



## Neglected tropical diseases of Namibia: Unsolved mysteries

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### ABSTRACT

Neglected tropical diseases (NTDs) are diseases most commonly found in settings of poverty and are responsible for the morbidity and/or mortality of millions each year. As an upper-middle income country, Namibia is not normally considered to have many NTDs but published reports indicate the possible presence of over 30. Because much of the data is buried in historical studies published before Independence in 1990, there is a risk of losing valuable information on which to build current and future integrated public health strategies. The purpose of this review, therefore, is to bring together these significant fragments to identify existing knowledge gaps which need to be addressed to build effective control, prevention, and even elimination strategies. The review focuses on intestinal helminthes, schistosomes/snail 'vectors', viruses (Rift Valley Fever, Crimean Congo Hemorrhagic Fever, rabies), protozoa (*Leishmania*, *Toxoplasma*, *Amoeba*, *Giardia*), bacteria (*Rickettsia*, *Ehrlichia*, *Leptospira*, *Coxiella*, *Brucella*, and *Borrelia*), fungi (*Pneumocystis*) and myiasis. Each NTD speaks to the possible need for surveillance and the creation of integrated disease risk maps, linking prevalence of related NTDs with environmental and ecological factors to assist control and prevention efforts. The predominance of zoonotic disease suggests a need to integrate veterinary and public health components as the national public health surveillance system is established.

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## 1. Introduction

Neglected Tropical Diseases (NTDs) are diseases most commonly found in settings of poverty. The lists differ by organizational focus, but each disease is responsible for the morbidity and/or mortality of millions each year (Hotez and Kamath, 2009). While important in their own right, they often contribute to the disease burdens caused by the 'big 3': malaria, Tuberculosis, and HIV/AIDS (Nacher, 2011; Noblick et al., 2011). Sixty percent of NTDs are zoonoses meaning that animals are reservoirs for the pathogens and contribute to the spread to and infection of surrounding human populations (Molyneux et al., 2011). Most of these diseases directly impact Sub-Saharan Africa (SSA) and considerable effort is being made to address their prevention and control (Hotez and Kamath, 2009). However, there is not enough epidemiological information to effectively map their prevalence or severity (Hotez and Kamath, 2009). Such is the case in Namibia, an upper middle income country in south-western Africa (World Bank, 2012).

Namibia consists of a large land area (823,290 km<sup>2</sup>) with a relatively small population (2,160,000) (CIA, 2012) living in 13 regions (Fig. 1). This means that NTDs impacting other Sub-Saharan African countries with high populations may not be present due only to the sparseness of the human population. As 70% of the population lives in the northern part of the country (Best Country Maps, 2012), NTDs are usually mapped to this hot, humid region which borders Angola, Zambia, and Botswana (Global Atlas, 2011) (Fig. 1). This does not mean, however, that they only exist in the northern regions. Throughout the country, there is a high level of interaction between cattle, goats, and sheep with humans both in 'communal' areas and commercial and hunting farms making it conducive for the transmission of many zoonotic pathogens. To date, NTDs have not been a priority as the principle focus has been to control and prevent malaria ( $n=18$ ), TB ( $n=7$ ), and HIV/AIDS ( $n=95$ ) as is evidenced by the numbers of publications since 1995 (Noden, 2011).

The public health history of Namibia is a fascinating study with a rich history of information locked away in forgotten publications. Attaining independence in 1990, Namibia has been steadily building its health infrastructure and lines of communication as

regards infectious disease notification. However, before independence, Namibia (called 'South West Africa') was administered by South Africa and many infectious diseases studies were published within a wider southern Africa focus. As such, past studies may only briefly refer to Namibia as South West Africa and are easily overlooked. Through time, these important studies can become lost to the detriment of public health.

The purpose, then, of this review is to bring together significant fragments of data to identify existing knowledge gaps which need to be addressed so that effective control, prevention and even elimination strategies can be envisioned. As the focus is historic in nature, this review mainly focuses on pre-Independence publications involving NTDs in Namibia with reference to more recent studies, newspaper articles or websites to update what is known. While effort was made to locate relevant publications, it cannot be assumed that every published study was identified. Also, as this review only focuses on published records (in press or online), updated information on one or more of these NTDs may be known to the Ministry of Health and Social Services (MoHSS). That said, however, conversations with those engaged in data management, epidemiology or laboratory testing have not highlighted the availability of such updated information. The course of the review will begin by summarizing what has been published concerning helminths, moving into protozoa, bacteria, viruses, mycoses and a few miscellaneous pathogens, ending with a discussion of future directions.

*Neglected tropical diseases in Namibia:* Thirty-six NTDs have been published in Namibia since 1959 (Table 1). It is known that some NTDs definitely do not occur in Namibia such as Chagas Disease, guinea-worm, loiasis, onchocerciasis, Japanese encephalitis, yellow fever (CDC, 2012), paracoccidiomycosis and Buruli ulcer (Hotez et al., 2007; WHO, 2009). Through the years, however, various samples have been tested, particularly vector-borne diseases, with positive or questionable results (Table 2). While the positive results are highlighted, lymphatic filariasis has never been identified (Kyronseppa and Goldsmid, 1978) and Human African Trypanosomiasis (HAT) has not been reported in Namibia for over 10 years (Simarro et al., 2011). Tables 1 and 2 include several surprises with briefly mentioned diseases or information hidden in

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