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Tuberculosis, Malaria, and HIV/AIDS: An Analysis of Biomedical, Social, Cultural, and Economic Impacts in the Global Context and Thailand's Southern Border Areas

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Abstract

This study aimed to analyze the impact of tuberculosis, malaria, and HIV/AIDS infections within the global context and in the southern border provinces of Thailand. A systematic literature review was conducted on research published from 2006 to 2024, supplemented by qualitative research through non-participant observation in a community within the region. The findings revealed that these diseases are complex and intertwined with structural factors such as poverty, lack of resources, and unequal access to healthcare. Furthermore, these infectious diseases reflect the concept of "diseases as products," diminishing labor potential and economic productivity. They are also referred to as "diseases of poverty," adversely affecting the poor in terms of treatment and prevention, and as "diseases of reproduction," reinforcing cycles of vulnerability and inequality in similar communities worldwide. This situation was also observed in the southern border regions of Thailand where multicultural dynamics present unique challenges and opportunities in educational management. The study highlighted the interconnected impacts of these three infectious diseases across biological, medical, political, economic, and social dimensions. Therefore, addressing these issues required consideration at both the global level and in the southern border provinces of Thailand, promoting international cooperation and developing health policies that account for cultural, religious, and social contexts to ensure sustainable long-term disease prevention and control.

Keywords: Tuberculosis, Malaria, HIV/AIDS, Structure factors, Thailand's Southern border areas

Introduction

Tuberculosis (TB), malaria, and HIV/AIDS were major infectious diseases with significant impacts on global population health, earning the designation as the "Big Three" or "Three Major Infectious Diseases" (World Health Organization [WHO], 2022; Tuberculosis Bureau, 2014). These diseases posed critical challenges to global public health systems, particularly in low- and middle-income countries, where resource limitations and healthcare service constraints were common (United Nations Development Programme [UNDP], 2020). Beyond health impacts, these diseases also carry substantial social and economic implications, such as loss of labor and human resources due to illness and mortality. Barriers to accessing essential healthcare services for prevention and treatment further exacerbated these challenges. For example, tuberculosis, caused by the bacterium Mycobacterium tuberculosis, primarily affected the lungs but could also spread to other organs. Common symptoms included chronic cough, coughing up blood, and weight loss (WHO, 2016). Moreover, tuberculosis remained a leading cause of death in developing countries, especially among impoverished and immunocompromised populations (Connell, 2011). Despite the availability of vaccines, such as the Bacillus Calmette-Guerin (BCG) vaccine, controlling the disease remained challenging due to multidrug-resistant strains and the lengthy treatment process.

Malaria was an infectious disease caused by the Plasmodium parasite, transmitted through the bites of female Anopheles mosquitoes. Symptoms included high fever, chills, and headaches, with severe cases potentially leading to life-threatening complications. The spread of malaria remained a significant issue in tropical and subtropical regions, particularly in Africa and Southeast Asia. Malaria outbreaks contributed to high mortality rates, especially among children under the age of five. Despite the availability of treatment and preventive measures, such as insecticide-treated mosquito nets and insecticides, controlling the disease remained challenging due to issues like drug resistance (UNICEF, 2023). Another critical disease was HIV/AIDS, which progressed in two stages. The first stage, HIV (Human Immunodeficiency Virus), involves attacking the body's immune system by destroying crucial CD4+ T cells (T-helper cells). This weakened the immune system, making it less effective at combating infections and diseases. HIV transmission typically occurs through exposure to virus-laden bodily fluids such as blood, semen, or vaginal secretions (WHO, 2022). Effective prevention and treatment strategies could reduce virus transmission and improve the quality of life for individuals living with HIV. If left untreated, HIV could advance to AIDS (acquired immunodeficiency syndrome). The immune system is severely compromised at this stage, leaving the body vulnerable to severe infections and life-threatening conditions (WHO, 2023).

The severity of these three diseases continued to pose a significant global health challenge, contributing to high mortality rates worldwide. According to the World Health Organization (2022), tuberculosis (TB) remained one of the leading causes of death from infectious diseases. Despite advancements in antibiotic treatments, the prevalence of TB remained high in certain regions, particularly in countries with fragile healthcare systems, such as those in parts of Africa, Asia, and Eastern Europe. Similarly, malaria was a major health issue in many countries, especially in Africa and Southeast Asia, where mosquito-borne transmission persisted. Endemic regions included the Amazon Basin, West Africa, and Southeast Asia. The WHO reported that in 2019, there were approximately 229 million malaria cases globally, resulting in over 400,000 deaths. HIV/AIDS also continued to have a profound impact on global populations, particularly in regions with weak healthcare systems, such as sub-Saharan Africa, parts of Asia, and Latin America (Kwenti, 2018). Although significant progress has been made with antiretroviral therapy (ART) and preventive measures like pre-exposure prophylaxis (PrEP), access to treatment remains a major challenge in many countries due to financial constraints, healthcare infrastructure limitations, and social stigma (United Nations Programme on HIV/AIDS [UNAIDS], 2021).

Additionally, these three diseases often manifested in economically and socially vulnerable areas (Tipayamongkhogul et al, 2013), disproportionately affecting such regions compared to others globally. While Thailand, as a whole, was not severely impacted, its southern border provinces— Pattani, Yala, and Narathiwat— exhibited higher infection rates for tuberculosis than other parts of the country (Tuberculosis Bureau, 2013; Tuberculosis Bureau 2014). Several risk factors contributed to this, including limited access to healthcare, insufficient health education, and widespread poverty, which weakened immune systems (Department of Disease Control, Thailand, 2021). Moreover, the southern border provinces experienced relatively high malaria incidence due to dense forests, remote locations with limited medical services, and ongoing human movement across borders (WHO, 2022). These factors hindered comprehensive malaria prevention and treatment efforts, further complicating disease control in the region. HIV/AIDS also posed a significant risk in Thailand's southern border areas, driven by frequent cross-border movements between Thailand and Malaysia, where infection rates were higher, unprotected sexual activities, and inadequate access to appropriate healthcare services. These factors exposed the border population to heightened vulnerability to HIV infection (UNAIDS, 2021). Furthermore, the social, cultural, and religious context of the southern border population, where over 90% were Muslims adhering to religious doctrines, impacted the effectiveness of HIV/AIDS prevention and treatment measures. Social stigma and a lack of acceptance toward individuals living with HIV created barriers to accessing necessary healthcare and services, preventing adequate management and containment of the disease. Therefore, this study focused on analyzing the biomedical, social,

cultural, and economic impacts of tuberculosis, malaria, and HIV/AIDS infections. It examined these impacts in terms of illness experiences and their broader implications within the context of the global society and Thailand' s southern border provinces. Specific questions were: How do factors, such as biomedical, social, cultural, and economic influence the understanding of infectious diseases and the experience of illness? Moreover, how do the bio-medical, social, cultural, and economic, impacts of tuberculosis, malaria, and HIV/AIDS manifest in the context of global society and the southern border areas of Thailand?

Methodology

This study was a systematic literature review following the framework of Joanna Briggs (2017) , which included 8 steps: defining the research objectives or questions, determining inclusion criteria for research, identifying data sources, selecting research based on criteria, assessing the quality of research, extracting data, analyzing and synthesizing data, and presenting the results. The study used reliable databases such as PubMed, Scopus, Scispace, and Google Scholar (Amimo et al. , 2020; Barberis et al. , 2017) , and references from related academic articles. The search focused on studies published between 2006 and 2024 that were open access to ensure the inclusion of up-to-date and accessible information.

The selected research had to be relevant to tuberculosis, malaria, and HIV/ AIDS, including their biomedical, social, cultural, and economic impacts (Farmer, 2003; Mhalu, 2006) , and the quality of the studies was evaluated using tools from the Joanna Briggs Institute (JBI) such as QARI for qualitative research and MAStARI for quantitative research (Bolaji et al., 2024; Christian et al., 2009). Research that passed the quality assessment had to score at least 60% of the predetermined criteria to ensure the reliability of the data used for analyzing the impacts in the global context and the southern border areas of Thailand (Sachs, 2008; Killewo, 2002).

Additionally, the study employed qualitative research through non- participant observation in a community located in Thailand' s southern border provinces, which had experienced high malaria infection rates over the past 7-8 years. The observation period lasted for over 3 months and focused on 4 villages, with 300 households and a population of approximately 1,400 people. The researcher chose to observe 5 households with a history of malaria infections, including households that had experienced recurrent infections and had tuberculosis co-infections. Some households had individuals who had contracted tuberculosis, while others had individuals who were HIV positive and had passed away, with tuberculosis co-infections.

The main objective of this observation was to gain in-depth insights into the social and health dynamics of infectious diseases in the community. The investigation not only focused on the behaviors related to disease treatment but also examined the unique health practices, beliefs about the diseases, traditional healing methods, and the way of life of people affected by diseases like malaria, tuberculosis, and HIV/AIDS. This was done to understand how the community managed and coped with these diseases.

Participants

The study focused on research published between 2006 and 2024, as summarized in Table 1. It prioritized open-access sources to ensure the inclusion of up-to-date and readily accessible information. The selected studies addressed tuberculosis, malaria, and HIV/AIDS, examining their biomedical, social, cultural, and economic dimensions (Farmer, 2003; Mhalu, 2006).

In addition, the study incorporated non-participant observation in a community in Thailand' s southern border provinces. The researcher selected 5 households to observe, each with a history of malaria infections. These households included those that had experienced recurrent malaria infections and had tuberculosis co-infections. Some households had individuals who had contracted tuberculosis, while others had individuals who were HIV positive and had passed away, with tuberculosis co-infections in Table 2.

Table 1 Characteristics of the researches

Research Characteristics	Number (n=49)	Percentage (%)
Research Topics		
Infectious Diseases	-	-
Tuberculosis	11 studies	22.45
HIV/AIDS	11 studies	22.45
Malaria	7 studies	14.29
Co-Infection Topics		
Tuberculosis and HIV/AIDS	1 study	2.04
Tuberculosis and Malaria	2 studies	4.08
HIV/AIDS and Malaria	2 studies	4.08
Tuberculosis, HIV/AIDS/, and Malaria	-	-
Factors Affecting Infectious Diseases	15 studies	30.61
Year of Study		
2006-2014	17 studies	34.69
2015-2019	19 studies	38.78
2020-2024	13 studies	26.53
Research Methodology		
Qualitative Research	10 studies	20.41
Quantitative Research	27 studies	55.10
Mixed-Methods Research	12 studies	24.49
Sample Characteristics		
General Population Samples	17 studies	34.69
Patient Samples	10 studies	20.41
Healthcare Workers or Health Personnel/Public Health Officers	8 studies	16.33
Specific Groups (e.g., high-risk groups)	5 studies	10.20
Sample Size		
Fewer than 30 people	7 studies	14.29
Between 31-199 people	19 studies	38.78
More than 200 people	6 studies	12.24
Not specified	16 studies	34.69
Study Area		
Southern Border Provinces (Yala, Narathiwat, Pattani)	32 studies	65.31
Global Context/Other Areas	11 studies	22.45
Study Location		
In Community	9 studies	18.37
In Urban Areas	3 studies	6.12
Global/Regional Context/ Healthcare Facilities	6 studies	12.24
Other (Documents/Secondary Data)	31 studies	63.27

Data collection

The quality of the studies was assessed using tools from the Joanna Briggs Institute (JBI), such as QARI for qualitative studies and MAStARI for quantitative studies (Bolaji et al., 2024; Christian et al., 2009). Studies that passed the quality assessment were required to score at least 60% of the set criteria to ensure the reliability of the data in analyzing the impacts in the context of global society and the southern border areas of Thailand (Sachs, 2008; Killewo, 2002).

Data analysis

The data analysis and synthesis in this research followed the approach of Scott (1990; 2006), which includes four criteria: Authenticity, Credibility, Representativeness, and Meaning. These criteria assessed the quality of the selected documents. The documents had to come from reliable sources, reflect the relevant context, and contain content that was easy to understand and aligned with the research objectives. Additionally, content analysis was employed to identify key issues and relationships within the data by interpreting it to determine trends and draw in-depth conclusions regarding the impacts of the diseases in bio-medical, social, cultural, and economic dimensions. The analysis provided data, which was then synthesized to create a deeper understanding that aligned with the research questions. The synthesis aimed to provide integrated conclusions that could be applied effectively in the context of Thailand's southern border areas and the global societal context (Mogalakwe, 2006).

Ethical issues

The ethics committee for human research at Prince of Songkla University, Pattani Campus, approved this research with the project code REC Number: psu.pn.2-089/67. After receiving ethical approval, the researcher began data collection and data extraction to conduct a systematic review. This research, selected documents that focused on the study population and the factors under investigation. Relevant data was then extracted from these documents and organized in tables for ease of analysis, which facilitated easy analysis, facilitating systematic and efficient data processing.

Table 1 provides a summary of 49 studies on infectious diseases, focusing on tuberculosis, HIV/AIDS, and malaria, particularly in Thailand's southern border provinces. The analysis of past research revealed several key patterns and trends. Regarding research topics and co-infections, tuberculosis and HIV/AIDS were the most frequently studied diseases, each accounting for 22.45% of the total studies, followed by malaria at 14.29%. However, studies examining co-infections, such as tuberculosis and HIV/AIDS or malaria, were limited (only 2.04%-4.08%), indicating a research gap in understanding the interactions between multiple infectious diseases. Much of the research (30.61%) explored the socio-cultural, economic, and demographic factors affecting infectious disease prevalence and management. This highlighted recognizing broader influences beyond biomedical aspects in disease control efforts. Examining research trends over time, researchers conducted the highest number of studies between 2015 and 2019 (38.78%), but this slightly declined from 2020 to 2024 (26.53%). This shift might have reflected changing research priorities following the COVID-19 pandemic.

In terms of research methodology, quantitative studies dominated (55.10%), while mixed-methods (24.49%) and qualitative studies (20.41%) played a supplementary role. This suggested that previous research primarily relied on statistical and numerical data analysis, with fewer in-depth explorations of lived experiences and contextual factors. The sample characteristics of past studies indicated that most research focused on the general population (34.69%) and patients (20.41%), while healthcare workers (16.33%) and high-risk groups (10.20%) were studied less frequently. This suggested a need for more research on the perspectives and experiences of healthcare personnel and vulnerable populations. Regarding study locations and sample sizes, most studies (65.31%) were conducted in Thailand's southern border provinces, emphasizing the region's public health concerns. Additionally, a significant number of studies (63.27%) relied on secondary data sources, while only a small proportion were conducted in community settings (18.37%) or urban areas (6.12%).

Table 2 Non-participant observation data of households

HH ID	Malaria Infection History	Tuberculosis Co-Infection	HIV/AIDS Co-Infection	Health Practices	Social and Cultural Dynamics	Economic Impact	Living Conditions	Other Observations
1	Recurrent infections	Present	Not applicable	Herbal remedies, self-treatment	Family support for health	Financial strain due to medical costs	Limited access to healthcare	Regular use of local healers
2	Recent infection	Not applicable	Not applicable	Modern medication and local remedies	Strong community ties, shared resources	Minimal financial impact	Access to healthcare nearby	Practices caution, preventive measures
3	Recurrent infections	Present	Deceased **(**HIV**+)**	Combination of traditional and modern treatments	Deep religious beliefs influencing treatment	Significant economic burden due to prolonged illness	Poor living conditions, overcrowded	Inherited health beliefs from deceased family members
4	Recent infection	Not applicable	Not applicable	Use of mosquito nets and antimalarial drugs	Close-knit family, elders involved	Low economic impact, stable income	Moderate access to healthcare, but limited resources	Preventative actions and adherence to treatment
5	Recurrent infections	Present	Deceased **(**HIV**+)**	Hospital treatments and some local remedies	Support from extended family	High medical costs, financial support from relatives	Poor living conditions, inadequate sanitation	Struggling with grief, adaptation to loss

Furthermore, researchers recorded the following details during a non-participant observation of five households. All households (100%) have a history of malaria infection, with some households experiencing repeated infections (40%) and others having co-infections with tuberculosis (30%). Additionally, in some households (20%), members have a history of tuberculosis infection, and in a few households (10%), members were infected with HIV and subsequently died from the disease.

Regarding health practices, some households (50%) use herbal or alternative treatments, while others (40%) seek hospital-based treatments grounded in scientific principles. Religious beliefs and traditions significantly influence treatment choices in some households (60%). Furthermore, in some households (30%), there is support from family members, while others (20%) lack community support.

In contrast economic impact, households with repeated infections face higher medical expenses (40%), whereas those with better income management experience a lower economic burden (60%). With respect to living conditions, some households (50%) lack access to appropriate medical care or live in overcrowded conditions, while the remaining 50% have better access to healthcare and improved living conditions.

In summary, the observations from these households reveal the diverse health and economic impacts of infections in the southern border areas and the varying coping strategies employed by households with a history of various infectious diseases, as shown in Table 3.

Table 3 Data on household observations with malaria, tuberculosis, and HIV infections in Thailand's southern border area

Item	Number of Households	Percentage (%)
Malaria Infection History		
Malaria	5	100
Recurrent Malaria Infection	2	40
Malaria with Tuberculosis Co-Infection	3	30
Household Members with Tuberculosis	1	20
Household Members with HIV/AIDS, Deceased	1	10
Health Practices		
Use of Herbal Remedies or Alternative Treatment	3	50
Hospital-based Treatment	2	40
Influence from Religious Beliefs and Traditions	3	60
Support from Household Members	2	30
Lack of Community Support	1	20
Economic Impact		
High Treatment Costs	2	40
Good Income Management	3	60
Living Conditions		
Lack of Access to Appropriate Healthcare or Overcrowded Housing	2	50
Access to Healthcare and Good Living Conditions	3	50

Findings

This study found that infectious diseases such as tuberculosis, malaria, and HIV/AIDS manifest due to biological, social, economic, and cultural factors within both the global society and the southern border region of Thailand, as shown in the following data:

The understanding of infectious diseases and experiences of illness

The holistic definition of infectious diseases, as outlined by Merrill Singer (Singer, 2014), was explained through the bio-sociocultural approach. This perspective emphasized that infectious diseases were not merely biological or medical phenomena; rather, they resulted from the complex relationships between humans, society, and the environment in which they lived. Infectious diseases reflected how humans adapted to ecological systems and social contexts. Various factors influenced the spread of diseases, including biological aspects such as the nature of pathogens and the human immune system, as well as social and cultural dimensions like religious beliefs and family structures. Economic and political factors, such as poverty, access to healthcare, and relevant policies, also played significant roles. Furthermore, ecological factors, such as environmental conditions that facilitated the spread of pathogens, played a crucial role and could not be overlooked. The interconnectedness of different diseases also highlighted the complexity of infectious diseases. For example, the HIV epidemic increased the risk of tuberculosis infection. Studies on these diseases within ethnic contexts revealed that economic and cultural factors significantly impacted how people perceived, treated, and were affected by these diseases within their communities. This approach allowed for a more comprehensive understanding of infectious diseases, recognizing the links between humans, pathogens, and the shifting social contexts. It underscored the importance of considering the broader ecological, social, and cultural dimensions when addressing infectious diseases' causes, spread, and impact.

In contrast, Good Byron' s (Byron, 1994) explanation of illness behavior emphasized the interpretation of disease and treatment through formal, professional medical systems. This could lead to the neglect or undervaluation of local knowledge that held significance within each community. Viewing disease from a professional medical perspective often placed health behaviors secondary to biomedical knowledge and tended to overlook cultural diversity. This could become an obstacle in disease control, particularly in the case of infectious diseases. Byron also discussed populations with social and cultural diversity, where knowledge and care practices rooted in community experience and perception might have been marginalized or treated as " other" compared to academically driven medical systems. Therefore, understanding disease and illness was not solely a matter of biology or medicine but also involved cultural perceptions held by individuals and communities, shaped by experiences and inherited beliefs. This highlighted the importance of recognizing local knowledge and cultural context in managing and treating diseases, especially in diverse societies.

Illness behaviors result from the interplay between perceptions and adaptations to disease within different cultural frameworks. When patients managed diseases in ways that differed from academic medical systems, it led to diverse understandings of the disease. These differing perspectives created both obstacles and opportunities in developing disease control strategies suitable for the target groups' social and cultural contexts. In viewing infectious diseases through the lens of ecological relationships and social changes, it became evident that emerging infectious diseases (EIDs) often arose from changes in ecosystems, such as climate change, urban expansion, and population movements, which affected disease spread (Silva, & Skotnes-Brown, 2023). Previous studies by the World Health Organization (WHO) on malaria reflected the impact of environmental and social factors on disease distribution. Understanding emerging infectious diseases from a sociological perspective involved revisiting ontological and epistemological dimensions related to "new localities", which influenced disease outbreaks in specific social contexts. This highlighted the ecological relationships of malaria, which had affected people's lives in Africa. A lack of understanding of the social and cultural dimensions and differing ecological adaptation strategies, was a key factor in controlling malaria. The control of malaria depended on varying environmental conditions and vectors (such as mosquitoes) across regions and on the cultural perceptions and

understanding of malaria in different societies (WHO, 2023).

Chandler and Beisel (2017) that reviewed knowledge on reimagining malaria, emphasizing the role of communities and international public health control. Their study found a lack of linkage between historical, political, economic facts, and an awareness of differences in spatial and temporal relationships. The 21st century disease control strategies were crucial in developing approaches to eradicate malaria. However, limitations were identified in implementing disease control operations, particularly in patient behaviors at the grassroots level. These included medication use, ecological adaptation in endemic environments, and participation in economic activities, which affected clinical management. Additionally, the increasing resistance to chloroquine emerged as a significant obstacle in controlling malaria and other infectious diseases.

At the same time, a study by Paul Farmer (Farmer, 2024) and other studies found that social inequalities, such as unequal access to healthcare services and resources, often contribute to the spread of infectious diseases. Mainstream health systems often exclude disease distribution and patient treatment, particularly among marginalized groups such as ethnic minorities, migrants, and people in overcrowded communities. This reflects political, economic, and social relationships that influence the spread of diseases and access to treatment (Farmer, 2024; Kenley, 2015; Nading, 2014; Nadal, 2020). The situation of infectious diseases and disease management in many areas worldwide is closely tied to social relationships linked to the identities of infected individuals, reflecting structural inequalities in health and illness. Factors such as economic status, citizenship status, and beliefs contribute to making access to healthcare services a significant issue for marginalized infected groups in the healthcare process, which in turn exacerbates the spread of diseases (Singer, 2014).

In Singer's study (2015) explained the occurrence of infectious diseases from an anthropological perspective, emphasizing human experiences and daily perceptions of illness. Biological, environmental, and socio-cultural factors interact in health crises such as HIV/ AIDS, tuberculosis, and malaria. Analyzing disease outbreaks through this lens helped us understand the spread of diseases and the community's adaptation as a process interconnected by multiple biological, social, and cultural dimensions. This approach highlighted the importance of considering these various factors when examining infectious disease transmission dynamics and community responses. As depicted in Figure 1, the anthropological elements of infectious disease included a complex interplay of biology, society, and culture, illustrating how these dimensions collectively influenced the understanding and management of diseases within different populations.

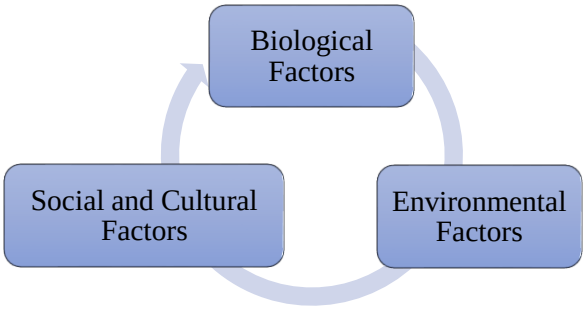

Figure 1 The anthropological elements of infectious diseases
Source: Adapted from Singer (2015)

The aforementioned components used an anthropological approach to infectious diseases to focus on understanding diseases from human experience (heuristic components). These components involved several interrelated factors that interacted with health crises, such as Biological Factors. This explained the pathology of the disease, including the functioning of the immune system in the human body, overall health

(nutrition, stress, or chronic illness), and the relationship between microorganisms (pathogens) and the human body, which affected the spread of infectious diseases in individuals. Then, Environmental Factors, this described changes in the environment, such as the quality of food and water, climate, and temperature, all of which influenced the spread of diseases and the risk of infection. The last one was Sociocultural Factors. This addressed local knowledge systems, attitudes, norms, and behaviors that arose in society. It included how different communities treated infectious diseases, as well as the impacts of social and historical environments that shaped access to resources and the management of diseases. These three factors were interconnected and interacted in complex ways in each situation. They played a significant role in determining how infectious diseases were responded to at the individual and community levels. Understanding these factors helped comprehensively analyze infectious diseases, considering the different social and cultural contexts. In a globalized world where diseases and goods cross borders, the connection between these three factors significantly affects our understanding and control of infectious diseases on an international scale.

Paul Farmer's studies (Farmer, 1997; 2003) demonstrated that illness and individual and group experiences of sickness are not solely linked to health and public health management but are also significantly influenced by economic, social, and political factors, particularly poverty. Farmer highlighted the impacts of illness, stress, and political and economic processes that disproportionately affect marginalized groups. For instance, in the case of Haitian individuals infected with HIV, Farmer argued that the disease was not merely a medical issue but also a reflection of structural violence, such as poverty, poor state management, lack of access to resources, and social exclusion. This perspective exposed the social exclusion faced by Haitians in American society during the AIDS epidemic. In the 1980s, medical knowledge portrayed Haitians as vectors of AIDS, reinforcing racial and ethnic discrimination and leading to their double marginalization. A similar pattern appears in Thai society. In the early stages of the AIDS epidemic, limited understanding of the disease led to the identification of homosexual men as the primary risk group. Later, the scope of risk expanded to include male nightlife patrons, female sex workers, and intravenous drug users. Consequently, society perceived people living with AIDS as morally "deviant" or "disgraceful," reflecting moralistic judgments shaped by societal views (Tipayamongkholgul, et al, 2013).

Furthermore, in Thailand, efforts to combat the negative image of people living with HIV/AIDS persisted for over 30 years through expanded education and more comprehensive healthcare services. Programs like the "30 Baht Universal Healthcare Scheme," while initially excluding antiretroviral therapy for HIV/AIDS patients, played a significant role in reducing stigma and social exclusion associated with the disease. A literature review, including studies by Farmer and other anthropologists like Das and Poole (2004), emphasized that illness and disease needed to be interpreted through social, cultural, and political processes. This perspective allowed for a more effective understanding and management of infectious diseases, moving beyond a purely biological framework. In complex contexts like Thailand's southern border provinces, addressing infectious diseases required recognizing challenges in accessing healthcare services, economic inequalities, and social exclusion. These interconnected factors highlighted the necessity of integrating sociocultural and political dimensions into health interventions to ensure equitable and sustainable solutions.

Factors affecting Tuberculosis, HIV/AIDS, and Malaria Infections

Infectious diseases such as tuberculosis (TB), HIV/AIDS, and malaria inevitably had profound biomedical impacts. These diseases deeply affected biomedical factors, with "biomedicine" referring to the scientific discipline that studied and applied biological and medical knowledge to understand, prevent, diagnose, and treat diseases and analyze their health-related effects on humans and the environment. The transmission and epidemiology of these three diseases were highly complex, influenced by biological, environmental, and human behavioral factors within specific contexts that included structural and environmental risks. For tuberculosis, the disease spreads through airborne droplets, posing a high risk in overcrowded communities and detention centers. In some regions, outbreaks of drug- resistant TB highlighted challenges in treatment management and control (Global Health and Development, 2017).

Malaria, on the other hand, was transmitted through the bites of Anopheles mosquitoes, particularly in areas with stagnant water and agricultural activities, which increased exposure to mosquito vectors. HIV/AIDS spreads through bodily fluids and risky behaviors, such as sharing needles, with high infection rates often observed among migrant workers and other vulnerable populations. The intricate interplay of these factors demonstrated the importance of adopting a biomedical approach alongside social and environmental considerations to address and manage these infectious diseases effectively.

Regarding cultural impacts, the three infectious diseases significantly altered the way of life in affected areas, particularly beliefs about health and treatment (Kunene, et al, 2017). Certain populations continued to rely on traditional medicine or hesitated to access modern medical services due to cultural values and religious beliefs. This led to misinterpretations of health information and misconceptions about diseases within local communities. Additionally, illness and disease were often perceived with bias, contributing to stigma and misunderstanding. From a social perspective, these infectious diseases imposed heavy burdens on public health systems and families, particularly in households where members suffered from chronic illnesses or died due to infections. The loss of family labor created economic challenges and heightened vulnerability to poverty. Furthermore, the stigma associated with these diseases often resulted in social isolation, preventing patients from accessing essential resources and social support. These interconnected cultural and social effects underscored the need for culturally sensitive public health interventions and community-based support systems to address infectious diseases' medical and societal dimensions.

Infectious diseases also had significant economic impacts, directly affecting household income and expenditures, particularly in vulnerable areas such as Thailand's southern border provinces, as highlighted in the analyzed data. These regions, characterized by low average incomes, faced challenges from prolonged treatments and the additional costs of traveling to healthcare facilities, which placed an increased financial burden on households. Many families had to borrow or sell assets to cover medical expenses. Additionally, the impact on family labor reduced their ability to generate sustainable income. At the community level, disease outbreaks diminished the capacity for producing goods and services, thereby hindering overall economic development in the southern border region. Similar patterns of economic vulnerability have been emerged in other regions with comparable conditions, where infectious diseases worsened financial instability and hindered local development. This underscores the global relevance of addressing economic fragility alongside public health challenges in such areas.

Furthermore, analyzing the three infectious diseases— tuberculosis, malaria, and HIV/ AIDS— revealed that they result from poverty and mechanisms of social reproduction. These diseases are not only biological phenomena but also reflect the structural relationships between populations and various economic, social, and cultural factors, in addition to the biomedical factors mentioned earlier. The conceptualization of these diseases as "diseases of poverty" and "diseases of reproduction" underscores their links to broader socio- economic inequalities. These conditions are deeply rooted in the structural realities of marginalized populations, where limited access to resources, healthcare, and economic opportunities vulnerability (Veena, & Deborah, 2004). The persistence of these diseases in such contexts highlights the cyclical nature of poverty and disease, which reinforces social and economic disadvantages across generations. This understanding emphasizes the importance of addressing not only the medical aspects of these diseases but also the social, economic, and cultural conditions that contribute to their persistence and spread.

Diseases of productivity

Diseases of Productivity referred to health issues that arose from efforts to increase output in the economic or industrial system, particularly in contexts where labor or natural resources were intensely utilized to drive economic growth. Tuberculosis (TB) , HIV/AIDS, and malaria were key diseases that significantly impacted economic productivity, especially in low- to middle-income countries that relied heavily on labor from agriculture and industries dependent on manual labor (Wang, et al,2024). The economic and productivity impacts of these diseases can be explained as follows: Tuberculosis (TB) directly

affected the workforce, particularly individuals in the productive age group (15-54 years). TB patients often struggle to work at full capacity due to symptoms like fatigue, persistent coughing, and the need for prolonged treatment (at least six months). This not only affected individual productivity but also had financial consequences for households. Families of TB patients bore the financial burden of medical costs, travel expenses for doctor visits, and loss of income during the period of illness (Doran & Henry, 2008). Furthermore, untreated or inconsistently treated TB could progress to drug-resistant TB, significantly increasing the cost of treatment and further straining the economic resources of affected households. This concept highlighted that health issues were not solely individual concerns but were deeply connected to broader economic systems and productivity. The economic consequences of these diseases were particularly severe in economies that relied heavily on physical labor, where illness directly undermined both individual and community productivity, with long-term economic implications.

The impact of HIV/AIDS on the workforce was significant. This disease primarily affected individuals in their productive years. The progression from HIV infection to AIDS reduced work capacity and increased dependence. People who died from HIV/AIDS during their working years led to the loss of primary income earners in families. At the same time, this had national economic implications. The widespread HIV/AIDS epidemic reduced overall economic productivity due to the loss of a large workforce. Additionally, it increased the financial burden on public health budgets for prevention and treatment programs, such as providing antiretroviral therapy (ART). Malaria had a similar impact on the agricultural workforce, particularly in rural areas that relied on agriculture. Malaria was a significant issue in regions with a hot and humid climate, such as southern Thailand. Malaria patients often lost time during the planting and harvesting seasons due to recovery periods, which impacted labor availability. The costs of controlling and treating malaria, including using insecticides, mosquito nets, and hospital care, added financial burdens at the household and national levels. Furthermore, the threat of drug-resistant malaria made treatment more expensive, further straining resources. These diseases impacted individuals' health and had significant economic consequences, including lost productivity, increased healthcare costs, and a more significant burden on national economies.

As a result, the experience of infectious diseases such as tuberculosis, HIV/AIDS, and malaria was closely linked to the economic status of individuals and households, and it also impacted entire countries. This was especially true as the populations affected by these diseases were often of working age. In many countries worldwide, the population structure has shifted towards an aging society, with over 20% of the population being elderly. Furthermore, the proportion of the working-age population had declined, which led to a shortage of production capacity in some countries. As a result, many nations relied on foreign migrant labor for various forms of production. The influx of migrant workers, however, contributed to the spread of diseases through labor migration (Narain, et al, 2022).

Eespecially in Thailand' s southern border provinces, where people from diverse ethnic backgrounds frequently cross borders. Additionally, there was a lack of awareness regarding self-protection, and; some lacked knowledge and access to health information, and proper healthcare management. Both local populations and migrant workers played essential roles in the production process, yet they faced challenges maintaining health and preventing disease transmission.

Diseases of poverty

Tuberculosis, HIV/AIDS, and malaria, in addition to being diseases of productivity, were also diseases of poverty. The term "diseases of poverty" refers to illnesses that are closely tied to poverty and socio-economic factors (Singh, & Singh, 2008). These diseases were commonly found in areas with low income and limited healthcare resources, such as tuberculosis, HIV/AIDS, and malaria, which served as prominent examples of diseases associated with poverty.

Tuberculosis (TB) was closely linked to poverty, as the bacteria spread through airborne droplets in crowded living conditions with poor ventilation—common characteristics of impoverished areas. Malnutrition was also prevalent among the poor, weakening the immune system and increasing the risk of infection, leading to the development of latent

tuberculosis and progressing to active pulmonary tuberculosis. Moreover, the limited access to healthcare services in impoverished households often resulted in avoiding or discontinuing treatment due to the high cost of medical care. Poverty, therefore, increased the likelihood of contracting TB, while TB in turn caused individuals to lose income from work and added to household expenses, creating a vicious cycle of poverty.

HIV/AIDS was also a disease closely associated with poverty (Tladi, 2006). People in impoverished areas often have limited education and a lack of knowledge about preventing HIV transmission, such as the use of condoms (Smith et al., 2021). Additionally, the scarcity of resources made it difficult for individuals in poor areas to access antiretroviral medication, or in some cases, they had no access at all. Furthermore, individuals with HIV were more likely to be laid off from work or die prematurely, leading to a loss of income for their families. As a result, poor households with HIV-infected individuals often bore the costs of treatment and care, depleting household resources. Children orphaned by parents who died from AIDS faced significant social and economic challenges. Similarly, malaria was linked to poverty because impoverished areas often had stagnant water sources and poor environmental management, which created breeding grounds for mosquitoes that transmitted the disease. Poor households frequently lacked protective equipment, such as insecticide-treated bed nets. Additionally, people in these areas, especially those working in agriculture, such as rubber plantations, were at high risk of mosquito bites. This resulted in malaria infection, causing individuals to stop working and affecting household income (Ingstad, et al. (2012). Moreover, the treatment of drug-resistant malaria further increased healthcare costs and reduced the effectiveness of economic recovery.

The infection from these diseases stemmed from poverty and exacerbated the poverty situation through interconnected mechanisms. These included reduced income due to the loss of work efficiency, families losing income while caring for the sick, and increased healthcare costs. Additionally, limited educational opportunities and lost prospects affected these children, as those in families with infected members were often forced to leave school to help with household chores.

Diseases of reproduction

Diseases of reproduction were a concept used to analyze illnesses that affected the creation and perpetuation of economic, social, and health cycles in communities or families. Tuberculosis, HIV/AIDS, and malaria fell under this concept. These diseases played a crucial role in reproducing inequalities and vulnerabilities in poor or at-risk areas, such as the southern border of Thailand. The concept of "reproduction" in the context of diseases refers to a process where the impacts of a disease are not limited to the affected individuals but extended to the community's economic, social, and health systems in a prolonged or cyclical manner. This caused the disease to become a factor that further weakened the community. The concept of reproduction was explained in terms of:

Reproduction of poverty, namely, diseases that led to income loss, such as tuberculosis and malaria, caused households to experience financial difficulties, resulting in children not receiving an education, which affected their future potential.

Reproduction of inequality explained that people with limited resources often had less access to healthcare, worsening health problems in impoverished communities.

Reproduction of health vulnerability was patients who did not receive proper treatment, such as those with drug-resistant tuberculosis or untreated HIV/AIDS patients, were more likely to spread the infection to others.

In the case of tuberculosis, malaria, and HIV/AIDS, these diseases were examples of illnesses that reproduced in communities. Tuberculosis reproduced within households when a family head contracted the disease, requiring family members to take care of the patient instead of working. This resulted in a decrease in household income (Prachya, 2008). Furthermore, tuberculosis transmission was common within the same household, particularly in crowded living conditions. If tuberculosis patients do not receive proper treatment or complete the treatment course, the disease could spread within the community, reproducing in a broader social context. HIV/AIDS also reproduced socially. Children born to mothers with HIV faced a higher risk of infection if appropriate preventive measures were not taken. Households losing working-age members had to bear the burden of raising orphaned

children, which compounded economic hardship. Economically, individuals with untreated HIV may be unable to work, which negatively affects local economic growth. Malaria reproduced in rural areas when agricultural workers infected with malaria had to stop working during the planting or harvesting seasons, leading to a decline in household income. Children in households with malaria patients also lost educational opportunities because they had to help with household chores. Moreover, malaria reproduction occurred in high-risk areas, particularly in places with stagnant water and poor environmental management, which continued to serve as breeding grounds for mosquitoes, perpetuating the spread of the disease within the community.

Discussion and conclusion

This study provided a clear understanding of the complexity and interconnectedness of tuberculosis, malaria, and HIV/AIDS— which were shaped by biological, social, economic, cultural, and political factors. The analysis of their impacts in both biological and social contexts revealed that fighting these diseases could not be solely based on medical treatment and healthcare but also had to consider more profound and more complex factors. Addressing these issues requires collaboration between the government, communities, and various sectors of society.

The significant economic impact of these diseases on households and communities was a crucial issue that should not be overlooked. Long-term treatment costs and the loss of labor in households in low-income areas with limited healthcare resources made it increasingly difficult to manage these diseases (Bolaji et al., 2024; Lusiana, 2022). Additionally, resource shortages and limited access to healthcare services further complicated disease control efforts (Virdis, 2023).

Social and cultural factors, such as traditional beliefs, religion, and a lack of health awareness, also posed significant barriers to disease prevention and control. In some areas, people relied on spiritual healing methods over scientific treatments, limiting access to healthcare services (Xu, et al., 2022; Nabilah, et al, 2018). This added further burdens to the health systems in these regions.

Politically, the lack of cooperation between the state and the southern border communities made managing health issues in these areas more challenging. Political conflicts and budget shortages for health infrastructure development were critical obstacles that needed urgent attention (Farmer, 2003; Mhalu, 2006). These factors hindered effective disease control and required prompt attention.

In conclusion, controlling these three infectious diseases in Thailand's southern border regions required developing strategies considering social, cultural, and political contexts. Policies needed to be designed to address the needs and challenges of these communities ensuring sustainable and effective disease prevention and control.

Recommendations

The analysis showed that tuberculosis, malaria, and HIV/AIDS are interrelated with various biological, social, cultural, political, and economic factors. Therefore, addressing this issue will require consideration globally and in Thailand's southern border provinces. The focus should be on structural solutions that impact health, living conditions, and sustainable community development.

Policy recommendations

Promote international cooperation*:* Efforts will focus on developing sustainable mechanisms for preventing and treating infectious diseases through international programs such as WHO and the Global Fund. Additionally, sharing data and best practices between countries will be essential to improve the effectiveness of disease control measures.

Support low-income countries*:* A resource support system will be established to help developing countries access vaccines, medicines, and advanced technologies, including funding initiatives to assist in managing infectious diseases.

Develop integrated health policies for the southern border provinces*:* Health policies should be developed to take into account the cultural, religious, and social contexts. Strengthening the healthcare system will require increased collaboration between government agencies and local organizations and providing education and health information tailored to the local population's specific needs.

Invest in infrastructure and medical resources*:* Investment will be increased in developing hospitals and

healthcare centers in remote areas, improving their standards. Adequate medical resources, such as medicines and diagnostic tools, will also be ensured to meet demand.

Research recommendations

Study cross-national factors*:* The research will focus on the link between infectious

disease outbreaks globally and in the southern border provinces of Thailand, particularly factors related to cross- border labor migration and health inequities.

Assess economic and social impacts*:* The impact of infectious diseases on labor productivity, household income, and economic development in the southern border provinces will be studied. Additionally, the costs and benefits of integrated treatment approaches in resource-limited settings will be evaluated.

Design context-specific disease control strategies*:* Mathematical models will be created to predict the spread of infectious diseases in the southern border areas, considering the impact of co-infections. The effects of health policies tailored to the region' s cultural and religious contexts will also be studied.

Study structural vulnerabilities*:* Research will analyze the political, social, and economic factors that contribute to the risk of infections in the southern border region, as well as the disparities in access to healthcare services. Methods to reduce these gaps in vulnerable areas will be developed.

Lastly, the research will compare successful health policies from other countries with the context of the southern border provinces, studying ways to foster international cooperation to support infectious disease prevention and treatment in vulnerable regions. These recommendations will help create effective management strategies and sustainable control of infectious diseases in the complex context of the southern border provinces and globally.

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