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Chapter

Impact of the Implementation of Sustainable Development Goals on Neglected Tropical Diseases

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Abstract

Vector-borne diseases and infectious diseases in, general, affect the health of human and animal populations. By implementing the sustainable development goals (SDGs) in neglected populations, the level of living conditions is improved thus providing better housing, improving environments in cities and other populated sites, and developing better sanitary infrastructures altogether leading to higher-quality health conditions for the said populations. Transdisciplinary approaches can make successful implementation of the SDGs to tackle simultaneously the preservation and improvement of the environment, monitoring the health of human and animal populations, and studying in-depth those interactions in nature; those components are included in the One Health approach. Non-medicalized approaches can impact the roots of health problems, reducing the vulnerability of populations to disease, poverty, and malnutrition. Different initiatives of the SDGs can be effective in educating neglected populations to prevent exposure to vector arthropods, infectious agents, and undesired encounters with snakes and their disabling and life-threatening toxins. It will be important to actualize the implementation of the SDGs as a global strategy while also prioritizing each component.

Keywords: dengue, snake bites, geohelminths, housing, water, sanitation, One Health, neglected diseases, sustainable development goals

1. Introduction

In this chapter, we will try to address some of the problems that are part of the neglected tropical diseases (NTDs), which are some of the conditions that require more attention and care since they affect the poorest and least developed areas in the world. An important number of neglected tropical diseases have a component of vectorial transmission that is characteristic of the difficulty of developing protective barriers between transmitters of diseases (vectors) and susceptible populations. A recent addition to the neglected tropical diseases in 2017: Snakebites happen to occur in large part by accidental encounters of humans and domestic animals with snakes looking for natural prey or defending themselves or their territories [1].

How does this happen? Suboptimal housing, barefoot populations, and the need to work in unprotected areas are all part of the problem.

Water and sanitation deficiencies combine to expose humans to vectors of different diseases forcing them to use water contaminated with animal or human wastes or to keep searching for water streams that are distant from home, or to contaminate the soil or water sources through open-air fecalism or inadequate excretes disposal. Integrated approaches going beyond clinical attention to humans are needed to prevent instead of just treat cases of diseases, which is adopting a One Health approach. This approach is useful regardless of the specific etiology of diseases as long as it is based on environmental conditions, causing a positive impact on human or animal populations.

A population with water supply deficiencies is disposed to store water for long periods of time and mosquitoes can transform their deposits in breeding sites; if the walls of homes are permeable to the entry of insects like mosquitoes or bugs with the potential to transmit infectious agents, these populations are exposed to vector bites or infectious fluids [2, 3]. Snake bites are related to the lack of protection in the workplace (usually agricultural fields/forest exploitations) and/or lack of wearing appropriate and protective dressing and shoes [4].

An element involved in all the described risks is the lack or limited access to information about the infectious agents due to limited literacy in populations of different ages, especially with younger people. Thus, raising the efforts to improve education in quality and in population coverage can increase the general awareness of diseases, their social determinants, and the most efficient mechanisms to treat diseases once they affect people.

All the different goals (SDGs) add a new dimension to the development of the well-being of people without the need of directly originating in the health sector.

This chapter will mention what the sustainable development goals (SDGs) are and how through medical and non-medical strategies they can reduce the occurrence of many diseases. We will select some diseases among the group of neglected diseases (to be defined) and explain how reaching the SDGs can impact the reduction of this group of diseases. We will discuss the advances and setbacks of the SDG and how the NTDs have been affected.

Finally, we need to consider what possibilities exist for accomplishing those goals to benefit the well-being and health in neglected populations worldwide in the context of integrated approaches to health as we mentioned.

2. Defining the scope of the terms

2.1 Sustainable development goals

The United Nations sustainable development goals (SDGs) are targets for global development adopted in September 2015, set to be achieved by 2030. They are a follow-up to the millennium development goals (MDGs) centered around reaching a development goal in the first 15 years of the 21 century. There were advances but the results of the MDGs fell short. The sustainable development goals (SDG) aim to go beyond the MDGs. All the countries of the world have agreed to work toward achieving these goals. There are 17 goals, and they are defined in a list of 169 SDG Targets (See **Table 1**).

Progress toward these targets is agreed to be tracked by 232 unique indicators and the specific target for neglected tropical diseases is a 90% reduction in the number of

Number of SDG	What is this goal
SDG 1	End poverty in all its forms everywhere.
SDG 2	End Hunger achieved food security and improved nutrition and promote sustainable agriculture.
SDG 3	Ensure healthy lives and promote well-being for all at all ages.
SDG 4	Ensure inclusive and quality education for all and promote lifelong learning.
SDG 5	Achieve gender equality and empower all women and girls.
SDG 6	Ensure access to water and sanitation for all.
SDG 7	Ensure access to affordable, reliable, sustainable, and modern energy for all.
SDG 8	Promote inclusive and sustainable economic growth, employment, and decent work for all.
SDG 9	Build resilient infrastructure, promote sustainable industrialization, and foster innovation.
SDG 10	Reduce inequality within and among countries.
SDG 11	Make cities inclusive, safe, resilient, and sustainable.
SDG 12	Ensure sustainable consumption and production patterns.
SDG 13	Take urgent action to combat climate change and its impacts.
SDG 14	Conserve and sustainably use the oceans, seas and marine resources.
SDG 15	Sustainably manage forests, combat desertification, halt and reverse land degradation, halt biodiversity loss.
SDG 16	Promote just, peaceful and inclusive societies.
SDG 17	Revitalize the global partnership for sustainable development.

Source: www.Un.org.my.

Table 1.
Sustainable development goals (SDGs).

people requiring interventions against NTDs from 2010 baseline levels (the indicator being 3.3.5 the “number of people requiring interventions against neglected tropical diseases” in the United Nations framework). The target is 219 million people needing interventions against NTDs in the year 2030 [5].

How can sustainable goals improve health conditions in the world and permeate the life conditions of the neediest populations? The United Nations have supported the SDCs that are expected to bring together specific actions to raise the life conditions of populations living in precarious conditions worldwide and at the same time to provide leadership in planning an organized development for the future world. It should pull ahead marginalized populations by improving social and economic conditions [6].

As part of the SDGs (Goal 3 and target 3.3) the neglected tropical disease was only a late addition by the Inter-Agency and Expert Group on SDG indicators to “end the epidemics of HIV, tuberculosis, malaria and neglected tropical diseases” by 2030 [7]. The addition of this group of diseases can represent an improvement in the life of marginalized populations worldwide.

One of the positive aspects of the development of the SDG is the role provided to different groups and organizations to offer an input setting the goals in order to reduce the possibilities of leaving felt needs of the population unattended. This sets

their planning apart from the previous millennium development goals that had a more vertical design (top-down).

2.2 Neglected tropical diseases and their relation to neglected populations?

Neglected tropical diseases (NTD) are a group of health conditions occurring mostly in populations exposed to precarious environmental conditions: lack of water supply, deficient sanitation, sub-optimal housing conditions, rural locations, limited access to health care (see **Table 2**).

Most of the exposed population live in developing countries, and it has been estimated to include one billion people that represent about one-sixth of the world population [8].

According to some authors, children and women are the most affected groups. Indigenous populations are also included as potential victims of NTDs. Overall, these populations have been known as neglected populations living in poverty and going through the cycles of diseases that cause/perpetuate misery and poverty. An important detail is that they are deprived of access to medical treatment and drugs because they live in rural and isolated areas or treatments are not affordable or existent for their problems [7, 9].

2.2.1 Prioritization of treatments for NTDs

Some of the immediate questions that arise about the control and treatment of this group of diseases are: Are NTDs susceptible to being treated medically? Do we have

Neglected disease	Etiology
Soil-Transmitted helminthiasis Dracunculiasis (Guinea Worm) Taeniasis/Cysticercosis Schistosomiasis Onchocerciasis (River blindness) Lymphatic filariasis Food-borne trematodes. Echinococcosis	Helminths
Chagas disease Human African Trypanosomiasis Leishmaniasis	Protozoa
Buruli Ulcer Leprosy Trachoma Yaws	Bacterial diseases
Dengue and Chikungunya Rabies	Viral diseases
Snakebites Mycetoma Chromoblastomycosis Scabies and other ectoparasites	Recent additions since 2017

Adapted from: World Health Organisation. Neglected Tropical Diseases 2017. https://www.who.int/neglected_diseases/diseases/en/.

Table 2.

Official list of neglected tropical diseases according to the World Health Organization with the etiology. Updated in 2017.

the drugs and supplies to treat them? Is that necessary and sufficient to interrupt or at least minimize the transmissions and their effects on these populations?

Some NTD's have not been prioritized by the pharmaceutical industry for the production of treatment drugs and one of the reasons is that they occur in populations with very limited acquisitive power and no economic access to buy their treatments by themselves. Things are changing and the mobilization of governments and international organizations is making feasible some deals with the pharmaceutical industry to fund the research, development, and delivery of needed drugs [10].

However, if economic and social conditions do not change, the NTDs will hardly be controlled, so it is important to promote a real development of communities. Basic education and training opportunities and works make this effort of disease control possible [11].

Access to health care and treatment for NTD's is important but it is not enough to reach a sustainable control and reduction of this group of diseases. Reaching a success in the life improvement measures proposed by the SDGs is a necessity and an ethical responsibility. Any measures taken to be inclusive to protecting and promoting better environments for animal and human life are aligned with the integrated approach of One Health.

3. Some neglected tropical diseases

We will mention some of the NTDs in this chapter including Helminthiasis; Geo-helminthiasis; Guinea worm disease; viral diseases: dengue fever; protozoal Chagas disease; and the recently added Venomous snake bites which is in a special category.

3.1 Geo-helminthiasis

It is a group of diseases caused by parasites. As described by D'Amelio and Cavallero [12], the name comes from the Greek. *γειω* "soil, terrain" *ελμινς -ινθος* "worm," thus indicating that these worms are strictly dependent on soil environment for a critical developmental stage of their life cycles. Geohelminths, also known as soil-transmitted helminths (STHs), belong to several orders of nematodes that are responsible for specifically human diseases and zoonotic infections [12, 13].

Geo-helminthiasis are defined as chronic childhood infections of the gastrointestinal tract with immediate clinical features including reduction of the nutrition intake, appetite loss and decrease in physical fitness, and the presence of anemia. In the long term, geo-helminthiasis can produce neurological effects on cognitive development. Those manifestations interfere with affected children's educational advancement and consequently in the economic development of families and communities [12].

We see in young populations that they are affected by the disabling consequences and the morbidity caused by these parasitic diseases, even though mortality is relatively low.

Geo-helminthiasis transmission cycles occur because of sanitation failures, lack of latrines, open fecalism, lack of habits in handwashing, personal hygiene, and poor environmental health. Lack of shoe wearing is also an addition to the risks of being infected by those living in unhealthy conditions [13]. While all age groups may be affected, different studies demonstrate that school-age children are more affected than the rest of the population.

3.2 Guinea worm disease (GWD) or Dracunculiasis

It is also a parasitic disease caused by the helminth *Dracuncula medinensis*, which is endemic in countries of Africa [14].

The worm infects people who drink water from contaminated sources such as ponds and rivers. The water is contaminated by small crustaceans called copepods that are infected with worm larvae. Once the infection with contaminated water occurs, the immature forms of the worm (larvae) develop in a period of a year when the adults mate in the abdominal cavity. The female(s) have the need to give birth and must get back to the water, so they crawl down to the lower leg or foot. Once there, they burrow out through a painful blister in a process that lasts several weeks. The intense pain causes people to plunge their legs into the water to get relief, and this is when the worm expels her larvae, starting the cycle anew [15].

Recent control efforts have been successful in reducing the number of cases and getting closer to possible disease eradication. The participation of WHO agencies and the participation of the Carter Foundation make it possible to eradicate this disease; however, recent studies have identified that dogs are reservoirs to the Guinea worm keeping this helminthiasis as an active disease and reactivating its transmission in humans.

Guinea worm disease then illustrates how comprehensive approaches improving access to safe water, modifying risky unhealthy behaviors in humans and extending the prevention and control to domestic animals can succeed in eliminating NTD [16].

3.3 Poisoning and death from venomous snake bites

This is another serious public health problem worldwide. Snake poisoning results in significant morbidity and mortality. International statistics give an estimate of 138,000 deaths worldwide every year and 400,000 victims of permanent disability, including blindness or restricted mobility [17].

Its management usually requires hospitalization, with the risk of sequelae causing functional disability.

The habitats of human populations and snake habitats overlap, especially in rural areas with subsistence agriculture, and shepherding. Traditional groups living in highly forested and sylvatic regions also share similar habitats with venomous snakes. Sometimes the lack of adequate housing makes the entry of snakes into the human dwellings possible.

Snake bites occur in all health regions, but their greater health impact is in areas of sub-Saharan Africa, South and Southeastern Asia, the Americas, and the Pacific Region [18].

As we mentioned, rural populations, living in poverty and with limited access to health, are the most affected by the venomous snake bites. Accidental and lethal encounters are caused by work circumstances (farming or herding), stepping accidentally on the snakes while walking or wandering around in the case of small children (**Figure 1**) [18, 19].

Snake bites are emergencies that cannot be well attended if the victims live in areas several hours' distance from a health center or hospitals equipped with antivenom treatments and staffed with personnel ready to treat potential complications such as hemorrhages, neurological problems, necrotic damages to tissue, or disabling conditions [19].



Figure 1.
Quick facts on snakebite envenoming. Source: WHO strategy for prevention and control. Facts Adapted from: <https://www.who.int/activities/preventing-and-controlling-snakebite-envenoming>.

3.4 Dengue fever

It is another NTD. It is transmitted by *Aedes aegypti* mosquitoes and in its classic form causes fever, malaise, muscle, and joint pain. Dengue fever is a cause of school absenteeism in children and work absence in adults because of the disabling pain. Its severe form (less common) can advance to massive hemorrhages, shock, and death [20].

Dengue fever can be prevented through mosquito control and the reduction of breeding sites. Adequate control of breeding sites needs to consider an improvement in the water supply, sanitation, and refuse systems, which means to extend those services to underprivileged population in the developing world and provides education guidelines on the prevention measures [21].

3.5 Chagas disease

It is an NTD associated with poor housing in rural areas. It is also known as American trypanosomiasis and is transmitted to humans and some animal reservoirs by Triatomine hematophagous vectors [22]. It is endemic to the Americas from Southern USA to Northern Argentina; imported cases are reported in regions/countries with immigrants coming from endemic countries. Many clinical manifestations are associated with Chagas disease but basically, they are of chronic presentation: cardiomyopathy and in some areas abnormalities in the gastrointestinal tract (Megacolon being the most relevant) [23].

Unfortunately, even when some anti-Chagas drugs have been developed, they are not affordable to the infected individuals who live in poverty [24]. Active efforts from governments and international agencies are required to make measures such as housing improvement, insecticide spraying, and identification of acutely infected individuals for treatment in the initial weeks of infection accessible. Chagas disease is a condition where humans and animals are affected by the same vector and may

develop the disease manifestations. Control measures are required to protect humans and domestic pets to reduce reservoirs and transmission [25].

4. Recent situation of the NTD'S

4.1 First years of the SDGs

The NTDs we have described illustrate features of neglected populations such as poverty, suboptimal housing, lack of adequate water and sanitation, and close proximity with animals that are part of the risk factors for suffering these diseases; the implementation of the SDGs can improve their quality of life.

During the first 5 years of the SDGs, there was an important impulse for the control and elimination of NTDs and collaborations were fruitful between different stakeholders in support of the countries suffering the burden of these diseases [26].

4.2 Effect of the COVID-19 pandemic

Beginning in 2020, the advent of COVID-19 caused a distortion in the planning for managing health problems including the NTDs.

A study implemented by WHO in 2021 about the impact of the COVID-19 pandemic identified that the most severe disruption reported by the participant countries was on NTD activities and the mass drug administration was the most affected by the NTD services [27].

4.3 What has been done following the setting of SDG and what is still needed?

The SDGs included a prioritization of the neglected tropical diseases in target 3.3 but the fulfillment of different goals is also necessary to reaching a full control of the NTDs.

Advances have been reached with the SDGs, but different circumstances associated with the recent (and ongoing) COVID-19 pandemics and the current conflicts in Ukraine have produced setbacks in the advances of the goals [28].

The need to prioritize the pandemic and providing medical and social responses to highly demanding and politically influential populations in the cities has meant moving more resources to staff hospitals and providing medical and diagnostic equipment to those populations thus moving them from scheduled programmatic objectives and pressing the pharmaceutical industry to research and develop drugs and vaccines for COVID-19.

4.4 Responses to the pandemic have caused a more severe crisis in developing countries

Less developed countries just paralyzed their health programs to provide solutions to a real avalanche of COVID-19 cases, and facing the loss of health personnel by death, disease, and burnout. Infrastructure projects have been delayed as well because of the priorities given by the pandemic emergency.

When the pandemic seemed to be under control with the advent of vaccines, more reliable prevention measures and an important reduction in cases worldwide, the

recent start of an armed conflict in one of the food basket areas in the world—Eastern Europe and specifically Ukraine that provides grains to areas in Africa and Asia—limited a needed food safety for those regions where hunger is more frequent, and more of the population is in extreme poverty [28].

5. Sustainable development goals can contribute to the reduction of NTDs

Regardless of the recent events related to the pandemic, there is a need to assess the current state of the SDGs achievement and the barriers they are facing now. In 2022, the United Nations issued a report with some of the key obstacles to achieving the SDGs [29].

They will be mentioned in the following paragraphs just according to the assessment provided by the United Nations and its agencies.

5.1 For hunger and poverty

The first two goals: No poverty (Goal 1) and Zero Hunger (Goal 2) have met a significant obstacle in immobilization caused in many societies by isolation and quarantines, the reduction to minimal levels of productive machinery in many countries, and the simultaneous morbidity, and more recently by the setbacks in the production and distribution of grains—caused by conflict key producers for exportation to needy countries in Africa. According to UN estimates, the number of people in hunger has increased from 777 million in 2015 to more than 800 million in the following years [29]. As was mentioned in the introduction, the NTDs coincide with poverty and hunger in neglected populations and paralyze or delay actions for life improvement since people are just in survival mode.

These same processes increased the status of poverty and extreme poverty in the population.

5.2 Goal #3. Good health and well-being

This SDG seems to be specific to health and disease. There was an assumption that the health services could have an improvement during the period but during the last 3 years, practically all the resources in most affected countries have been utilized to face the pandemics with the additional factor that human resources personnel have been part of the victims of morbimortality by COVID-19 slowing down the processes of health care and treatment provision.

The pandemic has severely disrupted essential health services, triggered an increase in the prevalence of anxiety and depression, lowered global life expectancy, derailed progress toward ending HIV, tuberculosis (TB) and malaria, and halted the work toward making health coverage universal.

As a result, immunization coverage dropped for the first time in 10 years, and deaths from TB and malaria increased. Resources for neglected tropical diseases have suffered similar fate and efforts have been channeled to the pandemic. Processes of epidemiological surveillance, follow-up of cases, and in the case of helminthiasis, the deworming of school-age populations came to a halt or drastic reduction.

5.3 Education is important to overcome NTDs

About the Goal #4: Quality Education has seen a recent decrease in its effort to incorporate a balanced-gender population (incorporating girls and young women) in educational programs.

Populations with disabilities, rural dwellers, and ethnic minorities have felt the weight of the neglect in recent years having as a consequence difficulty to advance their road to knowledge for life and social advance [29].

The most recent report on SDGs mentions that “this generation of children could lose a combined total of \$17 trillion in lifetime earnings (in current value)” if missing school deprives them of the opportunity to acquire important skills for advantageous incorporation into the work market.

Similar to Goal 4, Goal #5 involves achieving gender equality and empowering women and girls. Opportunities for advancement in education have been lost. Additionally, women have not gained a similar or adequate access to decision-making positions where men traditionally are exercising positions of power. Women are still relegated to service positions as demonstrated in the management of the pandemic at the local and regional levels suffering without a doubt the effect of their first line work.

Turning our attention back to the neglected populations, the delays and/or setbacks in the first five SDGs have represented the loss of opportunities for preparing for the prevention and control of the NTDs in this and the coming generation thus depriving families, communities, and countries of social advances and the development of cohorts of well prepared, well fed, economically stable, and skilled individuals to face the challenges to defeat the impact of those incapacitating diseases.

These five goals had to do with the Human Capital that is needed in the different levels of action and decisions of a country in the social and health improvement of its population.

6. Some goals related to infrastructure and strategic goods also contribute to success to control/reduce NTDs

We will continue with four other goals that deal with infrastructure and strategic goods to avoid disease once we have the knowledge and skills to use them for prevention.

6.1 Goal #6: Clean water and sanitation

It is a key goal to be achieved to deal effectively with parasitic diseases, gastrointestinal disorders, and reduce dramatically the incidence of vector-borne diseases, all of them classified as part of the NTDs, and as we mentioned in previous sections it is able to reduce poverty caused by frequent cases of disease and to make feasible to reduce time of women and young people (as part of the existing unequal and inequitable domestic work distribution) looking for safer water sources and food preparation, making possible the allotment of time for productive and income earning activities. Unfortunately, this goal is still behind in its completion, billions of people will be without this important achievement in 2030 if the rate of development of new sanitary institution does not increase in the next few years [28, 29].

6.2 Affordable and clean energies (goal #7)

This goal is having modest advances but in urban and rural communities, the use of animal/fossil energy is still the cause of domestic and external pollution affecting life quality and, overall, an increase in global temperature and occurrence of respiratory infections and child morbimortality. Developing new strategies to provide access to clean energies is an important pending task in the post COVID-19 times [29, 30].

Recent studies show that just under one billion people are still lacking access to electricity and relying on traditional ways to heat their home and light it and to produce their food, keeping the cycles of pollution caused by traditional stoves inside the households [31]. This is part of the improvement of human household conditions that relate to preventing vector-borne diseases.

6.3 Goal #8 “Decent work and economic growth”

This involves macro-economic processes, initiatives, and partnerships between governments and private sectors to stimulate the productive machinery of countries. The population needs to be prepared to work in new initiatives where traditional and new knowledge needs to be combined to trigger development that reaches the local level and employs its population [29].

6.4 Goal #10: Reduced inequalities

Special importance should be given to this goal which relates to number five but encompasses a broader variety of inequalities in the population: children and women, rural and indigenous populations, migrants and refugees.

In the specific case of NTDs, this perfectly applies to inequalities and inequities in the provision of services, access to therapeutic drugs, and other preventive and curative resources.

Vulnerable groups have suffered more with the recent pandemic, but it also has accentuated their risk of suffering NTDs without a clear path to prioritization of their treatment and management. The inequalities are centered in access to income to improve health conditions and treat their health condition. This goal is pending to have a satisfactory achievement [29].

6.5 Goal #11: Sustainable cities and communities

This goal has suffered in the last 4 years at achieving a more inclusive and sustainable urbanization and it has been challenged by the facing of a pandemic, an epidemiological disaster. A positive result is that it revealed the weakness of the system in facing more constant problems and responding to the needs of newcomers to cities and towns, with a propensity for suffering problems caused by lack of sanitary infrastructure and living in substandard housing.

Cities in Latin America and Southeast Asia periodically suffer from dengue epidemics without the provision to effectively prevent the need for water and reliable refuse systems. Migration from rural communities to cities puts a pressure on planners to take decisions to extend sanitation and water networks and/or regulate the development of new neighborhoods with these needs [32].

Overall, all the SDGs should be seen as a unit contributing to the achievement of each one of its 17 components.

7. Advances in reducing the incidence of NTDs

There is no doubt that the approach to NTDs as part of an integrated approach to disease control and involving a broader perspective is getting results. Helminthiasis control and vector-borne disease control are receiving the benefit of better planned initiatives that reduce their incidence through controlling the diseases in positive patients. Strategies including slowing down the transmission, deworming programs, and vector breeding site control are being implemented [33].

The efforts to control vectors are going beyond traditional approaches and involving the scientific community in a multiplicity of disciplines and equally important are giving more participation power to local communities to provide ideas and give feedback on the appropriateness of some interventions.

One of the most successful programs is the Guinea worm elimination which is facing the challenges and problems of eradicating disease; that is, working terminal problems and realizing that ecologic factors need to be analyzed and the role of animal reservoirs cannot be minimized if a total eradication is implemented. The recent literature is consistent with the need to extend the boundaries of surveillance beyond human cases and incorporating elements of surveillance of environments and animal health, trying to guarantee sustainability to the current achievements [34–36]. Surprisingly, it has been identified that some economic activities such as fishery are also important in the establishment of reservoirs for Guinea worms in dog populations. To be effective it is necessary to expand the surveillance and assume a One Health approach [37, 38].

For several diseases such as the parasitic ones (helminthiasis) and vector-borne (dengue, Chagas, chikungunya), the implementation of control measures post-COVID can continue but it is realistic to consider that a delay can extend the calendar actions by at least 2 years [39].

For snakebite control, there is an ambitious goal: to reduce the need for snake bites intervention by 2030. However, to be effective in the management of snake bites, it is crucial to identify the problems and solve them. Recent studies demonstrate how social sciences are supporting the identification of some critical issues and proving their importance.

At the institutional level, it is important to have access to antitoxins for the specific venoms in the different regions and also to have the clinics in accessible sites so that the population can seek and find health care. The other factor is related to the reliance of the patients on local remedies and ethnomedicine that interfere with their search for institutional health care. African countries have the most severe crisis in the disbalance of population seeking treatment for snake bites and the limitation of the health system in providing services close to critical areas, lacking the antitoxins and the qualified personnel to provide all the necessary services during the acute and follow-up stages of snakebite management [40–42].

Overall there is a positive, there is an increase in the research done on NTDs and multidisciplinary teams are trying to identify and provide answers to the challenges posed to the implementation of the SDGs and the understanding of a holistic approach to health problems encompassing Environmental, Animal Health, and Human Health as well making good the application of the One Health perspective.

8. Conclusions

The years after the onset of COVID 19 have been particularly difficult. More developed countries are accessing a steadier recovery but those countries in the Global South are still struggling with weak growth and labor market crises due to workplaces closure [29].

It is a time to re-assess the SDGs and the needs to retake the route to reach results by 2030 and to assure that the eradication and control of the NTDs continue to be feasible and aligned with the initial objectives.

8.1 Is it possible to reach the eradication/control of NTD by the deadlines given for SDG?

Different scientific groups are trying to assess the specific effect of the pandemic on the diseases included in the NTDs group and there is a consensus that strengthening the epidemiological surveillance will provide valuable data of acute and long-term effects on the mortality, disease, and disability indicators [26]. According to the data provided by United Nations, worldwide there was a change in the percentage of people requiring interventions for NTD's of 21% between 2010 and 2020, with greater success in Eastern and South-eastern Asia with a 45% change, while Latin America and the Caribbean had a moderate decrease in the need of interventions for NTDs of 30%. In the region requiring the most attention, sub-Saharan Africa, the change (reduction) was only 8%. These figures correspond to the period from 2010 to 2020 [6].

Again, the emphasis for the future needs to go toward solving the health crisis and the neglect of Sub-Saharan populations. As we mentioned in the previous pages, it is not enough to treat and cure diseases, and is necessary to reduce those determinants of health leading to more poverty, hunger, and sub-standard conditions of life and provide the neglected populations with the resources to dignify their lives.

Only by providing people with opportunities to participate in their own life promotion will it be possible to prevent NTD's risk factors and transmission. It is time to incentivize a new young generation, the same one suffering most of the NTDs, to change its life for a healthier and fuller existence.

Public Health interventions like deworming in the case of helminthiasis, treatment of Chagas disease positive cases or insecticide spraying for this and other vector-borne diseases, or access to anti-venom treatment have shown to be effective as immediate measures, but populations living in the same conditions and the same environments get re-infected, and new snake bites occur (suffering, death, and disability). It is adequate to modify the mindset of populations and governments, the production methods that expose individuals to risks of disease and accidents, their environmental conditions, and provide water and sanitation to households in rural and marginalized urban neighborhoods.

The SDGs will be reached to some level by 2030 but as we saw there are emergencies and disasters in the way that can delay the main goal of providing a better life to those in poverty, but there is an international responsibility to provide continuity to the goals beyond 2030. Governments need to be committed to supporting their populations in escaping from NTDs and reaching the life they deserve.

9. Executive summary

- Disease control and prevention require integrated approaches to be successful. Environment and animal health need to be considered as part of the holistic approach to human health and well-being. Neglected tropical diseases exemplify the need for integrated approaches.
- Sustainable development goals were adopted in 2015 by the United Nations with the basic aim of promoting prosperity for mankind while protecting and preserving the environment for the generations to come. Disease in all its forms is tackled through different specific goals
- Neglected tropical diseases were a recent inclusion in the MDGs in Goal #3.
- It is not enough to reach medical solutions to end the NTDs, and it is necessary to complement those with solutions for the lack of water and sanitation, the improvement of human housing quality, sanitary condition of domestic animals and livestock, and especially poverty, malnutrition, and inequity. All of these areas are covered by non-medical SDGs but those providing for better quality of life and planning for life in communities.
- Different examples are provided of NTDs that can benefit from the inclusive implementation of the SDG covering the neglected populations needs.
- While the implementation of the SDG provided important advances to the control and prevention of NTD, that progress was drastically reduced during the acute phase of the COVID-19 pandemic (especially 2020–2021)
- The deadlines to complete the implementation of the SDGs and their specifics for neglected disease will require adjustments.
- One disease: Guinea worm disease or Dracunculiasis is in the process of eradication with only four countries reporting cases, but it has been identified that domestic dogs can be also parasitized and remain as reservoirs for the human disease. This finding highlights the need for integrated approaches to health.
- Political will by the governments can make the implementation of the SDGs feasible and with it the improvement of population including the currently neglected and impoverished populations.
- Research demonstrates that communities can provide important contributions to accomplish the SDGs.

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Conflict of interest

The authors declare no conflict of interest.

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