

Mind your Language: Discursive Practices Produce Unequal Power and Control Over Infectious Disease: A Critical Discourse Analysis

Mzwandile A. Mabhala, Asmait Yohannes¹, Alan Massey, John A. Reid

Faculty of Health and Social Care, Department of Public Health and Wellbeing, University of CHESTER, Riverside Campus, Chester, CH1 1SL, United Kingdom, ¹Mount Sinai, Department of Surgery, Ambulatory Surgery Centre, 5 East 98th Street, 14th Floor, Box 1259, New York, NY 10029-6574

Address for correspondence:

Dr. Mzwandile A. Mabhala,

Department of Public Health and Wellbeing, University of Chester, Riverside Campus, Chester, CH1 1SL, United Kingdom.

E-mail: a.mabhala@chester.ac.uk

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Abstract

Background: Power, socioeconomic inequalities, and poverty are recognized as some of the fundamental determinants of differences in vulnerability of societies to infectious disease threats. The economic south is carrying a higher burden than those in the economic north.

This raises questions about whether social preventions and biomedical preventions for infectious disease are given equal consideration, and about social institutions and structures that frame the debate about infectious disease.

This article examines how institutionalized ways of talking about infectious disease reinforces, creates, and sustains health inequalities.

Methodology: Critical discourse analysis was considered to be epistemologically and ontologically consistent with the aims and context of this study.

Results: The study examined three types of infectious disease:

- Emerging infectious diseases/pathogens
- Neglected tropical diseases
- Vector-borne infections.

Examination revealed that poverty is the most common determinant of all three.

Conclusion: A sustainable reduction in infectious disease in the southern countries is most likely to be achieved through tackling socioeconomic determinants. There is a need for a change in the discourse on infectious disease, and adopt a discourse that promotes self-determination, rather than one that reinforces the hero-victim scenario and power inequalities.

Keyword: Critical discourse, inequalities, infectious disease, poverty, power

<H1>Background

Power, socioeconomic inequalities, and poverty are recognized as some of the fundamental determinants of differences in the vulnerability of societies to infectious disease threats.^[1-7] These differences in the burden of infectious disease have been observed between countries in the economic north and south: countries in the economic south have a higher burden of infectious disease.^[5,7-9] Despite this evidence, the strategies to prevent, eliminate, and control infectious disease continue to focus exclusively on biomedical interventions through drug administration.^[6,7,9] This raises questions about whether the social and biomedical explanations of infectious disease are given equal consideration and about social institutions and structures that frame the debate.

This paper uses a critical discourse analysis (CDA) approach to examine how the language used to conceptualize infectious diseases produces unequal power relations between societies

that suffer endemic infectious disease and those who benefit from its decline.^[10] In this paper, “critical discourse analysis” refers to a:

...methodological approach to language and society that centers on discourse as social practice: [and] uses micro-level analysis of discourse (words, phrases, conceptual metaphors) to uncover the processes by which ideology of power abuse, control, dominance, exclusion, injustice and inequity are created, re-created, and perpetuated in social life-processes which are often “naturalised” and taken for granted as common-sense notions [8, pp.312-313].

CDA advocates that researchers should be transparent about the particular philosophical position, values, and beliefs that make up the critical stance of their work.^[11-13] Consistent with this, the authors declare that the ontological position taken in this paper is based upon a belief in social justice being a foundation principle for public health, and also that public health is a strategy to reduce social and health inequalities.^[11,14-16] The authors theorize that discursive practices produce unequal power and control within the arena of infectious disease management, as those with vested interests set the discursive context.^[11]

The impetus for pursuing this line of argument comes from evidence that indicates the decline in mortality has been steeper in countries in the economic north than in the economic south.^[8] We argue that this uneven distribution has created a metaphorical scenario of “heroes” and “victims,” whereby northern countries which have benefited from the decline increasingly assume a heroic status, lending a hand to the southern victims who need the burden of infectious disease to be lifted off them. This hero-victim scenario is signified by the amount of investment by northern-based international organizations to tackle infectious disease in southern, and particularly African, countries. Ayittey^[17] indicates that the discourse reality of southern Africa in the eyes of international investors and support agencies is

characterized by terms such as civil unrest, starvation, deadly diseases, and economic disorder [17, p.6]. The populations of southern countries have become victims of the discourse, which portrays them to the world as being less worthy than their northern counterparts owing to factors beyond their control. The normalization of language such as “deadly diseases” creates an understanding that southern countries are victims of infectious disease, poverty, unrest, and so on, which embeds the inverse care paradox.^[17,18]

The discourse commonly used to conceptualize infectious disease includes phrases such as “new,” “old,” “emerging,” “re-emerging,” “the neglected tropical diseases (NTDs),” “vector-borne infectious diseases (VBIs),” and “infectious diseases of poverty,” which reinforces the hero-victim scenario and regulates action and inaction, thereby exerting power.^[11] Jäger and Maier^[11] describe this as “institutionalized talking”: the use of language to manage practical tasks and to perform the particular activities associated with participation in an institutional context. Arguably, these create an understanding of infectious disease management, which signifies the limitations of biomedical interventions to tackle the root causes of vulnerability and susceptibility to infectious disease. While biotechnological advances—particularly improvements in surveillance, early detection, vaccination, and antimicrobial drugs—have reduced infectious disease mortality rates,^[19] the long-term sustainability of these measures is questionable, particularly in southern countries due to the transient nature of infectious diseases: as soon as we discover solutions to existing diseases, new ones take their place because the fundamental causes remain in place.^[20-25]

The enduring advances in the health of people have come from improvements in social and economic status, including access to basic and essential resources such as clean air, better housing, potable water, sanitation, and nutritious food.^[26,27] The fact that mortality from infectious disease is highest in populations in the economic south^[23,25] implies that power inequalities and poverty create conditions that enable infectious diseases to thrive and prevent

subsequent access to healthcare.^[28] This position is based on evidence from several epidemiological studies that consistently demonstrate decreases in morbidity and mortality correlating with increases in socioeconomic position.^[24,25,28-30]

The Global Report for Research on Infectious Diseases of Poverty produced by the World Health Organization (WHO) in 2012^[28] explains that social, economic, and biological factors interact to drive a vicious cycle—the occurrence, distribution, emergence, and re-emergence of poverty and infectious disease.^[25,30] The report explains that even where effective interventions to treat infectious disease are available, the environments in which poor people live are often conducive to its emergence, re-emergence, and spread.^[28] Furthermore, social forces including globalization, environmental degradation, international trade, migration, conflicts, and terrorist threats have shaped the definition and contours of infectious disease, and the rapidity with which it changes.^[7,9,31]

<H1>Methodology

This article aims to examine how institutionalized ways of talking about infectious disease reinforce the hero-victim scenario and create and sustain health inequalities.

CDA was considered to be epistemologically and ontologically consistent with the aims and context of this study,^[22,23] in that it primarily considers the way power inequalities and dominance are enacted, reproduced, and resisted by text and talk in social and political contexts.^[32,33] Thus, CDA is sympathetic to the key argument that health inequalities are fundamental causes of differences in the distribution of morbidity and mortality from infectious disease.^[34-36] In our critique, we are mindful of Popper's^[37] warnings about the limitations of prevailing scientific paradigms, and of Polyani's^[38] guidance about our tacit understandings and non-detached construction of personal and scientific knowledge.^[38,39]

The principle underpinning critical discourse research is its commitment to identifying and challenging unjust social structures, policies, beliefs, and practices [19, p.60]. It affirms/holds the belief that inequalities in health are the outcome of material, power, social, and cultural inequalities across societies, which are, in turn, the product of inequalities in power, income, wealth, knowledge, social status, and social connections.^[15,32,33,36,40,41]

This article argues that the language used to construct the discourse of infectious diseases signifies how their occurrence and distribution are created and sustained by power inequalities. CDA allows greater insight into how language can be used by those with a privileged social position to determine what constitutes valid and reliable knowledge.^[22,23]

For example, decisions about interventions to tackle infectious diseases are constructed through such concepts as “reliable” and “valid” and “evidence-based knowledge.” The knowledge constructed in these terms is perceived as sacred and immune to value-judgement. CDA research accepts that the construct of evidence-based knowledge derives from the social context and is interpreted through discursive constructs in a language which is influenced by sociocultural factors.^[29] In this way, CDA recognizes that what is considered to be scientific knowledge is inherently part of and influenced by social structures, and produced in social interaction. Therefore, it enables researchers to examine how these constructs can be used by communities of knowledge that seek to disadvantage certain groups and positions, or do so inadvertently.

<H1>Description of Materials and Analysis

We initially consulted and read many websites, looking for themes that demonstrate how institutionalized ways of talking about infectious disease regulate, reinforce, and shape action, and thereby exert power. We then limited our analysis to themes emerging from three

major international organizations that influence policy on infectious disease: World Health Organization (WHO), National Institute for Allergy and Infectious Diseases (NIAID), and Centers for Disease Control (CDC). The following themes emerged from these key websites:

- Emerging infectious diseases (EIDs)/pathogens
- Neglected tropical diseases
- Vector-borne infections.

A literature review was undertaken to examine how infectious disease discourse is represented in the literature, guided by Bacchi's^[42] analytical questions:

- (1) What is the problem of infectious disease represented to be?
- (2) What assumptions underlie this representation of the discourse on infectious disease?
- (3) How has this representation of the problem come about?
- (4) What are the gaps and silences?
- (5) What effects are produced by this representation of the problem?
- (6) How and where have these representations been produced and disseminated?

Rather than slavishly follow Bacchi's^[42] questions, we took a holistic approach and integrated them in various aspects of this article where we deemed appropriate. For example, the first, second, and fourth questions formed an integral part of the background and presentation of findings sections of this paper. The third question was excluded as it would have required extensive policy analysis which is beyond the scope of this article. The fifth and sixth questions were integrated in the discussion section of this paper. The authors acknowledge that extensive exploration of all six questions was not possible due to the limit on how much one can fit in one article.

<H1>Findings: The Assumptions which Underlie this Representation of Infectious Disease

The use of the Bacchi's^[42] framework enabled us to uncover what we believe is being taken for granted about the institutionalized ways of talking about infectious disease. We acknowledge this represents our perspective of discourse, which is informed by our experiences, values, and beliefs in our context and time. The assertion by Wodak and Meyer^[43] resonates with our experiences in relation to the discourse on infectious disease: that it is easy to assume that we have solved the problem by discovering things. They go on to explain that the more we write about these things, the more we take their existence for granted. Bacchi^[42] makes a similar observation in policymaking contexts, that the common assumption by policymakers is that policies solve social problems, but contends that although policies give shape to the problem, they do not necessarily address it.^[37] This is true for the institutions of power in infectious disease: they appear to assume that by grouping infectious disease in different categories, they found common solutions to all those belonging to the same category. They then assume that by framing their assumption in terms of evidence-based practice/guidelines, they can purport political and ideological neutrality. This discourse separates illness from the context within which it occurs. For example, WHO^[44] published the comprehensive *Practical Guidelines for Infection Control in Health Care Facilities* in 2004, and in 2016 published *Guidelines on Core Components of Infection Prevention and Control Programmes at the National and Acute Health Care Facility Level*.^[45] The WHO^[45] states as its two objectives:

...to provide evidence-based recommendations on the core components of IPC [infection prevention and control] programmes that are required to be in place at the

national and acute facility level to prevent hospital-acquired infections (HAI) through IPC good practices;

...to support countries and health care facilities to develop or strengthen IPC programmes and strategies through the provision of evidence- and consensus-based guidance that can be adapted to the local context, while taking account of available resources and public health needs.

These are just two examples, but there many similar examples where the dominant powers assume that by producing policies and guidelines, and validating them in terms of problem solving and evidence-based discourse, they have solved the problem, when in actual fact they shifted the focus of discourse from its social context, thus constructing it as politically neutral. The unintended consequences of this approach are reinforcing power inequalities and creating hero-victim status, thus generating an inverse care law effect.^[18] CDA advocates a paradigm shift from problem solving to problem questioning, thereby uncovering the discursive processes through which infectious disease discourse is shaped and communicated, normalized and propagated, which involve hidden dimensions of power, control, and inequality.^[42,43]

<H2>Emerging infectious diseases/pathogens

Emerging and re-emerging infectious diseases are commonly defined, respectively, as diseases/pathogens that are recognized in a human host for the first time; and diseases that historically have infected humans, but continue to appear in new locations or in drug-resistant forms, or that reappear after apparent control or elimination.^[46,47] The concept of EIDs is closely related to the discourse of risk management.^[48] As such, EIDs are conceptualized within the positivist paradigm and scientific solutions are given credence. The focus on risk emerges as the accepted discourse, to the detriment of other discourses. Attention is directed

toward the organic causes of disease, which can be studied and addressed by downstream biomedical interventions.^[48,49] This allows control of the agenda for infectious disease to rest with those who benefit from downstream interventions.^[48] Dissenting discourses appear abnormal as they infringe upon the rules of the discursive regime created by the scientific community.^[50] The outcome is that socioeconomic or upstream interventions are considered secondary.^[49,50]

The WHO^[51] published a list of the top eight EIDs needing urgent research and development (R&D) attention [Table 1]. In addition, the WHO designated chikungunya, severe fever with thrombocytopenia syndrome, and Zika as serious EIDs that require urgent action by their R&D staff.^[51] The WHO's list reflects those of several other international agencies such as the CDC^[52] and NIAID.^[47] Four out of eight diseases listed by WHO also appear on the NIAID list of category A priority pathogens, organisms/biological agents that pose the highest risk to national security and public health. A further three EIDs on the WHO priority list—coronavirus diseases, chikungunya, and Nipah and Rift Valley fever—also appear on the NIAID list of category C priority pathogens, their third highest priority.

For this paper, the global distribution of these EIDs and how the priority was decided are significant. It has been observed that the highest prevalence of the majority of them is in countries in the economic south, which are already battling with other adverse social, economic, and political conditions [see Table 3].

The evidence shows that in the last three decades approximately one to three new human infectious diseases have been identified each year; others have re-emerged, causing greater numbers of cases than before or affecting different populations and regions than in the past (e.g., dengue fever or Ebola), while others have developed resistance to available treatments (e.g., multi-drug resistant tuberculosis).^[30,53]

A number of factors contribute to disease emergence, including population growth and movement, changes in land use, greater contact between people and animals, international travel and trade, and poor public health infrastructure. EIDs that have attracted global attention or responses over the last few decades include HIV, SARS, H1N1, H5N1, and Ebola.^[53] The recent outbreaks of Ebola in West Africa, and persistent malaria, tuberculosis (TB), HIV/AIDS, and other infectious diseases in low-income countries, are an indication that these conditions cluster and persist wherever poverty is widespread.^[30,54]

Most re-emerging infectious diseases, including dengue virus, West Nile virus, cholera, multi-drug resistant tuberculosis, and drug-resistant malaria,^[30] are endemic in low-income countries. The few re-emerging infectious diseases that commonly occur in the developed world, including MRSA and C. Diff, are often associated with excessive or inappropriate use of antibiotics.^[30]

<H2>Neglected tropical diseases

The scientific rationale for grouping these infectious agents as NTDs began in the years following the release of the United Nations' millennium development goals (MDGs), and emerged through key WHO meetings held in Geneva and Berlin. The WHO's *Global Report*^[28] produced a list of infectious diseases that are considered "neglected tropical diseases" [Table 2]:

The report indicates that though these are not restricted to low-income countries, they manifest more in poor populations globally.^[28,29] Molyneux^[29] and several others reported that large numbers of the world's poorest people remain afflicted or are at risk from this group of diseases, and yet none of the international agencies have given them priority.

Hotez^[55] argues that the concept of NTDs is associated with the reproduction of colonial attitudes toward tropical countries; the phrase indicates that science diplomacy is seen by the

western powers as the best mechanism for health advocacy within tropical countries.^[55] Here the premise that western science is the only mechanism to resolve these issues is spoken into existence and becomes the dominant discourse. Socioeconomic and cultural solutions are disparaged.^[55]

Furthermore, the notion of neglected infectious diseases implies that they may receive low priority in terms of resource allocation. It also implies that individuals or social systems that have the power to prevent them are constrained by scientific discourses of downstream prevention. From the CDA point of view, the construct of NTDs is a reflection of inequalities in power.

<H2>Vector-borne infections

Table 3 indicates the WHO's list of major vector-borne diseases and Table 4 shows its list of other vector-borne diseases. It is estimated that the major vector-borne diseases together account for around 17% of the global burden of communicable diseases, claiming more than 700 000 lives every year. The evidence shows that the burden is highest in tropical and subtropical areas. Morbidity and mortality rates are often disproportionately high in poorer populations.^[56,57]

Increased global travel and trade, and social, economic, demographic, and environmental factors such as unplanned urbanization and lack of reliable piped water supply or solid waste management have all been blamed for the rate, pattern, geographical distribution, and re-emergence of these diseases. Despite these phenomena occurring in both the economic south and north, the disproportionately high burden of VBIs such as malaria, dengue, yellow fever, lymphatic filariasis, leishmaniasis, and onchocerciasis falls upon areas with a poor health infrastructure, underscoring that poverty is a major determinant of the manifestation of infectious disease.^[30] Furthermore, Brisbois and Ali^[58] indicate that the dominant discourse

of risk creates disciplinary boundaries which exacerbate the absence of political solutions to global climate change. The acceptance that all of the above diseases are linked to factors such as climate change creates a discourse where only the scientific community can find solutions and all other voices are discredited.

<H1>Discussion

The key contribution of this article is that it indicates that institutionalized ways of talking about infectious disease create power inequalities between populations where infectious disease is endemic and those that benefit from its decline. Consistent with the previous research, this study observes that the heaviest burden of infectious disease falls on poor populations. However, the difference between this study and others is that it questions the current assumption that by producing evidence-based associations between poverty and infectious disease we have solved the problem. It challenges the assumptions by dominant powers that application of evidence-based practices and guidelines solves the problem of infectious disease. It proposes that poverty creates vulnerability to infectious disease and restricts access to healthcare and, therefore, biomedical paradigms only serve to shift the focus away from the root cause of vulnerability to infectious disease. The current study proposes a new hypothesis that the search for the organic causes of infectious diseases needs to recognize that poverty is a fundamental determinant of their uneven global burden. This hypothesis is consistent with the argument by Molyneux^[29] that the focus on organic causes of infectious disease has created constructs such as emergence, re-emergence, and neglected diseases. This was further validated by the inclusion of the elimination of extreme poverty in the MDGs as a way of achieving sustainable reductions in HIV/AIDS, malaria, and TB.

The finding that most emerging and re-emerging infections are endemic in poor populations confirms the WHO's^[54] assertion that even when effective interventions exist, in many low-

income countries the internal political and economic situation and fragile infrastructure are unable to support them.^[58,59] The Ebola crisis in West Africa provides a typical example of how infectious diseases occur and persist in countries where there are extreme poverty, poor or inadequate healthcare systems, conflicts, and high levels of illiteracy. This pattern was also observed with other infectious diseases such as TB, poliomyelitis, and HIV.

There is a general acceptance that measures to achieve sustainable reductions in fundamental causes of infectious diseases, as opposed to their outcomes and manifestations, are outside the scope of traditional biomedical intervention.^[23-25,28,29,60] Farmer^[23] explains that despite the proven success of biomedical research in discovering cures and treatments for many infectious diseases, human pathogens continue to emerge or re-emerge today and have a profound impact on populations deprived of social resources.^[24] For these reasons, Farmer^[23] and others have advocated a social determinants approach to the study and prevention of infectious diseases at the population level. Farmer promoted wider analytical discourse, but did not advocate a “zero-sum game”; for instance, in tackling TB, he advised using effective short-term interventions while pursuing the root causes, and being mindful of historical contingencies and material changes. He later advocated a new search for understanding, with a research agenda and forms of scholarship that can examine the pathogenic effects of social inequalities.^[61] Marmot argues for a balance of the three pillars, social, economic, and environmental, that are vital for health equity.^[62]

The analysis in this paper indicates that social, economic, political, and environmental factors all influence the risk of, exposure to, and effects of infectious diseases.^[58] For example, the poorest populations have the least access to safe drinking water, decent sanitation, and effective waste disposal. Therefore, we propose that a sustainable decline in infectious disease can only be achieved through improving the socioeconomic status of those at risk.

We recommend an integrated three-dimensional model for future research and scholarship. This will involve periodic integrated reviews of world literature on infectious disease and allow our discourse frameworks to evolve. The three dimensions are:

- **Paradigmatic analysis:** This will involve systematic reviews of evidence to assess and critique the research stance, discourse vocabulary, ontology, and constraints, with reference to the latest paradigms in social justice.
- **Contextual analysis:** This will show the sociocultural, institutional, political, and economic settings and dynamics that apply to any infectious disease evidence under review. It will also include analysis of the research body's model of study, along with its vested interests and affiliations.
- **Synthetic analysis:** This will involve periodic critical reviews across all infectious diseases in terms of wider determinants and upstream risk factors.

<H1>Conclusion

While biotechnological advances—such as improvements in surveillance, early detection, vaccination, and antimicrobial drugs—have reduced infectious disease mortality rates, particularly in northern economies, the enduring health improvements came from advances based on socioeconomic determinants of health. A sustainable reduction in infectious disease in the southern countries is most likely to be achieved in the same way. The transient nature of infectious diseases means that as soon as we discover solutions to existing diseases, new ones take their place because the fundamental determinants remain in place. Poverty prevents southern countries from taking full advantage of the biotechnological advances, thus creating dependence on the northern countries.

All this requires a change in the discourse on infectious disease, as it reinforces unequal power relations between societies that suffer endemic infectious disease and those who

benefit from its decline. We should endeavor to promote a discourse that promotes self-determination, rather than one that reinforces the hero-victim scenario and power inequalities.

<H1>Limitations

The methodology used in this study (CDA) advocates mutual construction of knowledge, so the researchers' understandings and interpretations reflect their perspective (based on their experience, values, beliefs, and context) and, therefore, may not be generalized to other contexts. In addition, this research extracted and made use of case studies from three international organizations which focus on infectious disease, increasing the likelihood of bias.

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Consent for publication

Not applicable to this paper.

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<H2>Conflicts of interest

There are no conflicts of interest.

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Table 1: Emerging infectious diseases/pathogens	
WHO list of top emerging diseases	NIAID EIDs/pathogens: Category A priority pathogens
Crimean Congo hemorrhagic fever	Bacillus anthracis (anthrax)
Ebola virus disease	Clostridium botulinum toxin (botulism)
Marburg	Yersinia pestis (plague)
Lassa fever	Variola major (smallpox) and other related pox viruses
Middle East Respiratory Syndrome (MERS)	Francisella tularensis (tularemia)
Severe Acute Respiratory Syndrome	Viral hemorrhagic fevers
Coronavirus diseases	Arenaviruses
Nipah and Rift Valley fever	Junin, Machupo, Guanarito, Chapare (new in fiscal year (FY) 14), Lassa, Lujo (new in FY 14)
	Bunyaviruses
	Hantaviruses causing Hanta Pulmonary Syndrome, Rift Valley fever, Crimean Congo hemorrhagic fever
	Flaviviruses
	Dengue
	Filoviruses
	Ebola
	Marburg

Table 2: WHO's list of neglected tropical diseases	
Dengue	Cysticercosis
Rabies	Dracunculiasis (Guinea-worm disease)
Trachoma	Echinococcosis
Buruli ulcer	Foodborne trematode infections
Endemic treponematoses (including yaws)	Lymphatic filariasis (elephantiasis)
Leprosy	Onchocerciasis (river blindness)
Chagas disease (American trypanosomiasis)	Schistosomiasis (bilharziasis)
Human African trypanosomiasis (sleeping sickness)	Soil-transmitted helminthiases (intestinal parasitic worms)
Leishmaniasis	

Table 3: WHO's list of major vector-borne infectious diseases

Vector	Condition	High-risk populations
Anopheles	Malaria	Most malaria cases and deaths occur in sub-Saharan Africa. However, South-East Asia, Latin America, and the Middle East are also at risk
Aedes	Dengue	Tropical and sub-tropical climates, Asian, and Latin American
	Chikungunya	Africa, Asia, and the Indian subcontinent
	Zika virus disease	Africa and Asia, Brazil
	Yellow fever	Endemic in tropical areas of Africa and Central and South America
Culex	Japanese encephalitis	South-East Asia and Western Pacific regions
	Lymphatic filariasis	Republic of Congo (DRC), Ethiopia, Indonesia, Nigeria, and Zambia are new endemic countries
Triatomine bugs	Chagas disease	Latin America
Sandflies	Leishmaniasis	Brazil, Ethiopia, India, Somalia, South Sudan, and Sudan
Black flies	Onchocerciasis	Angola, Benin, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Republic of Congo, Côte d'Ivoire, Democratic Republic of the Congo, Equatorial Guinea, Ethiopia, Gabon, Ghana, Guinea,

		Guinea-Bissau, Kenya, Liberia, Malawi, Mali, Mozambique, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, South Sudan, Sudan, Togo, Uganda, United Republic of Tanzania
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Table 4: WHO's list of other vector-borne infectious diseases

Vector	Condition	High-risk populations
Aedes	Rift Valley fever	Republic of Niger
Culex	West Nile fever	Africa, Europe, the Middle East, North America, and West Asia
Sandflies	Sandfly fever (phlebotomus fever)	Africa, Europe (particularly the Mediterranean region), the Middle East, and Asia (particularly the Indian subcontinent)
Ticks	Crimean-Congo haemorrhagic fever	Africa, the Balkans, the Middle East, and Asia
	Lyme disease	Asia, north-western, central and eastern Europe, and the USA
	Relapsing fever (borreliosis)	Western United States, Southern British Columbia, the plateau regions of Mexico, Central and South America, the Mediterranean, Central Asia, and much of Africa
	Tick-borne encephalitis	Southern part of the non-tropical Eurasian forest belt, extending from north-eastern France to the Japanese Hokkaido Island
Tsetse flies	Sleeping sickness (African trypanosomiasis)	Angola, Burkina Faso, Cameroon, Chad, Congo, Côte d'Ivoire, Equatorial Guinea, Gabon, Ghana, Guinea, Malawi, Nigeria, South Sudan, Uganda, United Republic of Tanzania, Zambia, and Zimbabwe

Fleas	Plague	Madagascar, the Democratic Republic of Congo, and Peru.
	Rickettsiosis	Bangladesh, Mongolia, Kenya
Aquatic snails	Schistosomiasis (bilharziasis)	Africa, the Middle East, the Caribbean, Brazil, Venezuela, and Suriname