in a more coordinated way to facilitate their evaluation[61].

Behavioural interventions can be achieved at three levels. At an individual, community and national level. Such interventions encourage those that are facing the danger of a certain disease to improve their chances. [62]

[57] Marmot, Micheal (2005), Social determinants of health inequalities
[58] Cooper, Z., Fairburn, C. *A new cognitive behavioural approach to the treatment of obesity*
[59] Ralph J. DiClemente,Richard A. Crosby,Michelle Kegler, Emerging Theories in Health Promotion Practice and Research;
[60] POLLY RYAN (2010); Integrated Theory of Health Behavior Change: Background and Intervention
[61] Ibid
[62] Ibid

5. Analysis

5.1. ***What is lacking in today's health interventions when targeting NTDs?***

Neglected tropical diseases have long been regarded as secondary to others in the control of infectious diseases, which affect mainly developing countries. The lack of interest from pharmaceutical companies that did not see a healthy market and rich countries that were not affected by these diseases left the populations concerned alone in their struggle, although WHO began to fight against these diseases very early after its creation in 1948.

Things changed at the end of the 20th century with the emergence of NGOs such as Médecins Sans Frontières, which were interested in this health catastrophe, and the adoption of the *8 Millennium Development Goals* in the year 2000 by the Member States of the United Nations. Partnerships with pharmaceutical laboratories make it possible to provide medicines and vaccines at preferential rates or in the form of donations for the countries concerned by these diseases.

This work has enabled us to see that the fight against neglected tropical diseases, long ignored by the international community, has now become an indispensable element in the process of improving the living conditions of poor countries. Research and development of new treatments is an indispensable asset in the care of patients.

Similarly, chemoprophylaxis is a very effective way of reducing the risk of disease transmission. Nevertheless, treatments can be resisted by pathogenic germs, which necessitates the continuous search for new molecules that are effective against diseases. The continuous use of insecticides produces in the long term the same phenomenon. It seems impossible to eradicate pathogenic germs, especially if its life cycle uses a vector. It is therefore necessary that prevention should be the object of an intention as important as the search for treatments, in order to avoid infection and transmission. As we have seen, action on several levels is essential in the fight against these diseases:

- access to water;
- its sanitation;
- hygiene;
- education;

- adequate and quality food

Financially, research and development of new medicine has a cost important, and their purchase by the countries that need it is far from negligible. The preventive elements mentioned above are necessary in the development of these countries and not only in the fight against neglected tropical diseases, it is therefore essential that endemic countries do not focus on therapeutics at the expense of improving the lives of their populations.

Challenges to sustain and expand successful control and prevention efforts, there is a need for: - international support: countries, institutions and NGOs must maintain their bilateral and international support and encourage other donors to contribute their support. To control neglected tropical diseases, environmental factors must be considered, such as permeability of borders, population growth, migrations, urbanization, movements of livestock and vectors, climate change. All of these factors are lacking and aren't taken into account as much as the medicine distribution interventions.

5.2. ***Can Behavioral health interventions be used in health interventions to promote health and maybe prevent NTD?***

Over the past 40 years, population health research, and more specifically, the social and environmental determinants of health, has shown that risk factors for morbidity and mortality alone do not explain the differences in health, but that it was necessary to look for the "causes of causes" in order to understand them fully[63].

As we have seen, Bandura's social cognitive theory is much more than a theory. Indeed, this theory, which has been rigorously tested in a number of empirical studies, is a true operational model in many fields, in particular the acquisition of knowledge and competence understanding and action.

In intervention, social cognitive theory suggests that we obtain in advance the maximum amount of information concerning the perceptions of the individuals targeted in relation to their personal competence before adopting preventive behaviour and adjust the intervention accordingly. For example, an individual who is uncertain about his / her ability to adopt a particular exercise program will be reluctant to exercise regularly. It will then become important to help this individual gradually acquire this behaviour by respecting certain stages, and thus to accumulate successes (according to the increasing degree of difficulty) which will lead him to the final adoption of the new behaviour.

In SCT, the psychological function is analysed through a triple reciprocal determinism, as mentioned earlier. Which means that the different factors, such as the person, the behaviour and the environment interact in pairs and in a constantly variable way.

Thus, this theory puts forward the factors lacking in the current interventions for NTD. The individual is the main focus by changing its behaviour so that he or she may affect change in their environment. While today's intervention puts the disease in focus, with medical interventions which results in the individual not knowing how to affect the change needed for a healthy life.

[63] Frohlich KL, Potvin L. (2008); Transcending the Known in Public Health Practice. The inequality paradox: The population approach and vulnerable populations. American Journal of Public Health.

Health education aims to provide members of the population with the conditions that will facilitate the exercise of choices of health promoters. So, it is not a matter of deciding on how people should lead their lives, but rather of looking at the conditions that favour these major determinants: obtaining a diploma, housing, and decent work, rights etc.

6. Conclusion

Although neglected tropical diseases are the subject of much less scientific work than *the Big Three (*HIV/AIDS, TB and malaria), they do not appear to be neglected by scientists when we consider the quantity of publications produced with the health impact of diseases. There is, however, a large number of theoretical results on the ecology and control of some of them, including schistosomiasis, dengue and, to a lesser extent, rabies.

First, most other diseases are the subject of little or no theoretical work, while the health or economic burden they represent is still a problem for many populations around the world. Second, there are very few theoretical results on the evolution of neglected tropical diseases in general, which raises the question of our ability to anticipate the long-term consequences of the strategies used to combat these diseases. For example, today we have no theoretical basis for neglected tropical diseases on which to assess the risks of resistance development of pathogens or vectors. It is quite likely that this strongly constrains the optimization of the use of existing strategies, and the development of alternative control strategies. Clearly, this calls for developing theoretical approaches to the study of neglected tropical diseases.

The problem of neglected tropical diseases is part of a wider set of phenomena (lack of hygiene, malnutrition or undernutrition ...) whose main cause seems to be poverty. While the majority of countries affected by these diseases have resources (raw materials in soils, tourism) to meet the needs of populations, the unequal distribution of wealth keeps people in destitution.

The aim of this paper was the find what was missing from today's health intervention with a theory testing method. The previous research did not include poverty, socio-economic status, inadequate water etc. as a cause to these diseases, they simply reflected on the ecological part

which is why the health interventions used are mainly focus on mass drug distribution and vector-control. By overlocking the above mentioned causes, health organizations failed.

Health interventions should be a strategy to prevent pathologies and trauma, which is a prerequisite for any public action. However, to be effective, it requires the use of rigorous theoretical models that integrate the socio-economic and physical characteristics of living environments as the theory suggested. Without a thorough knowledge of these environments, the primary purpose of health education, which is to promote the health of individuals and communities, can be compromised and even lead to health inequalities. A necessary but insufficient strategy, health education must be integrated into a global promotion project. By educating the population and empowering them, the chances to reducing the prevalence will increase. With these diseases being endemic for so long thus to development mankind has made it is perhaps time to rethink the current health interventions and combine them with a behavioural change approach.

It’s time for a rapid response to information on the epidemiology, transmission and burden of neglected tropical diseases. The necessity for development of research to develop and use new drugs (against African human trypanosomiasis, Chagas disease, leishmaniasis, etc.), which must be provided free of charge, but also new vaccines, in particular against Dengue, should be a priority.

These diseases aren’t neglected, the population is neglected and therefor NTDs prevail. The number of people they affect daily and those who are at risk is far greater now. In 2017, where we have all the technological advances and other major fields, why is it still so difficult to tackle NTDs?

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