

# A scoping review on socioeconomic factors affecting tuberculosis loss to follow-up in Southeast Asia

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## ABSTRACT

**Introduction:** Tuberculosis (TB) is a global public health issue. The Southeast Asian region grapples with numerous challenges in TB management, with loss to follow-up (LTFU) emerging as a critical barrier to effective control of the disease. This review synthesised published articles to identify socioeconomic factors contributing to the burden of TB losses for follow-up in Southeast Asia.

**Materials and Methods:** This scoping review was conducted using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework developed by the Joanna Briggs Institute (JBI). A total of 10 studies were identified as eligible from the title and abstract review. The mixed method quality appraisal tool (MMAT) version 2018 was used to assess the quality of the included quantitative studies.

**Results:** The results showed that poverty, unemployment, low education levels, migrant status, community support, male gender, substance abuse, and regional disparities significantly impact the occurrence of TB LTFU in Southeast Asia.

**Conclusion:** The findings have significant implications for public health in Southeast Asia. Addressing these socioeconomic barriers through community-based strategies, educational initiatives, and policy reforms is vital for improving treatment outcomes and overall public health.

## KEYWORDS:

*Tuberculosis, Southeast Asia, loss to follow-up, socioeconomic factors, treatment adherence*

## INTRODUCTION

Tuberculosis (TB) is one of the most common chronic infectious diseases in the world, with an estimated 10 million people suffering from it. Therefore, TB remains a formidable public health challenge worldwide, with Southeast Asia being a region of particular concern because of its high TB prevalence.<sup>1</sup> In 2019, a large proportion of TB cases were concentrated in Southeast Asia (44%).<sup>2</sup> The region grapples with numerous challenges in TB management, with loss to follow-up (LTFU) emerging as a critical barrier to effective control of the disease.

TB loss to follow-up (LTFU) is a term used to describe patients who have started TB treatment but do not complete it or do not return for their scheduled follow-up appointments. According to the World Health Organization (WHO) definition, TB LTFU refers to the patients who underwent treatment for a minimum of four weeks and subsequently discontinued treatment for a continuous period exceeding eight weeks.<sup>3</sup> This interruption not only hampers individual health outcomes but also poses a significant public health risk by increasing the likelihood of drug-resistant TB strains.<sup>4</sup> LTFU is also a significant barrier to effective TB control as it can lead to continued transmission of the disease and increased morbidity and mortality among patients.<sup>5</sup>

Socioeconomic factors refer to the social and economic experiences and realities that shape individuals' and communities' lives, influencing their behaviour, attitudes, and opportunities. These factors encompass a wide range of elements, including income, education, employment status, social class and access to healthcare.<sup>6</sup> They play a crucial role in determining an individual's quality of life and can significantly impact health outcomes, including the treatment, management and outcome of diseases such as TB.<sup>6</sup> A retrospective cohort study in Brazil found that males, non-white ethnicity/colour, lower education level, homelessness, deprivation of liberty, drug, alcohol, and/or tobacco use, and recurrence or re-entry after abandonment were associated with higher odds of LTFU. Conversely, older age, extrapulmonary tuberculosis, deprivation of liberty, and supervised treatment were associated with lower odds of LTFU.<sup>7</sup> Other studies have consistently demonstrated that factors such as poverty, lack of access to healthcare, educational disparities and other socioeconomic stressors significantly contribute to patients failing to complete TB treatment.<sup>8,9</sup> These factors often create barriers that prevent consistent and effective treatment adherence.

In Southeast Asia, these socioeconomic factors are compounded by the high prevalence of TB, limited resources, and high population density.<sup>2</sup> In addition, focussing on Southeast Asia is essential because of the region's unique socio-economic and cultural landscape, such as the high number of immigrants<sup>10</sup> and various education levels,<sup>11</sup> which profoundly influence TB treatment outcomes. In one study conducted, which considered demographic characteristics, socioeconomic status, and distance to primary health centres, resulted in a higher rate of successful

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treatment and a lower "lost to follow-up" rate compared with conventional programmes.<sup>12</sup>

Thus, the objective of this review was to synthesise published articles to identify socioeconomic factors contributing to the burden of TB loss for follow-up in Southeast Asia. The findings are important because of the diversity and complexity of socioeconomic conditions in Southeast Asia, which necessitate a targeted understanding of how these factors interact with TB LTFU, enabling more effective, region-specific interventions and strategies.

### Scoping Review of the Research Questions

TB LTFU is a huge public health problem, as discussed; hence, this review aimed to answer the following questions:

1. What are the social factors that contribute to the burden of TB LTFU in Southeast Asia?
2. What economic factors influence the burden of TB LTFU in Southeast Asia?

## MATERIALS AND METHODS

This scoping review was conducted using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) for scoping review<sup>13</sup> and the framework by the Joanna Briggs Institute (JBI)<sup>14</sup> which is the improved version of the scoping review framework developed from the earlier methodology described by Arksey & O'Malley.<sup>15</sup> This review was not registered in the Prospective Register of Systematic Reviews (PROSPERO) because it is a scoping review and not a systematic review.

### Search Strategy

PubMed and Scopus databases were searched to retrieve articles published between 2011 and 2020. Accordingly, only studies meeting the eligibility criteria discussed below were included in the review. The search was conducted on January 7, 2023. The following search terms and keywords were used: socio-economic factors, TB LTFU, TB treatment default, TB defaulters, Southeast Asia, Malaysia, Singapore, Indonesia, Cambodia, Brunei, Laos, Myanmar, Philippines, Thailand, Vietnam, East Timor, social factors, economic factors, contributing factors and risk factors. During the data sources search process, sorting by year of publication was first applied. Next, we only considered the first 10 pages of the search results because of multiple similarities (duplicates) and unrelated articles (not about TB/not socioeconomic status).

### Eligibility Criteria

#### Inclusion criteria

Because this is a scoping review, we used the population/concept/context (PCC) framework recommended by JBI<sup>14</sup> to identify eligible studies, as discussed below:

1. **Population (P):** TB LTFU patients, including both pulmonary and extra pulmonary TB.
2. **Concept (C):** Quantitative studies investigating the influence of socioeconomic factor, drivers and status on the occurrence of loss to follow among TB patients.
3. **Context (C):** We conducted our search process between January 2012 to December 2022. Only cohort, case-control, cross-sectional studies and systematic reviews

evaluating socioeconomic factors influencing loss to follow among TB patients from Southeast Asian countries were included for further screening and synthesis.

#### Exclusion criteria

1. Publication does not peer reviewed.
2. Other reviews (editorial, commentaries), book chapters, editorials, letters and conference abstracts.
3. Publication in any language other than English.
4. Qualitative studies.
5. Publication for which we cannot access the full text.

### Selection Process

Our selection method followed the guidelines outlined in Joanna Briggs Institute's online manual. Two reviewers conducted an article search based on the defined eligibility criteria. The articles obtained were then organised in MS Excel spreadsheet for checking duplication and assessing eligibility. There was a consensus on the articles chosen and screened for this review, with no disagreements noted.

### Data Extraction and Analysis

The screening of titles and abstracts was independently conducted by one review author, adhering to the previously mentioned criteria. Subsequently, full-text evaluation of the studies identified as eligible from the title and abstract review was undertaken. The studies for inclusion were chosen by the reviewer after a thorough full-text assessment. Subsequently, data relevant to the study objectives were extracted and thematically analysed. This includes details such as author(s), publication year, country of origin (of the publication or study conduct), methodology and primary socioeconomic factors. The themes that emerged will be explored in the findings and discussion section.

## RESULTS

### Search Outcomes

On January 7, 2023, an initial search resulted in the identification of 28 articles from PubMed and 22 from Scopus. Following a preliminary screening of titles and abstracts, 19 articles were selected for further evaluation. This subset comprised 11 articles from Scopus and eight from PubMed. However, three articles were subsequently identified as duplicates and thus excluded. The remaining 16 articles, consisting of 16 quantitative studies, underwent a full-text review and were further assessed for suitability. Of the 16 articles reviewed in full, only 10 met the eligibility criteria for inclusion in this study. Figure 1 depicts a schematic representation of the search methodology and the outcomes of the article selection procedure.

### Study Setting and Summary of the Reviewed Articles

Among 10 eligible articles selected for review, three studies were conducted in Malaysia, two in Vietnam, two in Indonesia, two in the Philippines and one in Myanmar. There is only one prospective cohort study. The remaining studies consisted of three cross-sectional studies, five retrospective cohort studies and one case-control study. Table I presents the characteristics of the study population. Table II shows a summary of all 10 eligible articles, with a specific focus on the socioeconomic factors that influence the TB LTFU

Table I: Characteristics of the study population.

Characteristic	n	%	Citation
Mean age	41.8	-	(11, 16-24)
Sex			
Male	55843	65.5	(11, 16-24)
Female	29711	34.5	
Average duration of the study	49 months	-	(11, 16-24)
Treatment outcome			
Completed treatment/treatment success.	21803	24.0	(11, 16-24)
Loss to follow-up	2162	2.4	
Others (died, treatment failure)	1715	1.9	
Not evaluated	65078	71.7	

group. These studies broadly focussed on socioeconomic risk factors, social issues, and financial issues. There were 11 articles that focussed solely on social aspects, four focussed only on financial/economic issues, and five covered both social and economic aspects. Of the selected articles, with the updated search, one was a cross-sectional study focussing on social aspects and a systematic review covering both social and economic aspects.

#### Emergent Themes from the Studies Reviewed:

##### 1. Social issues influencing TB lost to follow-up in Southeast Asia

From the studies identified in the search, eight examined the social issues influencing TB LTFU in Southeast Asia. This included the level of education, immigrant status, support from the community, substance abuse and gender.

**1.1. Education level:** From the eligible studies, two found that education level can have some impact on the occurrence of TB LTFU.<sup>11,17</sup> Those with a low level of education have a higher risk of becoming TB LTFU than those with a higher education level.<sup>11</sup> Furthermore, those with an education level below secondary level are even more vulnerable.<sup>17</sup>

**1.2. Migrant status:** Compared with permanent residents, short-term, inter-province migrants are most likely to have a higher TB LTFU rate.<sup>18</sup> In addition, economic migrants, particularly those crossing provincial borders, have a higher risk of poor TB treatment outcomes.<sup>18</sup>

**1.3. Community support:** Two studies have described how community support may influence the rate of TB LTFU.<sup>19,23</sup> In Indonesia, there is a community social organisation that aids TB patients to complete treatment within a specified period, known as Aisiyiah, actively involved in TB management, particularly in North Sumatra, Indonesia. The organisation has established a communication network to prevent TB through the formation of the TB-HIV Care Aisiyiah team. This team consists of cadres who work at the community level, including villages, to provide services in collaboration with local health centres (Puskesmas). These cadres are tasked with humanitarian duties that prioritise human values without discrimination based on race, religion, or ethnicity.<sup>25</sup> Receiving this support contributes to a lower LTFU rate.<sup>19</sup> In the Myanmar, patients who reported having received any type of assistance (including travel support) from the TB programme showed a significantly lower risk of LTFU.<sup>21</sup>

**1.4. Substance use:** Tobacco and alcohol are the most common substances used, with two studies showing that they can affect the TB LTFU rate. There are increased odds of TB LTFU among alcoholics,<sup>22</sup> whereas there are noticeable higher TB LTFU rates among smokers.<sup>20</sup>

**1.5. Gender:** Being a male will most likely increase the risk of LTFU as compared to female, according to two studies in Malaysia and Myanmar.<sup>17,21</sup>

##### 2. Economic Factors influencing TB LTFU in Southeast Asia

From the studies identified in the search, several economic factors were found to contribute to the TB LTFU in Southeast Asia. This included the household income, employment status, health insurance and accessibility to healthcare.

**2.1 Household income:** Lower household income can contribute to TB LTFU. In Malaysia, risk of TB LTFU significantly increases by those in lower income group below RM2160 as compared to those that earn more.<sup>11</sup>

**2.2 Employment status:** Those that was unemployed was found to be more likely to become TB LTFU as compared to those with employment status<sup>11</sup> according to study in Malaysia. Similar findings were found in Indonesia where those with their household's head was self-employed were more likely to default TB treatment as compared to those with their household's head work as government employees.<sup>23</sup>

**2.3 Health insurance:** In Indonesia, those covered by health insurance are more likely to comply with treatment and follow-up as compared to those that not covered.<sup>23</sup> Furthermore, those that have to pay out of pocket are more likely to stop seeking treatment and follow-up altogether.<sup>16</sup>

**2.4 Accessibility to healthcare:** Poor accessibility to health centres is also an issue. People who received travel support to access the health facility were significantly lower risk of becoming TB LTFU.<sup>21</sup> People who had no access to transport and were forced to walk to health centres were most likely to default to TB treatment.<sup>23</sup> As comparison, the decentralisation of treatment to facilities near a patient's residence reduced default during treatment.<sup>24</sup>

#### Quality of Evidence

The Mixed Method Quality Appraisal Tool (MMAT) version 201826 was used to assess the quality of the included quantitative studies. Two people reviewed the articles to judge their quality. They looked at different aspects such as

Table II: Summary of eligible articles with specific focus on the socioeconomic factors that influence the group with TB LTFU

No.	Author/ references	Year	Study location/ countries of Origin	Method/ study design	Main socioeconomic findings
1	Sharani et al. <sup>11</sup>	2022	Malaysia	Cross-sectional study using secondary data	Risk of TB LTFU significantly increases by 1. Working age population aged 32–41 and 42–53 years 2. Malaysian nationality 3. Patients staying in an urban area 4. Income level less than RM2160 5. Unemployed 6. Have a low education level (below high school), Loss to follow-up was less common among patients covered by social health insurance compared with those who paid for treatment out-of-pocket Those significantly associated with default treatment were as follows: 1. Gender, 2. Age 3. Education levels
2	Wrohan et al. <sup>16</sup>	2022	Vietnam	Retrospective cohort study	
3	Shaifuddin et al. <sup>17</sup>	2022	Malaysia	Cross-sectional study using secondary data	Short term, interprovince migrants have higher default rates
4	Vo et al. <sup>18</sup>	2020	Vietnam	Cross-sectional study	Significant correlations between cure and default outcome in DR-TB patients accompanied by Aisyiyah compared with those unaccompanied. (2.8% vs 28.3%; p = 0.002)
5	Kusmiati et al. <sup>19</sup>	2020	Indonesia	Retrospective cohort study	Proportion of defaulters higher in the smoking group
6	Khan et al. <sup>20</sup>	2020	Malaysia	Retrospective cohort study	1. Patients with older age, male sex, patients residing in hilly regions, and HIV coinfection were risk factors for loss to follow-up 2. Patients who received travel support were less likely to be lost to follow-up
7	Aung, et al. <sup>21</sup>	2019	Myanmar	Retrospective cohort study	1. Increased odds of default in alcoholics 2. Reduce odds of default in those with better TB knowledge, and higher levels of trust in from physicians and nurses.
8	Tupasi et al. <sup>22</sup>	2016	Philippines	Case-control study	The default was associated with 1. Characteristics of the head of the household being self-employed 2. Walking to the clinic
9	Rutherford et al. <sup>23</sup>	2013	Indonesia	Prospective cohort study	Protective factor: 1. Have health insurance 2. Paying for diagnosis (as opposed to non-paying) Decentralization reduces the risk of default
10	Gler et al. <sup>24</sup>	2012	Philippines	Retrospective cohort analysis	

the purpose of the study, how well it was conducted, the design, how participants were chosen, how data was collected and analysed, and the conclusions drawn from the findings. The quality score indicates how good the studies are, with scores below 50% being considered low quality, scores between 51% and 75% being average quality, and scores between 76% and 100% being high quality. All 10 quantitative studies included in this assessment were of high quality, scoring between 76% and 100%. None of the studies were considered to be of low quality. Evaluation of the quality of evidence is done in a separate MS Excel file. The risk of bias was considered very low in these studies.

## DISCUSSION

Socioeconomic stressors such as poverty, unemployment and low household income critically impact TB treatment adherence and completion, leading to LTFU.<sup>11,17</sup> These factors create a dilemma in which individuals prioritise immediate economic survival over health care. Poverty can limit access to TB services and necessary nutrition, whereas unemployment and low income may lead to inadequate living conditions, reducing the ability to adhere to treatment schedules.<sup>27</sup> These circumstances often force individuals to choose between earning a livelihood and attending healthcare appointments, thereby increasing the risk of LTFU.

Educational levels significantly influence TB treatment outcomes. Lower education levels are often correlated with higher LTFU rates.<sup>11</sup> This can be attributed to limited health literacy, which affects understanding and adherence to treatment regimens. In addition, community support plays a crucial role in improving adherence to TB treatment. Strong community networks provide education, awareness, and support systems, encouraging patients to continue their treatment and reducing the incidence of LTFU.<sup>19,22</sup> These factors highlight the importance of integrating educational and community-based approaches into TB management strategies.

The findings highlight the pivotal role of community support in enhancing TB treatment adherence and reducing LTFU rates. In Indonesia, the Aisyiyah organisation's approach to TB management underscores the effectiveness of community-based interventions. The establishment of the TB-HIV care Aisyiyah team, which integrates cadres working closely with local health centres, is a prime example of leveraging local community networks to support TB patients. These cadres perform crucial roles, including patient education, medication adherence support, and facilitating access to healthcare services.<sup>25</sup> Their humanitarian approach, emphasising equality and non-discrimination, is likely to foster trust and cooperation among TB patients, thereby enhancing engagement and continuity of care.<sup>28</sup> The scenario in Myanmar provides further evidence of the importance of support mechanisms in TB treatment regimes. The provision of assistance, such as travel support from the TB program, addresses one of the significant barriers to sustained treatment adherence—accessibility to healthcare facilities. For many patients, especially those from rural or impoverished backgrounds, the cost and logistics of travel

can be prohibitive factors that discourage regular clinic visits, thereby increasing the risk of LTFU.<sup>28</sup> By alleviating these logistical challenges, the TB program not only ensures that patients can attend their appointments but also communicates a level of care and support that may encourage patients to complete their treatment regimen. This type of support is particularly crucial in settings where economic hardships are prevalent and can be a determinant factor in the success of public health interventions.

This scoping review has identified two critical risk factors that exacerbate the odds of TB LTFU: alcoholism and smoking. Alcoholics demonstrate increased odds of TB LTFU, which could be attributed to the potential for alcohol to impair judgment, reduce adherence to treatment schedules, and diminish the effectiveness of TB medications due to interactions between alcohol and the drugs used in TB treatment.<sup>29-31</sup> Similarly, the review highlights a noticeable elevation in TB LTFU rates among smokers.<sup>11,32</sup> Smoking may contribute to this trend through several mechanisms, including the exacerbation of pulmonary symptoms, which could complicate the TB treatment process, and a potential decrease in the efficacy of TB treatment due to the harmful effects of tobacco on the respiratory system. Both alcoholism and smoking are indicative of broader socio-behavioural patterns that may include reduced access to healthcare, lower socioeconomic status, and a higher likelihood of engaging in behaviours that compromise health. These findings underscore the importance of integrating comprehensive support services, including smoking cessation and alcohol abuse treatment programs, into TB treatment plans to address these risk factors and improve treatment adherence and outcomes.

The finding that being male increases the risk of LTFU compared to females finds some support in the literature, particularly in studies focusing on health behaviours and treatment delays in specific populations. For instance, a study conducted in Selangor, Malaysia, found that male pulmonary TB patients experienced a longer total delay from symptom onset to treatment initiation than their female counterparts, which could potentially increase their risk of LTFU.<sup>33</sup> Factors contributing to this delay included symptoms like weight loss and employment status, which might complicate timely access to healthcare. Similarly, gender-specific differences in health-seeking behaviours were noted in a study on high-risk sexual behaviours among methamphetamine users in Myanmar, where gender played a significant role in the engagement with health services.<sup>34</sup> These findings suggest that gender differences in health behaviours and access to treatment could influence the likelihood of LTFU, with males potentially at higher risk due to factors such as longer delays in seeking treatment and specific lifestyle or employment conditions that hinder regular follow-up.

Migrants face unique challenges in TB treatment, leading to a higher risk of LTFU.<sup>18</sup> These challenges include a lack of stable housing and employment, which contributes to inconsistent treatment adherence.<sup>35</sup> The transient nature of migrants often results in interrupted treatment due to relocation and the inability to access consistent health care.<sup>35</sup>

Additionally, migrants may face language barriers and limited knowledge of health care systems, further hindering their ability to seek and continue treatment. These factors necessitate tailored approaches in TB management for migrant populations to reduce LTFU rates.

The relationship between health insurance coverage and TB treatment compliance, as well as the impact of out-of-pocket payments on treatment-seeking behaviour, underscores a critical aspect of public health management. Studies have shown that individuals covered by health insurance are more likely to adhere to TB treatment and follow-up protocols, suggesting that financial barriers significantly influence patient compliance.<sup>36-38</sup> For instance, the introduction of multichannel financing in China, which includes medical insurance and local funds to cover the medical expenses of TB patients, has been associated with improved medical security and reduced economic burden for these patients.<sup>36</sup> Conversely, the financial strain of out-of-pocket payments can deter individuals from continuing or seeking TB treatment, as evidenced by the higher loss to follow-up rates among those facing higher out-of-pocket costs.<sup>39,40</sup> This financial fragility, particularly among the married middle working class in urban area, highlights the socioeconomic burdens that can exacerbate the public health challenge posed by TB, especially with the emergence of multi-drug resistant strains.<sup>37</sup> Therefore, enhancing health insurance coverage and reducing out-of-pocket expenses could be pivotal in improving TB treatment compliance and reducing the overall burden of the disease, aligning with global health objectives to combat TB effectively.

In Southeast Asia, regional variations significantly impact TB LTFU, which is reflected in the results. These variations are often due to the differing economic performance, healthcare infrastructures and cultural differences across the region. Some areas with well-developed health care systems have lower LTFU rates, whereas regions with limited resources face higher challenges in maintaining TB treatment adherence.<sup>41</sup> Social and cultural differences, including beliefs about health and medicine, also play a role in how communities perceive and engage with TB treatment, influencing LTFU rates.<sup>22</sup> These regional disparities highlight the need for context-specific strategies in TB management across Southeast Asia.

#### Limitations of the Review

This scoping review faces limitations, including potential biases in selected studies and the quality of these studies, which may affect the interpretation of findings. In addition, the generalisability of the results to Southeast Asia might be limited due to regional differences in socioeconomic conditions and health care systems.

Implications for public health policy and practice: The findings have significant implications for public health in Southeast Asia. Addressing socioeconomic barriers through community-based interventions, educational campaigns, and policy changes could improve TB treatment adherence. Tailored approaches to accommodate different regional healthcare capacities and cultural backgrounds are essential.

#### Recommendations for Future Research

Future research should focus on longitudinal studies to understand the long-term impact of socioeconomic factors on TB LTFU. Investigating specific subpopulations and testing interventions aimed at reducing socioeconomic barriers can provide more targeted solutions. This research is crucial for developing effective strategies to decrease TB LTFU rates in Southeast Asia.

#### CONCLUSION

In conclusion, socioeconomic factors play a critical role in tuberculosis loss to follow-up (TB LTFU) in Southeast Asia. Poverty, unemployment, low education levels, and regional disparities significantly impact treatment adherence. This review highlights the necessity for targeted interventions, including community-based strategies, educational initiatives and policy reforms, to address these socioeconomic barriers. Addressing these factors is vital for improving TB treatment outcomes and overall public health in Southeast Asia.

#### CONFLICT OF INTEREST AND FUNDING DISCLOSURE

The authors report no conflicts of interest in relation to this study. This research was self-funded by the authors.

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