ASSESSING DRUG-RESISTANT TUBERCULOSIS STIGMA AMONG HEALTHCARE WORKERS IN THE PHILIPPINES

A Thesis submitted by

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ABSTRACT

Drug-resistant tuberculosis (DRTB) presents a growing global public health challenge characterised by increasing incidence, treatment complexities, and financial burden, all exacerbated by disease stigma. This research explores the stigma surrounding DRTB among healthcare workers (HCWs) in the Philippines, utilising a two-part approach: a scoping review and quantitative studies. An online survey was conducted among HCWs (n= 258) from the selected geographic locations in the Philippines between February and June 2022 using the recommended questionnaire from the Mental Health Secondary Stigma Scale. The survey was expanded to assess HCW's awareness of organisational support, confidence in infection control, and the impact of stigma on stress and absenteeism. The data was analysed using a variety of statistical methods, including descriptive statistics to summarise the main characteristics of the data, multivariable linear regressions to examine the relationships between variables, and the Hayes Process Model to explore mediation and moderation effects of stress and organisational support between stigma and absenteeism. Stigma was found to be consistent across HCWs, the highest among Barangay Health Workers and the lowest among midwives. The impact of stigma subtypes varied among healthcare worker groups. BHWs experienced higher levels of concealing, labelling, and negative effects, while medical laboratory technicians experienced higher levels of fear of infection. Stigma was positively correlated with absenteeism and was substantiated by stigma-induced stress. Awareness of organisational support and confidence in infection control may not fully address existing stigma. These findings highlight the need for targeted interventions to address stigma-related challenges, establish inclusive and supportive environments that prioritise the well-being of HCWs and effectively manage stress, and improve policies and practical solutions to mitigate the effects of the stigma. This research recommends creating a more equitable and compassionate healthcare environment to enhance care delivery and support HCWs. More research is needed to identify further and understand the factors contributing to the DRTB stigma and to ultimately develop more effective stigma-reduction strategies for HCWs.

CERTIFICATION OF THESIS

I, Lolita S Liboon (formerly Lolita S Liboon-Aranas), declare that the PhD Thesis entitled *Assessing drug-resistant tuberculosis stigma among healthcare workers in the Philippines* is not more than 100,000 words in length, including quotes and excluding tables, figures, appendices, bibliography, references, and footnotes.

This Thesis is the work of Lolita Liboon except where otherwise acknowledged, with the majority of the contribution to the papers presented as a Thesis by Publication undertaken by the student. The work is original and has not previously been submitted for any other award, except where acknowledged.

Date: 2 August 2024

Endorsed by:

Principal Supervisor : Professor Khorshed Alam, PhD
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External Supervisor : Rashidul Alam Mahumud, PhD

Student and supervisors' signatures of endorsement are held at the University.

STATEMENT OF CONTRIBUTION

The following detail is the agreed share of contribution for candidate and co-authors in this thesis:

Paper 1

Liboon-Aranas L, Alam K, Gyawali P, Mahumud RM. Examining Drug-Resistant Tuberculosis Stigma Among Health Care Workers Toward the Development of a Stigma-Reduction Intervention: Protocol for a Scoping Review. JMIR Res Protoc 2023;**12**:e43084 doi: 10.2196/43084.

Lolita Liboon conceptualised, designed the methods, analysed the results, and drafted and finalised the manuscript with supervision and valuable insights from Professor Khorshed Alam, Dr Prajwal Gyawali, and Dr Rashidul Mahumud. All authors are considered to have contributed equally to the paper.

Paper 2

Liboon-Aranas L, Alam K, Gyawali P, Alam RM. Drug-Resistant Tuberculosis Stigma Among HealthCare Workers Toward the Development of a Stigma-Reduction Strategy: A Scoping Review. Inquiry 2023;**60**:469580231180754 doi: 10.1177/00469580231180754.

Lolita Liboon made a 65% contribution to the paper by leading the conception, method design, article screening, descriptive analysis, and drafting and editing of the manuscript. Khorshed Alam contributed 15% by assisting in article screening and review. Prajwal Gyawali made a 10% contribution by reviewing and verifying the articles, and Rashidul Mahumud also contributed 10% by overseeing the data analysis and reviewing and editing the manuscript. All authors were involved in searching for articles, interpreting results, critically reviewing, and revising the manuscript.

Paper 3:

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Lolita Liboon made 65% contribution to the concept, study design, literature review, data collection and analysis, drafting, revisions, and preparation of the final draft. Khorshed Alam contributed 15% to the study design, supervised data analysis, and reviewed the manuscript. Prajwal Gyawali contributed 10% to the research design and manuscript revisions. Rashidul Mahumud contributed 10% to data analysis and article review.

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Lolita Liboon contributed 70% to the concept, study design, literature review, data collection and analysis, drafts, revisions, and preparation of the final draft. Khorshed Alam contributed 10% to the design of the study, supervision of data analysis, and review of the manuscript. Prajwal Gyawali contributed 10% to the research design and revisions of the manuscript. Rashidul Mahumud contributed 10% to the data analysis and review of the article.

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To my iConnect family, your companionship has made this research endeavour not only bearable but truly enjoyable. I am incredibly fortunate to have you all by my side.

And above all, to God be the Glory!

DEDICATION

To Matthew and Alono,

I pray that you will continue to have a passion for learning and the drive to push the boundaries of what is possible.

With love and pride,
Lola

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ABBREVIATIONS

BHW	Barangay Health Worker
DOH	Department of Health
DRTB	Drug-resistant tuberculosis
DSTB	Drug-susceptible tuberculosis
HCWs	Healthcare workers
HREC	Human Research Ethics Compliance
HSDF	Health Stigma Discrimination Framework
HIV-AIDS	Human Immunodeficiency Virus-Autoimmune Disease Syndrome
LGU	Local Government Unit
MHPSSS	Mental Health Professional Secondary Stigma Scale
MLT	Medical Laboratory Technician
NCR	National Capital Region
NTP	National Tuberculosis Program
PCA	Principal Factor Analysis
PSA	Philippine Statistics Authority
SDG	Sustainable Development Goal
SMS	Short Message Service
TB	Tuberculosis
UniSQ	University of Southern Queensland
WHO	World Health Organisation

CHAPTER 1: INTRODUCTION

1.1 Background

This research presents a critical yet underexplored aspect of drug-resistant tuberculosis (DRTB): the stigma surrounding the disease among healthcare workers (HCWs). This study specifically highlights the stigma, and its subtypes experienced by HCWs and its association with the level of perceived stress and workplace absenteeism.

Why research in this topic?

Over the past decade, my career as a healthcare worker has been profoundly shaped by my involvement in a tuberculosis (TB) program. This experience has not only defined my professional trajectory but has also driven me to pursue research in this critical area of public health. Reflecting on my journey, the challenges faced, and the motivations that have emerged from my work with TB patients, this background provides a comprehensive context for the research study.

My journey began during the early years of my professional career as a healthcare worker when I first joined a local health unit in the National Capital Region (NCR) in the Philippines specialising in TB care. The early years were defined by a steep learning curve characterised by extensive training to understand the pathology of TB, diagnostic procedures, and treatment protocols. A significant part of my early career was devoted to laboratory diagnosis, where I engaged mainly in sputum microscopy to identify *Mycobacterium tuberculosis*. This core laboratory experience was supplemented with learning how to communicate effectively with patients from various socioeconomic backgrounds and undertaking fieldwork to ensure patient adherence to treatment, contact tracing, and screen test TB patients' contacts.

As I progressed in my career, my role expanded beyond clinical duties to include program management and community outreach. I joined the team that collaborated with local health authorities to design and implement TB control programs tailored to

community needs and helped initiatives to raise awareness about TB, combat stigma, and educate the public on prevention and treatment. My involvement in data collection for epidemiological studies contributed to a better understanding of TB trends and treatment outcomes. During this period, I encountered numerous challenges, particularly addressing issues related to patient adherence to long-term treatment regimens, a critical factor in TB management.

Throughout my decade-long career, several challenges have profoundly impacted my perspective on TB care. I have witnessed the stigma faced by TB patients, which has often led to delayed diagnosis and treatment. Similarly, I have realised that HCWs like myself also often confronted stigma related to working with TB patients, though this issue was seldom discussed openly among colleagues. While massive support systems are available for patients to tackle TB-related stigma, including counselling, nutritional support, and social services, there are limited support structures for HCWs in addressing stigma and its effect on perceived stress. The emergence of DRTB further posed significant treatment challenges and exacerbated the stigma associated with the disease. These confronting systemic issues underscored the necessity for continuous improvement in TB care strategies and motivated me to seek solutions through research.

These experiences and challenges have fuelled my passion for research in TB care, with a key motivation being the translation of research findings into tangible support systems for HCWs. My research aims to investigate if HCWs experience stigma related to DRTB and how it is associated with various factors. The research findings may be used to modify policies to support HCWs against DRTB stigma.

Further, my research focuses on supporting HCWs by investigating the stigma associated with their daily work in DRTB. My future aspirations include expanding research collaborations with international organisations and research institutions to advance global TB research, developing comprehensive support systems to address the psychosocial needs of HCWs working in DRTB, and advocating for public health policies that also prioritise the support infrastructure for HCWs.

Why focus on the Philippines?

A Southeast Asian country, the Philippines (Figure 1) is an archipelagic country with about 115.6 million population in 2022 [2]. The country is fast urbanising; however, poverty persists [3]. In 2021, an estimated 19.9 million Filipinos lived in poverty [4]. Over half of its population lives in urban areas and cities, and an estimated 37% living in slums in 2020 [4]. The consequences of poverty and crowded living conditions increase the risk of many Filipinos to ill-health like TB. In 2022, the country registered 638 TB cases per 100,000 population, with more than 200,000 cases missing TB diagnosis [5]. The country ranks 6th among the highest TB-burdened countries worldwide, and, together with India and the Russian Federation, accounts for 42% of the estimated global number of people who developed DRTB in 2022 [5].

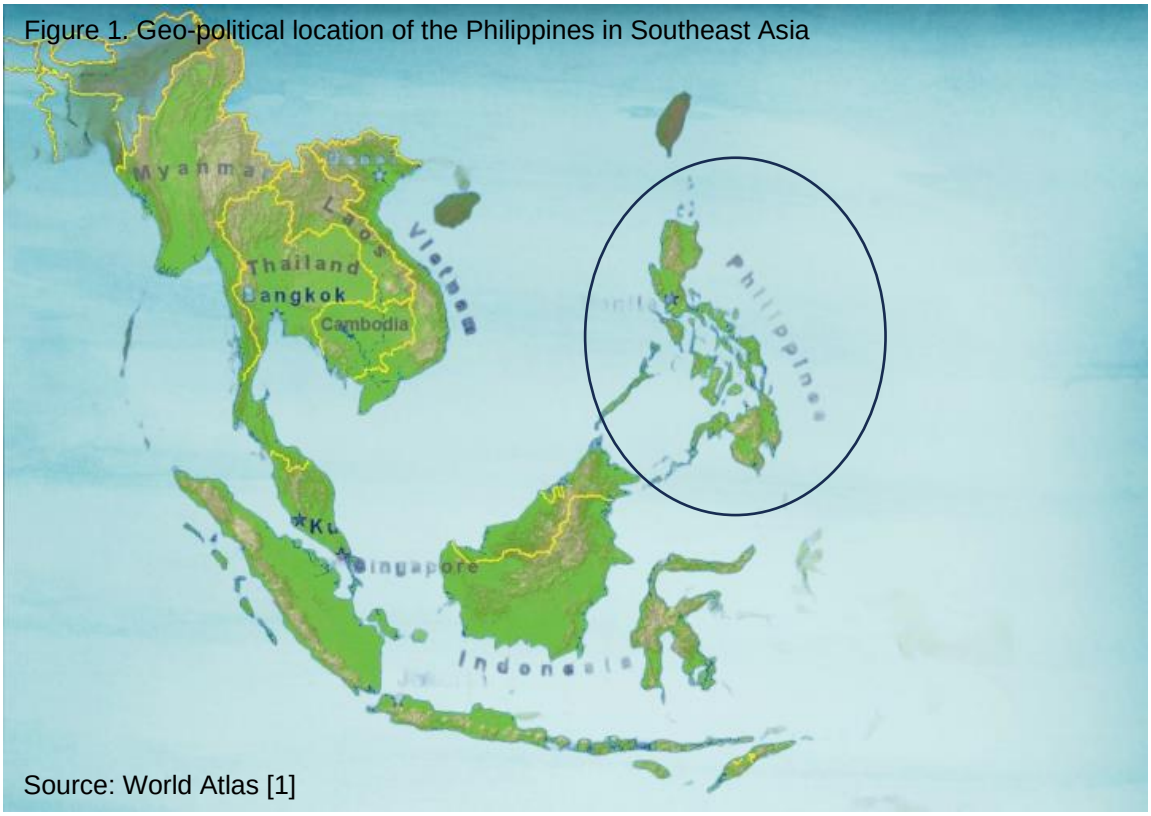


Figure 1. Geo-political location of the Philippines in Southeast Asia

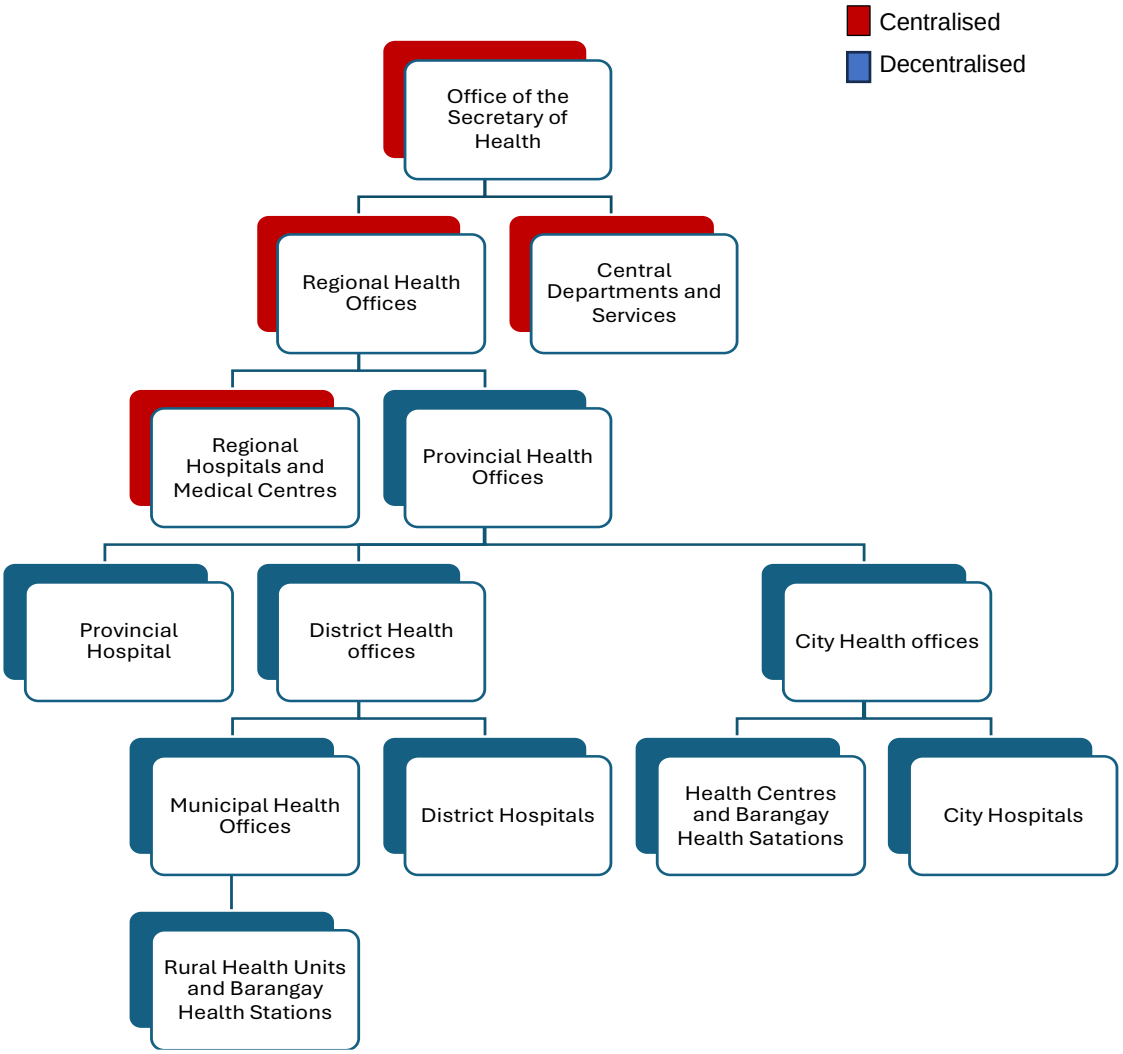
Source: World Atlas [1]

The country's TB program envisions attaining "A Tuberculosis-free Philippines" [6]. The program accomplished its impact targets in reducing the burden of TB in the country, indicating success in case finding and treatment outcomes. However, targets for the case detection and treatment success rates for DRTB fell short [7]. The DRTB cases continue to rise – an increase from 6256 cases in 2021 to about 9791 cases in 2022 [5], which is below its notification target of 17,300 cases [8].

Eliminating TB by 2035 is contained in the Sustainable Development Goal - 3 (SDG- 3) [9]. SDG-3 includes the aim to accelerate efforts to diagnose TB and DRTB through research and innovation, improve drug-resistance surveillance, and strengthen public-private partnerships [9]. In the Philippines, this preventive and control efforts are delivered by a multifaceted blend of private and public healthcare providers that are supervised by the Department of Health (DOH) [10].

The healthcare system in the Philippines operates on a dual system – centralised and decentralised systems. The central health system assumes the crucial role of overseeing and safeguarding national-level health policies, strategies, standards, and regulations. On the other hand, decentralised systems are comprised of autonomous local health systems operated by provinces, cities, and municipalities. These decentralised entities take the responsibility of managing and providing direct healthcare services at the local level, thus catering to the specific needs of their respective communities [10]. The decentralised units involve an extensive array of healthcare facilities, ranging from major hospitals in urban centres to rural health units and barangay (village) health centres, all strategically positioned to ensure the accessibility of healthcare services throughout the entire archipelago of the Philippines. DRTB services for patients and their families are delivered through community-based strategies [10]. These services include activities such as case finding, screening, diagnosis, treatment and monitoring, health promotion and education, and psycho-social support [6]. Central to these activities are the HCWs. Figure 2 provides a diagrammatic representation of the organisational structure of the healthcare system in the Philippines, illustrating the centralised and decentralised aspects.

Figure 2. Illustration of the organisational structure of the healthcare system in the Philippines



Source: Dayrit et al. (2018)

Currently, the TB program adheres to the community-based care model principle, where TB diagnosis and treatment are integrated into a primary health centre's service – patient-centred care. Patient-centred care encompasses the provision of clinical services while also addressing the factors that contribute to patient's TB burden, including stigma [6]. Given community health workers' significance in delivering essential services for TB (and DRTB), substantive support

to drive their performance, such as adequate financial, psycho-social, and continuing in-service education, is significant [11].

Why focus on HCWs?

Studies reveal that interventions to reduce stigma are crucial but underutilised [11-13]. In the Philippines, as it grapples with the increasing burden of DRTB, support for addressing the stigma associated with the disease is inadequate [14]. Arguably, the healthcare system of the country acknowledges the prevalence of TB stigma in general. In 2021, a plan for enhancing the ability of healthcare providers to combat TB stigma and discrimination was officially endorsed. Unfortunately, the plan's advancement in several areas has been impeded due to modifications in the healthcare system's procedures and mechanisms [14]. The Global Fund [14] stated in its report that the plan includes initiatives to strengthen the capacity of a national patient support group network, implement community-led monitoring, construct TB patient hotlines, and enhance service provider skills. Of note, the plan is more geared toward supporting patients and less toward HCWs. HCWs play a crucial role in managing and treating DRTB cases [6], yet the stigma associated with the disease poses a serious barrier to effective care [15].

Studies showed that HCWs managing DRTB face potential discrimination from peers and the broader community [13 15 16]. However, there is a notable dearth of research focusing specifically on the stigma faced by HCWs dealing with DRTB in the Philippines. Most studies to date have centred on patient-related stigma or generalised TB stigma, leaving a significant gap in understanding the unique challenges faced by HCWs in the DRTB context.

1.2 Significance of the study

The critical issue of stigma associated with DRTB among HCWs in the Philippines demands immediate attention and thorough investigation. Conducting research focusing on HCWs is crucial for improving disease management, enhancing the psychological well-being of HCWs, and developing more efficient public health

policies. Given the scarcity of studies in this field, it is important to do research focused on HCWs to gain a thorough understanding of and address the consequences of DRTB stigma in healthcare settings [11 13]. By addressing this research gap, the Philippines can strengthen its TB control efforts, support its healthcare workforce, and improve public health outcomes.

1.3 Aims and objectives

The pervasive stigma associated with DRTB among HCWs is well-recognised yet remains largely unexplored. Thus, this research explores the prevalence of DRTB stigma among HCWs in the Philippines. It seeks to understand the impact of the stigma on these HCWs, thus investigating the central research question: What is the extent of DRTB stigma experienced by HCWs, and what subtypes of stigma are experienced?

To this end, this research:

1. comprehensively identify, assess, and synthesise existing research and literature on DRTB stigma among HCWs;
2. investigate the extent of DRTB stigma and its subtypes among HCWs in the Philippines; and
3. examine the influence of DRTB stigma on the stress level and work absenteeism of HCWs.

1.4 Scope and limitations

This research delves into the stigma experienced by HCWs, exploring its prevalence and impacts within healthcare settings. This study mainly focuses on HCW groups—Barangay Health Workers (BHWs), medical laboratory technicians (MLT), midwives, nurses, and physicians. However, it is limited to HCWs employed at community health units and paid by the local government unit.

This study faced limitations due to financial constraints and pandemic-related restrictions, which significantly impacted the survey's scope. Consequently, data collection was restricted to three specific locations in the Philippines: Mandaluyong City, Northern Samar, and Western Samar.

1.5 Structure of the thesis

The introductory chapter, Chapter 1, presents an overview of the key aspects of the research. The background section follows to offer a broader perspective on the study's significance, expanding the overall scope of the research. The chapter then presents the research objectives, primary research question, conceptual framework, and the structure of the thesis.

Following the introductory chapter, Chapter 2 presents a review of related literature. It provides the necessary background material to establish the foundation for the current research. It emphasises the significance of the study and situates it within the wider framework of academic discussion.

Chapter 3 presents the research design, procedures, and techniques for collecting and analysing data.

This research follows the thesis-by-publication approach to present research outputs. Chapter 4 – 6 covers the research objectives and their corresponding output. In this instance, Chapter 4 - Paper 1 (scoping review protocol) and Paper 2 (the scoping review) have successfully undergone the peer-review process and are published. The review articles answered the first research objective, which aimed to provide a global picture of DRTB stigma among HCWs.

Chapter 5, Paper 3 provides a thorough analysis of the results obtained from RO2, which aims to explore the extent of stigma related to DRTB among HCWs in the Philippines. This chapter explores the intricate nature of stigma in this setting, providing insight into the different aspects it includes.

Chapter 6, Paper 4 focuses on the results of research objectives three, which aims to investigate the various effects of DRTB stigma on absenteeism and stress levels among HCWs. This research examines the complex relationship between stigma, absenteeism, and mental well-being, providing a thorough examination of the linked factors. Both Papers 3 and 4 are currently undergoing rigorous scrutiny in the peer-review process.

Chapter 7, the final chapter of the thesis, provides a thorough examination of the research findings. The objective is to develop cohesive connections among the findings, the initial research enquiries, current literature, and existing conceptual frameworks. Also, the chapter explains the implications of the findings, offering a deeper understanding of how they contribute to the existing knowledge in the field. Furthermore, this section briefly summarises the noteworthy achievements of the research and proposes potential directions for future research, with the goal of advancing the comprehension of the subject area.

CHAPTER 2: RELATED LITERATURE

DRUG-RESISTANT TUBERCULOSIS: AN OVERVIEW

2.1 Tuberculosis: The disease and its burden

TB is a significant public health challenge globally [17]. Despite advances in treatment and prevention, the emergence of drug resistance has exacerbated the risks and complexities of managing TB [18]. DRTB arises when TB bacteria become resistant to the pharmacological agents commonly used to treat them [17]. Accordingly, TB resistance typically develops through improper or incomplete treatment. DRTB is not only more difficult to treat but is also associated with higher treatment costs and poorer health outcomes. DRTB treatment success rate is only 63% compared to 88% for drug-sensitive TB (DSTB) [5].

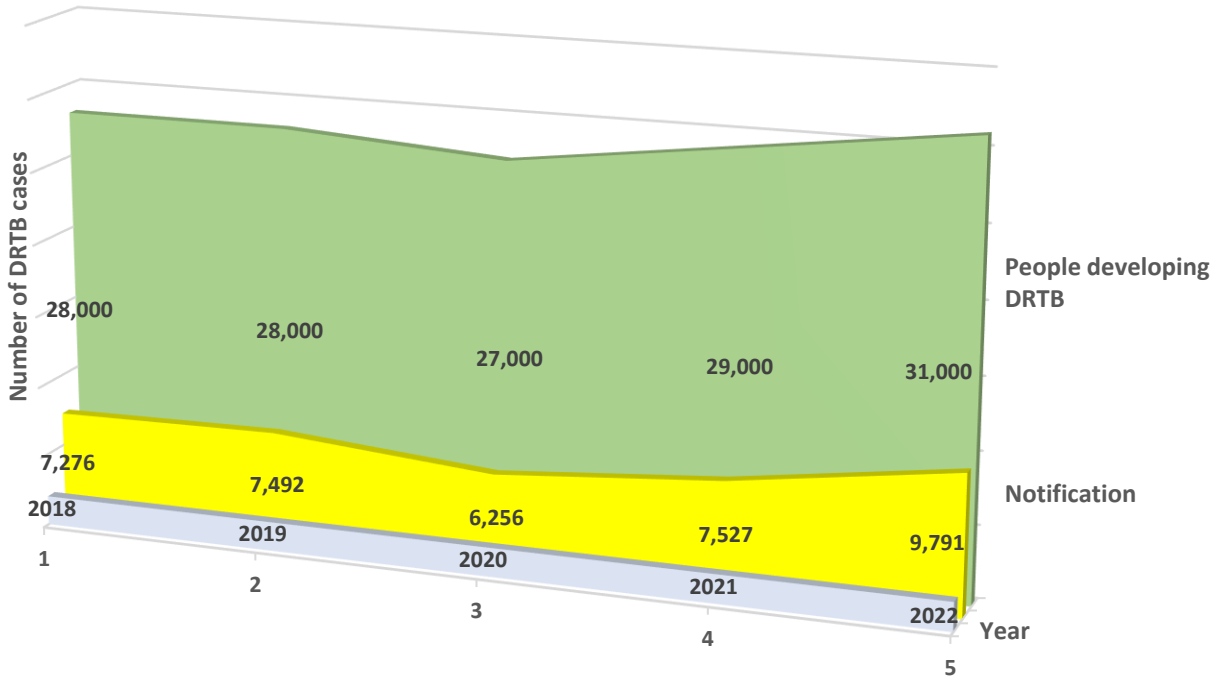
Worldwide, DRTB is a significant contributor to drug resistance. In 2022, about 4.0% of new TB cases and 17.7% of previously treated cases were found resistant to at least one anti-TB drug [5]. Yearly, about half a million people become ill with the disease. With direct treatment costs mainly covered by the public sector, DRTB increasingly burdens public health and the economy [17]. For low-income countries like the Philippines, providing holistic support for patients that encompasses socio-economic factors, including mental health is challenging. Meanwhile, for patients and their families, the impact of DRTB can be catastrophic with significant and long-term physical, mental, and financial consequences [19]. Despite the availability of free treatment, DRTB can still incur significant costs. Non-medical expenses such as transportation, food, nutritional supplements, and other related costs primarily contribute to the catastrophic cost of DRTB [20]. Extensive financial assistance is provided to patients with DRTB who are seeking treatment in community health units [7]. However, despite this financial support, it may not be sufficient to offset the overwhelming cost burden associated with the disease. A study conducted by Florentino et al.[20] highlighted that the TB (including DRTB) financial support, provided through the TB Enabler Package, which aims to offer social and welfare

assistance to mitigate the barriers to completing treatment, resulted in reducing the catastrophic cost of the disease by only 13.1% points. This finding underscores the significance of addressing the financial challenges faced by DRTB patients, especially considering the potential impact on their emotional well-being and the escalating stigma associated with the disease.

Further, the health threat of the disease is substantiated by its high mortality rate. DRTB-specific deaths have contributed to TB mortality and overall global death [5]. Out of the estimated 410,000 reported cases of DRTB in 2022, the case fatality was about 39% (160,000 deaths) globally [5]. Kisito et al. [21] mentioned that about 20% of DRTB patients in Uganda die while on treatment each year. In the Philippines, almost a 21% DRTB treatment are deemed unsuccessful [5]. Given this burden, DRTB warrants increased global attention and prioritisation.

In the Philippines, the challenge of DRTB reflects a broader public health issue that complicates the fight for TB. Among the 30 TB highest-burden countries, the country ranks seventh; and fourth for DRTB [5]. In 2020, the country had an estimated of 591,000 TB cases [5]. In the same year, it notified 256,541 cases, a gap of 334,459 TB cases being missed with diagnosis or treatment [5]. For DRTB, the gap in notified cases is even higher. In 2020, out of 20,221 estimated DRTB cases, only 4,944 (24%) started treatment [22]. In 2022, the number of cases increased to about 31,000 [7]. TB, in general, resulted in 39,000 deaths in 2022 [5]. Figure 3 below illustrates the Philippine DRTB burden.

Figure 3. Estimated number of people who developed DRTB and notified cases in the Philippines, 2018 - 2022



Source: WHO Global Tuberculosis Report 2023

In general, global efforts concerning DRTB (and TB, in general) strive to enhance technical protocols by adopting novel tools and strategies, with a particular focus on patient-centred care [17]. In this line, the World Health Organisation (WHO) [5] urges governments to strive towards ensuring universal access to all services for TB. At the grassroots, the forefront of the fight for DRTB is HCWs. HCWs' roles expand from case finding, screening, diagnosis, and treatment to engaging in public health campaigns, conducting community outreach programs, including health education [17]. Clearly, the efforts of HCWs are crucial to the global fight to prevent and manage DRTB.

2.2 The disease transmission

The transmission dynamics of infectious agents, like DRTB, are especially important in healthcare settings. HCWs are at increased risk since they have frequent and direct contact with patients who may carry these infectious strains [23-25]. TB (and DRTB) can be transmitted through the air when patients who are actively infected cough, sneeze, or speak, releasing tiny particles containing TB bacteria into the air [17]. In poorly ventilated environments, these bacteria can stay suspended in the air for extended periods, contacting individuals who lack sufficient respiratory protection [17]. Accordingly, the spread of DRTB within healthcare settings, also called nosocomial transmission, is particularly concerning due to the increased risk it poses to both HCWs and patients. This transmission dynamics, coupled with disease misconceptions, contributes to the stigma experienced by patients, their families, and the HCWs [12].

Further, the spread of TB is strongly influenced by socioeconomic factors such as poor living conditions, overcrowding, and poverty, including stigma [15]. Countries around the world emphasised the need to identify and understand how these factors determine the course of the TB epidemic. In countries like India, Pakistan, and the Philippines, where the highest incidence of TB are reported, poverty plays a significant role [5]. Poverty not only limits access to healthcare but also amplifies stigma, promoting a vicious cycle that hastens the spread of diseases like DRTB [26]. Link and Phelan [27] mentioned that poverty is often closely linked to stigma because individuals living in poverty frequently face societal judgment and discrimination. Meanwhile, Craig et al. [26], in their study, highlighted the significant impact of stigma on deterring individuals from seeking necessary healthcare. Poor health-seeking behaviour contributes to the uncontrolled transmission of the disease within various communities [15]. Undoubtedly, it is crucial to identify socio-economic factors to effectively address the inherent burden of DRTB.

2.3 Stigma in Healthcare

The presence of stigma is a widespread problem that can have significant consequences on patient outcomes and the quality of care [12]. Stigma is generally understood as a powerful social process of devaluing people or groups based on a real or perceived difference [27], such as health status. According to Craig et al. [26] stigma is a significant barrier to managing illnesses and completing treatments. Meanwhile, Sommerland et al. [12] noted that stigma in healthcare settings can impact HCWs' personal and professional lives, resulting in increased stress, anxiety, and mental health problems. Arguably, with HCWs at the forefront of healthcare delivery, stigma is a considerable concern.

Stigma appears in different forms, including social, professional, and self-stigma [15]. Social stigma refers to the negative attitudes and beliefs that the general public or specific communities hold toward people affected by the disease [27]. Mitchelle et al. [28] argue that social stigma, which leads to discrimination and social isolation of patients, can also impact the healthcare workers responsible for their care. Meanwhile, Stangl et al. [15] mentioned that professional stigma could involve negative perceptions and behaviours against HCW’s peers in healthcare settings, often stemming from fears of infection or misconceptions about the illness. The authors also noted that when HCWs internalise stigma and experience self-stigma, these negative perceptions could result in a decrease in self-esteem [15 26].

HCWs can be significantly influenced by the fear of being stigmatised [12]. For instance, stigmatisation of HCWs can lead to concerns about confidentiality, potentially causing reluctance among them to undergo regular testing for infectious diseases or report symptoms. [29]. This reluctance not only puts HCWs well-being at risk but also increases the risk of spreading the disease to peers and patients, hence weakening efforts to contain the spread of the disease [11].

However, the stigma experienced by HCWs can be worsened by systemic problems in healthcare settings [15]. Jourdain and Chênevert [30] highlighted that a lack of sufficient institutional support and unclear norms for protection and support

could lead to stigmatisation and discrimination against employees. Similarly, a workplace environment that attaches a stigma to illness and places more importance on productivity than on well-being can prevent HCWs from taking essential sick leave or following prescribed treatment plans [31].

DRTB is a stigmatised disease [16 32]. The WHO [17] emphasises that the stigma related to the disease is a crucial predictor of its high incidence and contributes to its growing burden. Yet, despite recognising DRTB-stigma concern, there is a lack of studies specifically addressing this issue concerning HCWs [16]. Authors agree that the stigma surrounding the disease deserves attention, highlighting the need for interventions aimed at reducing the stigma [11 16 18 26 33 34]. Nyblade et al. [11] also mentioned that one of the key gaps in addressing the burden of DRTB is the lack of initiatives aimed at reducing stigma in health facilities. Indeed, with HCWs' crucial role in combating the DRTB challenge, efforts aimed at providing care and support for their well-being require attention. But then, there is a dearth of studies to understand the stigma associated with DRTB in healthcare settings and address the issue effectively.

The Philippines, likewise, focuses on people-centred care models in addressing the DRTB burden [35]. Patient-centred care is led by healthcare workers who bring health services directly to the communities in which patients reside [36]. Its aim is to enhance accessibility and convenience, making it easier for individuals to obtain the care they need without having to travel long distances [6]. For DRTB, this approach involves integrating its services within primary healthcare facilities. This integration not only ensures the accessibility of high-quality DRTB treatment services but also addresses the psycho-social needs of the patients [35].

Evidently, activities for DRTB are mostly geared toward addressing the impact of DRTB on patients, less on HCWs. O'Donnell et al. [37] posit that patient-centred care is about supporting patients and HCWs. In the Philippines, there is continued support for the integration of DRTB into TB services and support packages in the local healthcare system [35]. However, with limited research, it is unclear if there is a system

in place that ensures support for HCWs, particularly the stigma they face while delivering DRTB care.

2.4 The gap in the literature

The global spread of DRTB is presenting an increasingly difficult challenge for public health systems and economies worldwide [17]. This rising health crisis is putting a significant strain on resources and necessitating a re-evaluation of priorities at the grassroots level. At the forefront of these challenges is the need to improve care delivery and address the psycho-social impact of the disease [26], particularly the stigma associated with it. Efforts at the community level are mainly directed towards providing support to patients and their families, aiming to alleviate the burden of the disease and its associated challenges, including stigma. Notably, there is a need to also focus on the well-being of HCWs who are actively involved in managing the impact of DRTB. Research in this field is crucial for cultivating a nuanced understanding of the stigmatisation associated with DRTB within healthcare settings. Such understanding is significant for devising effective strategies to address and mitigate DRTB-related stigma [11]. However, studies are scarce in this area.

The HCWs play a vital role in the efforts to combat DRTB and require comprehensive support in various aspects [11], including addressing the stigma associated with their work. In the Philippines, ongoing initiatives are aimed at providing support to HCWs in effectively managing DRTB care and related activities [6]. However, it remains uncertain whether there is a well-defined support system in place to ensure that HCWs receive the necessary support, particularly in tackling the stigma they encounter while providing care for DRTB patients.

The stigma associated with DRTB is profound [17] ; yet, in the Philippines, there is limited understanding and awareness of the issue. The lack of available literature makes it challenging to fully grasp and effectively tackle the stigma related to DRTB within healthcare settings. Therefore, this research aims to investigate the stigma experienced by HCWs, how it manifests in the workplace, and their knowledge of available support systems within their healthcare organisations.

2.5 Conceptual and theoretical frameworks

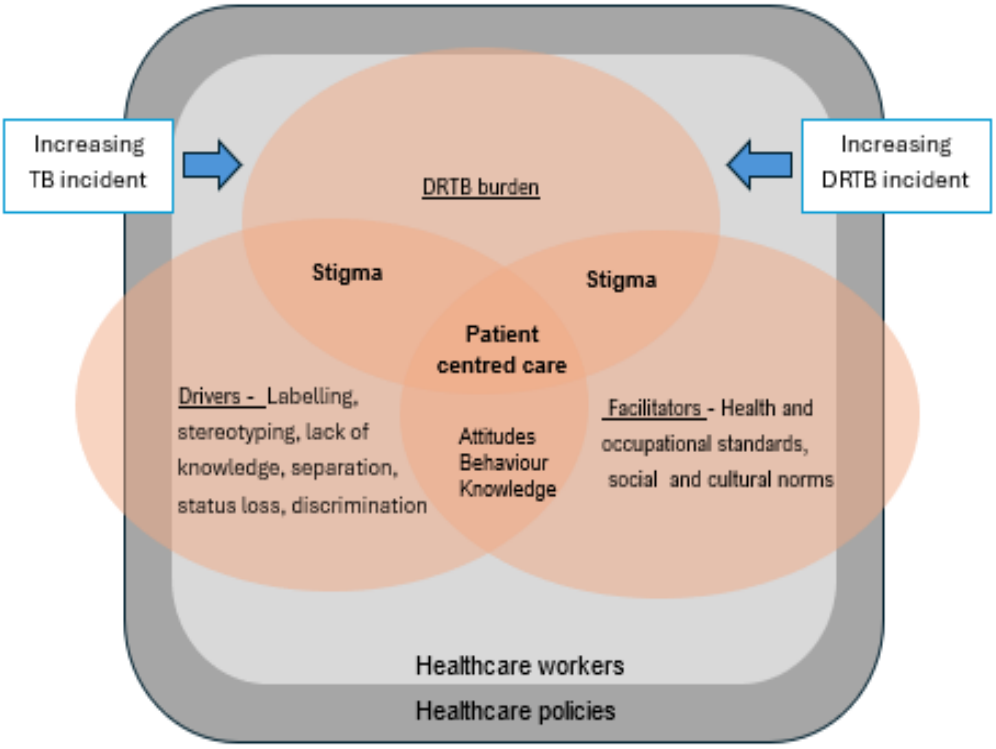
The research is based on the utilisation of two complementary frameworks. The first framework, the Health Stigma and Discrimination Framework (HSDF) developed by Stangl et al. [15], focuses on understanding and addressing stigma related to health issues. It delves into the psychological and practical pathways of stigmatisation at both individual and societal levels. The HSDF provides a comprehensive understanding of the socio-ecological spectrum of health-related stigmatisation and aids in the design of targeted interventions to reduce stigma [15]. The second framework, articulated by Link and Phelan [27], complements the HSDF by providing a deeper insight into the fundamental components of stigma. By adopting both these frameworks, the research aims to explore the psychological pathways of individual stigma experiences and understand the social and structural factors that contribute to stigmatisation. This approach will facilitate the identification of specific components of DRTB-related stigma, thereby enabling the development of more effective targeted interventions. In summary, by integrating these two theories within an integrated approach, the research seeks to inform the development of interventions that can meaningfully influence the stigmatisation process. This, in turn, will result in more effective stigma reduction efforts in the context of DRTB.

The stigmatisation process, as outlined by the HSDF [15], encompasses various constituent domains, including drivers and facilitators, stigma 'marking', and manifestations. These domains collectively influence a wide range of health outcomes among diverse populations, including impacts on organisations and institutions. Additionally, according to Link and Phelan [27], the stigmatisation process is characterised by the convergence and co-occurrence of interrelated components such as labelling, stereotyping, separation, status loss, and discrimination in a power situation. The concepts presented by HSDF [15] and Link and Phelan [27] are consistent with the viewpoints of other social experts, underscoring how stigma affects social relationships, behavioural responses, health processes, and resource availability [33 38 39]. The cumulative effect of stigma exacerbates poor health outcomes, thus necessitating interventions to mitigate its detrimental consequences.

Furthermore, the HSDF [39] underscores the crucial role of research in identifying specific areas that can be targeted to effectively prevent the stigmatisation process or mitigate the stigma associated with health conditions like DRTB. Link and Phelan [39] advocate for stigma research to be carried out at the facility level as it can provide valuable insights into the mechanisms through which stigma operates, thereby helping to inform more targeted interventions and strategies.

Figure 4 illustrates the significant impact of stigma on HCWs and its implications for the healthcare system's capacity to deliver effective care for DRTB. This research concept prioritises the investigation of the following key areas: 1) drivers and facilitators contributing to stigma among HCWs; 2) the extent of stigma 3) the various components or elements of stigma; and 4) the organisational factors within healthcare settings that either perpetuate or mitigate stigma surrounding DRTB care.

Figure 4. Concept model in the study of DRTB stigma among healthcare workers as its implication for healthcare demands in delivering DRTB care



This research concept model illustrates HCWs' crucial role in providing patient-centred care while navigating the challenges of DRTB and the stigma associated with it. The model illustrates how the burden of disease and health policies, coupled with factors like discrimination, norms, and standards, shape societal attitudes, behaviour, and knowledge—collectively contributing to stigma and affecting the effectiveness in managing DRTB. In turn, this impacts the personal and professional lives of HCWs. The model analyses the varied perceptions of HCWs about working with DRTB, revealing how these perceptions are shaped by multifaceted factors such as personal, societal, and policy-related influences. By exploring the relationships between DRTB burden, stigma, and healthcare policies, the model seeks to offer a deep understanding of the various barriers to effective DRTB management. Also, it aims to suggest approaches to better support HCWs, ultimately leading to improved care outcomes. Importantly, this approach emphasises the significance of policy measures that not only address the physical challenges of DRTB but also consider the psychosocial factors that have a significant impact on healthcare delivery.

In implementing this research’s conceptual model, the focus is on identifying the primary factors that drive and facilitate stigma, specifically to delivering essential services for DRTB. This identification will help pinpoint crucial areas where interventions, monitoring, policy changes, or further research may be needed to improve the effectiveness of healthcare workers. The drivers are generally perceived as inherently harmful and can contribute to the perpetuation of stigmatising beliefs and behaviours. Meanwhile, various facilitators of stigmatisation, such as mechanisms, standards, or policies within health facilities, play a significant role in either exacerbating or mitigating stigma, furthering stress, and impacting work productivity [15]. These facilitators can impact the experiences of individuals accessing healthcare services and play a critical role in shaping community attitudes towards specific health conditions like DRTB [39].

The next critical stage requires a detailed assessment of the extent of stigma and meticulously identifies its various subtypes. Effectively identifying the subtypes of stigma entails deconstructing how HCWs experience stigma. By carefully analysing

each subtype of stigma, we can gain valuable insights into how each aspect contributes to the overarching phenomenon of stigma in healthcare settings [15].

Further, it is important to identify and address the specific facilitators that contribute to stigma within and emanating from healthcare facilities. Understanding and addressing organisational support is crucial when it comes to combating stigma within the healthcare setting [30]. An in-depth analysis in this critical area involves exploring how the structure and culture of the healthcare organisation either contribute to the perpetuation of stigma or work to mitigate it. This study examines the extent to which HCWs are aware of the support provided within their organisation and their level of confidence in infection control within the healthcare facility to effectively prioritise essential support needs. The findings from the analysis are invaluable in identifying effective strategies for addressing stigma facilitators, like mechanisms and policies within the health facility, and their impact on stress and work absenteeism. These insights can guide the development of targeted interventions geared towards enhancing support and understanding within healthcare settings, ultimately improving the care and support for DRTB patients.

In summary, the research concept model is focused on analysing and addressing the stigma associated with DRTB in healthcare settings. The drivers and facilitators of DRTB stigma are examined in the scoping review (Chapter 4), which forms the foundation for investigating the extent of DRTB stigma among HCWs in the Philippines (Chapter 5). This study also explores the different aspects of stigma that affect various groups of HCWs and the organisational factors that could influence stigma. The study examines HCWs' awareness of organisational support and their confidence in infection control. In addition to the findings in Chapter 5, the research also investigates the impact of stigma on HCWs' absenteeism and stress, and how organisational support can mitigate these effects, which is detailed in Chapter 6.

CHAPTER 3: RESEARCH METHODOLOGY

This research examined the stigma associated with DRTB among HCWs in the Philippines. Specifically, this study examined the prevalent stigma experienced by HCWs, investigating its relationship with awareness of organisational support and their confidence in infection control, and explored the effects of stigma on stress levels and absenteeism among these HCWs.

This research used a two-part approach, starting with a scoping review followed by a cross-sectional quantitative survey to thoroughly test the research questions, with a focus on stigma related to DRTB among HCWs. Similar to previous stigma studies [40-43], this research examined stigma-related narratives to identify emerging themes. The scoping review systematically mapped the existing literature on DRTB stigma to identify and synthesise relevant themes for HCWs. This involved a structured search, selection, and analysis of a wide range of sources to understand the current landscape and highlight gaps in the existing research [44]. The scoping review identified the DRTB stigma phenomenon, determining the potential factors influencing the stigma in healthcare settings. The review provided a detailed exploration of stigma experiences, narratives, and perceptions obtained from previous studies, which provided detailed accounts of HCWs and empirical evidence. Irwin [45] pointed out that by investigating into existing evidence, researchers can gain meaningful insights, potentially enhancing the cumulative nature of research findings. Henceforth, the narratives from the scoping review provided rich, contextual insights regarding DRTB stigma among HCWs. The pieces of evidence helped develop the initial framework, guided the research questions of this study, providing a solid foundation and informed the design of the subsequent quantitative study. Also, the review of existing evidence leveraged efficiency in cost, time, and practicality. The use of this approach was valuable in the face of the COVID-19 restrictions, which posed challenges to the collection of primary (narrative) data in the study area. This approach was highly recommended by local TB coordinators as a way to address the limitations imposed by the pandemic.

After completing the scoping review, a cross-sectional quantitative study was designed to collect empirical data from a diverse sample of HCWs. Statistical findings generated from quantitative analysis are necessary to assess the level of stigma in a population and the factors that are strongly associated with it [46-48]. In this research, the quantitative study was used to understand the prevalence of DRTB stigma among HCWs in the Philippines and identify the factors contributing to it. The quantitative study provided measurable data on the extent of stigma, its frequency, and the demographic and systemic factors associated with it. The findings in this two-part approach were interpreted by integrating the results from both scoping review and quantitative data analyses.

The quantitative phase of this study was conducted using a structured survey questionnaire to solicit participants' standardised responses, analyse data systematically, and compared the stigma subtypes between groups of HCWs [49]. Also, the survey was conducted online, as it is a secure and efficient approach for collecting data for this study amid the COVID-19 pandemic. The survey minimised face-to-face interactions and strictly adhered to social distancing guidelines, ensuring the safety of researchers and participants. This approach not only resulted in a good response rate but also ensured that in situations where face-to-face interactions were necessary, they were conducted safely.

The stigma survey used a set of 17 questions adapted from the Mental Health Secondary Stigma Scale [50] which was recommended by the TB Stigma Measurement Guidance [51]. The instrument underwent reliability and validity tests, including a pilot test with a sample of 15 individuals representing the target population.

This survey was expanded to ask questions about awareness of organisational support and confidence in infection control in the survey questionnaire. The goal sought to determine the extent of HCWs' awareness of organisation's support in addressing the stigma associated with DRTB. This is essential for promoting an inclusive and supportive healthcare environment. Secondly, it is crucial to assess HCWs' confidence in infection control methods, as this directly indicates their trust in

the system's ability to prevent the spread of DRTB. Insights gained from this question could help in developing a targeted strategy that addresses both the structural and psychological aspects of DRTB stigma. The narrative documentation of the survey instrument and its conduct is detailed as part of the supplementary file of the publication article in Chapter 5. See Appendix 1 (Tables 1- 3, Figure 7) and Appendix 2 (Tables 4 -11) for the aggregated data of the survey instrument.

3.1 Engagement with Stakeholders

This study began with engaging local TB coordinators in the study area to explore the feasibility of conducting the research. The meticulously prepared research proposal outlined its objectives and methodology, emphasising its significance and potential implications for the DRTB program. It was then presented to the local TB program committee through a series of online consultative meetings and email correspondence to ensure that the study addressed the needs and perspectives of the DRTB program. The feedback provided by the local TB coordinators was discussed with the supervisors and when deemed appropriate were incorporated into the study protocol. Throughout the project, consultative meetings were conducted using *Messenger* video calls, totalling four video conferences. Open lines of communication were ensured by scheduling individual *Messenger* calls with the TB coordinator, as needed. The Short Messaging Service (SMS) was consistently utilised for weekly updates and quick communication. This collaborative approach underscores the commitment to producing both theoretically sound and practically useful research.

3.2 Study Settings and participants

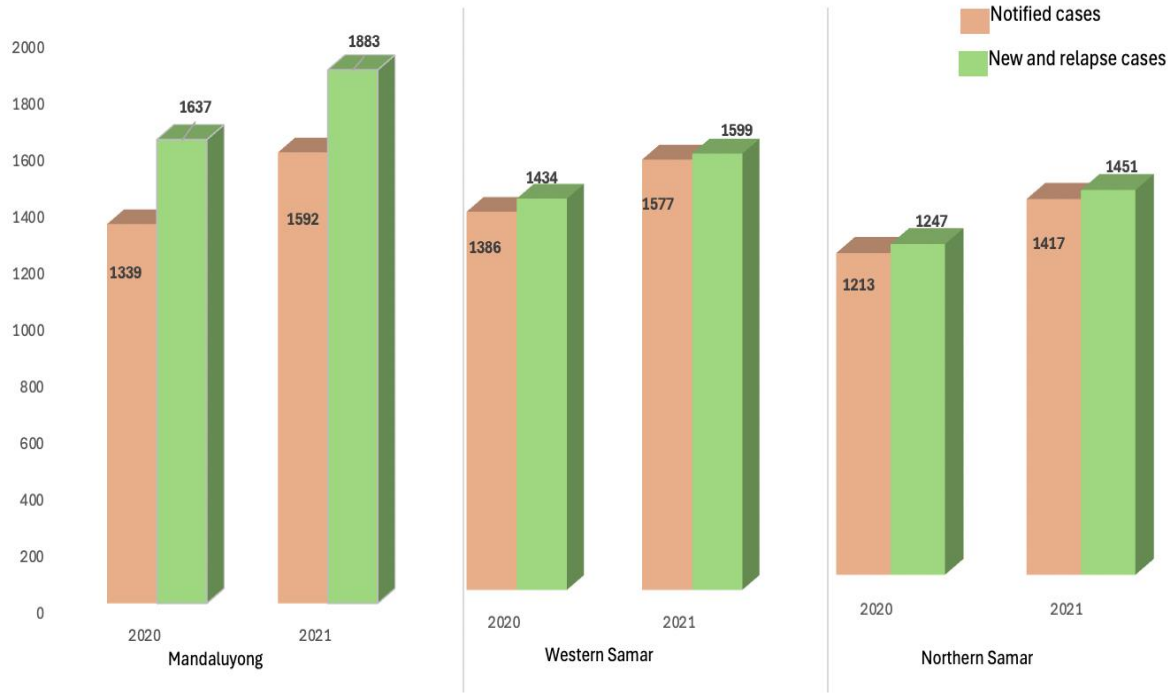
This research was conducted in three conveniently selected locations in the Philippines – Mandaluyong, Northern Samar, and Western Samar (Figure 5), taking into consideration factors of accessibility. Mandaluyong is one of the major cities in the National Capital Region (NCR). In 2020, Mandaluyong City had an estimated 425,758 population, comprising 100,356 households, mostly living in multi-unit residential facilities [2]. Meanwhile, Northern Samar and Western Samar are two rural

provinces in the Eastern Visayas region of the Philippines. In 2020, the provinces had a combined population of approximately 1.45 million [52]. The native language spoken in Mandaluyong is Tagalog, while the Samar province is Waray; English language is also predominantly spoken in these locations.

Figure 5. Geographic location in exploring DRTB stigma among HCWs in the Philippines

The three locations registered a total of 4020 and 4620 cases of new and relapse TB case in 2020 and 2021, respectively [6]. Figure 6 presents the comparative number of notified and new and relapse TB cases in 2021–2022.

Figure 6. Number of notified TB cases and number of new and relapse TB cases, 2021 - 2022



Source: Philippine National Tuberculosis Report 2022

Sampling was convenient and purposive. All HCWs (n = 310) from the three selected geographic locations in the Philippines were invited to participate in the survey. In this study, HCWs are defined as Barangay Health Workers (BHWs), medical laboratory technicians (MLT), midwives, nurses, and physicians involved in patient management, prevention, and control of DRTB. BHWs are local community members trained on various health-promotion tasks and assist health professionals in primary healthcare services within their communities [53]. This definition of HCWs in this study applies exclusively to individuals employed at community health facilities and who receive compensation from the local government unit (LGU).

Of all HCWs (n = 310) invited to participate in the survey, 258 participated. The survey was participated by BHWs (n = 88, 34%), MLTs (n = 49, 19%), midwives (n = 19, 7%), nurses (n = 82, 32%), and physicians (n = 20, (8%). The participants had a mean age of 45.47 years (SD = 11.47) and a mean number of years of professional experience as an HCW was 14.05 years (SD = 10.01). The majority were female (n = 227, 88%) and living with their immediate families (n = 179, 70%). Household income

after compulsory deductions varied between groups, with the highest in physicians and the lowest in BHW. Almost all participants were married, belonged to the same religion, and held at least an undergraduate degree. These parameters were excluded from further analysis due to a lack of response variability. Flatt et al. [54] highlighted the importance of adhering to the underlying assumptions, like lack of variability, of an analysis to ensure the integrity of scientific insights. Accordingly, disregarding these assumptions can lead to distorted and unreliable conclusions, potentially undermining the validity of the research findings [54]. See Appendix 3 (Table 12) for descriptive statistics of the HCW participants.

3.3 Ethics

The research proposal was submitted to the University of Queensland Ethics Committee and the local TB Program Committee for approval. It included a comprehensive section on ethical considerations, highlighting the commitment to participants' privacy, consent, and the non-invasive nature of the data collection. Ethical approval was granted under HREC: H21REA254F1, and the local TB program management granted permission to conduct the survey. This step ensured all planned procedures followed the required ethical guidelines and regulations.

3.4 Data analysis

The data was analysed using the SPSS V28. Initially, a descriptive analysis was performed to obtain the mean score and sub-scales for stigma, which were then compared. The descriptive analysis laid out the extent of the pervasive stigma among HCWs in the Philippines. Multivariable regression was utilised to explore the relationship between stigma and explanatory variables.

Univariate regression modelled the strength and directional relationship between the explanatory variables and the stigma (outcome variable) [55]. The simplicity of the model allowed for a clear understanding of whether there is a significant association and the direction of this relationship (positive or negative). Sarstedt [56]

mentioned that univariate regression is particularly useful in initial exploratory analysis or when focusing on a specific aspect, like stigma.

Meanwhile, multivariate regression analysis modelled the relationship between the stigma and two or more explanatory variables [56]. The multivariable regression model offered a comprehensive analysis as it accounted for the multifaceted nature of stigma. The model helped understand how each explanatory variable influences the stigma while accounting for the effects of the other explanatory variables. DRTB stigma among HCWs is likely influenced by a combination of factors, such as demographic variables (age, gender, income, years of experience) and workplace environment (support from peers, confidence in infection control). By using the multivariate model, the impact of these multiple variables on stigma levels was assessed simultaneously. This approach not only helps in understanding the relative importance of each explanatory variable but also in identifying potential confounders that might distort the results if not properly accounted for [56]. The publication of Article 3 in Chapter 5 of this thesis provides an in-depth exploration of the extent of stigma and its relationship to explanatory factors.

The relationships between stigma, stress, absenteeism, and awareness of organisational support were measured using the Hayes PROCESS Model 9 [57]. Hayes' Process Model 9 [57], a widely used statistical model in the field of mediation analysis, is designed to investigate the indirect effects of the independent variable on a dependent variable through two mediators in a serial manner. The Hayes' Process Model has been instrumental in providing deeper insights into the complex interplay between stigma and other dependent variables [58-60]. In this research, the model helped in understanding how stigma can impact absenteeism by mediating the effects of stress and awareness of organisational support sequentially. The interrelationship among these factors is expounded upon in publication article 4 in Chapter 6 of this thesis. See Appendix 4 (Tables 13 – 16) for the aggregated data on stigma and its subscales.

In summary, this research utilised a two-part approach – a complement of a scoping review and a quantitative survey. Phase one entailed gathering data from a comprehensive review of relevant articles, while phase two involved collecting quantitative data from a cross-sectional online survey of 258 HCWs from selected locations in the Philippines. The quantitative data was analysed using descriptive and regression analysis – linear, multivariate, and Hayes' Process Model. The phases of design, data collection, and analysis were separately undertaken; findings were integrated in the interpretation.

CHAPTER 4: SCOPING REVIEW

4.1 PAPER 1- EXAMINING DRUG-RESISTANT TUBERCULOSIS STIGMA AMONG HEALTHCARE WORKERS TOWARDS THE DEVELOPMENT OF STIGMA-REDUCTION INTERVENTION: PROTOCOL FOR A SCOPING REVIEW

4.1.1 Introduction

A study protocol is the blueprint for conducting a research project, ensuring the study is conducted efficiently and systematically [61]. This chapter presents a study protocol for a scoping review that maps the existing literature regarding DRTB-related stigma among HCWs. The study protocol laid out an elaborate plan explaining the specific objectives, research questions, and methods, including the study inclusion and exclusion criteria, data sources, and data extraction and synthesis tools. This study protocol was registered, peer-reviewed and published to ensure transparency and inform the research community about the ongoing study. This effort allowed other researchers to understand exactly how the scoping review was conducted, so preventing duplication of effort. Peer-reviewing allowed other experts in review studies and in the field of DRTB to scrutinise and provide feedback on the proposed methodology, improving the quality and rigour of the scoping review.

4.1.2 The publication

Protocol

Examining Drug-Resistant Tuberculosis Stigma Among Health Care Workers Toward the Development of a Stigma-Reduction Intervention: Protocol for a Scoping Review

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Abstract

Background: Drug-resistant tuberculosis (DRTB) is an increasing threat to human health and economic security worldwide. Exacerbating the severity of DRTB is the low rate of service delivery, leading to increased community transmission of the disease, further amplified by stigma. Health workers are on the front line of service delivery; their efforts in all areas of disease control are suspected of having resulted in stigmatization, impacting patient-centered care. As a growing concern, attention to addressing the DRTB stigma confronting health workers is required. However, little is known about stigma among health workers delivering services to patients with DRTB. This scoping review will provide an overview that could help inform appropriate responses toward stigma-reduction interventions for these health workers.

Objective: This scoping review protocol articulates a methodology that will examine the facets of DRTB-related stigma confronting health workers in high TB- and DRTB-burdened countries. This scoping review will (1) summarize stigma barriers and facilitators contributing to stigmatization among health workers delivering services to patients with DRTB, (2) identify the most common stigma barrier and facilitator, and (3) summarize the stigma-reduction intervention recommendations in the studies.

Methods: Guided by Arksey and O'Malley's framework and the recommendations of Munn et al, we will conduct a scoping review of relevant literature providing evidence of DRTB-related stigma among health workers from countries with a high burden of tuberculosis (TB) and DRTB. We will search published articles written in English from 2010 onward in electronic databases using Medical Subject Headings and keywords. Our search will apply a 3-step search strategy and use software tools to manage references and facilitate the entire scoping review process. The findings of our review will be presented following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses for Scoping Reviews checklist. Our study is registered with Open Science Framework Registries.

Results: This scoping review is part of a bigger project that will critically investigate stigma among health workers delivering services to patients resistant to TB medications. This study began in November 2021 and is expected to finish in 2023. The study has retrieved 593 abstracts out of 12,138 articles searched since February 2022 from the identified databases. The findings of this study will be published in a peer-reviewed journal.

Conclusions: This review will provide an outline of the aspects of DRTB-related stigma confronting health workers. The findings of this review could help inform appropriate responses toward stigma-reduction interventions for these health workers. This is significant because interventions addressing related TB (and DRTB) stigma in the workplace are lacking.

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KEYWORDS

drug-resistant tuberculosis; health workers; stigma; tuberculosis stigma; TB stigma; DRTB stigma

Introduction

Background

Tuberculosis (TB) exists in every part of the world. Approximately 25% of the world's population has latent TB and is at risk of developing the disease during their lifetime [1]. Accordingly, about 10 million people fall sick with this disease each year, two-thirds of whom are in Bangladesh, China, India, Indonesia, Nigeria, the Philippines, and South Africa [1]. Meanwhile, drug-resistant tuberculosis (DRTB) is the highest in China, India, and Russia, while 9 of the 30 countries with the highest DRTB burden are within the European region [1].

With over a million people becoming ill with DRTB each year, the disease is considered a significant contributor to drug resistance worldwide [2]. In 2021, overall, 3.6% of new TB cases and 18% of previously treated patients were resistant to at least 1 anti-TB drug [3]. However, DRTB has become more challenging as the number of people previously treated for the disease had declined because of COVID-19 pandemic–related disruptions to TB service delivery. In 2021, the burden of DRTB increased by 3%, with 450,000 new cases [3]. As the increasing incidence of DRTB burdens public health, the country's economic security is threatened. Treatment of DRTB is prolonged and requires new-generation drugs, making it financially burdensome [4]. Additionally, the DRTB treatment success rate is lower than for new TB cases.

Ending the TB epidemic by 2035 is one of the priority goals of global health organizations. However, attaining this goal requires an urgent action that will accelerate efforts to diagnose, treat, and prevent TB (including DRTB). Such efforts can be achieved strategically by focusing on cutting-edge research and innovation, improving drug resistance surveillance, and strengthening public-private partnerships [3]. In the community, essential services such as case finding, diagnosis, treatment, health promotion and education, and psychosocial support are among the current strategies used to reduce the disease burden [1]. Central to these activities are the health workers, where DRTB essential services are integrated into community health services and directed toward patient-centered care [5]. Patient-centered care involves clinical service delivery and provides support for the patient's social and economic conditions that increase the burden of DRTB, such as malnutrition, poor housing, and financial and geographic barriers to health care access. In addition, it provides a holistic approach by incentivizing patients, treatment supporters, and health care providers [6].

The burden of DRTB is a multifaceted health challenge and social issue [6,7]. Medications for DRTB are more toxic and expensive [8], and the risks and treatment outcomes are influenced by various determinants and are commonly associated with stigma [9,10]. Stigma is the negative evaluation of oneself tainted by a particular attribute, making one constantly unsure how others will identify or receive it [11]. In terms of stigma in health, patients and communities distinguish and label various health conditions, views, and perceptions differently. As such, stigma influences community norms, interpersonal relations, and health institutions' culture [12,13].

A growing area of research has evidenced the stigma associated with DRTB. Datiko et al [14] posited that stigmatization of TB (including DRTB) affects prevention, care, and treatment. As a result, TB-related stigma contributes to the increasing DRTB burden and is a crucial predictor of its high incidence [15], and thus, warrants reduction interventions [9]. Tackling DRTB stigma is significant because it affects the quality of life of people affected by the disease and, in part, confronts health workers [16-18]. In health care, for health workers delivering essential services, the stigma surrounding TB (in general) is commonly associated with the "dirty work" stigma [19]. Hughes (1962) referred to dirty work as tasks and occupations perceived by the community as disgusting or degrading.

Current literature reviews on TB-related stigma suggest that most studies are geared toward understanding stigma among patients and their families. For example, in their qualitative review, Juniarti and Evans [20] explored stigma and the impact of either having TB, or a family member having TB. Craig et al [21] mapped TB stigma research and found that the majority of studies aimed to assess the knowledge, attitudes, and beliefs regarding TB (including DRTB) in low-incidence countries. The review of Sommerland et al [22] evaluated TB stigma–reduction interventions within the community. Notably, their reviews generally highlight the impact of TB stigma on individuals and communities. However, the growing evidence of DRTB-related stigma among health workers requires attention. There is a need to better understand the stigma surrounding the disease and how it is currently addressed in health facilities.

We conducted a preliminary search of MEDLINE, the Cochrane Database of Systematic Reviews, and Joanna Briggs Institute (JBI) Evidence Synthesis and found no current systematic reviews or scoping reviews underway on DRTB-related stigma among health workers. Using Arksey and O'Malley's [23] methodological framework and the recommendations of Munn et al [24], we will conduct a scoping study to examine the

literature about the stigma of health workers delivering services for DRTB, explicitly examining the facets of disease stigma. Stangl et al [25] mentioned that the facets of stigmatization primarily constitute drivers and facilitators (eg, government policies, institutional support, and exaggerated fear) that influence disease outcomes among affected populations, organizations, and institutions. This scoping review will provide an overview of the aspects of DRTB-related stigma confronting health workers and other relevant information. The result of this review could help inform appropriate responses toward stigma-reduction interventions for these health workers. This is significant because interventions addressing related TB (and DRTB) stigma in the workplace are lacking [9]. Nyblade et al [26][26] stated that it is crucial to sustainably address this issue, from national to facility levels, because it undermines the delivery of quality health care and successful health outcomes.

Review Question

Based on our objective, the overarching research question in this review is: "What aspects of DRTB-related stigma are confronting health workers in high TB- and DRTB-burden countries?" We will consider subquestions:

- What are the stigma drivers confronting the health workers, and what is the most common stigma driver?
- What are the stigma facilitators confronting the health workers, and what is the most common stigma facilitator?
- What stigma-reduction interventions are recommended in the study?

Methods

We will apply the JBI scoping review methodology and use the features and functionalities of the JBI System for the Unified Management, Assessment, and Review of Information (SUMARI) [27] web-based software tool throughout the review process. The scoping review is registered with OSF Registries.

Inclusion and Exclusion Criteria

Our review will apply the Participants/Concept/Context criteria recommended by Peter et al [28]. The eligibility criteria for this review will be as follows.

Participants

The participants in the study are health workers, including physicians, nurses, midwives, medical technologies, pharmacists, and other allied professionals in health care settings such as hospitals, clinics, community centers, and TB treatment facilities delivering DRTB services such as case-finding, screening, diagnosis, treatment, and prevention.

Concept

This review will include evidence of the stigma of health workers delivering services to patients with DRTB. Concepts to be examined are stigma drivers and facilitators, including but not limited to beliefs, fears, lack of awareness about the DRTB and stigma, inability to clinically manage the condition, negative attitudes, and institutionalized procedures or practices.

Context

This review will consider available data from countries identified in the World Health Organization's list of high TB- and DRTB-burden countries (Table S1 in Multimedia Appendix 1). Any article whose study participants are not included in the list will not be considered. To be eligible, stigma confronts the health worker delivering services to patients with DRTB. Studies in which the context of stigma relates to drug-susceptible TB (DSTB), DRTB patients, and their families will be excluded from the review. We will also exclude sources coming from opinion articles, commentaries, or editorial reviews.

Types of Sources

We will consider qualitative, quantitative, and mixed study designs, including descriptive observational studies, case reports, and gray literature on stigma confronting health workers delivering essential services to patients with DRTB. Peters et al [29] noted that one crucial point in scoping reviews is to draw upon data from any source of evidence and research methodology; thus, identifying articles for a scoping review will be less restrictive. As a result, an appraisal of the methodological quality of the available evidence on health workers' stigma in this scoping review will not be performed. As mentioned, we could not find any systematic or scoping reviews on this topic. However, if any review is found as a result of a rigorous literature search in this study, those that meet the inclusion criteria will also be considered, depending on the research question.

Search Strategy

This review will locate published articles using the 3-step search strategy recommended by the JBI scoping review guidelines [28]. We first conducted a pilot search of the PubMed and EBSCO databases to identify articles on the topic using Medical Subject Headings terms and keywords. In the next step, we will create a search protocol using the identified text terms in the titles, abstracts, and keywords and use the protocol to develop a full search strategy for CINAHL and MEDLINE (Table S2 in Multimedia Appendix 1). To enhance our search strategy, we will seek expert advice from university librarians to develop a search protocol that will be used to retrieve potentially relevant articles from the databases. The search strategy will be applied to Cochrane, ProQuest, Scopus, Web of Science, and other databases and information sources. Finally, we will search for gray literature and additional resources in electronic sources such as Google Scholar, ProQuest Dissertation, Open Access Theses and Dissertations, Networked Digital Library of Theses and Dissertations, and researchgate.net.

Study Selection

After the initial search, all identified citations will be collated and uploaded to EndNote X9, de-duplicated, and imported to JBI SUMARI. Two independent reviewers will subsequently screen the titles and abstracts to assess the inclusion criteria for the review. We will retrieve potentially relevant sources for full-text screening to confirm the eligibility of the study for analysis. Any study that includes stigma associated with DRTB and health workers will qualify for the analysis. The bibliographies of studies meeting the inclusion criteria will be

scanned to identify additional articles eligible for inclusion. Any disagreements between the reviewers at each stage of the selection process will be resolved through discussion or with an additional reviewer. The scoping review will record and report reasons for excluding sources of evidence in the full text that do not meet the inclusion criteria.

Data Charting

We developed a draft extraction chart (Table S3 in Multimedia Appendix 1) that will be piloted to examine results from 3 to 5 articles. The piloting is aimed to ensure that the extraction chart captures all relevant information to satisfy the scoping review objectives and questions. The data extraction chart includes specific details about the participants, concept, context, study methods, and key findings relevant to the review questions. Henceforth, to ensure comprehensive coverage in the literature search, the search process will be iterative and require reviewers to engage reflexively [23]. We will have an opportunity to modify and revise the data extraction chart at this stage to suit our needs. Once all the reviewing team members are satisfied with the pilot charting, the 2 independent reviewers will use the finalized chart to extract relevant data from the identified studies. The reviewers will detail the modifications in the scoping review. If appropriate, we will contact the authors of papers to request missing or additional data, where required.

Data Analysis and Presentation

We will use the Preferred Reporting Items for Systematic Reviews and Meta-analyses extension for scoping review flow diagram [30] to report the review search and inclusion pathway. First, the details of the included articles will be summarized and presented in tabular form outlining the authors, year of publication, settings, outcome measures, and main descriptions of the results to provide an overview of the extent, nature, and distribution of the studies in this scoping review. Second, we will present a summary list of findings with illustrations and narratives. Third, we will thematically synthesize the key findings of the studies and will present a graphic diagram following the aspects of DRTB stigma (stigma drivers and facilitators) identified in the research questions of this scoping review. Lastly, we will provide a summary of our findings and describe how the results relate to the objectives and questions of this scoping review.

Results

This study commenced in October 2021. After conception, this scoping protocol was registered in OSF to promote transparency in our research and prevent duplication by others. The protocol refinement was completed in December 2021, and soon after, a pilot search of the PubMed and EBSCO databases was performed to inform the search strategy's development. The study has retrieved 593 abstracts out of 12,138 articles searched since February 2022 from the identified databases. This study is expected to finish in 2023. The findings of this study will be published in a peer-reviewed journal.

Discussion

Principal Findings

The stigma surrounding DRTB is a growing concern. Research has shown that frontline health care workers delivering DRTB services are affected by such stigma, so it requires attention [9]. In scanning the literature, gaps emerged as most interventions were geared toward patients with DRTB and their families, less toward health workers. Also of note was the focus of reviews on DSTB-associated stigma in health facilities. As of yet, no literature review summarizing the stigma surrounding DRTB among health workers has been found.

Addressing the multiple facets of stigma from national to facility levels is important for a sustainable response to stigma. At the facility level, there is increasing recognition to target the primary factors—the drivers and facilitators—that constitute the stigmatization process. Akin to stigma-reduction interventions for patients and their families that primarily result from an understanding of the factors contributing to the stigma process, DRTB stigma–reduction interventions for health workers likewise require critical analysis of what drives and facilitates the stigmatization. However, unlike patients and their families, where beliefs and lack of knowledge of the disease are common stigma factors, the stigma among health workers could be originated from a range of other factors. Such factors could include innate disease characteristics (eg, being a potent version of TB), and certain features from within the health facilities (eg, institutional policies) and from individual health workers (eg, attitudes and behaviors) [25]. Without an analytic study, intervention reduction efforts for health workers could be undermined.

This scoping review is part of a bigger project that will critically investigate stigma among health workers delivering services to patients resistant to TB medications in the Philippines. This study will provide an overview of the health workers' stigma surrounding DRTB by explicitly examining the available literature regarding drivers and facilitators contributing to disease stigma, and how it is currently addressed. The findings of this review will offer insights that could help inform appropriate responses toward stigma-reduction interventions for these health workers. Moreover, being part of a bigger project, this review's findings could also be valuable in the translation and implementation of stigma-reduction measures.

A limitation of this review is its inclusivity in time, language, and place of study; thus, it will only capture part of the picture regarding the stigma associated with DRTB and health workers. Also, the methodological quality of the searched literature will not be assessed. However, the results of this review will inform knowledge users, researchers, DRTB program managers, and implementers to identify key factors leading to stigma among health care workers. The findings of this scoping review will be disseminated through conference and webinar presentations and peer-reviewed journal publications. Should there be modifications to the protocol after its publication, we will provide the details and rationale for the changes, including the dates.

Conclusions

This review will provide an outline of aspects of DRTB-related stigma confronting health workers. The findings of this review could help inform appropriate responses toward stigma-reduction interventions for these health workers. This is significant because interventions addressing related TB (and DRTB) stigma in the workplace are lacking and such interventions are likely to have a positive impact on both patient care and patient outcomes.

Acknowledgments

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Data Availability

All data sets generated and analyzed in this current study will be made available on the Open Science Framework (OSF) website.

Authors' Contributions

LA conceived the paper, conducted the initial search, designed the search strategy, and drafted the protocol. KA, RAM, and PG will verify the articles, and review and edit the manuscript. All authors contributed to the revision and finalization of this manuscript. All authors have read and approved this manuscript.

Conflicts of Interest

None declared.

Multimedia Appendix 1

DRTB scoping. DRTB: Drug-resistant tuberculosis.
[DOCX File , 20 KB-Multimedia Appendix 1]

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Abbreviations

DRTB: drug-resistant tuberculosis
DSTB: drug-susceptible tuberculosis
JBI SUMARI: Joanna Briggs Institute System for the Unified Management, Assessment, and Review of Information
OSF: Open Science Framework
TB: tuberculosis

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Multimedia Appendix 1

Table S1: World Health Organization list of high TB- and high DRTB-burden countries

30 High TB burden countries	
Angola	Philippines
Bangladesh	Russia
Brazil	South Africa
China	Thailand
DPR Korea	UR Tanzania
DR Congo	Vietnam
Ethiopia	Cambodia
India	Central African Republic
Indonesia	Congo
Kenya	Lesotho
Mozambique	Liberia
Myanmar	Namibia
Nigeria	Papua New Guinea
Pakistan	Sierra Leone
Zimbabwe	Zambia
30 high drug-resistant TB countries	
Bangaladesh	Philippines
China	Russia
DPR Korea	South Africa
DR Congo	Thailand
Ethiopia	Ukraine
India	Uzbekistan
Indonesia	Vietnam
Kazakhstan	Angola
Kenya	Azerbaijan
Mozambique	Belarus
Myanmar	Krygyzstan
Nigeria	Papua New Guinea
Pakistan	Peru
Reprubic of Moldova	Somalia
Zimbabwe	Tajikistan

Source: WHO. Tuberculosis: World Health Organizarion. https://www.who.int/health-topics/tuberculosis. [Accessed on January 15, 2021].

https://www.researchprotocols.org/2023/1/e43084/#app1

Table S2. Preliminary Data Base Search Strategies File	
1. Insert name of database:	EBSCOhost
Search conducted on:	22 September 2022
Interface	EBSCOhost Research Databases
Search Screen	Advanced Search
Database	Academic Search Ultimate
Search term	drug-resistant tuberculosis OR drug resistant tb OR multidrug-resistant tuberculosis OR multidrug-resistant TB AND (stigma or prejudice or attitude or discrimination) OR (stigmatization or stigmatisation) AND healthcare professionals OR healthcare workers OR (medical workers or medical staff or health care worker or healthcare employees)
Limiters	Published Date: 20100101-20220931; Document Type: Abstract; Language: English
Expanders	Apply equivalent subjects
Search modes	Boolean/Phrase
Number of records retrieved by the search	379 articles
2. Insert name of database	Scopus
Search conducted on	22 September 2022
Interface	https://www-scopus-com.ezproxy.usq.edu.au/search/form.
Search Screen	Advanced Search
Search term	(TITLE-ABS-KEY (drug-resistant AND tuberculosis) OR TITLE-ABS-KEY (drug-resistant AND tb) OR TITLE-ABS-KEY (multidrug-resistant AND tuberculosis) OR TITLE-ABS-KEY (multidrug-resistant AND tb) AND TITLE-ABS-KEY (stigma) OR TITLE-ABS-KEY (stigmatisation) OR TITLE-ABS-KEY (stigmatization) OR TITLE-ABS-KEY (stigmatise) OR TITLE-ABS-KEY (prejudice) OR TITLE-ABS-KEY (attitude) OR TITLE-ABS-KEY (discrimination) AND TITLE-ABS-KEY (health AND workers) OR TITLE-ABS-KEY (health AND professionals) OR TITLE-ABS-KEY (medical AND workers) OR TITLE-ABS-KEY (medical AND professional)) AND PUBYEAR > 2009
Expanders	Apply equivalent subjects
Search modes	Boolean/Phrase
Number of records retrieved by the search	108 articles

https://www.researchprotocols.org/2023/1/e43084/#app1

Table S3: Data extraction chart for the scoping review in mapping the evidence of drug-resistant tuberculosis related stigma among health workers in high TB- and drug-resistant-TB burden countries

Key Domain	Sub-domain	Description
Citation details	Name of Authors	Indicate the name of the authors
	Year of Publication	Indicate the year when the article was published
	Title of Publication	Indicate the full title of the article
	DOI	Indicate, if provided
Language		Only English language
Type of publication		Identifies the article if original review, or grey
Source Title		Identifies the name of the journal
Study details	Aims/Objectives	Describe the aims and objected stated in the study
	Study location	Indicate the study sites (country or region)
	Sample characteristics	Indicate the group of health workers involved in the study
	Sample size	Indicate the number of participants in the study
	Study design	Indicate the methodology adopted e.g. qualitative, quantitative, mixed-method, case study, review.
	Data collection	Indicate the type of data (primary or secondary) and how the data was collected (e.g. interview, survey, etc.)
	Key themes or type of stigma assessed	Indicate the stigma domain (e.g. fear), if primarily identified in the title or objectives of the study
	Description of stigma association	Describe the association of stigma in the finding of the study
	Significant mediators/moderators	Indicate of interventions were identified in the study
	Key findings	Describe the main results (evidence, concept, themes) and link to the scoping review question and objectives
	Study limitations	Indicate the limitations of the study
Abstract		A copy of the study abstract

4.1.3 Links and implications

The implications of this carefully planned scope review protocol are significant. In addition to ensuring a comprehensive review of the literature that demonstrates the stigma of DRTB among HCWs, this process enhanced the review's reliability and validity by minimising biases. It ensured that other researchers could replicate the study technique which is important for building a foundation of evidence that can guide future research and practice. Also, the protocol's emphasis on transparency and systematic methodology helped identify gaps in the current DRTB research. This could guide future research into previously under-explored areas, such as DRTB-related stigma among healthcare workers, furthering our understanding.

This protocol has played a pivotal role in the efficient management of this study’s research resources. By outlining the methods and processes, it has allowed for the judicious allocation of time and resources, a critical aspect in large-scale literature reviews. This efficiency has significantly enhanced the overall quality of the study review and expedited the research process, instilling confidence in the thoroughness and effectiveness of this work.

4.2 PAPER 2 – DRUG-RESISTANT TUBERCULOSIS STIGMA AMONG HEALTHCARE WORKERS TOWARD THE DEVELOPMENT OF STIGMA-REDUCTION STRATEGY: A SCOPING REVIEW

4.2.1 Introduction

This chapter involved a meticulous mapping of the existing literature to determine the origins, manifestations, and consequences of DRTB-related stigma among healthcare workers. This study has diligently sought out the underlying factors contributing to stigma, such as lack of knowledge, fear of disease, and cultural beliefs, among others. By employing an exhaustive and rigorous search of relevant literature, this study has offered a comprehensive understanding of DRTB stigma within the healthcare industry.

4.2.2 The publication

Review Articles (excluding Systematic Reviews)

Drug-Resistant Tuberculosis Stigma Among HealthCare Workers Toward the Development of a Stigma-Reduction Strategy: A Scoping Review

INQUIRY: The Journal of Health Care Organization, Provision, and Financing
Volume 60: 1–10

DOI: 10.1177/00469580231180754
journals.sagepub.com/home/inq
Sage

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Abstract

Drug-resistant tuberculosis (DRTB) is a growing concern worldwide. The poor rate of service delivery exacerbates the severity, leading to an increase in community transmission, which is further amplified by stigma. Health care workers (HCWs) are at the forefront lines of service delivery; their efforts are suspected of resulting in stigmatization, negatively impacting patient-centered care. However, little is known about DRTB-related stigma among these HCWs, and interventions are limited. Our scoping review is significant because it provides an overview of the DRTB stigma confronting HCWs and informs subsequent stigma-reduction initiatives. Utilizing Arksey and O'Malley framework, we exhaustively searched electronic databases for relevant English-language studies published from 2010 to 2022, identifying the drivers and facilitators of DRTB-related stigma among HCWs from high-TB and -DRTB burden countries, and compiling recommendations that could reduce DRTB stigma. From 443 de-duplicated papers, 11 articles on HCWs' DRTB-related stigma were reviewed and synthesized. Fear was mentioned across included articles as a stigma driver. Other reported stigma drivers identified included feelings of discrimination, isolation, danger, lack of support, shame, and stress. Poor infection control (IC) was the leading stigma facilitator. Other stigma facilitators identified were differing IC interpretations, workforce culture, and workplace inequality facilitating to stigmatization of HCWs. Three key recommendations identified were addressing infection control issues; increase the competence of healthcare workers; and provide psychosocial assistance, emphasizing HCW safety during DRTB activities. DRTB stigma among HCWs is multifaceted, largely driven by fear and facilitated by varying implementation or interpretations of policies within the workplace. Making HCWs feel safe while conducting DRTB activities is a priority issue that should be addressed by improving IC, training and psychosocial support. More studies investigating country-specific and multilevel DRTB-related stigma among HCWs are required to inform the development of an effective stigma intervention strategy.

Keywords

drug-resistant tuberculosis, DRTB stigma, health workers, stigma, TB stigma, tuberculosis stigma

What do we know so far about this topic?

Health workers are on the front lines of DRTB service delivery; their efforts in all areas of disease control are suspected of resulting in stigmatization, which has a negative impact on patient-centered care.

What contribution does this research make to the field?

This is the first study to provide an overview of the DRTB stigma drivers and facilitators, which could assist program managers and policymakers in identifying the policies that need to be addressed to create a stigma-free healthcare environment.

What are the implications of the research for theory, practise, or policy?

Policymakers must examine TB and DRTB policies, particularly IC and risk-payments, in order to minimize disparities and develop viable, effective solutions that discourage DRTB factors that driver and facilitator stigma among HCWs.

Introduction

Tuberculosis (TB) is a global public health concern.[1] About a fourth of the world's population had latent TB in 2020, and 10 million had active TB.[1] Alarmingly, TB drug resistance is growing and affecting about 500 000 people annually, and its persisting increase is an urgent and challenging obstacle to TB control and prevention.[2]

Combatting DRTB requires therapeutic efficacy, equity, and safety, as well as patient-centered care.[3] Patient-centered care addresses socioeconomic issues that worsen DRTB, like poverty and geographic barriers to health care. Its holistic approach rewards patients, treatment advocates, and healthcare providers, minimizing stigma.[4] Healthcare workers (HCWs) involved in DRTB activities and psychosocial support are integral to patient-centered care.[5]

TB is a stigmatized disease.[6] Stigma is the community's labeling of a trait as undesirable or devalued, which can lead to disgust, fear, guilt, and shame.[7,8] In healthcare, TB-related stigma is commonly associated with "dirty work," and HCWs delivering care for TB are viewed as facing the dirty work stigma.[9]

The stigma of TB causes diagnostic delays and treatment refusals. Stigmatized TB patients are reluctant to seek and complete treatment[10]; whereas stigmatized HCWs exhibit undesirable behaviors toward their patients or co-workers.[11] However, stigma's impacts extend beyond disease prevention and treatment, affecting the quality of life of patients and those around them, including HCWs[12-15]; consequently, DRTB spread.[2]

DRTB stigma is pronounced,[2] and patients are particularly vulnerable to it.[16] The psychosocial concerns surrounding the disease disrupt the social lives of patients and their families.[17-19] Similarly, stigma in DRTB affects HCWs' well-being and often leads to stigmatizing behaviors in healthcare settings,[11] thus, a major barrier to patient-centered care.[20-22]

Stigmatization mechanisms frequently share characteristics, but their consequences can differ.[11] For instance, many DRTB patients experience depression, guilt, loss of self-identity or self-esteem[23]; while others experience isolation, relationship failure, or separation.[24] Despite a lot of study on the consequences of DRTB stigma on patients and their families, no study has systematically examined the stigma confronted by HCWs.

As a growing concern, reducing DRTB workplace stigma is important[11] and calls for a sustainable response that should be addressed at all levels.[9,25] At the facility level, targeting the factors comprising the stigmatization process is increasingly recognized. Stigma factors may include illness characteristics (eg, virulence), features from within the facility (eg, policies), and individual HCW (eg, attitude).[25] However, measures addressing workplace health stigma are lacking.[26] Thus, this review on DRTB-associated stigma among HCWs is significant to TB program managers and researchers to build sustainable stigma reduction efforts.

Methods

Part of a larger study on DRTB stigmatizing Filipino HCWs, this review highlights materials that may influence future research and decision-making.[27,28] Unlike systematic review, which synthesizes primary studies to address a specific topic to minimize bias,[29] this review combines material and finds gaps in workplace DRTB-related stigma.[28]

This review aimed to (1) acquire a better understanding of the stigma surrounding DRTB; and (2) provide insights that could inform the development of interventions to reduce DRTB stigma among HCWs. DRTB-related stigma factors affecting HCWs were identified by identifying stigma drivers and facilitators and HCW stigma experiences. We collected DRTB stigma-reduction recommendations.

This review utilized Arksey and O'Malley framework,[30] Peters et al's recommendations[31] and the Joanna Briggs Institute System for the Unified Management of the Assessment and Review of Information (JBI SUMARI) utilities. To ensure systematic reporting, the PRISMA Extension for Scoping Reviews (PRISMA-ScR) checklist was used.[32] Prior to conducting this review, this scoping review was registered in Open Science Framework osf.io/43kp9 and a protocol was published.[33]

Study Selection

Preliminary search was conducted in February 2022 and updated in September–November 2022. Peters et al's[34] Population, Concept, and Context (PCC) criteria (Table 1) guided our search strategy, focusing on 2 concepts – DRTB and stigma. The search followed JBI scoping review protocol—pilot search, search protocol preparation, and database search utilizing Medical Subject Heading (MeSH) terms (Supplemental Appendix 1).

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Table 1. Scope of Inquiry for Examining DRTB Stigma Drivers and Facilitators Among HCWs.

Participants	*Health workers*—including physicians, nurses, midwives, medical technologist, pharmacists, and other allied professionals in healthcare settings such as hospitals, clinics, community centers, and TB treatment facilities delivering DRTB services such as case-finding, screening, diagnosis, treatment, and prevention.
Concept	*Stigma of health workers delivering services to DRTB patients* - stigma drivers and facilitators, including but not limited to beliefs, fears, lack of awareness about the DRTB and stigma, inability to clinically manage the condition, negative attitudes, and institutionalized procedures or practices.
Context	Available data from countries identified in the World Health Organization's list of high TB- and drug-resistant TB burden countries (Supplemental Appendix 1).

After de-duplication, the searches yielded 443 articles, 65 were selected for title and abstract evaluation, and 39 were excluded due to inclusion criteria ineligibility. After reviewing 26 full-text articles, 11 relevant articles were reviewed and synthesized. Figure 1 shows the PRISMA-ScR article flow from identification through inclusion.

Inclusion Criteria

Eligibility of included studies were:

- focused on DRTB stigma among HCWs, or
- presented evidence that are associated to DRTB stigma among health workers, and
- participants from WHO high-TB/DRTB burden countries (Supplemental Appendix 2)

Studies pertaining to health professionals' stigma toward TB, not DRTB, was excluded. DRTB stigma studies on patients and their families, and those from non-WHO high TB and DRTB-burden countries were excluded. Editorials and comments were excluded.

Data Charting

Data charting was iterative to ensure comprehensive literature search. Reviewers independently and thoroughly evaluated the articles and charted the relevant material in a chart developed beforehand (Supplemental Appendix 3). Utilization of data charting was to prevent removing potential results of importance to this review's synopsis.[35] Endnote's citations and full texts imported into NVivo were used to improve data charting and textual data source analysis. Citation specifics, study details, the verbatim accounts of stigma experience and the findings associated with stigma reduction were likewise charted.

The articles were examined using JBI's quality assessment tool. Unlike a systematic review, which formally analyzes methodological quality for risk of bias, our scoping review broadly examined the quality of the studies to provide an overview of research activity on a topic.[36] It was not intended to rank the articles based on the evidence provided, and no articles were excluded from the review based on their quality. Supplemental Appendix 4 contains a quality assessment of each study design included in this review.

Results

Included Studies' Characteristics

This review comprised case series/case history (n=2), analytical cross-sectional (n=3), and interpretative and critical research (n-=6), with most studies from South Africa (n=8) and one each from Indonesia, the Philippines, and Tanzania. Nine studies used interviews and surveys, 3 used historical data, and no systematic reviews. Only 2 of 11 studies focused solely on DRTB stigma among HCWs. The other 9 studies focused on HCWs' perspectives on DRTB care (n=4), HCWs and DRTB infection control (IC) (n=2), and DRTB infection among HCWs (n=3). However, the studies found evidence of DRTB-related stigma among HCWs. Eight studies included a mix of health workers, while 3 studies solely included physicians. No studies solely included nurses, medical laboratory technologists, pharmacists, and other allied health workers. Supplemental Appendix 5 describes the included research by design. Table 2 summarizes the stigma drivers and facilitators, including verbatim quotes from the included studies.

Stigma drivers. All studies identified more than one stigma driver, with an emphasis on fear. HCWs working in DRTB wards are most afraid about catching the disease, which could spread to their families and others.[22,37-45] HCWs' nosocomial infection concerns vary, reflecting workplace behaviors,[38,39,42,43] and lack of knowledge on IC guidelines.[37,38,41,42]

Another stigma driver noted is stress from treating DRTB patients. Four studies found that HCWs were stressed about providing DRTB care, mostly due to a lack of experience,[37,40,42,43] and confidence in their facility's capability to provide DRTB care.[41]

Two studies mentioned HCWs' stigma being perpetuated by their colleagues and peers. Example, HCWs were concerned about potential rejection or compromising work relationships if they became ill, whereas those who became ill faced discrimination and career implications.[39,44] In 4 studies, infected HCWs' psychological experiences were described as extensive, including depression, anxiety, resentment, paranoia, and intense fear of relapse or re-exposure.[22,40,44,46] Two

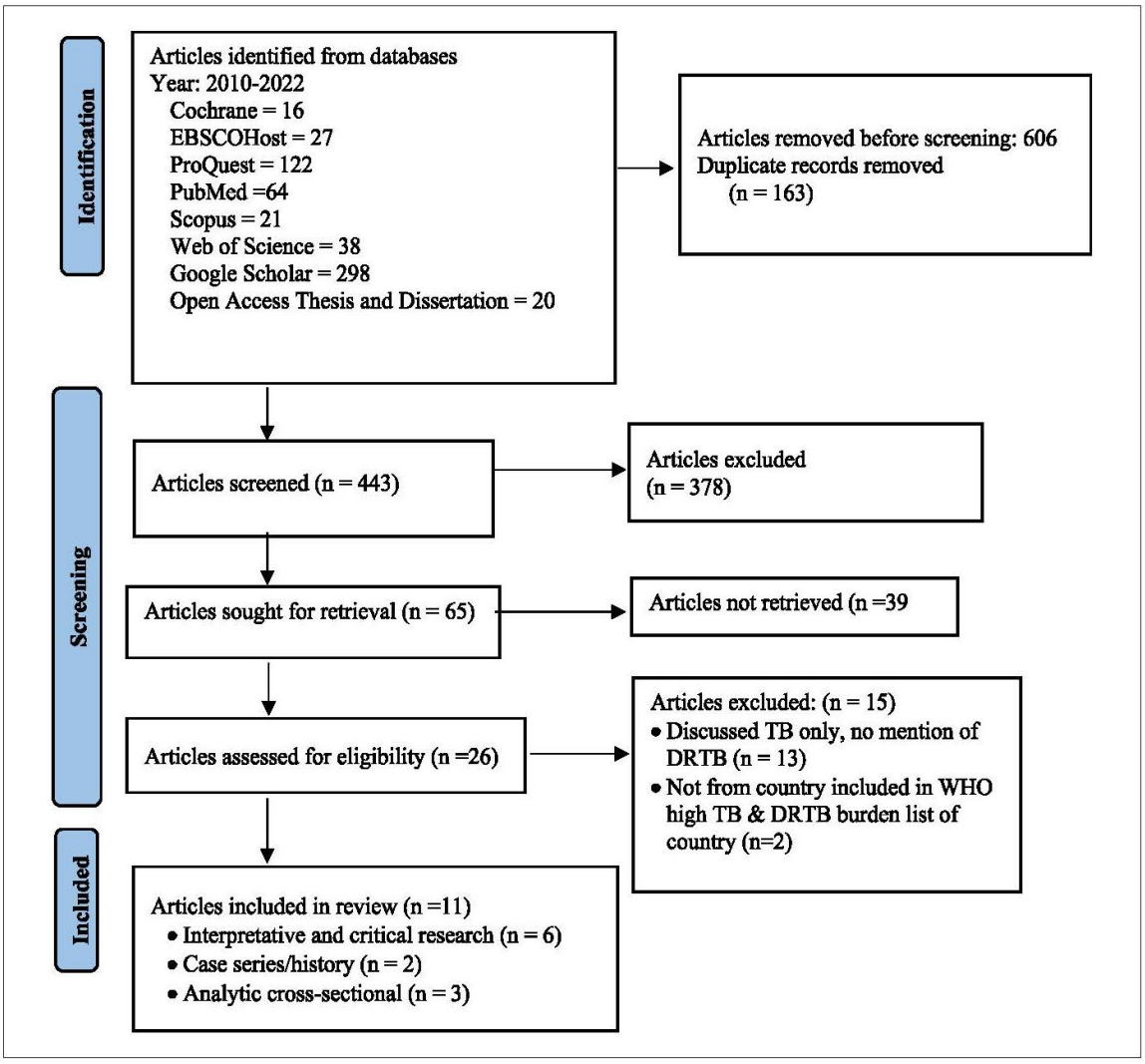

Figure 1. PRISMA-SCr flow diagram in examining the driver and facilitators of DRTB-related stigma among CHWs and recommendations to help address the stigma.

studies mentioned the fear of isolation or separation from family and friends.[22,46]

Stigma facilitators. Stigma facilitators are perceived influences that reduce or enhance stigmatizing behaviors.[47] In healthcare, cultural norms, workplace safety requirements, and health policy are examples of stigma facilitators.[25] Poor occupational safety standards, including a lack of IC, were most frequently regarded as a stigmatizing facilitator in the included studies. Seven South African studies reported HCWs' worry with workplace poor IC practices and complacency[22,37-40,42,44] with some HCWs not following IC advice.[39] Six studies mentioned inadequate IC due to disparities in risk perceptions among co-workers, varying policy interpretations, or lack of knowledge about IC.[22,37,38,42,44,45]

Weak workplace structure support was also mentioned. Six studies identified HCWs' low morale as a result of disparities in hazard compensation, job instability, and organizational bureaucracy.[22,37,38,40,44,45] Also with "freeze hire policy" in place, HCWs felt helpless to provide support to colleagues, while others felt anxious about not receiving the necessary support to conduct the DRTB care program.[43]

Stigma reduction recommendations. Three key recommendations surfaced from the studies: (a) address IC issues; (b) increase the competence of healthcare workers; and (c)

Table 2. Summary of Included Studies in Examining the Evidence of DRTB Related Stigma Among HCWs in High TB and DRTB Countries.

Citation	Study design	Data collection	Target population	Study setting or country	Drivers of stigma	Facilitator of stigma	Verbatim quote descriptions of stigma experience	Verbatim quote recommendation for stigma reduction
Padayatchi et al.[40]	Case Series	Historical data	Physician	South Africa	Fear of contracting the disease; Stress in providing care; Shame; Feeling unsafe	Lack of infection control; Weak psychosocial support	*"Doctors felt the personal and professional stresses of carrying on work after being diagnosed with DRTB"*[37] *"Several doctors experienced difficulty and awkwardness re-integrating into a teaching environment where their illness have been publicised."*[37] *"Doctors expressed feeling ashamed and blamed for acquiring TB as they were professionals who are expected to be fully aware of risk exposure yet ill-equipped to apply this knowledge to protect themselves."*[37]	*"Prioritization of infection control education and practice;* *Enhanced infection control education in medical curricula and practice, towards mitigating occupational risks;* *Adherence to legislation for occupational safety."*[37] *"Psychological support and professional counselling should be a routine part of conventional medical care for doctors with TB in high-risk settings."*[37]
Kanjee et al.[39]	Cross-sectional Study	Questionnaire	HCWs	South Africa	Fear of contracting the disease; Feeling unsupported; Feeling isolated; Shame	Lack of infection control	*"As several staff members had died from confirmed TB/MDR-TB/XDR-TB, 82.1% and 42.9% of respondents were less willing to work in high-risk areas of the hospital or to work as an HCW, respectively."*[38] *"HCWs do not trust the health services to take care of them if they have TB"*[38] *"HCWs fear potential rejection and stigma from staff if they have TB; and think it is shameful to admit they might have TB"*[38]	*"Facilities must implement multi-faceted TB IC facility and behavioural change interventions"*[38] *"Facilities should ensure confidentiality of staff health information and reduce the stigma in order to improve HCW uptake of personal diagnosis and other risk-reduction strategies."*[38]
Naidoo et al.[46]	Cross-sectional study	Self-administered questionnaire	Physicians (inlcuding 4 respondents with DRTB)	Sub-sahara Africa	Feeling discriminated, unsupported.	Lack of infection control; Lack of psychosocial support	*"It hurts when our own well-being is jeopardized, and our own colleagues and management show an uncaring attitude towards us."*[39] *"Physicians regretted choosing clinical medicine as a career option, another stated being treated inappropriate by colleagues and criticised for taking sick leave"*[39]	The study emphasizes the need for improved educational and awareness programs for all healthcare personnel, including hospital administrators, and changes in attitudes on the part of senior medical colleagues and administrators towards medical doctors with TB.
Tudor et al.[22]	Cross-sectional Study	Questionnaire	HCWs	South Africa	Fear of contracting the disease; Feeling isolated; Feeling discriminated; Feeling unsupported	Lack of infection control; Inequity in income protection	*"they were concerned about being isolated from their family for long periods of time "to be isolated and away from family and friends"*[22] *"how will society accept you, how will your colleagues treat you?"*[22] *".. . getting infected with MDR- or XDR-TB and no one cares about what happens to me"*[22] *"HCWs do not receive danger allowance for working in MDR-/XDR-TB wards and the lack of compensation they would receive if they were to acquire MDR-/XDRTB"*[22] *"HCWs responded that they were concerned about stigma and the perceived lack of psychosocial support if they become ill."*[22]	*"It is imperative that efforts are made to improve IC and ensure safe working conditions for all HCWs."*[22] This study highlights training of HCWs in IC measures, and specifically on protecting self and others from the TB(DRTB) Recommended all HCWs, to have free access occupational health services and income protection.
Daftary and Padayatchi[42]	Qualitative Study	Interviews	HCWs	South Africa	Stress in providing care; Fear of contracting the disease	Lack of infection control	*"Junior HCWs expressed concern on nosocomial exposure due to patients no closing their mouths when coughing."*[40]	This study recommended addressing suboptimal infection control practices and complacency in the workplace through leadership and governance

(continued)

Table 2. (continued)

Citation	Study design	Data collection	Target population	Study setting or country	Drivers of stigma	Facilitator of stigma	Verbatim quote descriptions of stigma experience	Verbatim quote recommendation for stigma reduction
Jaramillo et al.[45]	Qualitative Study	Interviews	HCWs	Philippines	Fear of contracting the disease Stress in providing DRTB care	Lack of infection control	*"There is poor infection control practices, fear, and limited capacity in rural health centers"*[41]	This study recommended that professional development opportunities, oversight of personnel, and information campaigns should be in place to curb stigma in the community
Lyakurwa et al.[41]	Qualitative Study	Interview and focus group discussions	HCWs	Tanzania	Fear of contracting the disease. Feeling unsupported	Lack of knowledge in DRTB care, Lack of financial support	*"HCWs lacked confidence in the quality of care at their facility and fear DRTB because they have no experience in treating DRTB patients and assume having a higher risk to be infected by them"*[42] *". . .no extra-duty pay for staff working on holidays"*[42]	*"The teams proposed to train more HCWs, including facility managers in the training and ongoing mentorship"*[42]
Probandari et al.[37]	Qualitative Study	Questionnaire	Primary Health Care health staff	Indonesia	Fear of contracting the disease; Feeling unsafe; Stress in providing care	Lack of infection control	*"Staff fear of being infected and feeling afraid to talk to MDRTB patients; they are stressed and fearful of conducting MDRTB care"*[43]	The study emphasized the need for knowledge and capacity building for infection control The Study identified that training alone is not sufficient; and research is needed to evidence effective strategies that reduce stigma among health staff providing MDRTB care
Vanleeuw et al.[43]	Qualitative Study	Interviews	HCWs	South Africa	Fear of contracting the disease; Stress in providing care	Lack knowledge in DRTB program implementation; Lack of administrative support in addressing changes in DRTB care.	*"These doctors are scared of TB patients and refer them quickly."*[44] *"Majority of HCWs at primary healthcare level did not have this experience and expressed concern with the sudden addition of DR-TB patients to their daily routine"*[44]	The study recommended that attention is required as to how the decentralized DR-TB unit can be supported by district management and other healthcare providers.
Zelnick et al.[38]	Qualitative Study	Key informant interview and survey questionnaire	HCWs	South Africa	Fear of contracting the disease; Feeling unsafe; Feeling discriminated	Lack of infection control; Inequity in income protection	*"Nurse: TB is all over, so we can't get a risk allowance. . .the only compensation we can get is being treated free when you are diagnosed with TB."*[25]	This study recommended for evaluation of IC efforts and the decentralized management of DRTB as part of the initiatives to control DRTB and create as safe workplace.
Von Delft et al.[44]	Text and opinion	Historical data	Physicians	South Africa	Feeling isolated; Fear of discriminated; Fear of infection	Lack of infection control	*"The medical student with MDR tuberculosis experienced extreme social isolation, driven by a lack of understanding from family members and peers as well as the medical school administrator."*[45] *"HCWs in low-resource settings with possible tuberculosis symptoms are already wary of presenting for testing and treatment, because of stigma and career implications; and fear of infecting family members."*[45]	This study recommends for an urgent action to improve IC implementation.

provide psychosocial assistance. In tackling IC, the recommendations centered on behavioral modification, skill enhancement, and implementation governance. One recommendation mentioned ensuring adequate IC supply,[39] while others recommended educating HCWs in IC control[22,37] and ensuring compliance with IC policy.[40] Two studies recommend assessing the IC program and leadership to address HCWs' mistrust in IC initiatives, traditional workplace practises, and workplace hierarchies that result in poor IC practices.[38,42]

Stigma reduction recommendations also included knowledge and capacity training, notably in the new DRTB care paradigm that includes primary health services. The recommendations addressed HCWs' worry and anxiety around DRTB care changes by engaging and supporting them. One recommendation was for DRTB program managers to be mindful of the assistance required by the decentralized DRTB units.[43] Three studies recommended training[41,43,45]; however, continued mentoring,[41] and intensified information campaigns to curb DRTB stigma among HCWs and community were emphasized.[45]

Most agreed that HCWs' safety and security during DRTB activities is a priority.[22,37,38,40,44,48] For example, one study recommended ensuring the confidentiality of information in DRTB facilities to encourage testing and diagnosis among HCWs,[39] while another recommended providing equitable compensation and free access to appropriate health services.[22] But for Probandari et al,[37] more research is needed to collect evidence about the effective strategies to reduce stigma among CHWs providing MDR-TB care.

Discussions

We found few studies, predominantly from South Africa and one each from Indonesia, the Philippines, and Tanzania. No literature review DRTB stigma among HCWs was found, so far. The stigma associated with communicable diseases[49] is consistent with this review. In this review, DRTB stigma is driven by fear of the disease, comparable to studies where HCWs reported stigma from infectious disease exposure.[50-52] The inherent characteristics of DRTB, treatment toxicity, and poor treatment outcomes all contribute to stigmatization.[9,53] We found that impacted HCWs engage in stigmatizing behaviors such as avoiding delivery care, transferring patients with DRTB quickly, or performing unnecessary overprotection IC practices.[37,43] More concerning is the report that 82.1% of hospital staff and 42.9% of HCWs are less willing to work in DRTB-specific areas or continue to work as health workers.[39]

Our analysis found multiple stigma facilitators, with healthcare system social and structural variables having the biggest impact. IC was frequently mentioned as requiring proper execution, not adhering to, or having its policy interpreted differently among stigma facilitators. HCWs worried about inadequate IC practice and complacency in their health facilities.[22,38-40,42,44,46] Due to limited IC supply at health institutions, some HCWs were stigmatized for not following IC procedure.[39,46] Even more alarming is the reluctance of other HCWs to adhere to the IC's TB recommendations.[39] We found that the IC reluctance was due to lack of knowledge regarding DRTB risks or conflicting interpretations of IC policy.[22,37,39,40,42,46] Unsurprisingly, inadequate IC in the workplace facilitates HCWs' fear of the disease.

Working with stigmatized individuals or diseases promotes stigmatization[54,55]; and this is echoed in this review. We identified the stigmatizing experiences of HCWs, such as discrimination, isolation, rejection, and shame. For example, co-workers may reject HCWs if they become ill, but those who contracted DRTB delayed testing and diagnosis out of fear of discrimination and career implications.[39] Some HCWs with DRTB suffered anxiety and depression as a result of isolation from family and friends, or lost contact with colleagues due to extended absences from work.[22,40,44,46] Yet concerning is leaving their families, particularly their children, to pursue DRTB treatment.[22]

We, likewise, identified discriminating behaviors in the workplace. For instance, senior HCWs do not feel themselves to be in danger from the disease, hence blaming junior colleagues for IC wastage and limiting their access to supplies.[42] Arguably, stigmatizing tendencies are prevalent among HCWs who lack knowledge and training in DRTB.[41,45,48] We also identified policies characterized by disparities in financial security among HCWs. Compared to those working in other high-risk settings, like HIV, some HCWs in DRTB wards do not receive a "danger pays," day off on holidays, or compensation if they acquire DRTB.[22,41] In another instance, some HCWs were excluded from training opportunities, thus felt discriminated.[43,45]

Additionally, we found that decentralization of DRTB care to community health centers also stressed HCWs. Fear and anxiety resulted from the increase in workload, with HCWs expressing concern about the lack of assistance from coordinators to guide them through the adjustments and aid them with patient-related issues, and coordinators experiencing stress due to excessive workloads.[41-43] We found that an appointment moratorium prevented DRTB supervisory assistance.[43] Our findings support WHO's[56] assertion that a lack of appropriate structures and support at work could adversely impact HCWs' mental health, thereby hindering their capacity to enjoy and perform well at work.

Of note, data on the causes and facilitators of stigma are necessary for determining the most effective stigma reduction intervention in a given environment.[25] In this review, we identified the stigma drivers and facilitators that could assist the DRTB community with identifying the policies that need to be modified to promote a stigma-free healthcare environment. With our findings, we urge DRTB implementers and policymakers to enable policy revisions, notably regarding occupational health and safety, and HCW income protection.

Most studies concluded with stigma reduction interventions, emphasizing DRTB knowledge, current training (including refresher training), and capacity building on IC, and enhancing administrative IC operational standards. However, HCWs were concerned that training could not overcome stigma; implying that IC training could help reduce barriers to implementing IC, but not fear. This finding supports the claim that training alone is insufficient for sustainability if the healthcare system lacks infrastructure.[57] We found that continual mentoring and supportive supervision that improves knowledge and abilities may reduce stigma better because additional attention and on-the-job mentoring were deemed essential for HCWs to acquire confidence in providing DRTB care.[41]

Notably, stigmatization in DRTB workforce is viewed as a result of both individual and institutional factors. This review, however, falls short of identifying stigma drivers and facilitators from multiple countries due to a significant lack of literature that explicitly characterizes the domains in DRTB-related stigma. The WHO[58] identifies many countries with significant TB and DRTB burdens combined; yet, only few countries have investigated the stigmatization of HCWs providing DRTB care. Also, workplace DRTB-associated stigma has just recently been recognized. We urge stakeholders, including academics and policymakers, to investigate stigma routes at facility level, focusing on HCWs experiencing stigma and those perpetuating stigma. Similarly, it is important to identify and understand the elements that facilitate and mediate stigmatization in a multi-level context, addressing the ecological and social pathways to DRTB stigma.[25]

Strengths and Limitations

This review summarizes stigma among HCWs caring DRTB patients from TB- and DRTB-affected countries. So far, this is the first review to focus solely on DRTB stigma and HCWs. With limited studies found, our review is unable to comprehensively picture DRTB-associated stigma among HCWs; a significant information gap requiring attention. HCWs' DRTB stigma needs further study at the facility, program, and national levels.

This review has some limitations. Despite attempts to be as exhaustive as possible, this review may not have found every study in the published and gray literature. The literature search's inclusivity in terms of period, language, and study location may have missed some relevant studies. Our review is focused on studies conducted in countries with the highest TB and DRTB burdens, according to the WHO. While many TB- and DRTB-burden nations have non-English-speaking populations, this review may have omitted non-English studies. The MeSH search included phrases related to DRTB and health professionals, but they may not have been in the title or abstract.

Our review objective is to provide breadth rather than depth of evidence regarding DRTB related stigma confronting HCWs; thus, included studies regardless of research design, or outcome. Studies' quality gives an overview of research effort on a topic but is not a reason for exclusion. The studies' variabilities limit the conduct of meta-analysis, which is an inherent limitation of scoping reviews. We ensured a complete and transparent presentation of results by utilizing the recommended conventions of PRISMA-Scr.

Research and Practice Implications

Healthcare professionals and DRTB stigma have not yet been extensively studied. More research is needed to fully reflect DRTB stigma in healthcare and develop the requisite stigma reduction strategy and evaluate its efficacy. To overcome inequities and create effective, viable solutions that discourage stigma facilitators, policymakers must reconsider TB and DRTB policies, notably IC and risk-payments. Researchers need more data to critically identify the factors that contribute to and facilitate stigmatization among HCWs. It is prudent to take note of the WHO's recommendation to expand country-specific DRTB research and Stangl et al's[25] recommendation to investigate stigmatization across its socio-ecological range.

Conclusions

Our scoping research aims to identify the drivers and facilitators of stigma around HCWs providing crucial services for DRTB, particularly in countries with a high prevalence of TB and DRTB, as well as recommendations to reduce stigma. Despite the low number of studies reviewed, the findings imply that the stigma associated with DRTB in the healthcare sector is multifaceted and largely driven by the fear of infection. Other collective stigmas experienced by HCWs included discrimination, loneliness, insecurity, embarrassment and stress. Inconsistencies health workplace structure, such as conflicting IC interpretations and culture and values, also significantly contribute to the stigmatization among HCWs. Making HCWs feel safe while conducting DRTB activities is a priority issue that should be addressed. There are gaps in the literature, with no studies were found in most of the WHO's high-burden TB and DRTB nations. Further research regarding country-specific and multi-level DRTB-related stigma among HCWs is necessary.

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Declarations

This study utilized secondary data and does require ethical committee approval. No editorial assistance was made for this manuscript.

Ethical Considerations

This study does not require ethical approval because of the study type.

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Supplemental Material

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- **APPENDICES**

Appendix 1 Supplementary file for scoping review protocol

Multimedia Appendix 1

Table S1: World Health Organization list of high TB- and high DRTB-burden countries

30 High TB-burden countries		30 high drug-resistant TB countries	
Angola	Philippines	Bangaladesh	Philippines
Bangladesh	Russia	China	Russia
Brazil	South Africa	DPR Korea	South Africa
China	Thailand	DR Congo	Thailand
DPR Korea	UR Tanzania	Ethiopia	Ukraine
DR Congo	Vietnam	India	Uzbekistan
Ethiopia	Cambodia	Indonesia	Vietnam
India	Central African Republic	Kazakhstan	Angola
Indonesia	Congo	Kenya	Azerbaijan
Kenya	Lesotho	Mozambique	Belarus
Mozambique	Liberia	Myanmar	Krygyzstan
Myanmar	Namibia	Nigeria	Papua New Guinea
Nigeria	Papua New Guinea	Pakistan	Peru
Pakistan	Sierra Leone	Moldova	Somalia
Zimbabwe	Zambia	Zimbabwe	Tajikistan

Source: WHO. Tuberculosis: World Health Organizarion. https://www.who.int/health-topics/tuberculosis. [Accessed on January 15, 2021].

Appendix 2. Search strategy for examining DRTB stigma among healthcare workers

The search strategy was designed around the aims of the review and included two key concepts, DRTB and stigma. The search was designed to align with the 3-step strategy recommended by JBI scoping review guidelines. First was the pilot search of the PubMed and EBSCO databases using Medical Subject Heading (MeSH) terms to identify the articles on the topic. Second step was the creation of the search protocol using the identified text terms in the titles, abstracts, and keywords and used the protocol to in the full search of databases CINAHL, Cochrane, ProQuest, Scopus, Web of Science. The systematic search utilized the terms “drug-resistant tuberculosis”, “drug-resistant TB”, “multidrug-resistant tuberculosis”, “multidrug-resistant TB”, “stigma”, “stigmatization”, “stigmatize”, “prejudice”, “attitude, “discrimination”, “health workers”, “medical workers”, “healthcare professionals”; and Boolean terms (AND/OR) as separators. Last was the search for gray literature and additional resources in electronic sources such as Google Scholar, ProQuest Dissertation, Open Access Thesis and Dissertations and researchgate. The search filters applied in English from 2010 to 2022 to identify the more recent concern regarding DRTB stigma among health workers. The bibliographies of the included articles were scanned to identify additional relevant articles.

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Table S3: Data extraction chart for the scoping review in mapping the evidence of drug-resistant tuberculosis related stigma among health workers in high TB- and drug-resistant-TB burden countries

Key Domain	Sub-domain	Description
Citation details	Name of Authors	Indicate the name of the authors
	Year of Publication	Indicate the year when the article was published
	Title of Publication	Indicate the full title of the article
	DOI	Indicate, if provided
Language		Only English language
Type of publication		Identifies the article if original review, or grey
Source Title		Identifies the name of the journal
Study details	Aims/Objectives	Describe the aims and objected stated in the study
	Study location	Indicate the study sites (country or region)
	Sample characteristics	Indicate the group of health workers involved in the study
	Sample size	Indicate the number of participants in the study
	Study design	Indicate the methodology adopted e.g. qualitative, quantitative, mixed-method, case study, review.
	Data collection	Indicate the type of data (primary or secondary) and how the data was collected (e.g. interview, survey, etc.)
	Key themes or type of stigma assessed	Indicate the stigma domain (e.g. fear), if primarily identified in the title or objectives of the study
	Description of stigma association	Describe the association of stigma in the finding of the study
	Significant mediators/moderators	Indicate of interventions were identified in the study
	Key findings	Describe the main results (evidence, concept, themes) and link to the scoping review question and objectives
	Study limitations	Indicate the limitations of the study
Abstract		A copy of the study abstract

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Table S2. Preliminary Data Base Search Strategies File

1. Insert name of database:	EBSCOhost
Search conducted on:	22 September 2022
Interface	EBSCOhost Research Databases
Search Screen	Advanced Search
Database	Academic Search Ultimate
Search term	drug-resistant tuberculosis OR drug resistant tb OR multidrug-resistant tuberculosis OR multidrug-resistant TB AND (stigma or prejudice or attitude or discrimination) OR (stigmatization or stigmatisation) AND healthcare professionals OR healthcare workers OR (medical workers or medical staff or health care worker or healthcare employees)
Limiters	Published Date: 20100101-20220931; Document Type: Abstract; Language: English
Expanders	Apply equivalent subjects
Search modes	Boolean/Phrase
Number of records retrieved by the search	379 articles
2. Insert name of database	Scopus
Search conducted on	22 September 2022
Interface	https://www-scopus-com.ezproxy.usq.edu.au/search/form.
Search Screen	Advanced Search
Search term	(TITLE-ABS-KEY (drug-resistant AND tuberculosis) OR TITLE-ABS-KEY (drug-resistant AND tb) OR TITLE-ABS-KEY (multidrug-resistant AND tuberculosis) OR TITLE-ABS-KEY (multidrug-resistant AND tb) AND TITLE-ABS-KEY (stigma) OR TITLE-ABS-KEY (stigmatisation) OR TITLE-ABS-KEY (stigmatization) OR TITLE-ABS-KEY (stigmatise) OR TITLE-ABS-KEY (prejudice) OR TITLE-ABS-KEY (attitude) OR TITLE-ABS-KEY (discrimination) AND TITLE-ABS-KEY (health AND workers) OR TITLE-ABS-KEY (health AND professionals) OR TITLE-ABS-KEY (medical AND workers) OR TITLE-ABS-KEY (medical AND professional)) AND PUBYEAR > 2009
Expanders	Apply equivalent subjects
Search modes	Boolean/Phrase
Number of records retrieved by the search	108 articles

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Table S3: Data extraction chart for the scoping review in mapping the evidence of drug-resistant tuberculosis-related stigma among health workers in high TB- and drug-resistant-TB burden countries

Key Domain	Sub-domain	Description
Citation details	Name of Authors	Indicate the name of the authors
	Year of Publication	Indicate the year when the article was published
	Title of Publication	Indicate the full title of the article
	DOI	Indicate, if provided
Language		Only English language
Type of publication		Identifies the article if original review, or grey
Source Title		Identifies the name of the journal
Study details	Aims/Objectives	Describe the aims and objected stated in the study
	Study location	Indicate the study sites (country or region)
	Sample characteristics	Indicate the group of health workers involved in the study
	Sample size	Indicate the number of participants in the study
	Study design	Indicate the methodology adopted e.g. qualitative, quantitative, mixed-method, case study, review.
	Data collection	Indicate the type of data (primary or secondary) and how the data was collected (e.g. interview, survey, etc.)
	Key themes or type of stigma assessed	Indicate the stigma domain (e.g. fear), if primarily identified in the title or objectives of the study
	Description of stigma association	Describe the association of stigma in the finding of the study
	Significant mediators/moderators	Indicate of interventions were identified in the study
	Key findings	Describe the main results (evidence, concept, themes) and link to the scoping review question and objectives
	Study limitations	Indicate the limitations of the study
Abstract		A copy of the study abstract

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Appendix 3C: Interpretative and Critical Research

Questions	Daftary A, Padayatchi N. 2016.	Lyakurwa et al, 2021	Probandari et al., 2019	Vanleeuw et al., 2020	Zelnick et al., 2013	Jaramillo et al., 2022
Is there congruity between the stated philosophical perspective and the research methodology?	Y	Y	Y	Y	Y	Y
Is there congruity between the research methodology and the research question or objectives?	Y	Y	Y	Y	Y	Y
Is there congruity between the research methodology and the methods used to collect data?	Y	Y	Y	Y	Y	Y
Is there congruity between the research methodology and the representation and analysis of data?	Y	Y	Y	Y	Y	Y
Is there congruity between the research methodology and the interpretation of results?	Y	Y	Y	Y	Y	Y
Is there a statement locating the researcher culturally or theoretically?	Y	Y	Y	Y	Y	Y
Is the influence of the researcher on the research, and vice-versa, addressed?	Y	Y	Y	Y	Y	Y
Are participants, and their voices, adequately represented?	Y	Y	Y	Y	Y	Y
Is the research ethical according to current criteria or, for recent studies, and is there evidence of ethical approval by an appropriate body?	Y	N	Y	Y	Y	N
Do the conclusions drawn in the research report flow from the analysis, or interpretation, of the data?	Y	Y	Y	Y	Y	Y

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Appendix 4A: Characteristics of Included Studies - Interpretive and Critical Research Form

Study	Methods for data collection and analysis	Country	Phenomena of interest	Setting/ context/ culture	Participant characteristics and sample size	Description of main results
Lyakurwa D, Lyimo J, Mulder C, Pelzer PT, Koppelaar I, Heus M. 2021.	Interview and focus group discussions analysed using thematic analysis	Tanzania	Drug-resistant TB care performance among HCWs	Drug-resistant TB facilities	454 HCWs	HCWs developed DRTB competencies after training and mentoring. HCWs main challenges un DRTB care were delays in laboratory results, stigma and workforce shortage.
Vanleeuw L, Atkins S, Zembe-Mkabile W, Loveday M. 2020.	Interview anlayzed thematically	South Africa	Perceptions and experiences of HCWs in DRTB care	Primary health care facilities and DRTB hospitals	HCWs	The introduction of DRTB care in primary care facilities created fear and anxiety among HCWs. HCWs felt unsupported and expressed feeling isolated which they feel impacts on the quality of care they provide to their patients.
Zelnick JR, Gibbs A, Loveday M, Padayatchi N, O'Donnell MR. 2013.	Key informant interview and survey questionnaire analysed using deductive analysis	South Africa	Workplace exposure to DRTB	Hospitals	55 HCWs	The key themes identified in the study were lack of infection control measures, stigma and support in workplace.

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Appendix 3B: Analytical cross-sectional

Question	Citation		
	Kanjee et al., 2011	Tudor et al., 2013	Naidoo et al., 2013
Were the criteria for inclusion in the sample clearly defined?	Y	Y	Y
Were the study subjects and the setting described in detail?	Y	Y	Y
Was the exposure measured in a valid and reliable way?	Y	Y	Y
Were objective, standard criteria used for measurement of the condition?	Y	Y	Y
Were confounding factors identified?	Y	Y	Y
Were strategies to deal with confounding factors stated?	Y	Y	Y
Were the outcomes measured in a valid and reliable way?	Y	Y	Y
Was appropriate statistical analysis used?	Y	Y	Y

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Appendix 3. Quality Assessment of the Studies

Appendix 3A: Case-series/history

	Citation	
Question	Padayatchi et al., 2010	Von Delft et al., 2016
Were there clear criteria for inclusion in the case series?	Y	Y
Was the condition measured in a standard, reliable way for all participants included in the case series?	Y	Not Clear
Were valid methods used for identification of the condition for all participants included in the case series?	Y	Not clear
Did the case series have consecutive inclusion of participants?	Y	No
Did the case series have complete inclusion of participants?	Y	Yes
Was there clear reporting of the demographics of the participants in the study?	Y	No
Was there clear reporting of clinical information of the participants?	Y	Yes
Were the outcomes or follow up results of cases clearly reported?	Y	No
Was there clear reporting of the presenting site(s)/clinic(s) demographic information?	Y	No Clear
Was statistical analysis appropriate?	y	No

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Cont. Study	Methods for data collection and analysis	Country	Phenomena of interest	Setting/ context/ culture	Participant characteristics and sample size	Description of main results
Jaramillo J. 2022.	Interview analysed using framework analysis	Philippines	Barriers associated with DRTB care service delivery	DRTB treatment facilities	272 HCWs, mainly nurses and physicians	Results identified five themes included: nurses not feeling empowered; poor infection control practices, fear and limited capacity in rural health centres, limited government support mechanisms on DRTB elimination activities.
Daftary A, Padayatchi N. 2016.	Interviews	South Africa	HCW experiences with service delivery for multi-drug resistant and extensively drug-resistant tuberculosis (MDR/XDR-TB and TB-HIV	Centralised tertiary TB site	17 health care workers (primary care nurses and doctors	A thematic result identified included 1) weak of personal infection control practices among HCWs due to work culture characterised by low motivation, disparate risk perceptions and practices, physical discomfort and problems managing patients, 2) stigma associated with MDR/XDRTB is worst that HIV and maybe perpetuated by those less familiar with the disease, 3)

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						administration restrictions, workplace norms and provider mindsets imped effective integration of HIV and MDR/XDR-TB services, 4) HCWs who struggle with daily routines of MDR/XDR-TB treatment supervision are increasingly supportive of treatment literacy and self-administration
Probandari A, Sanjoto H, Mahanani MR, Azizatunnisa L, Widayati S. 2019.	Structured questionnaire, in-depth interviews and observations analyzed using content analysis technique	Indonesia	Issues of safety and stigma among health staff	Primary health care facilities	123 health staff, 17 primary health care facilities	The knowledge and motivation to follow Multidrug-resistant TB care protocols are suboptimal. HCWs feeling unsafe is related to stigmatising attitudes in providing MDRTB care.

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Appendix 4B: Characteristics of Included Studies – Case Series/History Form

Study	Country	Setting/context	Participant characteristics	Groups	Outcomes measured	Description of main results
Padayatchi N, Daftary A, Moodley T, Madansein R, Ramjee A. 2010.	South Africa	Dry-resistant TB hospital	HCWs	5 doctors with primary DRTB	Psychological impacts of DRTB illness among doctors	Content analysis revealed five themes prolonged morbidity, psychological impact, poor infection control , weak support structures and attrition from the field.
Von Delft A, Dramowski A, Sifumba Z, Mosidi T, Ting TX, Von Delft D, et al. 2016.	South Africa	DRTB facilities in low-resource settings	Healthcare workers	3 physicians working in DRTB facilities	Physical and psychological impact of DRTB on the three physicians who got ill of the disease	The isolation and fear among healthcare workers was extreme. As they have seen their coworkers pass away from the illness, they are concerned for their safety.

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Appendix 4C: Characteristics of Included Studies - Analytical Cross-Sectional Study Form

Study	Country	Setting/context	Participant characteristics	Groups	Outcomes measured	Main description of results
Tudor C, Mphahlele M, Van der Walt M, Farley JE. 2013.	South Africa	Drug-resistant TB hospitals across South Africa	HCWs	286 nurses38 medical officers10 others	Personal concerns about HCWs fears of contracting MDR-/XDR-TB	Thematic analysis identified fears associated with the personal risks of acquiring drug-resistant TB, treatment course, financial implications, family concerns, working environment and psychosocial issues.
Naidoo A, Naidoo SS, Gathiram P, Lalloo UG. 2013.	South Africa	Public and private sector clinics and hospitals	HCWs	Female doctors (19)Male doctors (21)	Experiences, attitudes and perceptions of medical doctors following treatment for TB within the healthcare system.	Majority of the participants expressed concerns regarding lack of infection control at the workplace, delays in diagnosis, negative attitudes of senior colleagues and administrators.
Kanjee Z, Catterick K, Moll AP, Amico KR, Friedland GH. 2011.	South Africa	District hospital	HCWs (n=57)	43 female HCWs14 male HCWs	Tuberculosis infection control knowledge, attitude and practice among hospital staff	Findings showed that staff concerns involved confidentiality of staff health information, stigma of TB and HIV, inadequate resources for infection control, and patient non-compliance. Many staff were less willing to continue as healthcare worker because of staff deaths caused by TB/MDR/XDR-TB.

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Appendix 5: Study findings

Study: Tudor C, Mphahlele M, Van der Walt M, Farley JE. 2013.	
Finding	A major concern raised by HCWs was that they do not receive danger allowance for working in MDR-/XDR-TB wards and the lack of compensation they would receive if they were to acquire MDR-/XDRTB. - how the lack of compensation for illness may affect family. (C)
Illustration	Financial implications
Finding	A nurse stated, '. . . getting infected with MDR- or XDR-TB and no one cares about what happens to me'. (C)
Illustration	Feeling unsupported
Finding	"Fear of separation from family members if they needed to undergo treatment for MDR-/XDR-TB and the impact that illness would have on other family members were common concerns. Several mentioned that they were worried about dying of MDR-/XDRTB and leaving their children; Others mentioned that they were concerned about being isolated from their family for long periods of time 'to be isolated and away from family and friends." (C)
Illustration	Fear of isolation
Finding	"Several HCWs responded that they were concerned about stigma and the perceived lack of psychosocial support if they become ill." (C)
Illustration	Lack of psychosocial support
Finding	"One nurse stated, 'how will society accept you, how will your colleagues treat you?' Another nurse responded, '. . . stigma and discrimination by colleagues." (C)
Illustration	Feeling discriminated
Finding	"Several HCWs responded that they were concerned about stigma and the perceived lack of psychosocial support if they become ill." (C)
Illustration	Feeling discriminated
Finding	"...if UVG are not working, I'm threatened because I'm at risk of getting MDR/XDR-TB..." (Nurse) (C)
Illustration	Lack of equipment for infection control
Finding	"...poor ventilation, working in busy and congregate settings, working with undiagnosed MDR/XDR patients". (medical officer) (C)
Illustration	Lack of infection control
Finding	"...this hospital we don not have green N95 mask. I cannot trust the N95 that we are wearing, and we do not have UV lights". (nurse) (C)
Illustration	Lack of resources for infection control
Study: Daftary and Padayatchi (2016)	
Finding	"Suboptimal infection control practices and complacency in the workplace must be addressed through leadership and governance." (C)
Illustration	Complacent infection control practices
Finding	Junior HCWs expressed concern on nosocomial exposure due to patients no closing their mouths when coughing (C)
Illustration	Nosocomial exposure
Study: Jaramillo et al. (2022)	
Finding	"some respondents mentioned working closely with rural health units to increase local staff knowledge about TB infection control and prevention measures." (C)
Illustration	Poor infection control
Finding	"...professional development afforded to TB-hired staff which are not extended to organic staff and impact morale" (C)
Illustration	Feeling discriminated
Finding	"...low observance of infection control guidelines." (C)
Illustration	Lack of infection control
Finding	"A misinformed healthcare worker is very tragic... The stigma comes from the barangay health workers or the informal health workers who are not trained properly." (C)

Illustration	Misinformation
Study: Kanjee et al. (2011)	
Finding	"As several staff members had died from confirmed TB/MDR-TB/XDR-TB, 82.1% and 42.9% of respondents were less willing to work in high-risk areas of the hospital or to work as an HCW, respectively." (C)
Illustration	Unwillingness to work in DRTB ward
Finding	"...inconsistent cough hygiene among patients." (C)
Illustration	Fear of contracting the disease
Finding	'HCWs do not trust the health services to take care of them if they have TB.' (C)
Illustration	Feeling unsupported
Finding	'HCWs fear potential rejection and stigma from staff if they have TB.' (C)
Illustration	Feeling unsupported
Finding	'HCWs think it is shameful to admit they might have TB.' (C)
Illustration	Shame
Finding	"Facilities must enable implementation by providing an adequate supply of necessary resources, such as respirators and cough hygiene materials." (C)
Illustration	Lack of infection control
Finding	"Facilities should ensure confidentiality of staff health information and reduce the stigma of TB/HIV in order to improve HCW uptake of personal diagnosis and other risk-reduction strategies." (C)
Illustration	Concerns on confidentiality
Study: Lyakurwa et al. (2021)	
Finding	"HCWs lacked confidence in the quality of care at their facility and fear DRTB because they have no experience in treating DRTB patients and assume having a higher risk to be infected by them." (C)
Illustration	High risk of infection
Finding	"...trainers expressed their hesitations mainly due to lack of adequate facility equipment and infrastructure and insufficient infection prevention and control practices." (C)
Illustration	Inadequate infrastructure for infection control and
Study: Naidoo et al. (2013)	
Finding	"It hurts when our own well-being is jeopardized, and our own colleagues and management show an uncaring attitude towards us." (C)
Illustration	Feeling discriminated and unsupported
Finding	"Physicians regretted choosing clinical medicine as a career option, another stated being treated inappropriate by colleagues and criticised for taking sick leave; another felt angry and resentment towards TB patients for having infected them." (C)
Illustration	Feeling of anxiety
Finding	"The majority expressed concerns regarding lack of infection control at the workplace and delays in TB diagnosis." (C)
Illustration	Lack of infection control
Study: Padayatchi et al. (2010)	
Finding	"Doctors felt the personal and professional stresses of carrying on work after being diagnosed with DRTB." (C)
Illustration	Stress in providing care
Finding	"Several doctors experienced difficulty and awkwardness re-integrating into a teaching environment where their illness have been publicised." (C)

Illustration	Shame
Finding	"Doctors expressed feeling ashamed and blamed for acquiring TB as they were professionals who are expected to be fully aware of risk exposure yet ill-equipped to apply this knowledge to protect themselves. " (C)
Illustration	Shame
Finding	"...no specific strategy to mitigate airborne contagion." "Face masks were seldom available". (C)
Illustration	Lack of resources for infection control
Finding	"They were disenchanted by the bureaucratic difficulties faced with resuming work after having become patients themselves." (C)
Illustration	Weak support structure
Study: Probandari et al. (2019)	
Finding	"Staff fear of being infected and feeling afraid to talk to MDRTB patients." (C)
Illustration	Fear of contracting the disease
Finding	"Health staff stated about feeling stressed and fearful of conducting MDRTB care." (C)
Illustration	Stress in providing care
Finding	"...the study revealed that the knowledge of health staff about infection control protocols was inadequate." (C)
Illustration	Lack of knowledge in infection control
Finding	...observation in 17 PHCs showed suboptimal infrastructure and fidelity of activities to infection control protocols." (C)
Illustration	Suboptimal infection control protocols
Study: Vanleeuw et al. (2020)	
Finding	"These doctors are scared of TB patients and refer them quickly." (C)
Illustration	Fear of contracting the disease
Finding	"Majority of HCWs at primary healthcare level did not have this experience and expressed concern with the sudden addition of DR-TB patients to their daily routine." (C)
Illustration	Stress in providing DRTB care
Study: Von Delft et al. (2016)	
Finding	"The medical student with MDR tuberculosis experienced extreme social isolation, driven by a lack of understanding from family members and peers as well as the medical school administrator." (C)
Illustration	Feeling isolated
Finding	"HCWs in low-resource settings with possible tuberculosis symptoms are already wary of presenting for testing and treatment, because of stigma and career implications." (C)
Illustration	Feeling discriminated
Finding	"Fear of infecting family members." (C)

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Illustration	Fear of infection
Finding	"All HCWs, including volunteers and trainees, should have free access to appropriate occupational health services, income protection, and/or compensation in line with ILO workplace standards. Support broad social awareness campaigns that target stigma and discrimination by celebrating survivors and "normalizing" preventive and care-seeking behavior." (C)
Illustration	Lack of support in workplace
Study: Zelnick et al. (2013)	
Finding	"Patients are not diagnosed when they come in, so we are exposed." (C)
Illustration	Fear of contracting the disease
Finding	"TB is all over, so we can't get a risk allowance…the only compensation we can get is being treated free when you are diagnosed with TB. HCWs expressed frustrations over not given danger pay." (C)
Illustration	Feeling discriminated
Finding	"Lack of resources and distrust of infection control efforts among HCWs." (C)
Illustration	Lack of infection control

4.2.3 Links and implications

The application of a scoping review in research on DRTB carries significant implications for understanding the current landscape of knowledge, identifying gaps, and shaping future research directions. DRTB, being a complex and evolving public health challenge, demands an extensive synthesis of existing literature to grasp the multifaceted dimensions of its diagnosis, treatment, management, and public health implications. One of the primary implications of this scoping review was the identification of the breadth and depth of existing research, which revealed areas in DRTB that have been extensively studied and those that require further investigation. This scoping review uncovered significant drivers and facilitators that lead to stigmatisation among HCWs. These insights are crucial in assisting the researcher to prioritise the area that needs to be investigated.

This scoping review also highlighted the scarcity of data in certain DRTB-burdened countries, such as the Philippines. This finding raised the curiosity to examine the extent of DRTB stigma and its impact on healthcare facilities in the Philippines.

From a global perspective, this scoping review could spur the need for international collaborations and discussions on best practices for reducing stigma in healthcare settings. It can provide a platform for sharing experiences and strategies across countries, promoting a cohesive and efficient global response to DRTB.

CHAPTER 5: PAPER 3 – EXPLORING STIGMA AMONG HEALTHCARE WORKERS: A STUDY OF DRUG-RESISTANT TUBERCULOSIS IN THE PHILIPPINES

5.1 Introduction

Stigmatisation has emerged as a significant area of concern amidst the many challenges associated with DRTB management. In healthcare, the stigma that exists within its workforce has a substantial negative influence on the efficacy of TB control programmes and patient-centred care. This chapter delved into the extent of stigmatisation and its subtypes among HCWs delivering DRTB services in the Philippines. Additionally, it examined the association between organisational support awareness and confidence in infection control.

5.2 The publication

Original Paper

Exploring Stigma among Healthcare Workers: A Study on Drug-Resistant Tuberculosis in the Philippines

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ABSTRACT

Background: Drug-resistant tuberculosis (DRTB) is a global health concern, and its surrounding stigma exacerbates its burden. Healthcare workers (HCWs) are at the forefront of service delivery, but their efforts have been found to result in stigmatisation. In the Philippines, little is known about DRTB-related stigma among these HCWs.

Methods: We conducted an online survey in three locations in the Philippines between February and June 2022 to examine the extent of stigma and its subtypes among HCWs and the correlation between organisational support awareness and confidence in infection control. DRTB stigma was assessed using the Mental Health Professional Secondary Stigma Scale, recommended in the TB Stigma Measurement Guidance, and analysed quantitatively using a regression model.

Results: 258 HCWs (83.2%) out of 310 participated in the survey. Stigma was consistent across HCWs, with a mean score of 57.60 (SD = 10.33), which was highest in Barangay Health Workers (BHWs) (M = 59.16, SD = 10.63) and lowest for midwives (M = 53.47, SD = 12.35). BHWs experienced greater concealment, labelling, and negative effects, while medical laboratory technicians (MLTs) experienced greater fear of disease. Stigma was positively associated with awareness of organisational support in BHWs and confidence in infection control in MLTs.

Conclusions: HCWs delivering DRTB services are stigmatised, with various HCW groups impacted differently. Some HCWs face stigma despite having organisational support and confidence in infection control. This study highlights the need to recognise and understand how stigma affects diverse healthcare worker (HCW) groups to provide support and effective interventions. It recommends a targeted

strategy to address stigma related to drug-resistant tuberculosis (DRTB) for a more supportive environment for these HCWs.

Keywords:

community health; drug-resistant tuberculosis; healthcare workers; stigma

INTRODUCTION

The Philippines is among the top 10 countries with high drug-resistant tuberculosis (DRTB) prevalence [1]. In its efforts to reduce the burden of DRTB, the country utilises a holistic approach to prevention and treatment that incorporates socioeconomic factors and provides care where patients live and work [1]. It addresses a variety of factors that contribute to the emergence and spread of drug-resistant TB, including stigma[1].

DRTB is a stigmatised disease [1]. Stigma is viewed as undesirable characteristics that cause fear, disgust, guilt, or shame [2]. In our recent scoping review, we found that HCWs face stigma when providing DRTB services [3]. For example, some HCWs were found to maintain increased physical distance from individuals diagnosed with DRTB or over practise infection control [4]. In South Africa, fear of getting the disease was the leading cause, especially with delayed patient transfers, poor ventilation, and crowded waiting rooms [3]. Consequently, HCWs' well-being is affected, posing a challenge in the delivery of health services [5,6] . Stigmatisation may cause HCWs to regret working with patients, become demotivated, and increase turnover [5]. Some studies revealed that some HCWs were less willing to work in high-risk areas like DRTB or continue working as an HCW [7,8] . In the Philippines, some clinicians experienced stigma while providing DRTB care [9]; however, the extent of this stigma remains unknown.

Stangl et al. [10] recommended shifting disease norms and eliminating stigma drivers at all levels. At the facility level, TB stigma drivers can range from fear of infection to social judgment and blame [11]. However, HCWs' DRTB stigma and its intervention is understudied. In the Philippines, unlike DRTB, studies examined HCWs' stigma when treating COVID-19 and HIV/AIDS patients. The disease stigma resulted in Filipino

HCWs being bullied or even forced out of their homes [12,13]. In recent studies, HCWs were reported to experience work-related anxiety and depression [8,14,15], symptoms associated with stigma . It is, therefore, possible that the DRTB stigma influencing HCWs' mental health could also impact their livelihood. Thus, this must be investigated to facilitate timely intervention.

Making HCWs feel safe and supported needs to be addressed [16]. Studies have shown that various institutional factors, like infection control and organisational support implementation, may lead to stigma [3]. However, in the Philippines, little is known. Notably, data is lacking to inform policymakers and implementers on HCWs' DRTB stigma and its association with infection control and organisational support. To this end, we explored the extent of HCWs' DRTB-related stigma and its subtypes among HCW groups. We also examine the relationships between DRTB-related stigma and awareness of organisational support, and confidence in infection control. We sought important information that could inform the development of DRTB stigma reduction strategies for HCWs.

METHODS

Study design, population and settings

A cross-sectional study was conducted through an online survey of HCWs from community health units (CHUs) involved in DRTB diagnosis and management in three locations in the Philippines - Mandaluyong, a city in the National Capital Region, Northern and Western Samar, two provinces from the Eastern Visayas Region [17], from February to June 2022. The three locations registered 3,787 TB cases with a history of previous TB treatment in 2020 [18]. Due to the COVID-19 restrictions during sampling, the three locations were conveniently selected. The three locations comprised of 59

CHUs, manned by 310 HCWs. A CHU consists of HCWs such as Barangay Health Workers (BHWs), midwives, nurses, and physicians. BHWs are local community members trained on various health-related topics and work closely with the health facility staff. Medical laboratory technicians (MLTs) were included in the study since they provide DRTB diagnoses and participate in DRTB training regardless of location in the health facility. All HCWs from the 59 CHUs were selected in the survey.

Data collection

The study was granted ethical approval. Participants provided informed consent at the beginning of the survey.

The chief investigator trained one research assistant at each location. The local TB coordinators helped identify the participants and their email or messaging details. Participants were sent a survey link via email or messaging. If participants could not respond to the survey due to technical issues such as internet connectivity or device incompatibility, they were asked to respond to the message informing the research assistant about the issue. In such cases, the research assistant brings a tablet with internet access or questionnaire software to the health unit so that the participant can complete the survey.

DRTB stigma was measured using the Mental Health Professional Secondary Stigma Scale (MPHSSS) [19] recommended in the *TB Stigma Measurement Guidance* [20]. This study assessed stigma using four subscales: concealing, (4 items), fear of disease (3 items), labelling (4 items), and negative effects (6 items). This study substituted the word DRTB for TB. Items were scored on a 5-point Likert scale ranging from 1 (strongly disagree, lowest) to 5 (strongly agree, highest). Higher scores indicate greater stigma. Three additional items were added in the survey: awareness of organisational social

support (1 item), financial or medical support (1 item), and confidence in infection control (1 item). The translation was performed by a professional Filipino translator, allowing respondents to utilise either language. Content validity was assessed by language and subject experts. A pilot test was conducted on 15 non-representative samples, which helped identify potential issues with the questionnaire's structure, wording, and flow. A reliability test was performed using item matrix correlation.

The survey collected sociodemographic data (age, gender, years of experience as an HCW, household income, and living arrangements). Almost all participants were married, of the same religion, and had an undergraduate degree; they were omitted from the questionnaire. Supplemental files 1 and 2 elaborate on the data collection and questionnaire.

Data analysis

Descriptive analysis included means and standard deviations (SD) for the numerical variables, frequencies, and percentages for categorical variables. DRTB stigma and its sub-scales composite mean scores were obtained and compared descriptively. Based on the composite score range, thresholds were established to categorise scores into three groups: high, moderate, and low. The crude association between the predictor and stigma score was analysed using simple linear regression. A multivariable regression model was performed to determine the association between DRTB stigma and its predictors. As this analysis is exploratory, any variable with a p-value ≤ .250 was selected for the multivariate analysis to account for potentially significant covariates[21]. Utilising a p-value ≤ .250 cut-off point could help identify variables insignificantly associated with the DRTB stigma on their own but significantly contribute to the presence of other predictors [21 22]. Multivariate analysis also included

organisational support awareness and confidence in infection control regardless of their p-values to provide additional insights into the links between these factors and DRTB stigma. We report results with a p-value ≤ .050 as significant. We also report those with p-value ≤ .150 to inform potential associations between predictors and DRTB stigma that could serve as a basis for further investigation [23]. Data was analysed using SPSS V29.

RESULTS

Table 1 illustrates the descriptive analysis. Of the 310 HCWs contacted, 83.2% (n=258) participated. The participants' mean age was 45.5 years, and their mean years of experience were 14 years. Most participants were female (n=227/258, 88%) and lived with immediate family (n=179/258, 69.4%). Household income after compulsory deductions was highest for physicians and lowest for BHWs.

The HCWs' scores had a mean of 4.0 (SD = 1.11, high) for organisational social support awareness, M = 3.83 (SD = 1.31, high) for organisational financial or medical assistance awareness, and M = 4.04 (SD =.96, high) for confidence in infection control.

Table 2 illustrates the stigma and its subscale scores. HCWs' DRTB stigma score distribution was normal, with a mean of 57.60 (SD = 10.33; high) (Figure 1). BHWs scored highest (M = 59.91, SD = 10.63, high) and lowest in midwives (M = 53.47, SD = 12.35, moderate). In the sub-analysis, the BHWs scored highest in the concealing (Mean = 13.42, SD = 3.20, moderate), labelling (Mean = 12.73, SD = 3.31, moderate), and negative effects (M = 21.96; SD = 4.07, high) subscales, while the MLTs scored highest on the fear of disease (Mean = 11.67, SD = 2.31, high) subscale.

Table 1. Characteristics of HCW study participants

Characteristics	Barangay Health Worker n=88 (34%)	Medical Laboratory Technicians n=49 (19%)	Midwife n=19 (7%)	Nurse n=82 (32%)	Physician n=20 (8%)	p-value
Gender(n,%)						<.001
Male	2 (2)	6 (12)	19 (100)	21 (25)	2 (10)	
Female	86 (98)	43 (88)	0 (0)	62 (74)	18 (90)	
Age (mean, SD)	49.99 (11.8)	43.33 (11.7)	46.68 (10.9)	41.10 (11.2)	46.90 (8.9)	<.001
Years' experience as RHU worker (mean, SD)	12.60 (8.9)	13.60 (9.3)	17.05 (12.18)	14.79 (11.19)	15.02 (8.55)	.373
Living Arrangement(n,%)						.013
Living with immediate family	49 (55.7)	37 (75.5)	16 (84.2)	61 (74.4)	16 (80.0)	
Living with an extended family or friends	39 (44.3)	12 (24.5)	3 (15.8)	21 (25.6)	4 (20)	
Household Income per month (PHP) after tax (mean, SD)	5931.8 (0.52)	28792.7 (0.64)	25309.6 (0.85)	41379.0 (0.53)	86587.0 (0.81)	.001
#Awareness of organisation social support group *(mean, SD)	4.2 (1.06)	3.9 (1.05)	3.89 (1.10)	4.11 (0.92)	3.95 (1.23)	.410
#Awareness of available financial or medical support** (mean, SD)	3.97 (1.14)	4.0 (1.07)	3.68 (1.00)	4.05 (1.15)	4.25 (1.16)	.556
#Confidence in infection control *** (mean, SD)	4.07 (1.033)	3.96 (1.26)	3.84 (0.688)	4.12 (1.01)	4.0 (1.17)	.597

n count m mean *SD* standard deviation *DRTB* drug-resistant tuberculosis

PHP Philippine Peso

HCW healthcare worker (n=258)

= range of 1-5 (Low = 1-2.5; moderate = 2.6 – 3.5; high = 3.6 – 5.0)

* HCW group mean for awareness of organisational social support = 4.0 (SD = 1.11)

** HCW group mean for awareness of available financial or medical support = 3.83 (SD = 1.31)

*** HCW group mean for confidence in infection control = 4.04 (SD =.964)

p-value = Fisher-Freeman-Halton Exact Test (categorical variable)

ANOVA (continuous variables)

Table 2. DRTB stigma and its sub-scale mean score distribution among CHW groups

	All HCWs (n = 258)	BHW (n = 88)	95% CI for Mean		Laboratory (n= 49	95% CI for Mean		Midwife (n = 19)	95% CI for Mean		Nurse (n= 82)	95% CI for Mean		Physician (n=20)	95% CI for Mean	
	Mean	Mean (SD)	Low	High	Mean (SD)	Low	High	Mean (SD)	Low	High	Mean (SD)	Low	High	Mean (SD)	Low	High
*Negative effects	21.23	21.96(4.07)	20.92	23.13	21.78(5.03)	20.77	22.85	18.89(4.79)	16.58	21.20	21.00(4.53)	20.09	21.99	20.15(4.31)	18.13	22.17
**Labelling	12.07	12.73(3.31)	12.03	13.44	12.25(3.46)	11.25	13.25	11.57(4.00)	9.87	13.28	11.76(3.25)	11.05	12.48	10.35(3.46)	8.72	11.97
**Concealing	13.19	13.42(3.20)	12.74	14.09	13.32(3.26)	12.38	14.26	12.47(2.77)	11.13	13.82	13.07(3.05)	12.40	13.74	13.00(2.94)	11.62	14.37
***Fear of disease	11.19	11.20(2.25)	10.72	11.68	11.67(2.31)	11.01	12.33	10.78(3.05)	9.32	12.25	10.89(2.65)	10.31	11.47	11.50(2.98)	10.21	12.79
****Overall DRTB stigma	57.60	59.91(10.63)	56.91	61.41	59.24(9.98)	56.38	62.11	53.47(12.35)	47.52	59.43	56.65(9.66)	54.52	58.77	54.60(10.01)	50.33	58.87

*Score range: * (1-30) Low = 1-10; Moderate = 11 – 20; High = 21 -30*
*** (1-20) Low = 1-7; Moderate = 8 – 15; High = 16 - 20*
**** (1-15). Low = 1-5; Moderate = 6-10; High. = 11 - 15*
***** (1-85) Low = 1 – 28; Moderate = 29 – 55; High = 56 - 85;*

Table 3 illustrates the correlates of DRTB stigma and its predictors. A significant positive relationship existed between awareness of organisational support and stigma in BHW (β = 8.49, p =.024 for social support; β = 8.24, p = .007 for financial and medical support). After adjusting for other factors, these correlations decreased (β = 2.03, p = .085 and β = 3.34, p = .0630). A positive relationship also existed between confidence in infection control and stigma in all HCW groups. After adjusting for other factors, a positive correlation remained, notably in MLT, which is statistically significant (β = 10.32, p = .050).

Table 3. Crude and adjusted models in investigating DRTB stigma and its explanatory variables among HCWs

		Crude model				Adjusted model				
			95% CI for β				95% CI for β			
Category		β	Lower	Higher	p-value	β	Lower	Higher	p-value	VIF
Male (ref)										
Female	BHW	3.57	-13.85	20.36	.706					
	MLT	-11.35	-19.90	-2.80	.010	-10.95	-22.23	0.32	.057	1.43
	Nurse	10.95	-9.511	31.41	.290					
	Physician	-2.90	-7.19	1.38	.181	-4.82	-9.25	-.39	.033	1.11
Age	BHW	0.06	-0.15	0.28	.561					
	MLT	0.04	-0.22	0.30	.737					
	MW	-0.47	-1.07	0.13	.118	-0.531	-1.463	0.356	.198	2.49
	Nurse	-0.09	-0.33	0.06	.191	.160	-.320	.640	.508	5.54
	Physician	-0.09	-0.64	0.46	.731					
Income after compulsory deductions	BHW	2.47	7.35	2.43	.019	1.41	3.98	5.01	.250	1.15
	MLT	-2.85	-7.59	1.88	.232	-1.96	-6.74	2.82	.412	1.06
	MW	-9.69	-16.33	-3.05	.007	-10.26	-18.17	-2.35	.015	1.26
	Nurse	-2.93	-7.15	1.28	.171	-3.035	-7.54	1.48	.184	1.23
	Physician	-4.63	-10.22	0.95	.098	-1.88	-9.31	5.54	.597	1.65
Years as a community health worker?	BHW	0.17	-0.11	0.45	.231	0.371	-0.015	0.758	.057	1.09
	MLT	0.15	-0.16	0.48	.033	.331	-.432	1.09	.361	2.21
	MW	-0.23	-0.80	0.33	.398					
	Nurse	-0.13	-0.33	0.06	.191	-0.293	-0.771	0.185	.226	5.54
	Physician	-0.10	-0.68	0.46	.693					
Living with immediate family (Ref)										
Living with extended family or friends	BHW	-0.11	-3.21	2.99	.941					
	MLT	0.49	-1.35	5.79	.221	1.81	-1.21	4.82	.239	1.04
	MW	0.16	-2.88	3.20	.916					
	Nurse	0.26	-2.78	3.31	.865					

	Physician	-5.2	-15.97	5.57	.324					
Awareness of organisation support group	BHW	8.49	1.14	15.84	.024	2.03	-7.89	11.95	.085	1.88
	MLT	-3.31	-12.53	5.91	.474	-5.24	-14.70	4.21	.269	1.13
	MW	8.18	-6.97	23.35	.271	-2.16	-23.56	19.24	.522	2.39
	Nurse	-3.09	-9.44	3.25	.335	-5.72	-14.88	3.45	.218	2.07
	Physician	1.61	-2.25	5.46	.413	-.547	-37.19	36.09	.974	9.24
Awareness of available financial or medical support	BHW	8.24	2.29	14.19	.007	3.34	-3.64	10.33	.063	1.47
	MLT	0.17	-7.34	7.70	.962	-5.13	-15.11	4.85	.305	1.88
	MW	5.97	-8.05	20.00	.381	- 3.51	-14.05	21.08	.668	1.93
	Nurse	-1.92	-7.36	3.50	.482	-.429	-6.56	5.71	.890	1.27
	Physician	-2.15	-15.54	11.23	.739	-6.27	-31.08	18.57	.590	2.89
Confidence in infection control	BHW	9.07	1.77	16.3	.015	8.55	-1.46	18.56	.093	1.95
	MLT	3.4	-4.12	11.05	.363	10.32	-.210	20.84	.050	2.18
	MW	6.81	-9.81	23.44	.399	9.50	-11.73	30.73	.346	2.19
	Nurse	0.46	-5.83	6.75	.886	3.23	-6.32	12.78	.503	2.23
	Physician	5.0	-6.73	16.73	.383	4.47	-23.30	32.24	.284	4.53

Significance of p-value = .05 *Reportable value = ≤ .15*
BHW (Barangay Health Worker) *MLT (Medical laboratory technician)* *MW (Midwife)*

DISCUSSIONS

This study examined the extent of stigma around DRTB experienced by HCWs and its association with their awareness of organisational support and confidence in infection control. Similar to a previous study [24], this study revealed that HCWs experienced a greater level of stigma regarding DRTB than about TB. Other studies have shown that HCWs often express higher levels of stigma towards diseases that are perceived as more contagious [24-26], which can apply to DRTB than to TB. The disease complexity and longer duration of DRTB treatment[1] could exacerbate these perceptions, leading to increased stigma.

In Indonesia, approximately 50% of HCWs reported feeling fearful when providing DRTB care [6,16], and this study confirmed that the fear of disease is a significant driver of the stigma associated with DRTB. Interestingly, the findings showed that the experience of stigma was similar across all HCW groups, which suggests that DRTB-associated stigma is widespread and not limited to specific roles or settings.

Henceforth, this study examined the stigma subtypes influencing different groups of HCWs separately to illustrate how these groups of HCWs may experience stigma differently based on their specific roles and responsibilities. Recognising and understanding the subtle nuances of how stigma affects various HCW groups is crucial to providing appropriate support and implementing interventions that could effectively address the issues.

In this study, MLTs and physicians had the greatest fear of disease. At DRTB facilities, these HCWs are at the forefront of diagnosing and treating the disease. Since physicians work closely with patients and MLTs handle infectious specimens, their risk of disease exposure could be greater [27]. This highlights the importance of stringent safety protocols in daily operations to mitigate these risks effectively.

This study revealed that the stigma subscales of concealing, labelling and negative effects were most pronounced in BHWs. The close community interactions of BHWs may have caused these effects, but additional data are needed. BHWs provide TB services to the community, such as house-to-house visits and the referral of suspected TB cases [28]; however, stigma may surround these tasks. Previous studies revealed instances where patients labelled BHWs as unskilled, accused them of spreading gossip, or denigrated them due to their exposure to potential hazards and diseases [16,29]. Similarly, BHWs may have experienced such denigration because of their association with DRTB. More work is needed to explore these stigma experiences, their impact on work performance, and the DRTB control programme. Understanding the underlying issues of these stigmas could contribute to establishing a more supportive and enabling environment for BHWs.

This study revealed that awareness of organisational social support can reduce stigma among HCWs, except for BHWs. This finding supports the idea that awareness of

socio-emotional support can improve mental health and help individuals manage stress [30]. However, this study also revealed that BHWs experienced increased stigma despite having greater awareness of organisational social support. This finding is similar with the study that found social support was associated with TB-related stigma in TB patients [29]. It is important to note that receiving social support can sometimes lead to psychological stress, especially if it affects one's perception of support interactions and self [31]. Therefore, it is important to investigate stigma on multiple levels, including individual and societal factors [10].

The high endemicity of DRTB could put HCWs at greater risk of the disease [32]. Undoubtedly, acquiring the disease is stigmatising and has an economic burden [1]. Despite free treatment and organisational financial or medical support, DRTB is costly due to direct nonmedical costs, including food, nutritional supplements, and transportation [16,18,33]. BHWs' awareness of available financial and medical support is positively associated with stigma. Without narrative data, this study lacks discernment of this effect. However, accessing financial support could be challenging in low-income countries such as the Philippines. Financial assistance is provided if HCWs are ill [18], yet this may be insufficient to offset the disease's cost burden. Florentino et al. [33] reported that social and welfare support only reduces DRTB catastrophic costs by 13.1%. Thus, for those who are already struggling financially, inadequate support can lead to frustrations and further stigma. Unlike other HCWs, the average monthly household income of BHWs fall below the poverty threshold [17], and many of these households struggle financially. These findings suggest the need for targeted stigma interventions beyond simply raising awareness about financial and medical support to effectively address support inadequacies and cultivate a more empathetic and supportive socioeconomic environment.

Intuitively, confidence in infection control implies that HCWs can implement and follow workplace infection control measures, including understanding guidelines and protocols. This study revealed that HCWs' confidence in infection control does not reduce stigma, consistent with previous studies [5-7,16,25]. The stigma may be due to disease fear, distrust, or suboptimal infection control practices of others [5-7,16,25]. Therefore, confidence in infection control may not buffer perceived stigma. More work is needed to understand the intricate relationship between stigma and infection control.

This study revealed various relationships between stigma and HCW characteristics, implying that stigma affects various HCW groups differently. BHWs were found to be stigmatised more than other HCWs, consistent with a South African study that found that support staff are more likely to experience TB stigma than medical staff [24]. In other studies, HCWs' age, gender, income and years of experience were found to contribute to increased stigma [21,34]. The findings of this study showed a weak association between stigma and participant age and years of experience and a strong correlation between lower income and stigma. Living with extended family or friends has the potential to increase stigma. Reasonably, extra household contacts, such as relatives and friends, could increase one's risk of contracting DRTB, particularly if the extra household contact was previously infected or had developed the disease. This study was unable to discern the association between gender and stigma among HCWs. The most likely explanation is that our sampling approach resulted in high collinearity between gender and HCWs, which is unsurprising given that the medical profession in the Philippines is female-dominated [35]. Although some of the associations between explanatory variables and stigma may be attributable to chance, the findings of this study could offer significant insights for future research to understand the stigma component and how stigma may interact with other HCW group

characteristics. A longitudinal study to further explore HCW group differences in the development of DRTB stigma over time could provide a more nuanced understanding of specific factors contributing to stigma.

LIMITATIONS

This study has limitations. This study surveyed only three locations in the Philippines, so the findings may not represent the entire HCW population. The sample size was small, and the nature of study was cross-sectional, possibly lacking the power to identify some factors associated with TDRB stigma. We attempted to mitigate this by selecting model variables with a P-value = .25 or lower, however report values with p-value ≤ .15 [21]. A large-scale longitudinal study could better explain the extent of stigma. The data were collected at a single point, so this study cannot reveal how the stigma developed. A robust prospective study design could explore stigma over time and uncover its causes and drivers. The questions about organisational support and infection control were focused on HCWs' self-awareness; the details of these questions could have helped HCWs understand their association with stigma.

Nonetheless, this study verified the prevalence of DRTB stigma among Filipino HCWs and its varied impact across various HCW subgroups. Investigating this phenomenon may apply beyond the Philippines, especially to DRTB-endemic nations. Recognising and understanding the stigma confronting HCWs could offer valuable information to policymakers, programme managers, and researchers worldwide in the development of stigma strategies tailored to the specific needs and perspectives of diverse HCW groups.

This study underscores the significant impact of stigma within healthcare settings on HCWs, influencing their attitudes and behaviours towards patients and peers. The

findings from this study can be leveraged to develop targeted interventions to reduce stigma, thereby improving patient care and fostering positive interactions among healthcare workers. Additionally, gaining insight into the psychological mechanisms driving DRTB stigma can inform comprehensive strategies to cultivate empathy and ethical conduct in healthcare settings. This is crucial not only for improving patient outcomes in cases of stigmatised conditions such as DRTB but also for bolstering the overall efficacy of healthcare systems in managing infectious diseases.

Additionally, this study validated the adapted MHPSSS questionnaire recommended in the TB Stigma Measurement Guidance [20]. This validation strengthens the creditability and usefulness of the MHPSSS instrument, allowing other researchers to employ it confidently.

CONCLUSION

HCWs providing DRTB services are stigmatised, with various HCW groups impacted differently. Confidence in infection control and awareness of organisational support do not always mitigate stigma, particularly in BHWs and MLTs. This study emphasises the significance of recognising and understanding the subtle ways in which stigma impacts diverse groups of HCWs to provide the proper support and implement effective interventions to address these issues. Henceforth, a targeted strategy for addressing DRTB stigma to foster a more accepting and supportive environment for these HCWs is recommended and could improve HCWs' well-being, patient service delivery, and outcomes. Additional research is required to obtain a more comprehensive picture of the DRTB stigma that these HCWs face.

DECLARATIONS

ETHICAL APPROVAL AND CONSENT TO PARTICIPATE

The University of Southern Queensland (H21REA254F1) and the local TB Committees granted the study ethical approval. All participants provided informed consent at the beginning of the survey.

CONSENT FOR PUBLICATION

This manuscript does not contain identifiable data. The authors affirm that the research participants consented to publish their unidentifiable data.

AVAILABILITY OF DATA

The datasets generated and analysed during the current study are not publicly available because they represent an excerpt of ongoing research, but they are available upon reasonable request from the corresponding author.

COMPETING OF INTEREST

The authors declare no competing interests.

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AUTHORS' CONTRIBUTIONS

All authors contributed to the conception and design. Material preparation, data collection and analysis were performed by Lolita Liboon, Prajwal Gyawali and Rashidul Mahumud Alam. Manuscript preparation was performed by Lolita Liboon. Review and editing were performed by Khorshed Alam. Prajwal Gyawali and Rashidul Mahumud Alam. Supervision was performed by Khorshed Alam.

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SUPPLEMENTAL MATERIALS

Supplemental Files: The instrument, data collection and aggregated data

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Supplemental file 1. The Survey Instrument

The survey questionnaire was adapted from the Mental Health Professional Secondary Stigma Scale(1) recommended in the TB Stigma Measurement Guidance (2). The adapted questionnaire created by van der Land et al.(2) recommended 20 items in assessing secondary TB stigma with five stigma subscales: concealing, fear of disease, labelling, negative effects, and peril. This study used 17 of the 20 recommended items (Table 1) with four subscales: concealing, fear of disease, labelling, and negative effects. This study substitutes the word DRTB for TB. Items were scored on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Higher scores indicate more experience with stigma.

The Reduction Process:

The reduction process was employed to refine the questionnaire by eliminating redundant, irrelevant, or low-quality questions (3). This rigorous process enhanced the questionnaire's focus, respondent engagement, and the quality of the data collected (3).

Pilot Testing*:*
A pilot test of the questionnaire was conducted on a 15-representative sample of the target population. The pilot test helped identify potential issues with the questionnaire's structure, wording, and flow. The questionnaire was in English and Filipino (the Philippine national language). A professional Filipino translator translated it. Experts in the fields of language and subject performed the content validity. After the reduction, we conducted another round of testing to ensure that the revised questionnaire performed well.

Item Analysis using SPSS Version 29:
After collecting the pilot test data, perform item analysis to evaluate the effectiveness of each question. The questionnaire used 17 out of twenty items. Two items were deleted because they received consistent negative feedback during piloting.

Item-Total Correlation (See Appendix)
The Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy and Bartlett's Test of Sphericity are critical in assessing the dataset's appropriateness for factor analysis (3). The KMO measure varies between 0 and 1, with higher values indicating that the data set is more suitable for factor analysis (1). A KMO value of .851 suggests that the

majority of variance in the variables can be explained by underlying factors, making factor analysis a suitable method for this data (3).

The chi-square statistic of 1272.288 with 153 degrees of freedom and a p-value < .001 strongly indicates that the observed correlation matrix significantly differs from an identity matrix. This means significant relationships between the variables support the suitability of factor analysis.

In summary, the KMO value suggests that the data is well-suited for factor analysis, and the significant Bartlett's test indicates that the variables are sufficiently interrelated for the analysis. Together, these tests validate the appropriateness of applying factor analysis to your dataset.

Factor Analysis

Principal Component Analysis was used to identify the underlying structure of the data (4). This method helps determine which items are clustered together. It helps eliminate items that do not load well on any factor. A rotation method, Equamax with Kaiser Normalization, resulted in 17 items loading in four clusters; one item did not load well (<.300) on any factor, thus being eliminated. The first subscale, negative effects, consists of 6 items and measures the degree to which HCWs elicited a negative reaction, like disgust, from the community. The second subscale, labelling, consists of 4 items and measures the degree to which HCWs are associated with their DRTB patients. The third subscale, concealability, consists of 4 items and measures the degree to which HCWs hide their involvement with DRTB patients from others. The fourth subscale, fear of infection, consists of 3 items and measures the degree to which HCWs feel unsafe and are worried due to their involvement with DRTB patients. Internal consistency for the overall scale and subscale was examined using Cronbach's alpha. Cronbach's alpha for the overall scale was .77; .784 for negative effects (6 items), .734 for labelling (4 items), .681 for concealability (4 items) and .750 for fear (3 items).

Reliability Analysis:

Confirmatory factor analysis shows the fit indices of the survey instrument. Comparative Fit Index (CFI) = 0.933, Goodness of fit Index (GFI) = 0.923, and Root Mean Square Error of Approximation (RSMEA) = 0.054 indicated a good model fit, although the Adjusted Goodness of Fit (AGFI) = 0.891 and Normed Fit Index (NFI) = 0.859 are slightly lower than the reference (0.9). Byrne(4) described a good fit model

as those with CFI higher than 0.93, AGFI, GFI and NFI higher than 0.9, and RMSEA lower than 0.06. Hu and Bentler(5) posit that an acceptable model is one that has two of three fit indices indicating good fit. Overall Cronbach's alpha (0.77) and CR (.72 - .86) values suggest acceptable reliability(6). Except for one variable with a factor loading of 0.59, all other factor loadings exhibited acceptable values. Average Variance Extracted (AVE) values suggest average convergent validity, however, the concealability sub-scale (AVE = .47) is slightly lower than the recommended score of 0.50(3).

Table 1. Item analysis, Confirmatory factor analysis, Goodness of fit, reliability and validity tests

Description	Factor loading	Cronbach alpha	Average Variance Extracted (AVE)	Composite Reliability (CR)
Component 1 (Negative effects)		.784	.53	.89
People sometimes seem disgusted when they find out that my patients have drug-resistant TB.	0.645			
People sometimes talk to me about how they find my drug-resistant TB patients that I work with to be disgusting	0.741			
People tell me that the drug-resistant-TB patients I work with can be dangerous	0.680			
People often become uneasy when they learn that my patients have drug-resistant TB	0.727			
Sometimes even my family and friends seem disgusted that the kind of patients I work with have drug-resistant TB	0.658			
At times, family and friends tell me that I am in danger because the type of patients I work with have drug-resistant TB	0.658			
Component 2 (Labelling)		.734	.48	.73
People will always associate me with patients who have drug-resistant TB.	0.699			
I usually don't talk about what I do for a living to people that I have just met.	0.712			
I try not to talk about what I do for a living unless I am asked directly.	0.592			
At times, people hold me responsible for the poor choices made by my patients who have drug-resistant TB	0.789			
Component 3 (Concealability)		.681	.58	.82
People sometimes think that my drug-resistant TB patients can never really get cured.	0.775			
People have strong negative reactions when they learn that I work with drug-resistant TB patients	0.689			
At times, I feel stigmatized by others because the type of patients I work with have drug-resistant TB	0.672			
I feel that it is important to talk with my family and friends about the type of problems my patients usually face	0.652			
Component 4 (Fear of infection)		.750	.67	.89
I worry that I could get infected by my patients who have drug-resistant TB.	0.810			
At times, I am fearful of my patients who have drug-resistant TB.	0.807			
I would rather work with other community health programs than being assigned to case find, contact trace, screen or treat drug-resistant TB	0.656			

Fit indices: Overall Cronbach alpha.77 ; CFI = .933 ; NFI = .859; RMSEA = .054; GFI = .923; AGFI = .891

*Questions were adopted from the Mental Health Professional Secondary Stigma Scale (Jesse, 2015); categorization adopted from TB Stigma Measurement Guidance (2).

Addition of relevant research questions

We aim to achieve two objectives by including questions about awareness of organisational support and confidence in infection control in the survey questionnaire that primarily focuses on DRTB stigma among HCWs. First, understanding the extent of knowledge on the support provided by the organisation allows us to determine the perceived assistance that HCWs receive in addressing the stigma associated with drug-resistant tuberculosis (DRTB). This is essential for promoting an inclusive and supportive healthcare setting. Second, assessing the confidence level in infection control methods is crucial, as this directly indicates the trust in the system's ability to prevent the spread of drug-resistant tuberculosis (DRTB). This trust has a significant impact on HCWs' attitudes. These observations could help in the creation of a focused strategy that tackles both the structural and psychological elements of DRTB stigma.

Supplemental file 2: Data Collection Methodology

Obtaining Permission to Conduct the Survey

Proposal Submission:
The initial step in our process was to draft a detailed proposal outlining our survey's objectives, methodology, and significance. This proposal was submitted to the University of Queensland Ethics Committee and the local TB Program Committee.

Ethical Considerations:
Our proposal included a comprehensive section on ethical considerations, highlighting our commitment to participants' privacy, consent, and the non-invasive nature of our data collection.

Approval:
Upon thorough review, we received approval to proceed with our survey. This step ensured that all our planned procedures followed the required ethical guidelines and regulations. University of Southern Queensland (UniSQ) Ethics Approval (HREC: H21REA254F1) and approval letter from local TB program management.

Coordination and Research Assistant Training

The proposed research was meticulously prepared, outlining its objectives and methodology and highlighting its importance and potential implications for the DRTB

program. Before the research began, formal approval from the TB program management was obtained to prioritise transparency and collaboration,

The lead researcher, the TB coordinator, and the research assistants developed a clear line of contact to permit continual conversations and input, keeping the TB program coordinators informed throughout the study process. This collaborative approach was critical in establishing the value of the study and instilling a sense of ownership and engagement among key stakeholders (TB program and HCWs).

Identification of research assistants:

We appointed experienced research assistants to oversee the survey process. The research assistants were outsourced locally and chosen based on their data collection expertise and ability to manage research teams efficiently.

Training of Research Assistants:

The principal researcher trained the research assistants. The training covered understanding the survey's objectives, mastering the data collection tools, and adhering to ethical guidelines.

Distribution of Contact Details:

The local TB coordinators provided the research assistants with the email and messaging details of the participants. The coordinators also helped identify the public health units with potential internet connectivity or device issues.

This ensured a streamlined communication process and facilitated the efficient collection of data.

Demographic data

The method used in collecting demographic data was carefully designed to be thorough, ethical, and very efficient. The data collection activities were targeted and pertinent. The demographic data included in the questionnaire was constructed based on preliminary document scanning results.

Scanning of Documents:

As part of our data collection, we conducted a thorough scanning of available documents and records to gather preliminary demographic information about our participants.

Initial Findings:

The preliminary scanning revealed that a significant majority of participants shared common demographic characteristics: almost all were married, shared the same religion, and possessed an undergraduate degree.

Omission of Redundant Data Points:

Based on the preliminary findings, we decided to omit questions related to marital status, religion, and educational background from the questionnaire. This decision was made to avoid redundancy, as these data points were already well-established through document scanning.

Survey Dissemination:

310 participants from 59 public health units were sent a survey link via email or messaging. The link contained information about the study's objectives and rationale, informed consent, participant demographic details, and the survey questionnaires. If a participant could not respond to the survey due to technical issues such as internet connectivity or device incompatibility, they were asked to respond to the message to inform the researcher assistant about the issue. In such cases, the research assistant brings a tablet with internet access or questionnaire software to the health unit for the participant to complete the survey.

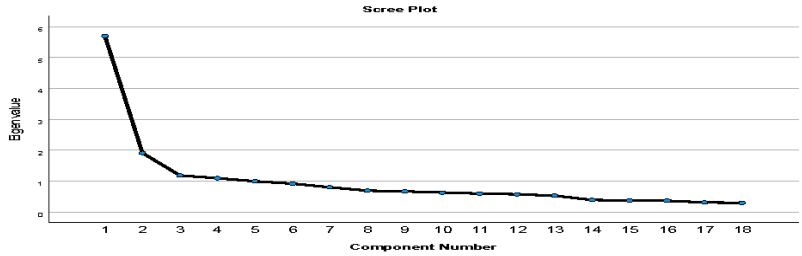
Item Correlation Matrix

Question	1	2	3	4	5	6	7	8	9	10	11	14	16	17	18	19	20
1	1																
2	0.598	1															
3	0.262	0.409	1														
4	0.523	0.489	0.329	1													
5	0.376	0.385	0.366	0.446	1												
6	0.298	0.345	0.418	0.358	0.307	1											
7	0.3	0.211	0.163	0.153	0.187	0.261	1										
8	0.394	0.314	0.292	0.382	0.329	0.288	0.43	1									
9	0.141	0.159	0.058	0.205	0.257	0.169	0.231	0.32	1								
10	0.253	0.202	0.161	0.216	0.318	0.26	0.22	0.456	0.408	1							
11	0.265	0.171	0.173	0.207	0.362	0.256	0.246	0.253	0.391	0.573	1						
14	0.182	0.142	0.071	0.181	0.225	0.099	0.245	0.14	0.295	0.24	0.273	1					
16	0.265	0.164	0.153	0.217	0.187	0.167	0.134	0.263	0.171	0.342	0.314	0.139	1				
17	0.254	0.231	0.192	0.283	0.296	0.252	0.215	0.252	0.321	0.293	0.281	0.279	0.225	1			
18	0.252	0.201	0.172	0.244	0.356	0.175	0.187	0.191	0.272	0.264	0.271	0.164	0.17	0.559	1		
19	0.119	0.121	0.187	0.234	0.39	0.086	0.097	0.211	0.274	0.296	0.412	0.086	0.123	0.199	0.224	1	
20	0.191	0.184	0.037	0.192	0.279	0.169	0.175	0.234	0.338	0.326	0.342	0.122	0.199	0.228	0.286	0.444	1

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.851
Bartlett's Test of Sphericity	Approx. Chi-Square	1272.288
	df	153
	Sig.	<.001

Scree Plot



Component Matrix

Component Transformation Matrix

Component	1	2	3	4
1	.524	.544	.476	.450
2	.753	-.643	-.134	.041
3	.213	.439	-.863	.134
4	-.335	-.315	-.105	.882

Extraction Method: Principal Component Analysis.

Rotation Method: Equamax with Kaiser Normalization.

Rotated Component Matrix[a]

	Component			
	1	2	3	4
Q1People sometimes seem disgusted when they find out that my patients have drug-resistant TB	.647	.087	.123	.348
Q2People sometimes talk to me about how they find my drug-resistant TB patients that I work with to be disgusting	.761	.055	.046	.193
Q3People tell me that the drug-resistant-TB patients I work with can be dangerous	.659	.043	.121	.096
Q4People often become uneasy when they learn that my patients have drug-resistant TB	.727	.151	.175	.065
Q5Sometimes even my family and friends seem disgusted that the kind of patients I work with have drug-resistant TB	.559	.434	.253	.017
Q6At times, family and friends tell me that I am in danger because the type of the type of patients I work with have drug-resistant TB	.533	-.041	.245	.286
Q7People sometimes think that my drug-resistant TB patients can never really get well	.109	.011	.094	.775
Q8People have strong negative reactions when they learn that I work with drug-resistant	.332	.186	.094	.689
Q10At times, I feel stigmatized by others because the type of patients I work wi	.063	.335	.208	.672
Q11People will always associate me with patients who have drug-resistant TB.	.112	.668	.143	.305
Q12I usually don't talk about what I do people that I have just	-.035	.643	.247	.210
Q14I try not to talk about what I do for a living unless I am asked directly.	.015	.543	.215	.341
Q16I feel that it is important to talk with my family and friends about the type	.126	.179	.227	.652
Q17I worry that I could get infected by my patients who have drug-resistant TB.	.127	.126	.810	.167
Q18At times, I am fearful of my patients who have drug-resistant TB.	.168	.134	.807	.037
Q19At times, people hold me responsible for the poor choices made by my patients	.200	.789	.055	-.080
Q20I would rather work with other community health programs than being assigned	.096	.199	.656	.092

Extraction Method: Principal Component Analysis.

Rotation Method: Equamax with Kaiser Normalization.

a. Rotation converged in 7 iterations.

Extraction Method: Principal Component Anal

Total Variance Explained

	Initial Eigenvalues			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.695	31.637	31.637	2.826	15.701	15.701
2	1.911	10.616	42.253	2.809	15.607	31.308
3	1.182	6.566	48.819	2.217	12.317	43.626
4	1.094	6.079	54.898	2.029	11.273	54.898
5	.993	5.515	60.414			
6	.917	5.097	65.511			
7	.798	4.433	69.944			
8	.690	3.832	73.776			
9	.667	3.706	77.482			
10	.629	3.493	80.975			
11	.596	3.309	84.284			
12	.572	3.179	87.462			
13	.527	2.930	90.393			
14	.389	2.163	92.556			
15	.371	2.062	94.618			
16	.363	2.019	96.637			
17	.309	1.716	98.353			
18	.296	1.647	100.000			

Extraction Method: Principal Component Analysis.

Negative Effects - Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.784	.785	6

Item Statistics

	Mean	Std. Deviation	N
Q1People sometimes seem disgusted when they find out that my patients have drug-	3.62	1.188	255
Q2People sometimes talk to me about how they find my drug-resistant TB patients	3.64	1.088	255
Q3People tell me that the drug-resistant-TB patients I work with can be dangerou	3.75	.985	255
Q4People often become uneasy when they learn that my patients have drug-resista	3.52	1.132	255
Q5Sometimes even my family and friends seem disgusted that the kind of patients	3.22	1.190	255
Q6At times, family and friends tell me that I am in danger because the type of	3.54	1.135	255

Inter-Item Correlation Matrix

	Q1People sometimes seem disgusted when they find out that my patients have drug-	Q2People sometimes talk to me about how they find my drug-resistant TB patients	Q3People tell me that the drug-resistant-TB patients I work with can be dangerou	Q4People often become uneasy when they learn that my patients have drug-resista	Q5Sometimes even my family and friends seem disgusted that the kind of patients	Q6At times, family and friends tell me that I am in danger because the type of
Q1People sometimes seem disgusted when they find out that my patients have drug-	1.000	.536	.310	.524	.375	.307
Q2People sometimes talk to me about how they find my drug-resistant TB patients	.536	1.000	.334	.414	.322	.300
Q3People tell me that the drug-resistant-TB patients I work with can be dangerou	.310	.334	1.000	.360	.370	.423
Q4People often become uneasy when they learn that my patients have drug-resista	.524	.414	.360	1.000	.455	.337
Q5Sometimes even my family and friends seem disgusted that the kind of patients	.375	.322	.370	.455	1.000	.305
Q6At times, family and friends tell me that I am in danger because the type of	.307	.300	.423	.337	.305	1.000

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	3.548	3.220	3.745	.525	1.163	.032	6

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Q1People sometimes seem disgusted when they find out that my patients have drug-	17.67	14.986	.588	.411	.738
Q2People sometimes talk to me about how they find my drug-resistant TB patients	17.64	15.923	.541	.339	.750
Q3People tell me that the drug-resistant-TB patients I work with can be dangerou	17.54	16.777	.503	.279	.760
Q4People often become uneasy when they learn that my patients have drug-resista	17.76	15.196	.603	.386	.734
Q5Sometimes even my family and friends seem disgusted that the kind of patients	18.07	15.574	.512	.281	.758
Q6At times, family and friends tell me that I am in danger because the type of	17.75	16.309	.459	.240	.770

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
21.29	21.804	4.669	6

ANOVA with Friedman's Test and Tukey's Test for Nonadditivity

			Sum of Squares	df	Mean Square	Friedman's Chi-Square	Sig
Between People			923.017	254	3.634		
Within People	Between Items		41.072	5	8.214	10.485	<.001
	Residual	Nonadditivity	2.115[a]	1	2.115	2.704	.100
		Balance	992.813	1269	.782		
		Total	994.928	1270	.783		
	Total		1036.000	1275	.813		
Total			1959.017	1529	1.281		

Grand Mean = 3.55

a. Tukey's estimate of power to which observations must be raised to achieve additivity = 2.037.

Labelling - Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.734	.740	4

Item Statistics - Labelling

	Mean	Std. Deviation	N
Q11People will always associate me with patients who have drug-resistant TB.	2.91	1.185	253
Q12I usually don't talk about what I do for a living to people that I have just	3.13	1.253	253
Q14I try not to talk about what I do for a living unless I am asked directly.	3.55	1.145	253
Q19At times, people hold me responsible for the poor choices made by my patients	2.93	1.172	253

Inter-Item Correlation Marix - Labelling

	Q11People will always associate me with patients who have drug-resistant TB.	Q12I usually don't talk about what I do for a living to people that I have just	Q14I try not to talk about what I do for a living unless I am asked directly.	Q19At times, people hold me responsible for the poor choices made by my patients
Q11People will always associate me with patients who have drug-resistant TB.	1.000	.496	.369	.419
Q12I usually don't talk about what I do for a living to people that I have just	.496	1.000	.319	.338
Q14I try not to talk about what I do for a living unless I am asked directly.	.369	.319	1.000	.349
Q19At times, people hold me responsible for the poor choices made by my patients	.419	.338	.349	1.000

Summary Item Statistics - Labelling

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	3.131	2.913	3.553	.640	1.220	.088	4

Item-Total Statistics - Labelling

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Q11People will always associate me with patients who have drug-resistant TB.	9.61	6.294	.520	.388	.746
Q12I usually don't talk about what I do for a living to people that I have just	9.40	5.836	.559	.422	.749
Q14I try not to talk about what I do for a living unless I am asked directly.	8.97	7.702	.580	.326	.753
Q19At times, people hold me responsible for the poor choices made by my patients	9.59	7.409	.515	.252	.732

Scale Statistics -Labelling

Mean	Variance	Std. Deviation	N of Items
12.53	10.790	3.285	4

ANOVA with Friedman's Test and Tukey's Test for Nonadditivity _ Labelling

				df	Mean Square	Friedman's Chi-Square	Sig
Between People			679.771	252	2.698		
Within People	Between Items		67.094	3	22.365	22.645	<.001
	Residual	Nonadditivity	3.675[a]	1	3.675	3.734	.054
		Balance	742.981	755	.984		
		Total	746.656	756	.988		
	Total		813.750	759	1.072		
Total			1493.521	1011	1.477		

Grand Mean = 3.13

a. Tukey's estimate of power to which observations must be raised to achieve additivity = 1.894.

Conceal - Reliability Statistics

Item Statistics - Conceal

	Mean	Std. Deviation	N
Q7People sometimes think that my drug-resistant TB patients can never really get well	3.25	1.206	257
Q8People have strong negative reactions when they learn that I work with drug-resistant	3.27	1.137	257
Q10At times, I feel stigmatized by others because the type of patients I work wi	3.16	1.198	257
Q16I feel that it is important to talk with my family and friends about the type	3.44	1.148	257

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.681	.683	4

Inter-Item Correlation Matrix - Conceal

	Q7People sometimes think that my drug-resistant TB patients can never really ge	Q8People have strong negative reactions when they learn that I work with drug-r	Q10At times, I feel stigmatized by others because the type of patients I work wi	Q16I feel that it is important to talk with my family and friends about the type
Q7People sometimes think that my drug-resistant TB patients can never really ge	1.000	.419	.336	.316
Q8People have strong negative reactions when they learn that I work with drug-r	.419	1.000	.395	.315
Q10At times, I feel stigmatized by others because the type of patients I work wi	.336	.395	1.000	.371
Q16I feel that it is important to talk with my family and friends about the type	.316	.315	.371	1.000

Summary Item Statistics - Conceal

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	3.283	3.163	3.444	.280	1.089	.014	4

Item-Total Statistics - Conceal

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Q7People sometimes think that my drug-resistant TB patients can never really ge	9.88	6.427	.405	.278	.756
Q8People have strong negative reactions when they learn that I work with drug-r	9.86	5.668	.615	.399	.686
Q10At times, I feel stigmatized by others because the type of patients I work wi	9.97	6.101	.474	.493	.600
Q16I feel that it is important to talk with my family and friends about the type	9.69	6.801	.472	.489	.678

Scale Statistics - Conceal

Mean	Variance	Std. Deviation	N of Items
13.13	9.748	3.122	4

ANOVA with Friedman's Test and Tukey's Test for Nonadditivity - Conceal

			Sum of Squares	df	Mean Square	Friedman's Chi-Square	Sig
Between People			623.875	256	2.437		
Within People	Between Items		10.563	3	3.521	3.448	.016
	Residual	Nonadditivity	2.495[a]	1	2.495	2.449	.118
		Balance	781.691	767	1.019		
		Total	784.187	768	1.021		
	Total		794.750	771	1.031		
Total			1418.625	1027	1.381		

Grand Mean = 3.28

a. Tukey's estimate of power to which observations must be raised to achieve additivity = 3.048.

Fear - Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.750	.759	3

Item Statistics – Fear

	Mean	Std. Deviation	N
Q17I worry that I could get infected by my patients who have drug-resistant TB.	3.93	1.089	257
Q18At times, I am fearful of my patients who have drug-resistant TB.	3.75	1.119	257
Q20I would rather work with other community health programs than being assigned	3.12	1.126	257

Inter-Item Correlation Matrix – Fear

	Q17I worry that I could get infected by my patients who have drug-resistant TB.	Q18At times, I am fearful of my patients who have drug-resistant TB.	Q20I would rather work with other community health programs than being assigned
Q17I worry that I could get infected by my patients who have drug-resistant TB.	1.000	.562	.382
Q18At times, I am fearful of my patients who have drug-resistant TB.	.562	1.000	.331
Q20I would rather work with other community health programs than being assigned	.382	.331	1.000

Summary Item Statistics - Fear

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	3.597	3.117	3.926	.809	1.260	.181	3

Item-Total Statistics – Fear

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Q17I worry that I could get infected by my patients who have drug-resistant TB.	6.86	3.102	.573	.318	.776
Q18At times, I am fearful of my patients who have drug-resistant TB.	7.04	2.901	.512	.333	.708
Q20I would rather work with other community health programs than being assigned	7.67	3.807	.554	.457	.719

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
10.79	6.104	2.471	3

ANOVA with Friedman's Test and Tukey's Test for Nonadditivity

			Sum of Squares	df	Mean Square	Friedman's Chi-Square	Sig
Between People			520.885	256	2.035		
Within People	Between Items		92.898	2	46.449	55.595	<.001
	Residual	Nonadditivity	3.337[a]	1	3.337	4.018	.046
		Balance	424.432	511	.831		
		Total	427.769	512	.835		
	Total		520.667	514	1.013		
Total			1041.551	770	1.353		

Grand Mean = 3.60

a. Tukey's estimate of power to which observations must be raised to achieve additivity = .171.

Supplement file 3.

Supplemental 3A: Descriptive statistics of stigma sub-scales

Table 3. DRTB stigma and its sub-scale mean score distribution among CHW groups

		BHW			Laboratory			Midwife			Nurse			Physician			
		(n = 88)	95% CI for mean		(n= 49	95% CI for mean		(n = 19)	95% CI for mean		(n= 82)	95% CI for mean		(n=20)	95% CI for mean		
	Mean	Mean (SD)	Lower Bound	Higher Bound	Mean (SD)	Lower Bound	Higher Bound	Mean (SD)	Lower Bound	Higher Bound	Mean (SD)	Lower Bound	Higher Bound	Mean (SD)	Lower Bound	Higher Bound	p-value
Negative effects	21.23	21.96(4.07)	20.92	23.13	21.78(5.03)	20.77	22.85	18.89(4.79)	16.58	21.20	21.00(4.53)	20.09	21.99	20.15(4.31)	18.13	22.17	.075
Labelling	12.07	12.73(3.31)	12.03	13.44	12.25(3.46)	11.25	13.25	11.57(4.00)	9.87	13.28	11.76(3.25)	11.05	12.48	10.35(3.46)	8.72	11.97	.064
Concealing	13.19	13.42(3.20)	12.74	14.09	13.32(3.26)	12.38	14.26	12.47(2.77)	11.13	13.82	13.07(3.05)	12.40	13.74	13.00(2.94)	11.62	14.37	.779
Fear of disease	11.19	11.20(2.25)	10.72	11.68	11.67(2.31)	11.01	12.33	10.78(3.05)	9.32	12.25	10.89(2.65)	10.31	11.47	11.50(2.98)	10.21	12.79	.434
Overall DRTB stigma	57.60	59.91(10.63)	56.91	61.41	59.24(9.98)	56.38	62.11	53.47(12.35)	47.52	59.43	56.65(9.66)	54.52	58.77	54.60(10.01)	50.33	58.87	.069

Score range: Negative effects (1-30)Labelling (1-20); Concealling (1-20); Fear (1-15); DRTB stigma (1-85)

Significant p-value = < .05

Reportable p-value = ≤ .25

Supplemental 2B: Descriptive statistics of stigma sub-scales by HCW groups

Descriptives

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean Lower Bound	95% Confidence Interval for Mean Upper Bound	Min	Max
All Stigma	Barangay Health Workers	88	59.16	10.634	1.134	56.91	61.41	29	82
	Laboratory	49	59.24	9.980	1.426	56.38	62.11	34	75
	Midwife	19	53.47	12.353	2.834	47.52	59.43	18	66
	Nurse	82	56.65	9.656	1.066	54.52	58.77	19	73
	Physician	20	54.60	9.127	2.041	50.33	58.87	27	67
	Total	258	57.60	10.330	.643	56.34	58.87	18	82
Component 1	Barangay Health Workers	88	21.96	4.077	.583	20.79	23.13	10	30
	Laboratory	49	21.78	5.027	.536	20.72	22.85	12	30
	Midwife	19	18.89	4.795	1.100	16.58	21.21	7	26
	Nurse	82	21.00	4.532	.501	20.00	22.00	7	30
	Physician	20	20.15	4.320	.966	18.13	22.17	10	29
	Total	258	21.23	4.674	.291	20.66	21.80	7	30
Component 2	Barangay Health Workers	88	12.74	3.317	.354	12.04	13.44	5	20
	Laboratory	49	12.24	3.461	.494	11.25	13.24	4	19
	Midwife	19	11.58	3.533	.810	9.88	13.28	4	19
	Nurse	82	11.77	3.256	.360	11.05	12.48	4	18
	Physician	20	10.35	3.468	.776	8.73	11.97	4	14
	Total	258	12.07	3.391	.211	11.65	12.48	4	20
Component 3	Barangay Health Workers	88	13.42	3.205	.342	12.74	14.10	5	20
	Laboratory	49	13.33	3.268	.467	12.39	14.27	4	20
	Midwife	19	12.47	2.776	.637	11.14	13.81	4	18
	Nurse	82	13.07	3.050	.337	12.40	13.74	4	19
	Physician	20	13.00	2.938	.657	11.62	14.38	6	18
	Total	258	13.19	3.106	.193	12.81	13.57	4	20
Component 4	Barangay Health Workers	88	11.20	2.250	.240	10.73	11.68	5	15
	Laboratory	49	11.67	2.313	.330	11.01	12.34	6	16
	Midwife	19	10.79	3.047	.699	9.32	12.26	3	15
	Nurse	82	10.89	2.653	.293	10.31	11.47	3	15
	Physician	20	11.50	2.763	.618	10.21	12.79	3	16
	Total	258	11.19	2.498	.155				

Supplemental 2C:

Test Statistics: Overall stigma of all groups of HCWs

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
All Stigma	Between Groups	924.560	4	231.140	2.207	.069
	Within Groups	26501.115	253	104.747		
	Total	27425.674	257			
Component 1	Between Groups	184.352	4	46.088	2.148	.075
	Within Groups	5429.156	253	21.459		
	Total	5613.508	257			
Component 2	Between Groups	112.051	4	28.013	2.492	.064
	Within Groups	2843.829	253	11.240		
	Total	2955.880	257			
Component 3	Between Groups	17.177	4	4.294	.441	.779
	Within Groups	2462.517	253	9.733		
	Total	2479.694	257			
Component 4	Between Groups	23.806	4	5.951	.953	.434
	Within Groups	1579.264	253	6.242		
	Total	1603.070	257			

Supplement 2C. Description of DRTB stigma among HCW participants

One Sample Test

	Median	Mean	Std. Deviation	Std Error	Minimum	Maximum	p-value
DRTB Stigma All HCW (n = 258)	58	57.60	10.33	.6.43	18	90	.628

One-Sample Test

Test Value = 51.51 (50.5% reference value from Sommerland et al 2017)

	t	Significance One-Sided p	Significance Two-Sided p	Mean Difference	95% Confidence Interval of the Difference Lower	Upper
All Stigma	9.476	<.001	<.001	6.095	4.83	7.36

Multiple Comparisons

Multiple comparison of the mean difference in the DRTB stigma scores of HCWs

Dependent Variable	(I) Occupation	(J) Occupation	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
All Stigma	Barangay Health Workers	Laboratory	-.086	1.824	1.000	-5.10	4.93
		Midwife	5.685	2.589	.185	-1.43	12.80
		Nurse	2.513	1.571	.499	-1.80	6.83
		Physician	4.559	2.535	.377	-2.41	11.52
	Laboratory	Barangay Health Workers	.086	1.824	1.000	-4.93	5.10
		Midwife	5.771	2.766	.229	-1.83	13.37
		Nurse	2.599	1.848	.624	-2.48	7.68
		Physician	4.645	2.716	.429	-2.82	12.11
	Midwife	Barangay Health Workers	-5.685	2.589	.185	-12.80	1.43
		Laboratory	-5.771	2.766	.229	-13.37	1.83
		Nurse	-3.173	2.606	.741	-10.33	3.99
		Physician	-1.126	3.279	.997	-10.13	7.88
	Nurse	Barangay Health Workers	-2.513	1.571	.499	-6.83	1.80
		Laboratory	-2.599	1.848	.624	-7.68	2.48
		Midwife	3.173	2.606	.741	-3.99	10.33
		Physician	2.046	2.552	.930	-4.97	9.06
	Physician	Barangay Health Workers	-4.559	2.535	.377	-11.52	2.41
		Laboratory	-4.645	2.716	.429	-12.11	2.82
		Midwife	1.126	3.279	.997	-7.88	10.13
		Nurse	-2.046	2.552	.930	-9.06	4.97
Component 1	Barangay Health Workers	Laboratory	-.175	.826	1.000	-2.44	2.09
		Midwife	2.889	1.172	.102	-.33	6.11
		Nurse	.784	.711	.805	-1.17	2.74
		Physician	1.634	1.148	.613	-1.52	4.79
	Laboratory	Barangay Health Workers	.175	.826	1.000	-2.09	2.44
		Midwife	3.064	1.252	.106	-.38	6.50
		Nurse	.959	.836	.781	-1.34	3.26
		Physician	1.809	1.229	.582	-1.57	5.19
	Midwife	Barangay Health Workers	-2.889	1.172	.102	-6.11	.33
		Laboratory	-3.064	1.252	.106	-6.50	.38
		Nurse	-2.105	1.179	.385	-5.35	1.14
		Physician	-1.255	1.484	.916	-5.33	2.82

	Nurse	Barangay Health Workers	-.784	.711	.805	-2.74	1.17
		Laboratory	-.959	.836	.781	-3.26	1.34
		Midwife	2.105	1.179	.385	-1.14	5.35
		Physician	.850	1.155	.948	-2.32	4.02
	Physician	Barangay Health Workers	-1.634	1.148	.613	-4.79	1.52
		Laboratory	-1.809	1.229	.582	-5.19	1.57
		Midwife	1.255	1.484	.916	-2.82	5.33
		Nurse	-.850	1.155	.948	-4.02	2.32
Component 2	Barangay Health Workers	Laboratory	.494	.598	.922	-1.15	2.14
		Midwife	1.160	.848	.649	-1.17	3.49
		Nurse	.970	.515	.328	-.44	2.38
		Physician	2.389*	.831	.035	.11	4.67
	Laboratory	Barangay Health Workers	-.494	.598	.922	-2.14	1.15
		Midwife	.666	.906	.948	-1.82	3.16
		Nurse	.477	.605	.934	-1.19	2.14
		Physician	1.895	.890	.211	-.55	4.34
	Midwife	Barangay Health Workers	-1.160	.848	.649	-3.49	1.17
		Laboratory	-.666	.906	.948	-3.16	1.82
		Nurse	-.189	.854	.999	-2.53	2.16
		Physician	1.229	1.074	.783	-1.72	4.18
	Nurse	Barangay Health Workers	-.970	.515	.328	-2.38	.44
		Laboratory	-.477	.605	.934	-2.14	1.19
		Midwife	.189	.854	.999	-2.16	2.53
		Physician	1.418	.836	.438	-.88	3.72
	Physician	Barangay Health Workers	-2.389*	.831	.035	-4.67	-.11
		Laboratory	-1.895	.890	.211	-4.34	.55
		Midwife	-1.229	1.074	.783	-4.18	1.72
		Nurse	-1.418	.836	.438	-3.72	.88
Component 3	Barangay Health Workers	Laboratory	.094	.556	1.000	-1.43	1.62
		Midwife	.947	.789	.752	-1.22	3.12
		Nurse	.347	.479	.951	-.97	1.66
		Physician	.420	.773	.983	-1.70	2.54
	Laboratory	Barangay Health Workers	-.094	.556	1.000	-1.62	1.43
		Midwife	.853	.843	.850	-1.46	3.17
		Nurse	.253	.563	.992	-1.29	1.80
		Physician	.327	.828	.995	-1.95	2.60

	Midwife	Barangay Health Workers	-.947	.789	.752	-3.12	1.22
		Laboratory	-.853	.843	.850	-3.17	1.46
		Nurse	-.599	.794	.943	-2.78	1.58
		Physician	-.526	.999	.985	-3.27	2.22
	Nurse	Barangay Health Workers	-.347	.479	.951	-1.66	.97
		Laboratory	-.253	.563	.992	-1.80	1.29
		Midwife	.599	.794	.943	-1.58	2.78
		Physician	.073	.778	1.000	-2.06	2.21
	Physician	Barangay Health Workers	-.420	.773	.983	-2.54	1.70
		Laboratory	-.327	.828	.995	-2.60	1.95
		Midwife	.526	.999	.985	-2.22	3.27
		Nurse	-.073	.778	1.000	-2.21	2.06
Component 4	Barangay Health Workers	Laboratory	-.469	.445	.830	-1.69	.75
		Midwife	.415	.632	.965	-1.32	2.15
		Nurse	.314	.383	.924	-.74	1.37
		Physician	-.295	.619	.989	-2.00	1.41
	Laboratory	Barangay Health Workers	.469	.445	.830	-.75	1.69
		Midwife	.884	.675	.686	-.97	2.74
		Nurse	.783	.451	.414	-.46	2.02
		Physician	.173	.663	.999	-1.65	1.99
	Midwife	Barangay Health Workers	-.415	.632	.965	-2.15	1.32
		Laboratory	-.884	.675	.686	-2.74	.97
		Nurse	-.101	.636	1.000	-1.85	1.65
		Physician	-.711	.800	.901	-2.91	1.49
	Nurse	Barangay Health Workers	-.314	.383	.924	-1.37	.74
		Laboratory	-.783	.451	.414	-2.02	.46
		Midwife	.101	.636	1.000	-1.65	1.85
		Physician	-.610	.623	.865	-2.32	1.10
	Physician	Barangay Health Workers	.295	.619	.989	-1.41	2.00
		Laboratory	-.173	.663	.999	-1.99	1.65
		Midwife	.711	.800	.901	-1.49	2.91
		Nurse	.610	.623	.865	-1.10	2.32

*. The mean difference is significant at the 0.05 level.

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5.3 Links and implications

Exploring the extent of stigma and its subtypes experienced by HCWs providing DRTB services in the Philippines has profound implications for the healthcare system and the broader public health community. In a country where TB prevalence is high and resources are scarce, understanding the nuances of stigma is not just an academic pursuit—rather it is a necessity for effective public health intervention. If HCWs harbour stigmatising beliefs towards DRTB patients, this can lead to sub-optimal care, delayed diagnoses, and potential spread of the disease, as patients might avoid or interrupt treatment due to fear of stigmatisation. Moreover, the presence of stigma among HCWs could result in a workforce that is less motivated and more stressed, further straining the healthcare system. Insights of this study could inform targeted interventions to foster a more inclusive and supportive healthcare environment, ultimately improving patient outcomes and promoting DRTB prevention and control.

For the wider community, the implications extend beyond medical care. Stigma can undermine public health campaigns, weakening community trust in healthcare services and thus impeding the fight against DRTB. When HCWs, who are often seen as community leaders and trusted sources of health information, exhibit stigmatising behaviours, this can exacerbate the challenges faced by DRTB patients. The implication of this research is not just a matter of improving healthcare practices; it is about advocating for social justice and dismantling barriers to healthcare access. This study could potentially catalyse policy changes and educational initiatives that target the underlying causes of stigma, thereby encouraging a holistic approach to addressing DRTB in the Philippines and similar jurisdictions.

The findings of this study spark curiosity and subsequent inquiry into several key areas, such as how stigma manifests in the health workforce.

CHAPTER 6: PAPER 4 - STIGMA ASSOCIATED WITH DRUG-RESISTANT TUBERCULOSIS, ABSENTEEISM AND PERCIEVED STRESS: THE CASE OF HEALTHCARE WORKERS

6.1 Introduction

This chapter explores the various ways in which the stigma associated with DRTB is evident beyond the disease's physical symptoms. DRTB stigma is a significant but often overlooked issue that adversely affects the psychological well-being of patients and HCWs, contributing to stress. The study of DRTB-related stigma, stress, and their manifestations, is an important field of public health research, particularly in understanding how these factors interact within healthcare settings. Here, the likelihood of HCWs experiencing work absence because of stigma and stress was investigated. It also explored the influence of organisational support in moderating stress against stigma.

6.2 The publication

Stigma associated with drug-resistant tuberculosis, absenteeism and stress: The case of HCWs

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Key words:

absenteeism, drug-resistant tuberculosis, healthcare workers, stigma, stress

Abstract

Background: This study examined the interactions of drug-resistant tuberculosis-associated (DRTB) stigma, stress, and absenteeism and how organisational support awareness might moderate the impact of stress among healthcare workers(HCWs).

Method: Data from a cross-sectional survey of 258 HCWs from three locations in the Philippines were utilised. We performed a three-step regression analysis - simple, multivariate, and Hayes PROCESS Model, to determine the risk ratio, main interactions of stigma, stress, and absenteeism, and the moderating effect of organisational support.

Results: Absenteeism was 1.65 times more likely among stressed HCWs than their non-stressed counterparts. The direct relationship between stigma and absenteeism was marginally positively significant and strengthened by the indirect effect of stress. Organisational support awareness does not moderate stigma-related stress.

Conclusion: Absenteeism is marginally affected by stigma, but substantially affected by stress. Organisational support awareness did not reduce stigma and stress, emphasising the need to re-evaluate support efforts and create a supportive workplace.

Key words: absenteeism, drug-resistant tuberculosis, healthcare workers, secondary stigma, stigma

Background

Healthcare workers (HCWs) are on the front lines of the fight against drug-resistant tuberculosis (DRTB). They provide care, implement treatment protocols, and advocate for public health efforts to reduce its transmission[1]. Efforts for DRTB are critical in mitigating the consequences of DRTB, which go beyond physical health and mental well-being[1]. DRTB has been considered a stigmatising disease[1].

Our recent study highlighted stigmatisation among HCWs involved in DRTB care [2]. For example, some HCWs were hesitant to perform DRTB-related activities, while others took extra time off to avoid increased health risks[3,4]. Also, stigmatising behaviours regarding DRTB can be stressful for some HCWs. In South Africa, some HCWs concealed their contact with DRTB patients out of fear of potential criticism from relatives or peers[3,5]. Meanwhile, other HWCs regret their career choices, which had detrimental professional consequences and led to a lack of motivation[6]. Belita et al. [7] found that HCWs who have experienced stigmatisation are more likely to display higher levels of absenteeism.

Adequate and collaborative HCWs are necessary for the success of DRTB initiatives[8]; however, absenteeism challenges this goal. Absenteeism negatively impacts the overall quality of care, especially in low-income countries[9]. In Kenya, absenteeism contributes to unreliability in health services, discouraging mothers from seeking care[10]. In the absence of co-workers, HCWs may perform tasks they lack qualifications for, posing risks to patients[11]. In the Philippines, absenteeism among HCWs providing DRTB services and the association between stigmatisation and absence from work remain unexplored. Hence, investigating this relationship is essential to ensuring the success of DRTB initiatives.

DRTB stigma can be challenging for HCWs. However, healthcare organisations can enhance their employees' physical and mental well-being by prioritising their support[12]. Yet, it's important to note that the effectiveness of organisational support depends on how the healthcare organisation engages with individual HCWs and how HCWs perceive the support provided[13]. Chatzittofis et al. [14] argue that organisational HCWs' perception of how well their organisation supports their well-being is crucial as it can impact job satisfaction, organisational performance, and absenteeism. Of note, opinions differ on how organisational support affects absenteeism and stigma. While some studies suggest that support reduces absenteeism and stigma[6,15], others have found that perceptions of organisational support do not predict absenteeism[16].

In the Philippines, standard forms of support other than salary include worker's compensation, access to medical services, and education and training opportunities [17,18]. Some organisations offer financial incentives to HCWs [19]. Although these supports could reward HCWs, their effectiveness in mitigating the stigma associated with DRTB that these HCWs encounter remains uncertain. Also, research on the interaction between DRTB stigma, work absenteeism, and awareness of organisational assistance is limited. A better understanding of the relationship between organisational support and stigma, stress, and absenteeism would significantly benefit the well-being of HCWs and have far-reaching implications for their productivity in providing DRTB services effectively[14,20]. Thus, this study examines the interaction between stigma and absenteeism and how stress mediates this association. This research also explores how awareness of organisational support moderates these effects[20].

Conceptual framework: stigma- stress- absenteeism triad and organisational support

Stigma and stress associated with DRTB are particularly unique. This is because HCWs may hold stigmatising attitudes but are also stigmatised and bear the burden of disease stigma[4,21]. DRTB requires specialised HCWs to manage treatment and provide significant patient education[1], which can cause minority-specific stress. The Minority Stress Model[22] explains how belonging to a minority group can cause unique stressors affecting physical and mental health. In high TB-prevalence countries with limited healthcare resources, HCWs face a heavy workload and increased stress[21]. As a minority group, this stance may stress HCWs mentally and physically[20].

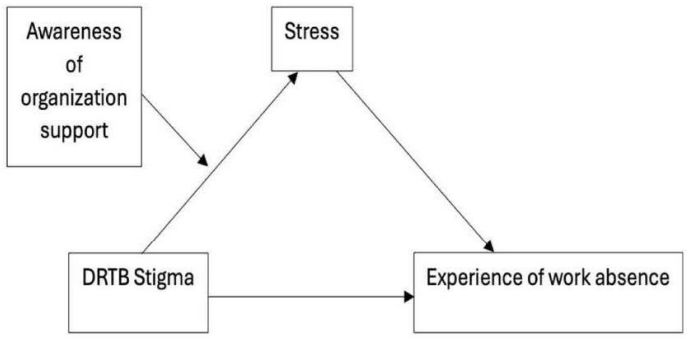
Coping with stigma can involve avoiding stressful situations[23]. According to the withdrawal model of absenteeism[24], employees may avoid work to relieve job strain symptoms including stress and worry. HCWs may be compelled to miss work as their stress progresses[20]. Sommerland et al. found that mental health issues among some HCWs have resulted in absenteeism due to the stigma associated with tuberculosis.

Brewer[25] argued that HCWs may be better equipped to cope with stress with organisational support. Some studies found social support improves mental health in HCWs[26,27]. However, others found weaker associations[28,29], highlighting the need to understand organisational support's many facets. In the Philippines, it is unclear how organisational support reduces DRTB-induced stress.

Our recent study revealed stigmatisation among HCWs delivering DRTB services in the Philippines. In this study, we examined how DRTB stigma affects HCW mental health and work [30]. We examined how organisational support mitigates stigma's stress and absence effects. The study proposes three hypotheses: DRTB stigma is linked to

absenteeism, stress further increases the link between stigma and absenteeism, and organisational support awareness moderates the indirect link between stigma and absenteeism. Figure 1 illustrates the concept.

Figure 1. Conceptual model investigating DRTB stigma, stress, absence, and organisational support.



Methods

Study design, setting and participants

We utilised data from our recent cross-sectional study, which surveyed HCWs delivering DRTB services from three conveniently selected locations in the Philippines – Mandaluyong City, Northern and Western Samar, between February and June 2022. The participants included BHWs, midwives, nurses, physicians, and medical laboratory technicians.

The Questionnaire

Our recent study found 57.60% stigmatisation of HCWs[30]. It utilised a questionnaire adapted from the Mental Health Professional Secondary Stigma Scale (MHPSSS) suggested in the *TB Stigma-Measurement Guidance*[31]. To better understand DRTB stigma, we added four questions and analysed the awareness of organisational

support, which included social support (1 item) and financial or medical support (1 item) measured on a 5-point Likert scale; feeling stressed (1 item), and work absence experience due to DRTB stigma (1 item) scored on a 4-point Likert scale. Scores four/five are the highest, and one is the lowest. A professional Filipino translator translated the questionnaire; language and subject experts performed the content validity; a pilot test was conducted; and a reliability test was performed. Supplement 1 elaborates on the instrument.

Data collection

The University of Southern Queensland and the local TB program management provided the ethical approval and consent for the study. The participants provided informed consent and answered the survey link through email or messaging. Participants were requested to notify the research assistant via message if technical difficulties, such as incompatible devices or unreliable internet connectivity, prevented them from completing the survey. In such situations, the research assistant provides the participant with a tablet equipped with questionnaire software or internet connectivity, which they use to complete the survey at the health unit.

The survey gathered sociodemographic information, including age, gender, years of experience as HCW, household income, and living arrangements. A preliminary scan of available documents revealed that almost all participants were married, shared the same religion, and held an undergraduate degree; hence, they were omitted from the questionnaire (Supplement 1).

Data analysis

Following descriptive analysis, a three-step regression analysis - simple, multivariate and Hayes PROCESS Model 9 [32] - was performed in SPSS-V28. The descriptive

analysis involved frequencies and percentages for categorical variables, means and standard deviations (SD) for numerical variables, while the test of assumptions included Durbin-Watson statistic, linearity, homoscedasticity, multicollinearity, and normality. Simple regression was initiated to determine the unadjusted association between DRTB stigma, stress, organisational support, and participant characteristics, with absenteeism as an outcome. A multivariable regression model subsequently determined the association between absenteeism and explanatory variables. Given the exploratory nature of this study, any variable with a p-value ≤.25 was chosen for the multivariate analysis. By employing a p-value threshold of ≤.25, it may be possible to identify variables that are marginally associated with the DRTB stigma when considered alone but might significantly contribute when combined with other variables[33]. Stigma, stress awareness, organisational support, and occupation were included in the multivariate analysis regardless of their p-values. A significant level is set at p-value ≤.05; however, we consider p-value ≤.25 as reportable to identify possible correlations between variables and DRTB stigma that may form the foundation for subsequent research. The final step tested the main interactions of DRTB stigma and absenteeism, with stress acting as a mediator and organisational support as a moderator. The significance of the moderation mediation effect was examined utilising 95% bias-correction confidence interval generated from 10,000 bootstrapping iterations.

Results

Table 1 describes the characteristics of the participants. 258 (83.20%) out of 310 HCWs contacted responded to the survey. The average age of the participants was 45 years; mostly female (n=227, 88%), lived with their immediate families (n=179,

70%) and an average of 14 years of experience as HCWs. Household income after mandatory deductions differs between groups, highest in physicians and lowest in BHWs.

The HCW group mean scores for organisational support awareness were 4.00 (SD = 1.11) for social support and 3.82 (SD = 1.31) for financial or medical assistance, while stress scored 2.95 (SD = 0.97), with no significant difference between the groups' mean scores.

Table 1. Characteristics of study participants

Variables	n (%)/ Mean (SD)
Exposure variables, mean (SD)	
Stigma	57.73 (10.68)
Stress *	2.95 (0.98)
Experience of work absence, n(%)	
I don't know/None	158 (60.5)
Limited experience of work absence	88 (34.1)
More experience in work absence	14 (5.4)
Awareness in financial and medical support#, mean(SD)	3.82 (1.31)
Awareness in social support# mean(SD)	4.00 (1.11)
Age in years, mean (SD)	45.41 (11.87)
Gender, n (%)	
Male	49 (19)
Female	209 (81)
Occupation, n (%)	
Barangay Health Worker	88 (34)
Medical laboratory technician	49 (19)
Midwife	19 (7)
Nurse	82 (32)
Physician	20 (8)
Household income, (mean, SD)	29, 127 (31610)
Year of HCW experience, mean (SD)	14.00 (10.01)
Living arrangement, n (%)	
Living with immediate family	179 (69)
Living with friends or relatives	79 (31)

*Range: * = 1 to 4; # = 1 to 6 SD = Standard deviation*

Table 2. Summary models in investigating DRTB stigma and its predictors to experience of work absence

Variables	Unadjusted model				Adjusted model			
	Limited experience of work absence vs no experiences		More experience of work absence vs no experiences		Limited experience of work absence vs no experiences		More experience of work absence vs no experiences	
	RRR (95% CI)	p-value	RRR (95% CI)	p-value	RRR (95% CI)	p-value	RRR (95% CI)	p-value
Exposure variables, mean (SD)								
Stigma	1.14 (1.09, 1.18)	<.001	1.08 (1.01, 1.15)	0.01	1.14 (1.09, 1.19)	<.001	1.07 (1.05, 1.15)	.05
Stress	2.44 (1.71, 3.48)	0.001	1.68 (.88, 3.18)	0.11	1.65 (1.10, 2.47)	.01	1.31 (.68, 2.73)	.37
Awareness in financial and medical support	1.01 (.82, 1.23)	0.94	.87 (.58, 1.29)	0.48	1.04 (.95, 1.14)	.40	.99 (.83, 1.18)	.91
Awareness in social support	1.02 (.80, 1.28)	0.89	1.22 (.72, 2.05)	0.45	1.04 (.63, 1.72)	.67	1.63 (.49, 2.58)	.62
Age in years, mean (SD)	1.00 (.97, 1.02)	0.99	1.01 (.95, 1.04)	0.96				
Gender, n (%)								
Male	1.47 (.65, 3.31)	0.35	2.54 (.63, 10.15)	0.18	1.10 (.39, 3.09)	.86	3.14 (.61, 16.15)	.17
Female (ref)								
Occupation, n(%)								
Barangay Health Worker	.39 (.14, 1.07)	0.06	.78 (.08, 7.43)	0.82	.19 (.05, .73)	.02	.85 (.06, 11.88)	.91
Medical laboratory technician	.67 (.23, 1.94)	0.45	.67 (.05, 8.25)	0.75	.38 (.10, 1.30)	.12	.55 (.04, 7.69)	.65
Midwife	.49 (.13, 1.88)	0.29	1.64 (.13, 21.10)	0.70	.43 (.09, 2.09)	029	2.26 (.15, 34.89)	.56
Nurse	.48 (.17, 1.31	0.15	.71 (.071, 7.06)	0.76	.34 (.10, 1.08)	.06	.52 (.05, 5.71)	.59
Physician (ref)								
Household income, (mean, SD)	1.12 (.88, 1.42)	0.34	.89 (.54, 1.46)	0.65				
Year of experiences, mean (SD)	1.01 (.98, 1.03)	0.63	1.05(.94, 1.05)	0.89				
Living arrangement, n (%)								
Living with immediate family	.74 (.38, 1.43)	0.37	.56 (.12, 2.60)	0.45				
Living with friends or relatives (ref)								

Significant level: p-value ≤.050; *Limited experience of work absence = only once*

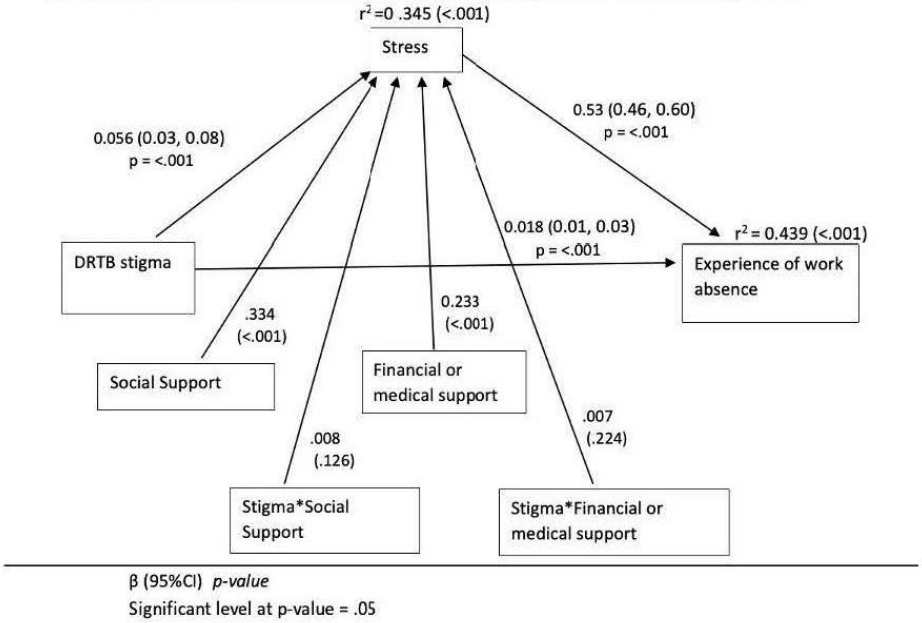
Reportable level: p-value ≤.25 *Multiple experiences of work absence = more than once*

Table 2 presents the relationship between the experience of work absence and its explanatory variables. We found that HCWs who experienced stigma were significantly more likely to experience work absence (for a limited experience of work absence, RRR = 1.14, 95%CI: 1.09 to 1.19; for multiple times of work absence, RRR = 1.07, 95%CI: 0.99 to 1.15) compared with those who had no exposure to stigma. HCWs who experienced stress were 1.65 times more likely to be absent from work than those who did not experience stress. The risk of work absenteeism varies across HCWs. For instance, BHWs were found to be at a significantly 81% lower risk of absenteeism compared with physicians.

Figure 2 presents the main interactions between DRTB stigma and experience of work absences through stress, with the potential moderating effects of organisational support awareness. DRTB stigma marginally directly affected the experience of work absence (β = 0.02, 95%CI: 0.01, 0.03, p < 0.001) and predicted stress (β = .056, 95%CI: 0.03, 0.08, p = < 0.001), while stress substantially indirectly affected work absence (β = .53, 95%CI: 0.46, 0.60, p = <0.001). Interactions were statistically significant, suggesting that increasing levels of stigma are associated with increasing levels of stress and, thus, work absence. However, neither the interaction between stigma and awareness in organisational financial or medical support nor the interaction between stigma and social support is significant (p = 0.22 and p = 0.13, respectively). Such interaction implies that the effect of stigma on stress does not differ significantly across different levels of awareness in organisational financial, medical, or social support. Also, the partially moderated mediation for both financial or medical and social support shows weak indices, implying that awareness of organisational support does not significantly alter the strength of the mediation effect of stress. However,

given the exploratory nature of this study, we consider such interactions worthy of being reported.

Figure 2.Direct and indirect effects of DRTB stigma on experience of work absence through stress



Discussion

This study explored the manifestations of DRTB stigma by examining stigma's interaction with stress and absenteeism. Whilst we found awareness of organisational supports, financial, medical, and social, was high among these HCWs, we delved further into the influence of this awareness on stigma, stress, and subsequent absenteeism.

The present findings supported our hypotheses that stigma associated with DRTB is positively correlated to absenteeism and that stress would contribute to this correlation. This result validated the claim established in previous studies regarding the interdependence of stigma, stress and absenteeism [20,24]. Although weak, our

findings suggest that stigma's significance as a predictor was not random but has, in fact, a significant influence on absenteeism. Thus, despite a small effect size, we consider stigma's apparent impact on absenteeism valuable. Bigger effect sizes are perhaps more important for understanding a phenomenon[34]; yet, small effect sizes are nonetheless meaningful, especially when they relate to issues that are widespread or have significant implications across time or populations [35]. Understanding such small effect sizes might provide valuable insights for implementing preventive measures. In this instance, even if stigma has a small effect on absenteeism, interventions can be designed to target early on, potentially preventing more significant problems. In practical applications, particularly in public health, small changes can lead to large-scale benefits over time or shift behaviours in a positive direction [36]. Taking prompt action to mitigate the small effect of stigma on absenteeism at an early stage might result in substantial benefits in the long term for the provision of care for DRTB. Meanwhile, from a policy perspective, even small effects on social values, such as stigma reduction or mental health awareness, should be regarded as crucial issues that policymakers must address to maintain a supportive work environment [31].

It is worth noting from other studies that workplace stress can lead to presenteeism. Presenteeism is the practice of showing up for work despite being in poor physical or mental conditions [20]. Health workers and stigmatised women employees were found to have higher risks of presenteeism [37,38]. With all participants in this study being health professionals and most women, our findings may be influenced by presenteeism. More work is required to validate this assumption because presenteeism impacts individual health outcomes and an organisation's productivity. It exacerbates chronic stress, increases the risk of damaging one's well-being, and reduces work productivity [20].

The impact of stress on absenteeism was found to be more significant than that of stigma. This means that the occurrence of significant indirect effects of stigma affected work absence in part by increasing stress. This finding suggests that interventions focused on mitigating stress may produce discernible outcomes in reducing work absence. However, from a practical perspective, addressing both stigma and stress could be beneficial in reducing absenteeism. Given the small effect size, stress interventions should be part of a broader strategy that includes other factors that could influence absence from work [20]. The significance of this study's finding resides not in its predictive power but in identifying relationships that can guide further research and inform policy choices.

Nonetheless, our findings dispute that awareness of organisational support could mitigate the adverse effects of stigma, including stress. Therefore, this finding fails to support our hypothesis that awareness of organisational support would moderate the indirect association between stigma and stress-related absence. While we found a considerably high awareness of organisational support, its association with stigma did not moderate stress and reduce absenteeism. This supports the finding that HCWs experiencing stress are more prone to avoid work despite the availability of organisational support.

Advocating for organisational support to reduce stigma is crucial to achieving the health system's objectives of providing care and long-term DRTB prevention and control [1]. Accordingly, these objectives could be met with adequate motivated and engaged HCWs. If financial, medical, and social support were intended to enhance the effectiveness of the TB program by mitigating stigma, low indices could suggest that these supports may not be functioning as expected. It might be necessary to re-evaluate the design and implementation of existing organisational support efforts.

Such efforts must go beyond raising awareness of organisational support and instead focus on ensuring the provision of adequate assistance [2]. Alternately, the negligible interaction between stigma and organisational support, which has a non-existent moderating effect on stress, might be accounted for by the perception of support receipt and the self-aspects that influence whether support is perceived as such [39]. It has been acknowledged that receiving social support increases during times of stress, resulting in a positive link between support mobilisation and increased psychological stress [40]. In this sense, HCWs may opt to be absent from work to cope with stress (stress model) or escape from a stigmatising environment (withdrawal model). Consistent with these frameworks, previous studies have generally agreed that organisations should focus their efforts on mitigating absenteeism by implementing interventions that target eliminating stress-inducing factors [20], which are among the direct causes of such absences.

Among the HCW groups, the BHWs had a statistically significant lower likelihood of absenteeism. As mentioned in previous studies, DRTB stigma was highest among this group [2]. Despite the stigma, their strong community ties may explain BHWs' lower absenteeism rate. Such inherent motivation may be driven by personal connections and a feeling of responsibility towards their family, friends, and neighbours. BHWs' local attachment, thus, helps maintain their commitment to supporting their communities even in the face of difficulties. As noted, BHWs earn far less than other HCW groups, with many pushed into poverty. Consequently, organisational support is critical for these stigmatised HCWs, especially when they are already facing financial difficulties. This finding aligns with previous studies [4,6,36,41] which suggest that the healthcare system might benefit from adopting a more targeted strategy to alleviate

the stigma effectively, potentially through enhanced financial, medical, or social support mechanisms.

The other variables, such as gender and working as medical laboratory technicians and nurses, revealed modest but reportable positive relationships with absenteeism, while age, household income, housing arrangements, and number of years of experience working as HCWs were shown to have no impact.

Limitations

While this study could provide valuable insights into how DRTB stigma influences HCWs' absenteeism and what strategies can be taken to mitigate its implications, however, we acknowledge some limitations that require attention. Firstly, a single-item survey was used to assess absence, awareness of organisational support and stress to gather focused feedback on the issue without the need for extensive questioning. Secondly, a small sample size may have reduced the ability to establish the interaction between the stigma and its outcome. The study was limited to three geographical areas in the Philippines, so its findings may not apply to the wider HCW community. Lastly, the study lacks temporal data because single-point data collection was employed. While it might be useful in this initial assessment, it did not allow for analysis of cause and effect or changes in the work absence of HCWs over time. An exhaustive cross-sectional enquiry may yield additional insights regarding the extent of the impact of DRTB stigma over time, resulting in stress and absenteeism among health workers in the Philippines.

Research and policy implications

This study demonstrated the influence of DRTB stigma on stress and absenteeism, or potentially presenteeism, and revealed that awareness of organisational support does

not mitigate stress due to stigma. The implication of this finding is profound and multifaceted because it encompasses HCWs' individual health and work efficacy, compromises the quality of DRTB care, and health organisational resource management. This calls for TB programme implementers and policymakers to critically address these findings by enhancing policies to provide mental health resources, including access to psychological services and interventions aimed at promoting well-being among HCWs. Absenteeism and presenteeism contribute to reduced work productivity and increased organisational costs, straining the healthcare system. This underscores the importance of establishing inclusive and supportive environments, prioritising a stigma-free work environment, and effectively managing stress. Further, robust research on the interaction of stigma, stress, and absenteeism or presenteeism could delve into how chronic exposure to DRTB stigma impacts mental health and well-being across diverse HCW populations worldwide.

Conclusions

This study shed light on the relationship between stigma, stress, and HCWs' absenteeism, including organisation support. DRTB-related stigma has a small but significant direct influence on HCWs' absenteeism, which increases with stress. This finding raises doubts about the likelihood of presenteeism, requiring further investigation. The notion that stigma could be alleviated through organisational support was also questioned. The findings indicated that increasing awareness of organisational support does not consistently reduce stigma, stress, or absenteeism; thus, there is a need to re-evaluate existing support efforts. It is recommended that health organisations prioritise the critical examination of DRTB stress-inducing factors, including stigma, that are the root causes of absenteeism or perhaps presenteeism. Further, as DRTB is a global issue and HCWs work in a variety of cultural and

socioeconomic contexts, robust studies into how DRTB stigma and stress manifest and are managed across different settings should be conducted.

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Availability of data

The datasets generated and analysed during the current study are not publicly available because they represent an excerpt of ongoing research, but they are available upon reasonable request from the corresponding author.

Informed consent

Written consent was obtained from all CHW participants included in this study.

Conflict of interest

The authors of this study report no conflicts of interest.

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6.3 Links and implications

Studies into stigma and stress in the healthcare workforce have significant implications for workplace management, mental health advocacy, and community health. This chapter highlighted that, while the consequences of DRTB-related stigma and stigma-related stress at work contribute to absenteeism, they may also lead to presenteeism. This finding leads to the hypothesis that stigma, stress, and absenteeism or presenteeism are interdependent and can be cyclical. Additional research to better understand this cycle is needed because it not only undermines the well-being of HCWs but also poses significant challenges to maintaining the integrity and effectiveness of patient-centred care.

This chapter revealed that raising an awareness about organisational support does not help alleviating stress caused by stigma. It highlights the importance of re-evaluating the existing organisational support systems and creating supportive environments, including environments where DRTB-related stigma is mitigated, stress is managed effectively, and support systems are in place for HCWs experiencing mental health issues.

The ultimate takeaway is to address stigma. At the facility level, addressing DRTB-related stigma will crucially maintain a resilient and effective health workforce. From an economic perspective, addressing issues of stigma can potentially save costs and improve the healthcare system's financial performance. Increased workplace stress and absenteeism or presenteeism can be costly for the healthcare system due to lost productivity, increased healthcare costs, and the expense of additional staff training. Research into DRTB stigma reduction also leads to more open discussions, increased awareness, and better support for HCWs, patients and their families.

The issues of DRTB-related stigma, stress and its impact on the workforce are relevant across different cultures and geographical settings. Therefore, the implications of this research can be far-reaching, providing significant insights for not just the Philippines but also other comparable jurisdictions.

CHAPTER 7: DISCUSSION AND CONCLUSION

7.1 Introduction

This research focused on the pervasive stigma associated with DRTB among HCWs in the Philippines. It also explored the socio-ecological challenges that contribute to DRTB stigma among HCWs at the grassroots level. The integrated findings of the comprehensive scoping review and exploratory studies, alongside the conceptual and theoretical lens of HSDF [15], and the stigma concept of Link and Phelan [27], were utilised to analyse and understand the intricate dynamics of DRTB stigma deeply rooted in the healthcare setting. This approach allows for a holistic exploration of DRTB stigma challenges, bridging the theoretical frameworks and the real-world experiences of healthcare workers. In this section, the findings are summarised, integrated, and discussed, addressing the research objectives.

7.2 Summary of findings and discussions

Stigma drivers, facilitators, extent and subtypes

This research unveiled studies that delved into the extent of stigma surrounding DRTB and the various contributing factors to this stigma among HCWs in regions heavily affected by the disease, thereby focusing on answering research question one. The scoping review findings highlighted fear as a prevalent driver of stigma, along with discrimination, isolation, lack of support, and stress. Poor or distrust in infection control measures emerged as a primary facilitator of stigma, further compounded by varying interpretations of infection control, the prevailing culture within the healthcare workforce, and workplace inequalities. These findings closely align with the HSDF [15], emphasising the multifaceted nature of DRTB stigma. The HSDF [15] further emphasised that stigmatisation stemming from these social and organisational factors can be analysed through its component domains, including drivers, facilitators, stigma marks, and manifestation.

Following a survey of selected locations in the Philippines, HCWs are found to face stigma surrounding DRTB. This finding is consistent with previous studies [16 25 29 62-64] that have also found stigma related to DRTB among healthcare workers. Delving further into the stigma subtypes, this study identified stigma subtypes - concealing, fear, labelling, and negative effects, impacting the groups of HCWs. In the preliminary phase of this research, the review of existing literature showed that the stigma subtypes identified are a direct result of the underlying primary factors that contribute to the perpetuation of stigma. These findings, however, were broadly applied to HCWs as a collective group. In this research, the various subtypes of stigma were found to have distinct impacts on diverse groups of HCWs. These findings address RQ2 of this research.

The fear of disease stigma subtype was consistent across groups of HCWs. The comparative analysis conducted in this study revealed that MLTs and physicians exhibited a heightened level of fear when compared with other groups of HCWs. MLTs and physicians have crucial roles in diagnosing and treating diseases at DRTB facilities, handling infectious specimens, and conducting physical examinations, respectively. Due to this close contact with potentially infectious materials, both MLTs and physicians face an increased risk of disease exposure [65]. These findings emphasise how crucial it is to implement and adhere to safety protocols as part of daily operations to effectively minimise these risks.

Further, fear plays a significant role in shaping societal attitudes toward diseases, like DRTB [15]. It is crucial to recognise that fear is not solely an individual's perception but also reflects broader concerns within society about the implications of the disease [39]. The fear surrounding the spread of the disease and its consequences contribute to various stigma subtypes like concealing, labelling, and negative effects, resulting in the discrimination and unfair treatment of both patients and HCWs [12]. This research found that the BHWs are more impacted by these stigma subtypes - concealing, labelling, and negative effects, compared with other HCWs.

Link and Phelan [39] mentioned that negative perceptions may be deeply ingrained in the community's social fabric. Consequently, negative perceptions give rise to complex issues of discrimination and can lead HCWs to conceal their involvement in DRTB care, potentially undermining trust within the healthcare team, which is essential for effective healthcare delivery [11]. Stangl et al. [15] suggest that in examining negative perceptions that contribute to stigma, it is important to re-evaluate the community's view of DRTB and those affected by it. This requires informed discussions to address the impact of stigmatisation and the urgent need for education that can refute unfounded concerns and perceptions. This necessitates engaging in well-informed, open discussions to effectively address the far-reaching consequences of stigmatisation and emphasise the need for educational initiatives aimed at debunking baseless concerns and misconceptions [24 26 66]. Furthermore, an enlightened and informed society that prioritises empathy and understanding over stigmatisation can enhance the collective effort to combat DRTB.

The disparity in levels of stigma and its subtypes among HCWs is a significant issue that needs thorough examination. This study found that BHWs have higher overall levels of stigma compared to other HCW groups. Reasonably, nurses, midwives, and physicians, due to their frequent exposure to scientific discourse and medical environments, may exhibit a greater resistance to the stigma surrounding the disease. This may also be attributed to their extensive involvement in clinical and medical care, which provides them with a deeper understanding and subsequently reduces misconceptions about the disease.

BHWs operate on the frontline in the community, where personal, cultural, and social dimensions closely intertwine [67], rendering them more susceptible to direct stigmatisation within the community. This discrepancy in the experience of stigma is not merely a reflection of different job roles but indicates a significant inequity in the healthcare system's efforts to address and reduce stigma associated with DRTB. This situation underscores the critical need for targeted interventions that cater to the specific challenges faced by different HCW groups. Understanding these disparities in stigma is needed as it significantly impacts the morale of HCWs and the overall

effectiveness of managing and preventing DRTB. Stakeholders and policymakers need to recognise the interconnectedness of knowledge, structural support, and occupational self-efficacy [15], all of which contribute to this complex picture of stigma across HCW groups. By gaining a deeper understanding of these dynamics, interventions and support programs can be tailored to address the nuanced challenges confronted by HCWs and the overall effectiveness of managing and preventing DRTB.

Impacts on stress and absenteeism

The findings in this study also revealed the range of challenges that these HCWs encounter in their efforts to address and confront the pervasive stigma associated with DRTB. These challenges, closely aligned with those identified in the scoping review, include the pervasive fear of disease and the lack of substantial organisational support within health facilities. The resulting stigmatisation led to some HCWs missing work, compounding the stress already caused by the stigma. This finding addresses RQ3 of the research.

As the stigma surrounding HCWs worsens, it has increasingly detrimental effects, potentially marginalising HCWs and undermining their stress and well-being [26 28]. This, in turn, can impact HCWs' performance, leading to increased absenteeism [68]. Although this study found the association between stigma and absenteeism to be weak, it still could emphasise the significance of stigma as a predictor of absenteeism. The stress caused by stigma can heighten HCWs' tendency to be absent from work. Consistent with other studies, this study suggests that the stress resulting from the stigma surrounding DRTB reveals fundamental weaknesses in the healthcare system [12 15 26 69]. This standpoint encourages a comprehensive examination of absenteeism, considering it as a symptom that may indicate deeper issues within the healthcare culture. Absenteeism disrupts the continuous care required for DRTB patients, potentially resulting in adverse health outcomes [40]. Additionally, it places excessive strain on other HCWs, creating a cycle of stress and burnout that can reinforce the stigma and weaken the response to DRTB [28].

There is reason to be concerned about the potential for presenteeism among healthcare workers who are stigmatised by DRTB. Stigmatisation could worsen presenteeism as employees may feel the need to demonstrate their competence or avoid discrimination from their peers [68]. When employees come to work despite being unwell, it can have significant impacts in healthcare settings. Similar to absenteeism, presenteeism despite being unwell reduces productivity and, more importantly, increases stress and burnout [68]. It is crucial to understand the complexities of presenteeism in the context of HCWs' stigma related to DRTB to develop targeted interventions. The aim is to reduce stigma and create an environment where HCWs feel supported. For example, HCWs should be able to take necessary health-related leave without facing any negative consequences.

Stigma and organisational support awareness

This study found that HCWs have a increased awareness of organisational support. However, there was not enough data to determine the actual level of support provided to HCWs. This thesis considers two perspectives: adequate organisational support and lack of organisational support. In cases where organisational support is deemed adequate, the study challenges the idea that increased awareness of support can alleviate the negative effects of stigma and stress. The analysis of this issue shows that besides physical resources, non-physical resources also play a crucial role. For example, confidence in infection control for DRTB may be undermined by fear of disease, differing opinions, and failure to adhere to infection control procedures within health facilities, thus contributing to stigmatisation. These findings indicate that stigma arises from both individual and organisational factors [15]. The study recommends providing HCWs with training that equips them with the necessary information, skills, and behaviour to manage DRTB confidently.

On the other hand, the lack of organisational support has significant and far-reaching effects. It leads to feelings of helplessness among HCWs, which can contribute to a negative perception of the illness and the HCWs [70 71]. A thorough re-evaluation of organisational support systems is needed to understand their

deficiencies and consequences. Additionally, this finding underscores the need for psychological support systems that specifically address the emotional and mental stress experienced by HCWs. Without comprehensive support, HCWs must face and deal with the challenges of DRTB, including the induced stress. Improving support systems can enhance healthcare services and safeguard the well-being of HCWs [12 71 72], ultimately reducing stigma and stress.

7.3 Contributions and implications to research and practice

This research study is the first attempt to quantify the level of stigma experienced by HCWs in the Philippines. It delves into the significant challenges posed by DRTB within the country's healthcare system, specifically shedding light on the profound effects it has on HCWs. Through an exploration of the prevalence of DRTB and its consequences, including stigma, stress, and an increased likelihood of HCW absenteeism, this research study makes a significant contribution by highlighting the crucial and immediate need for the development of forward-thinking policies, feasible solutions, and sustained exploration.

This research's findings highly support the adoption of a comprehensive approach to address the adverse effects on HCWs in combating DRTB in the Philippines, and addressing global challenges associated with DRTB management. This study addresses the knowledge gap by shedding light on the extent of DRTB stigma and its impacts on different subgroups of HCWs in the Philippines. It also emphasises that the relevance of this study extends beyond the borders of the Philippines, offering valuable insights to countries struggling with the substantial burden of DRTB. Recognising and comprehending this phenomenon can provide policymakers, program managers, and researchers worldwide with insightful information to develop tailored stigma reduction strategies that align with the diverse needs and perspectives of HCWs. Implementing such strategies holds promise for enhancing support for HCWs and improving the management of DRTB patients worldwide.

This study adds to the theoretical understanding of the disease-related stigma. It provides insight into the distinct ways in which different subtypes of stigma can affect various HCW groups. By critically examining the various aspects of stigma — such as fear, concealing, labelling and negative effects, this research contributes to the current theoretical frameworks on stigma in healthcare settings. It emphasises the different impacts of stigma based on the roles of individuals within healthcare institutions. This finding could significantly contribute to interdisciplinary insights by bridging gaps between psychological, sociological, and public health disciplines. For example, psychological theories of stigma, which typically focus on individual perceptions and behaviours [15 27 73], can be expanded by incorporating sociological insights about group dynamics and organisational practices [30 68] within healthcare settings. Public health perspectives also contribute by examining the impact of stigma on patient outcomes and service delivery. By combining these approaches, research could provide a comprehensive understanding of the operation of DRTB stigma across healthcare settings. This could lead to a robust theoretical framework that can effectively address the complexities of DRTB stigma in a healthcare setting. Consequently, it could lead to more effective interventions that are sensitive to the varied subtypes of stigma experienced by diverse groups of HCWs. This interdisciplinary approach has the potential to expand the theoretical understanding of the disease stigma and improve the practical applications of stigma research, making it more relevant and applicable within healthcare settings. Further, this nuanced understanding suggests that interventions need to address stigma yet emphasising the specific subtypes of stigma experienced by various HCW groups.

The research contributes to understanding the negative effects of stigma related to DRTB on stress levels, absenteeism, and potentially presenteeism. Its findings also confirm that simply being aware of organisational support does not reduce the stress caused by stigma, further contributing to the existing body of knowledge. These findings have broad implications for the quality of DRTB care, resource management in healthcare organisations, and the personal and professional well-being of HCWs. Implementers and policymakers of TB programs need to carefully consider these

findings to improve policies that provide mental health resources for HCWs. This includes ensuring access to psychological treatments and implementing interventions to promote the well-being of HCWs. Absenteeism and presenteeism, despite being unwell, both have a negative impact on job productivity and can lead to higher costs for organisations, putting a strain on the healthcare system. This research emphasises the significance of establishing inclusive and supportive work environments, prioritising stigma-free settings, and effectively managing stress. It might have far-reaching and diverse long-term impacts on shaping policies and practices that enhance the well-being and productivity of HCWs. Ultimately, this benefits both the workforce and the populations they serve.

The methodological approach in this research offers a template for other researchers interested in similar topics. Whilst this research was conducted amid the COVID-19 pandemic, the phased approach of this research enhanced research management, allowing for a more strategic allocation of resources and time. By starting with insights from rigorous and systematic review of relevant literature to identify key areas of interest and complexities, this research's framework ensures that subsequent quantitative (standardised) measures are profoundly informed and focused, minimising the wastage of resources on less relevant areas. Also, applying standardised measures enhances the reliability of data and ensures that this research's findings can be compared with other studies worldwide. The findings of this research fill an important gap in the current literature by providing a reliable baseline for understanding the aspects and impact of DRTB stigma in HCWs, not only in a local context but also in the global understanding of healthcare stigma associated with infectious diseases. Also, by focusing on the Philippines, the study addresses the crucial need for localised data in a region where DRTB is a significant health concern.

It is important to note that the TB Stigma Measurement Guidance [51] suggests using the MHPSSS [50], an instrument that has not been validated for DRTB stigma measurement. This research has validated the suggested question set and supports this recommendation. The influence of this research with the MHPSSS survey instrument extends beyond mere validation. By establishing the instrument's reliability

and validity, this research substantiates the effectiveness and usefulness of the MHPSSS instrument, thereby strengthening its credibility and applicability in the field and allowing other researchers to employ this tool confidently. Additionally, the successful validation of the MHPSSS instrument sets a benchmark for the methodical assessment of other suggested but unvalidated instruments, highlighting the importance of validation in achieving reliable and reproducible research findings [74].

This research sparked the attention of key TB implementers, policymakers, and researchers, signifying its meaningful contribution to practice, policy, and academic advancements in addressing DRTB. This research was presented at the 9th Regional Asia Pacific Region Conference (APRC 2024) for Tuberculosis and Lung Diseases from April 26th to 29th, 2024, and received significant recognition in the field. The findings in this research have led to a renewed commitment among stakeholders to incorporate these insights into national and international DRTB (and TB) control programs, aiming to enhance patient outcomes and the working environments of healthcare professionals. This recognition has resulted in an invitation to participate in the Philippine TB Research Forum on August 20th, 2024. This platform will offer an invaluable opportunity to share the overall findings of this research, interact with leading experts, and contribute to the ongoing discussion on DRTB stigma. The invitation emphasises the importance and potential of this research to influence TB programs and policies on a broader scale.

This research has made important contributions to academic discussions and has inspired researchers to expand this study to multiple new locations. This is crucial because it allows for exploration of the variability and similarities of DRTB stigma across diverse cultural, economic, and healthcare contexts. By broadening the scope of this research, a more comprehensive understanding of the factors that contribute to DRTB stigma in different settings could be developed. This will enable stakeholders to tailor interventions more effectively and provide nuanced, location-specific recommendations for policymakers and healthcare providers. The potential to significantly impact global health policies and improve DRTB management practices worldwide underscores the importance of this expanded research effort. Figure 9

(Appendix A.5, Figure 9) shows the poster utilised in the presentation at the APRC 2024.

This research is not without limitations. First, the sample is limited to three geographic locations, potentially lacking in its representation of the diversity present across geographic regions within the Philippines. This limitation curbs the applicability of this research's findings to other regions where sociocultural practises vary. Local norms and practises may influence perceptions and experiences of stigma, making the results less transferrable to other cultural contexts.

It is important to consider the potential impact of the COVID-19 pandemic on this study's findings. The pandemic has shifted healthcare priorities and resources, which could have influenced HCWs' attitudes and experiences of stigma due to increased stress, changes in workload, and the evolving nature of healthcare delivery during the pandemic. This is crucial to consider, as it could skew perceptions of stigma or alter the healthcare environment in ways not accounted for by this study, requiring additional work in this area.

Further, the temporal relevance of the data is a concern, as the finding in this study reflects the situation during the study period only. The data used in this study was collected at a single point, which limited the ability to understand the development of stigma. To gain a deeper understanding, a more comprehensive and long-term prospective study design would be necessary to track the development of stigma over time and uncover the underlying drivers and facilitators. Also, the questions related to organisational support and infection control were tailored to assess the self-awareness of HCWs. Detailed information about these aspects could contribute to a better understanding of how they are linked to the development of stigma.

7.4 Conclusion

This research examined the stigma associated with DRTB ~~in healthcare settings~~ among HCWs. HCWs are faced with DRTB-related stigma with fear, discrimination, isolation, lack of support, shame, and stress being the prevalent drivers of stigma,

while poor infection control measures serve as a primary facilitator. In the Philippines, HCWs face stigma while providing services for DRTB. The impact of the stigma subtypes -concealing, fear, labelling, and negative effects, varies among groups; emphasising the need for targeted interventions to address the specific challenges different HCW groups face.

Stigma in healthcare settings has notable consequences for HCWs, including increased absenteeism and presenteeism, which can have detrimental effects on job performance and patient care. The impact of stigma on HCWs' absenteeism is marginally positive, however is substantiated by stigma-induced stress. This underscores the necessity of creating inclusive and supportive environments that prioritise the well-being of HCWs and effectively manage stress. Organisational support and confidence in infection control do not necessarily mitigate stigma, highlighting the need for enhanced policies and practical solutions to address the impact of the disease stigma. Further research is significant to comprehend the intricate nature of DRTB stigma; nevertheless, there is a critical need to implement a holistic approach to overcome the challenges posed by DRTB in healthcare settings.

7.5 Recommendations

This study strongly advocates for the establishment of a healthcare environment that is more equitable and compassionate, aiming to enhance care delivery and promote a supportive workplace environment for HCWs. To this end, this study recommends:

Decentralised healthcare management approach to stigma

The decentralisation in healthcare management has the potential to improve the response to specific health challenges like DRTB stigma by empowering local health authorities and facilities to manage resources and respond to community-specific health needs. This approach allows customising stigma reduction strategies to meet the unique needs and cultural contexts of their communities. With the existing decentralised health system, local entities can easily create and implement targeted

educational and awareness programs that address the specific manifestations and impacts of DRTB stigma within their populations. This localised approach can also promote greater community engagement and accountability, ensures that health services are more responsive, culturally sensitive, and aligned with the needs of the individuals they serve [75]. A decentralised stigma reduction approach could include:

- Assessment and feedback mechanisms

  To address the issue of stigma in healthcare facilities, it is recommended to establish a system of regular evaluations. These assessments will help in determining the extent of stigma prevalence and identifying specific areas in which stigma reduction efforts can be focused. Feedback from both patients and HCWs will play a crucial role in this process, providing valuable insights that can be used to refine and improve the effectiveness of stigma-reduction activities. By gathering and analysing this feedback, healthcare facilities can work towards creating a more inclusive and supportive environment for all individuals.

- Awareness campaigns

  Intuitively, incorporating awareness campaigns with facilities is not merely a small action, but rather a significant and influential strategy. This study proposes that in addition to standard HCW training, HCWs should undergo additional awareness programs to address stigma. By integrating these campaigns into healthcare facilities, the aim is to empower and motivate HCWs. For example, programs providing in-depth information about the detrimental effects of stigma on both HCWs and their patients. By understanding these impacts, HCWs could be better equipped to provide empathetic care and contribute to improved patient outcomes. Further, educating HCWs about the broader implications of stigma on the healthcare system as a whole can lead to more inclusive and effective healthcare practices.

- Specialised counselling services

This research study recommends enhancing essential support systems for HCWs by prioritising the provision of specialised counselling services. It is suggested to establish comprehensive and tailored counselling programs to offer HCWs the necessary support and resources to navigate and overcome the unique challenges they face.

- Collaboration with advocacy groups

This research study recommends the establishment of collaborative partnerships with advocacy groups in the healthcare sector. These partnerships would focus on collectively developing strategies and educational resources geared towards the reduction of stigma associated with DRTB. Advocacy groups, due to their extensive experience and firsthand knowledge [76], are well-positioned to play a pivotal role in influencing stigma-reduction initiatives. Their unique insights and perspectives could significantly contribute to shaping effective strategies and interventions to combat stigma in healthcare. Also, by actively involving advocacy groups, the voices and opinions of HCWs could be integrated into the policymaking process, thus fostering a more inclusive and impactful approach to addressing stigma within the healthcare sector.

- Leadership and representation

This study recommends that healthcare organisations prioritise on fostering diverse leadership to actively include the viewpoints and perspectives of HCWs when formulating strategies to reduce stigma. Proactively involving diverse leadership could ensure that the distinct insights and experiences of various HCW groups are fully considered and effectively reflected in the development of stigma reduction strategies and policies.

Centralised health management approach to stigma

The centralised approach to tackling the stigma associated with DRTB in healthcare settings is crucial for promoting a consistent response across all regions. With a centralised policy in place, training programs can be standardised, ensuring that all HCWs receive consistent education and support regarding DRTB stigma. This approach can also facilitate the development of wider scope anti-stigma campaigns aimed at raising awareness, creating a coordinated effort that maximises available resources and expertise. By implementing strategies at the central level, the healthcare system can ensure a cohesive and comprehensive response to DRTB stigma, potentially leading to improved patient outcomes and creating a better work environment for HCWs nationwide. A centralised stigma reduction approach could include support systems such as:

- Training programs

  This study recommends the implementation of mandatory training programs for HCWs with a specific focus on cultivating empathy and addressing the unique requirements of stigmatised peers. These comprehensive programs aim to empower and instil value in HCWs and should encompass in-depth modules on understanding the impact of stigma, identifying and addressing unconscious biases, and developing effective strategies for fostering an inclusive environment within healthcare settings.

- Revisit available organisational support

  This research recommends a periodic reassessment of the health organisation's support systems to ensure they meet the evolving needs of HCWs in effectively managing stress and stigma. Activities, for example, include regularly conducting needs assessments to gather direct input from HCWs about their experiences and the effectiveness of current support systems. Based on findings, organisations should then customise their support programs to better align the specific challenges HCWs face. This

could involve improving the accessibility of mental health resources, creating targeted stress reduction programs, and launching campaigns to minimise stigma. It's important to maintain open and effective communication channels that allow HCWs to report issues confidentially and receive support without fear of reprisal.

The study likewise proposes an enhanced implementation of existing policies aimed at preventing any form of discrimination and stigmatisation within healthcare settings. This study stresses the importance of detailed and explicit procedures for both reporting and addressing cases of stigma. This is critical to ensure that HCWs affected by stigma receive the necessary support, and to hold those responsible for perpetuating stigma within healthcare accountable for their actions.

Future Research

This study underscores the critical importance of conducting further in-depth research on the pervasive issue of stigma within healthcare settings. A comprehensive exploration of this topic is necessary to refine our understanding and develop more effective intervention strategies over time.

This study recommends that future research delve into the enduring impact of stigma reduction programs by conducting longitudinally designed studies to identify any long-term effects and assess the sustained efficacy of these programs. Also, the research should investigate the factors contributing to the successful or unsuccessful outcomes of such programs, potentially including societal, cultural, and individual influences.

Lastly, more work is needed to explore the relationship between stigma, stress, absenteeism, and presenteeism, including examining the persistent effects of DRTB stigma on the mental health and overall well-being of HCWs across different global populations.

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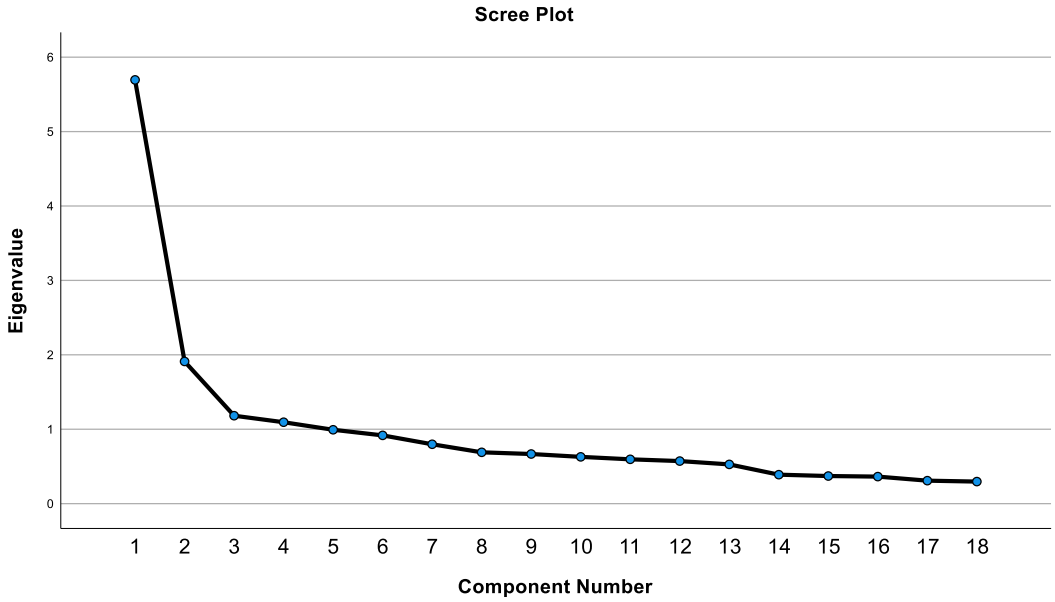
APPENDICES

A.1 Factor Analysis

A.1 Table 1. Total Variance Explained

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.695	31.637	31.637	2.826	15.701	15.701
2	1.911	10.616	42.253	2.809	15.607	31.308
3	1.182	6.566	48.819	2.217	12.317	43.626
4	1.094	6.079	54.898	2.029	11.273	54.898
5	.993	5.515	60.414			
6	.917	5.097	65.511			
7	.798	4.433	69.944			
8	.690	3.832	73.776			
9	.667	3.706	77.482			
10	.629	3.493	80.975			
11	.596	3.309	84.284			
12	.572	3.179	87.462			
13	.527	2.930	90.393			
14	.389	2.163	92.556			
15	.371	2.062	94.618			
16	.363	2.019	96.637			
17	.309	1.716	98.353			
18	.296	1.647	100.000			

Figure 7. Scree Plot of Sigma Components



A.1 Table 2. Component Transformation Matrix of Stigma Subtypes

Component	1	2	3	4
1 (Negative effect)	.524	.544	.476	.450
2 (Labelling)	.753	-.643	-.134	.041
3 (Conceal)	.213	.439	-.863	.134
4 (Fear)	-.335	-.315	-.105	.882

Extraction Method: Principal Component Analysis.

Rotation Method: Equamax with Kaiser Normalisation

A.1 Table 3. Rotated Component Matrix[a]	1	2	3	4
Q1People sometimes seem disgusted when they find out that my patients have drug-resistant TB	.647	.087	.123	.348
Q2People sometimes talk to me about how they find my drug-resistant TB patients that I work with to be disgusting	.761	.055	.046	.193
Q3People tell me that the drug-resistant-TB patients I work with can be dangerous	.659	.043	.121	.096
Q4People often become uneasy when they learn that my patients have drug-resistant TB	.727	.151	.175	.065
Q5Sometimes even my family and friends seem disgusted that the kind of patients I work with have drug-resistant TB	.559	.434	.253	.017
Q6At times, family and friends tell me that I am in danger because the type of patients I work with have drug-resistant TB	.533	.041	.245	.286
Q7People sometimes think that my drug-resistant TB patients can never really get well	.109	.011	.094	.775
Q8People have strong negative reactions when they learn that I work with drug-resistant TB patients	.332	.186	.094	.689
Q10At times, I feel stigmatised by others because the type of patients I work with	.063	.335	.208	.672
Q11People will always associate me with patients who have drug-resistant TB.	.112	.668	.143	.305
Q12I usually don't talk about what I do people that I have just met	.035	.643	.247	.210
Q14I try not to talk about what I do for a living unless I am asked directly.	.015	.543	.215	.341
Q16I feel that it is important to talk with my family and friends about the type patients I work with.	.126	.179	.227	.652
Q17I worry that I could get infected by my patients who have drug-resistant TB.	.127	.126	.810	.167
Q18At times, I am fearful of my patients who have drug-resistant TB.	.168	.134	.807	.037
Q19At times, people hold me responsible for the poor choices made by my patients	.200	.789	.055	.080
Q20I would rather work with other community health programs than being assigned to case find, contact trace, screen or treat drug-resistant TB	.096	.199	.656	.092

Extraction Method: Principal Component Analysis.
Rotation Method: Equamax with Kaiser Normalisation.
Kaiser-Meyer-Olkin Measure of Sampling Adequacy .851
Bartlett's Test of Sphericity (p-value <.001)
a. Rotation converged in 7 iterations.

A.2 Reliability tests of stigma components

A.2 Table 4. Item Statistics

Negative effects	Mean	Std. Deviation	Cronbach's Alpha
Q1People sometimes seem disgusted when they find out that my patients have drug-resistant TB	3.62	1.188	
Q2People sometimes talk to me about how they find my drug-resistant TB patients	3.64	1.088	
Q3People tell me that the drug-resistant-TB patients I work with can be dangerous	3.75	0.985	
Q4People often become uneasy when they learn that my patients have drug-resistant TB	3.52	1.132	
Q5Sometimes even my family and friends seem disgusted that the kind of patients	3.22	1.19	
Q6At times, family and friends tell me that I am in danger because the type of patients	3.54	1.135	
			.784
Labelling			
Q11People will always associate me with patients who have drug-resistant TB.	2.91	1.185	
Q12I usually don't talk about what I do for a living to people that I have just met	3.13	1.253	
Q14I try not to talk about what I do for a living unless I am asked directly.	3.55	1.145	
Q19At times, people hold me responsible for the poor choices made by my patients	2.93	1.172	
			.734
Conceal			
Q7People sometimes think that my drug-resistant TB patients can never really get well	3.25	1.206	
Q8People have strong negative reactions when they learn that I work with drug-resistant patients	3.27	1.137	
Q10At times, I feel stigmatised by others because the type of patients I work with	3.16	1.198	
Q16I feel that it is important to talk with my family and friends about the type	3.44	1.148	
			.681
Fear			
Q17I worry that I could get infected by my patients who have drug-resistant TB.	3.93	1.089	
Q18At times, I am fearful of my patients who have drug-resistant TB.	3.75	1.119	
Q20I would rather work with other community health programs than being assigned	3.12	1.126	
			.759

A.2 **Table 5. Summary Item Statistics**

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance
Negative effects (n = 6)	3.548	3.22	3.745	0.525	1.163	0.032
Labelling (n = 4)	3.131	2.913	3.553	0.64	1.22	0.088
Conceal (n=4)	3.283	3.163	3.444	0.28	1.089	0.014
Fear (n=3)	3.597	3.117	3.926	0.809	1.26	0.181

A.2 **Table 6. Scale Statistics**

	Mean	Variance	Std. Deviation	p-value
Negative effects (n = 6)	21.29	21.804	4.669	<.001
Labelling (n = 4)	12.53	10.79	3.285	<.001
Conceal (n = 4)	13.13	9.748	3.122	.016
Fear (n = 3)	10.79	6.104	2.471	<.001

A.2 **Table 7. Inter-Item Correlation Matrix - Negative Effects**

	Q1	Q2	Q3	Q4	Q5	Q6
Q1People sometimes seem disgusted when they find out that my patients have drug-	1.000	.536	.310	.524	.375	.307
Q2People sometimes talk to me about how they find my drug-resistant TB patients	.536	1.000	.334	.414	.322	.300
Q3People tell me that the drug-resistant-TB patients I work with can be dangerou	.310	.334	1.000	.360	.370	.423
Q4People often become uneasy when they learn that my patients have drug-resista	.524	.414	.360	1.000	.455	.337
Q5Sometimes even my family and friends seem disgusted that the kind of patients	.375	.322	.370	.455	1.000	.305
Q6At times, family and friends tell me that I am in danger because the type of patients	.307	.300	.423	.337	.305	1.000

A.2 Table 8. Inter-Item Correlation Marix - Labelling

	Q11	Q12	Q14	Q19
Q11People will always associate me with patients who have drug-resistant TB.	1.000	.496	.369	.419
Q12I usually don't talk about what I do for a living to people that I have just	.496	1.000	.319	.338
Q14I try not to talk about what I do for a living unless I am asked directly.	.369	.319	1.000	.349
Q19At times, people hold me responsible for the poor choices made by my patients	.419	.338	.349	1.000

A.2 Table 9. Inter-Item Correlation Matrix - Conceal

	Q7	Q8	Q10	Q16
Q7People sometimes think that my drug-resistant TB patients can never really ge	1.000	.419	.336	.316
Q8People have strong negative reactions when they learn that I work with drug-r	.419	1.000	.395	.315
Q10At times, I feel stigmatised by others because the type of patients I work wi	.336	.395	1.000	.371
Q16I feel that it is important to talk with my family and friends about the type	.316	.315	.371	1.000

A.2 Table 10. Inter-Item Correlation Matrix - Fear

	Q17	Q18	Q20
Q17I worry that I could get infected by my patients who have drug-resistant TB.	1.000	.562	.382
Q18At times, I am fearful of my patients who have drug-resistant TB.	.562	1.000	.331
Q20I would rather work with other community health programs than being assigned	.382	.331	1.000

A.2 Table 11. Scale Statistics

Negative effects	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Q1People sometimes seem disgusted when they find out that my patients have drug-	17.67	14.986	0.588	0.411	.74
Q2People sometimes talk to me about how they find my drug-resistant TB patients	17.64	15.923	0.541	0.339	.75
Q3People tell me that the drug-resistant-TB patients I work with can be dangerou	17.54	16.777	0.503	0.279	.76
Q4People often become uneasy when they learn that my patients have drug-resista	17.76	15.196	0.603	0.386	.73
Q5Sometimes even my family and friends seem disgusted that the kind of patients	18.07	15.574	0.512	0.281	.76
Q6At times, family and friends tell me that I am in danger because the type of	17.75	16.309	0.459	0.24	.77
Labelling					
Q11People will always associate me with patients who have drug-resistant TB.	9.61	6.294	0.52	0.388	.75
Q12I usually don't talk about what I do for a living to people that I have just met	9.4	5.836	0.559	0.422	.75
Q14I try not to talk about what I do for a living unless I am asked directly.	8.97	7.702	0.58	0.326	.75
Q19At times, people hold me responsible for the poor choices made by my patients	9.59	7.409	0.515	0.252	.73
Conceal					
Q7People sometimes think that my drug-resistant TB patients can never really ge	9.88	6.427	0.405	0.278	.76
Q8People have strong negative reactions when they learn that I work with drug-r	9.86	5.668	0.615	0.399	.69
Q10At times, I feel stigmatised by others because the type of patients I work wi	9.97	6.101	0.474	0.493	.60
Q16I feel that it is important to talk with my family and friends about the type	9.69	6.801	0.472	0.489	.68
Fear					
Q17I worry that I could get infected by my patients who have drug-resistant TB.	6.86	3.102	0.573	0.318	.78
Q18At times, I am fearful of my patients who have drug-resistant TB.	7.04	2.901	0.512	0.333	.71
Q20I would rather work with other community health programs than being assigned	7.67	3.807	0.554	0.457	.72

A.3 Description of participants

A.3 Table 12. Characteristics of HCW study participants

Characteristics	All HCWs	Barangay Health Worker	Laboratory	Midwife	Nurse	Physician	p-value
		n=88 (34%)	n=49 (19%)	n=19 (7%)	n=82 (32%)	n=20 (8%)	
Gender (n, %)							<.001
Male (n, %)	30 (11.6)	2 (2)	6 (12)	19 (100)	21 (25)	2 (10)	
Female (n, %)	227 (88)	86 (98)	43 (88)	0 (0)	62 (74)	18 (90)	
Age (mean, SD)	45.41 (11.87)	49.99 (11.8)	43.33 (11.7)	46.68 (10.9)	41.10 (11.2)	46.90 (8.9)	<.001
Years' experience as RHU worker (mean, SD)	14.00 (10.01)	12.60 (8.9)	13.60 (9.3)	17.05 (12.18)	14.79 (11.19)	15.02 (8.55)	.373
Living Arrangement (n, %)							.013
Living with immediate family (n, %)	179 (69.4)	49 (55.7)	37 (75.5)	16 (84.2)	61 (74.4)	16 (80.0)	
Living with an extended family or friends (n, %)	79 (30.6)	39 (44.3)	12 (24.5)	3 (15.8)	21 (25.6)	4 (20)	
Household Income per month (PHP) after tax (mean, SD)		5931.8 (0.52)	28792.7 (0.64)	25309.6 (0.85)	41379.0 (0.53)	86587.0 (0.81)	.001
Awareness of organisation social support group *(mean, SD)	3.79 (.93)	4.2 (1.06)	3.9 (1.05)	3.89 (1.10)	4.11 (0.92)	3.95 (1.23)	.410
Awareness of available financial or medical support* (mean, SD)	3.73(1.16)	3.97 (1.14)	4.0 (1.07)	3.68 (1.00)	4.05 (1.15)	4.25 (1.16)	.556
Confidence in infection control * (mean, SD)	3.89 (.96)	4.07 (1.033)	3.96 (1.26)	3.84 (0.688)	4.12 (1.01)	4.0 (1.17)	.597

n count m mean *SD* standard deviation *DRTB* drug-resistant tuberculosis
PHP Philippine Peso *HCW healthcare worker (n=258)*
p-value = Fisher-Freeman-Halton Exact Test (categorical variable); ANOVA (continuous variables);

A.4 Aggregated data of stigma sub-scales

A.4 Table 13. DRTB stigma and its sub-scale mean score distribution among CHW group

		BHW			Laboratory			Midwife			Nurse			Physician			
		(n = 88)	95% CI for mean		(n= 49	95% CI for mean		(n = 19)	95% CI for mean		(n= 82)	95% CI for mean		(n=20)	95% CI for mean		
	Median	Mean (SD)	Lower Bound	Higher Bound	Mean (SD)	Lower Bound	Higher Bound	Mean (SD)	Lower Bound	Higher Bound	Mean (SD)	Lower Bound	Higher Bound	Mean (SD)	Lower Bound	Higher Bound	p-value
Negative effects	22.0	21.96(4.07)	20.92	23.13	21.78(5.03)	20.77	22.85	18.89(4.79)	16.58	21.20	21.00(4.53)	20.09	21.99	20.15(4.31)	18.13	22.17	.075
Labelling	12.0	12.73(3.31)	12.03	13.44	12.25(3.46)	11.25	13.25	11.57(4.00)	9.87	13.28	11.76(3.25)	11.05	12.48	10.35(3.46)	8.72	11.97	.064
Concealing	17.0	13.42(3.20)	12.74	14.09	13.32(3.26)	12.38	14.26	12.47(2.77)	11.13	13.82	13.07(3.05)	12.40	13.74	13.00(2.94)	11.62	14.37	.779
Fear of disease	12	11.20(2.25)	10.72	11.68	11.67(2.31)	11.01	12.33	10.78(3.05)	9.32	12.25	10.89(2.65)	10.31	11.47	11.50(2.98)	10.21	12.79	.434
Overall DRTB stigma	58	59.91(10.63)	56.91	61.41	59.24(9.98)	56.38	62.11	53.47(12.35)	47.52	59.43	56.65(9.66)	54.52	58.77	54.60(10.01)	50.33	58.87	.069

Score range: Negarive effects (1-30)Labelling (1-20); Concealling (1-20); Fear (1-20); DRTB stigma (1-85)

A.4 Table 14. Description of stigma components by HCW groups									
					95% Confidence Interval for Mean				
		Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Min	Max	p-value
All Stigma	BHWs	59.16	10.634	1.134	56.91	61.41	29	82	
	MLT	59.24	9.980	1.426	56.38	62.11	34	75	
	Midwife	53.47	12.353	2.834	47.52	59.43	18	66	
	Nurse	56.65	9.656	1.066	54.52	58.77	19	73	
	Physician	54.60	9.127	2.041	50.33	58.87	27	67	
	Total	57.60	10.330	.643	56.34	58.87	18	82	.069
Component 1 Negative effects	BHWs	21.96	4.077	.583	20.79	23.13	10	30	
	MLT	21.78	5.027	.536	20.72	22.85	12	30	
	Midwives	18.89	4.795	1.100	16.58	21.21	7	26	
	Nurses	21.00	4.532	.501	20.00	22.00	7	30	
	Physicians	20.15	4.320	.966	18.13	22.17	10	29	
	Total	21.23	4.674	.291	20.66	21.80	7	30	.075
Component 2 Labelling	BHWs	12.74	3.317	.354	12.04	13.44	5	20	
	MLT	12.24	3.461	.494	11.25	13.24	4	19	
	Midwives	11.58	3.533	.810	9.88	13.28	4	19	
	Nurses	11.77	3.256	.360	11.05	12.48	4	18	
	Physicians	10.35	3.468	.776	8.73	11.97	4	14	
	Total	12.07	3.391	.211	11.65	12.48	4	20	.064
Component 3 Concealling	BHWs	13.42	3.205	.342	12.74	14.10	5	20	
	MLT	13.33	3.268	.467	12.39	14.27	4	20	
	Midwives	12.47	2.776	.637	11.14	13.81	4	18	
	Nurse	13.07	3.050	.337	12.40	13.74	4	19	
	Physician	13.00	2.938	.657	11.62	14.38	6	18	
	Total	13.19	3.106	.193	12.81	13.57	4	20	.779
Component 4 Fear	BHWs	11.20	2.250	.240	10.73	11.68	5	15	
	MLT	11.67	2.313	.330	11.01	12.34	6	16	
	Midwife	10.79	3.047	.699	9.32	12.26	3	15	
	Nurses	10.89	2.653	.293	10.31	11.47	3	15	
	Physicians	11.50	2.763	.618	10.21	12.79	3	16	
	Total	11.19	2.498	.155	10.88	11.49	5	16	.434
Total number = 258 (BHW = 88, MLT = 49, midwives = 19, nurses = 82, physicians = 20)									

A.4 Table 15. One Sample Test

	Median	Mean	Std. Deviation	Std Error	Minimum	Maximum	p-value
DRTB Stigma All HCW (n = 258)	58	57.60	10.33	.6.43	18	90	.628

	Significance			95% Confidence Interval of the Difference	
	t	One-Sided p	Two-Sided p	Mean Difference	Lower	Upper
All Stigma	9.476	<.001	<.001	6.095	4.83	7.36

Test Value = 51.51 (50.5% reference value from Sommerland et al 2017)

A.4 Table 16. Multiple comparison of the mean difference in the DRTB stigma scores of HCWs

Dependent Variable	(I) Occupation	(J) Occupation	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
All Stigma	Barangay Health Workers	Laboratory	-.086	1.824	1.000	-5.10	4.93
		Midwife	5.685	2.589	.185	-1.43	12.80
		Nurse	2.513	1.571	.499	-1.80	6.83
		Physician	4.559	2.535	.377	-2.41	11.52
	Laboratory	Barangay Health Workers	.086	1.824	1.000	-4.93	5.10
		Midwife	5.771	2.766	.229	-1.83	13.37
		Nurse	2.599	1.848	.624	-2.48	7.68
		Physician	4.645	2.716	.429	-2.82	12.11
	Midwife	Barangay Health Workers	-5.685	2.589	.185	-12.80	1.43
		Laboratory	-5.771	2.766	.229	-13.37	1.83
		Nurse	-3.173	2.606	.741	-10.33	3.99
		Physician	-1.126	3.279	.997	-10.13	7.88
	Nurse	Barangay Health Workers	-2.513	1.571	.499	-6.83	1.80
		Laboratory	-2.599	1.848	.624	-7.68	2.48
		Midwife	3.173	2.606	.741	-3.99	10.33
		Physician	2.046	2.552	.930	-4.97	9.06
	Physician	Barangay Health Workers	-4.559	2.535	.377	-11.52	2.41
		Laboratory	-4.645	2.716	.429	-12.11	2.82
		Midwife	1.126	3.279	.997	-7.88	10.13
		Nurse	-2.046	2.552	.930	-9.06	4.97
Component 1	Barangay Health Workers	Laboratory	-.175	.826	1.000	-2.44	2.09
		Midwife	2.889	1.172	.102	-.33	6.11
		Nurse	.784	.711	.805	-1.17	2.74

		Physician	1.634	1.148	.613	-1.52	4.79
	Laboratory	Barangay Health Workers	.175	.826	1.000	-2.09	2.44
		Midwife	3.064	1.252	.106	-.38	6.50
		Nurse	.959	.836	.781	-1.34	3.26
		Physician	1.809	1.229	.582	-1.57	5.19
	Midwife	Barangay Health Workers	-2.889	1.172	.102	-6.11	.33
		Laboratory	-3.064	1.252	.106	-6.50	.38
		Nurse	-2.105	1.179	.385	-5.35	1.14
		Physician	-1.255	1.484	.916	-5.33	2.82
	Nurse	Barangay Health Workers	-.784	.711	.805	-2.74	1.17
		Laboratory	-.959	.836	.781	-3.26	1.34
		Midwife	2.105	1.179	.385	-1.14	5.35
		Physician	.850	1.155	.948	-2.32	4.02
	Physician	Barangay Health Workers	-1.634	1.148	.613	-4.79	1.52
		Laboratory	-1.809	1.229	.582	-5.19	1.57
		Midwife	1.255	1.484	.916	-2.82	5.33
		Nurse	-.850	1.155	.948	-4.02	2.32
Component 2	Barangay Health Workers	Laboratory	.494	.598	.922	-1.15	2.14
		Midwife	1.160	.848	.649	-1.17	3.49
		Nurse	.970	.515	.328	-.44	2.38
		Physician	2.389*	.831	.035	.11	4.67
	Laboratory	Barangay Health Workers	-.494	.598	.922	-2.14	1.15
		Midwife	.666	.906	.948	-1.82	3.16
		Nurse	.477	.605	.934	-1.19	2.14
		Physician	1.895	.890	.211	-.55	4.34
	Midwife	Barangay Health Workers	-1.160	.848	.649	-3.49	1.17
		Laboratory	-.666	.906	.948	-3.16	1.82

		Nurse	-.189	.854	.999	-2.53	2.16
		Physician	1.229	1.074	.783	-1.72	4.18
	Nurse	Barangay Health Workers	-.970	.515	.328	-2.38	.44
		Laboratory	-.477	.605	.934	-2.14	1.19
		Midwife	.189	.854	.999	-2.16	2.53
		Physician	1.418	.836	.438	-.88	3.72
	Physician	Barangay Health Workers	-2.389*	.831	.035	-4.67	-.11
		Laboratory	-1.895	.890	.211	-4.34	.55
		Midwife	-1.229	1.074	.783	-4.18	1.72
		Nurse	-1.418	.836	.438	-3.72	.88
Component 3	Barangay Health Workers	Laboratory	.094	.556	1.000	-1.43	1.62
		Midwife	.947	.789	.752	-1.22	3.12
		Nurse	.347	.479	.951	-.97	1.66
		Physician	.420	.773	.983	-1.70	2.54
	Laboratory	Barangay Health Workers	-.094	.556	1.000	-1.62	1.43
		Midwife	.853	.843	.850	-1.46	3.17
		Nurse	.253	.563	.992	-1.29	1.80
		Physician	.327	.828	.995	-1.95	2.60
	Midwife	Barangay Health Workers	-.947	.789	.752	-3.12	1.22
		Laboratory	-.853	.843	.850	-3.17	1.46
		Nurse	-.599	.794	.943	-2.78	1.58
		Physician	-.526	.999	.985	-3.27	2.22
	Nurse	Barangay Health Workers	-.347	.479	.951	-1.66	.97
		Laboratory	-.253	.563	.992	-1.80	1.29
		Midwife	.599	.794	.943	-1.58	2.78
		Physician	.073	.778	1.000	-2.06	2.21
	Physician	Barangay Health Workers	-.420	.773	.983	-2.54	1.70

		Laboratory	-.327	.828	.995	-2.60	1.95
		Midwife	.526	.999	.985	-2.22	3.27
		Nurse	-.073	.778	1.000	-2.21	2.06
Component 4	Barangay	Laboratory	-.469	.445	.830	-1.69	.75
	Health	Midwife	.415	.632	.965	-1.32	2.15
	Workers	Nurse	.314	.383	.924	-.74	1.37
		Physician	-.295	.619	.989	-2.00	1.41
	Laboratory	Barangay Health Workers	.469	.445	.830	-.75	1.69
		Midwife	.884	.675	.686	-.97	2.74
		Nurse	.783	.451	.414	-.46	2.02
		Physician	.173	.663	.999	-1.65	1.99
	Midwife	Barangay Health Workers	-.415	.632	.965	-2.15	1.32
		Laboratory	-.884	.675	.686	-2.74	.97
		Nurse	-.101	.636	1.000	-1.85	1.65
		Physician	-.711	.800	.901	-2.91	1.49
	Nurse	Barangay Health Workers	-.314	.383	.924	-1.37	.74
		Laboratory	-.783	.451	.414	-2.02	.46
		Midwife	.101	.636	1.000	-1.65	1.85
		Physician	-.610	.623	.865	-2.32	1.10
	Physician	Barangay Health Workers	.295	.619	.989	-1.41	2.00
		Laboratory	-.173	.663	.999	-1.99	1.65
		Midwife	.711	.800	.901	-1.49	2.91
		Nurse	.610	.623	.865	-1.10	2.32

*. The mean difference is significant at the 0.05 level.

A.5 Power analysis

A.5 Table 17: Effect size, sample size and statistical parameters for regression analysis

	BHW	MLT	Midwife	Nurse	Physician
α err prob	0.05	0.05	0.05	0.05	0.05
Power (1-β err prob)	0.8	0.8	0.8	0.8	0.8
Total sample size	88	49	19	82	20
Number of tested predictors	6	6	6	6	6
Total number of predictors	7	7	7	7	7
Noncentrality parameter λ	14.73	15.83	23.17	14.82	22.22
Critical F	2.21	2.33	3.09	2.22	3.00
Numerator df	6	6	6	6	6
Denominator df	80	41	11	74	12
Effect size f^2	0.17[a]	0.32[a]	1.22[b]	0.18[a]	1.11[b]

Power analysis calculated using G*Power
[a] = medium effect
[b] = large effect

A.6 Regression assumptions

A.6 Table 18. Model Summary linear regression

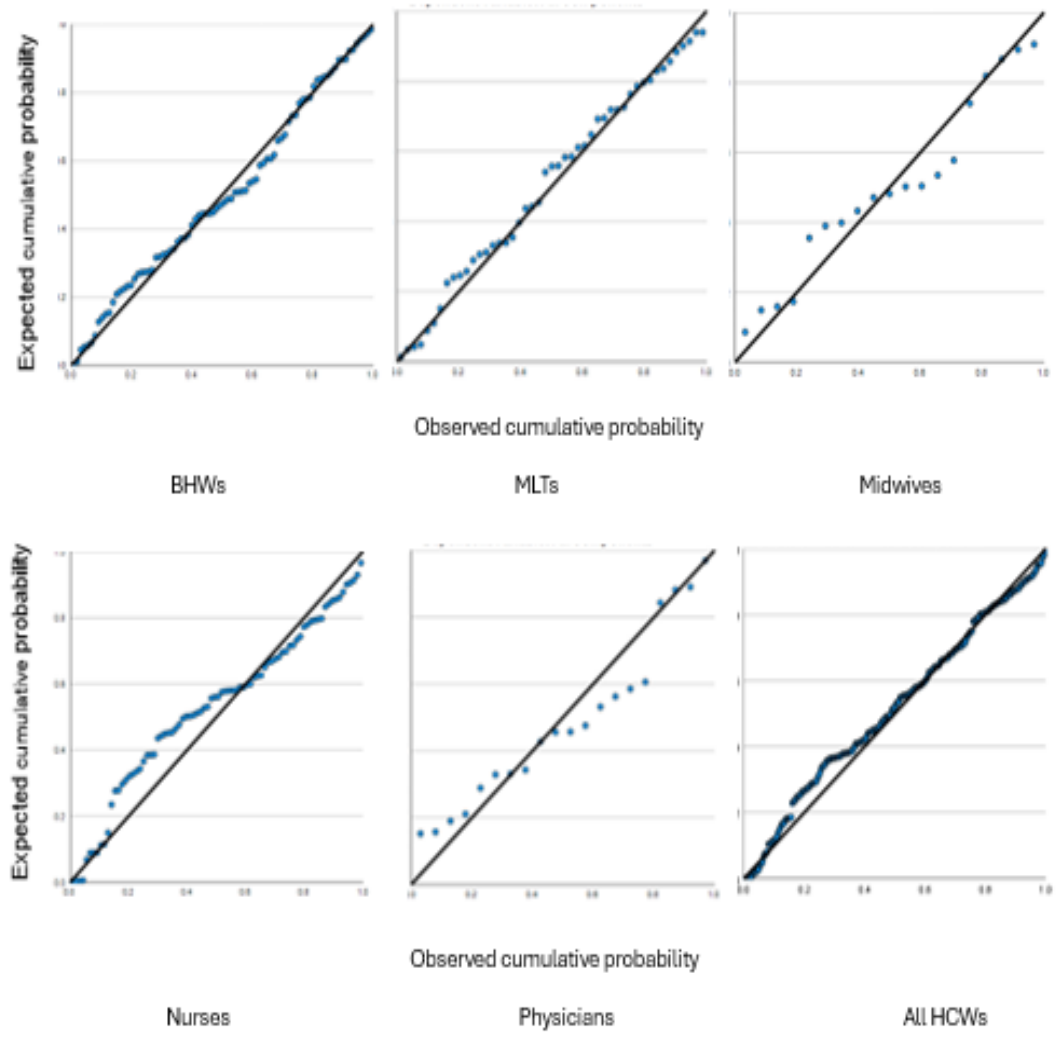
Occupation	R	R^2	Adjusted R^2	Std. Error	R^2 Change	F Change	Durbin-Watson Statistic
BHW	0.67	0.45	0.40	10.15	0.45	8.82	2.09
MLT	0.72	0.52	0.43	8.47	0.52	6.04	1.96
Midwife	0.89	0.80	0.67	8.11	0.80	6.11	1.72
Nurse	0.55	0.30	0.23	9.58	0.30	4.46	1.70
Physician	0.72	0.52	0.23	8.77	0.52	1.82	2.50
All HCWs	0.59	0.35	0.32	9.88	0.35	16.02	1.95

Predictors: Age, years of experience, Living arrangement, Income, confidence in infection control, knowledge of organisational support, knowledge of financial support

Dependent variable: DRTB stigma

Collinearity statistics: All VIFs are below 5.5 and Tolerance below 1.0

A.6 Figure 8. Normal P-P Plot for standardised residual for HCWs, DRTB stigma as the dependent variable



A.7 Figure 9: Drug-resistant tuberculosis stigma: Healthcare workers' perspectives in the Philippines

Drug-resistant tuberculosis stigma: Healthcare workers' perspective in the Philippines

Lolita Liboon Aranas [1,2] Khorshed Alam [1] Prajwal Gyawali [1] Mahumud Rashidul Alam [3]

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Key Takeaways

- Healthcare workers face DRTB stigma
- DRTB stigma impacts various HCWs groups differently.
- Awareness of organizational support only alleviates stigma on a certain level.
- Confidence in infection control does not necessarily reduce stigma.

Recommendations

- Explore every aspect of stigma and addressing the underlying issues may contribute to establishing a more supportive and enabling environment for HCWs, encouraging them to be more open about their involvement with DRTB.
- A need for targeted stigma interventions that go beyond raising awareness in organisational support to effectively address support inadequacies and cultivate a more empathetic and supportive socio-economic environment·
- More robust studies to understand the intricate relationship between stigma and infection control.
- A wider prospective study designed to explore stigma over time and uncover its drivers and facilitators

Introduction

Drug-resistant tuberculosis (DRTB) is prevalent worldwide. Studies revealed that HCWs face stigma when providing DRTB services. As a result, HCWs' well-being is affected, posing a challenge to health service delivery. In the Philippines, studies are few, and the extent of the DRTB stigma confronting HCWs is unexplored.

Objectives

We explored the:
(1) extent of HCWs' DRTB stigma
(2) differences in perceived stigma among HCW groups
(3) relationships between stigma and awareness of organisational support and confidence in infection control.
We sought important information that could inform the development of stigma reduction strategies for HCWs.

Methodology

Study design: Cross-sectional
Location: Philippines: (3 locations)
Data collection: Online survey
Collection date: February - June 2022
Participants: 258 HCWs
Questionnaire:

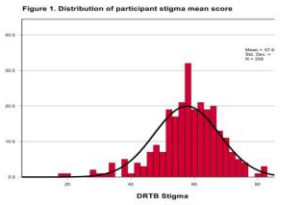
- MPHSSS adaptation
- organisational social support awareness
- organisational financial/medical support awareness
- confidence in infection control

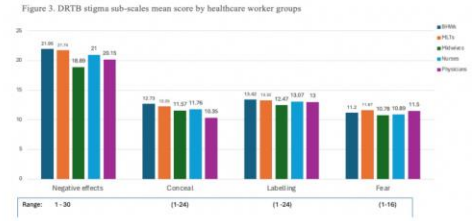
Analysis

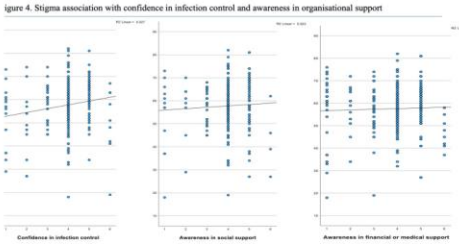
- Data analysis by SPSS V29; AMOS V29
- Simple linear regression for crude stigma-predictor association
- Multivariate regression for the adjusted model
- Exploratory analysis considered
  - >.05 significant level
  - >.25 reportable level

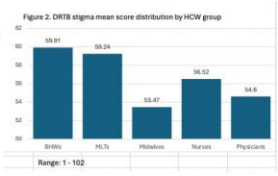
Results

- HCWs stigma score (M = 56.60, SD = 10.33)
  - 6.1 points higher than the previous study
  - Highest: BHW (M = 60.04, SD = 11.06)
  - Lowest. : Physicians (M=54.60, SD=9.13)
- Lower household income, higher stigma
- Age, gender, and years of service weak to no association with stigma
- BHW: more likely to conceal their work
- MLT: more likely to face disgust
- MLT & Physicians: highest scores in fears
- Awareness of organisational support is negatively associated with stigma, except in BHWs
- Confidence in infection control is positively associated with stigma









Conclusion

HCWs providing DRTB services are stigmatised, with various groups impacted differently, despite confidence in infection control and awareness of organisational support. We recommend a targeted strategy for DRTB stigma to foster a more accepting and supportive environment for these HCWs. Reduced disease stigma could improve HCW well-being, patient service delivery, and outcomes. Additional research is required to have a more comprehensive picture of the DRTB stigma that these HCWs face.

References:
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