



Integrating Health Belief Model and Social Cognitive Theory in Tuberculosis Prevention in Urban Indonesia

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Abstract

Good prevention of TB depends on changing how people see the risks and making sure they take action consistently. This study wanted to create and check a model for preventing TB by using important ideas from the HBM and SCT. A survey was done with 325 TB patients from 17 city health clinics in Surakarta, Indonesia. The study looked at how people see threats and benefits, what stops them, how confident they feel, the support they get from others, their intentions, and their actions to prevent TB. They used a specific analysis method called PLS-SEM with 5,000 samples to help with their findings. The results showed strong links between the factors Self-confidence was the biggest factor in deciding someone's intention This was followed by how much they felt threatened and the benefits they saw On the other hand, perceived obstacles had a negative impact People's intentions greatly influenced their chances of taking preventive actions, and having support from others also had a strong direct impact The model explained 64% of the differences in people's intentions and actions. The combination of HBM and SCT showed that just having the intention to act is not enough. Being confident in oneself and having support from others are important for actually taking action. This gives useful information for TB programs on how to help people and communicate risks.

INTRODUCTION

Tuberculosis is still one of the most common infectious diseases around the world, with about 10 million new cases reported each year and around 1.3 million deaths, even though there are effective treatments available (Schito et al., 2023; World Health Organization, 2024b). TB continues to be a big problem, especially because there's an increase in strains that are resistant to many drugs, like MDR and XDR TB. This makes it harder to reach the global goals of eliminating TB (Dheda et al., 2017; Floyd et al., 2022). New tools like fast diagnostic tests, better treatment plans for MDR TB, and a new vaccine called M72/AS01E show promise in fighting TB. However, these new tools aren't being used widely, especially in poorer countries where

there's not enough money, weak health systems, and poor policies, which stop people from getting equal access to these advances (Tiberi et al., 2018; World Health Organization, 2024b; Zumla et al., 2020).

Combining medical advances with changes in behavior and social efforts is important for making real progress toward SDG 3.3, which aims to stop the global TB outbreak by 2030. This method looks at more than just medical progress; it also includes helping patients take control of their health, involving the community, and improving the healthcare system. This makes sure that both preventing and treating diseases are not only working well but can also last over time (Lönnroth et al., 2021; United Nations, 2015). In Indonesia, which is one of the three countries

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with the most tuberculosis cases in the world, cities like Surakarta still have a lot of TB cases that are not reported. This makes it hard to know exactly how many people are affected and to plan the right actions to help them (Ministry of Health Republic of Indonesia, 2023; World Health Organization, 2024b). In cities like Surakarta, several factors increase the spread and return of tuberculosis. These include people smoking, not having much education, poor air circulation in homes, and economic struggles (Fatimah et al., 2020). Even though the DOTS strategy, which is a way to treat tuberculosis, has been used a lot around the world, people aren't following the preventive behaviors very well, according to the World Health Organization in 2024a. Behavior and psychosocial factors, like not seeing much risk, feeling ashamed or judged, and not feeling confident in managing their health, keep patients from getting involved in prevention and following through with treatment (K. W. R. Putra et al., 2020; Sulistyowati et al., 2021). These situations highlight the importance of developing more focused and tailored behavior programs to improve motivation, confidence, and support for patients, especially in urban community health centers where social settings are constantly changing and people often move around a lot.

The success of preventing TB relies on medical methods and on people being dedicated to regularly practicing healthy behaviors and taking care of themselves (Lönnroth et al., 2021). Studies in different countries have shown a big difference between what people know and what they actually do. Even though more people know about how TB spreads and how to prevent it, many still don't take preventive actions regularly. Low understanding of health, social shame, and lack of community support often make it harder for people to feel motivated and stick to these preventive measures. By tackling these mental and social challenges with community health education, open communication, and emotional support, we can make TB prevention methods more effective and help people act on what they know.

The HBM and SCT are two helpful ideas that explain why people take steps to stay healthy. The Health Belief Model looks at how people's views on their risk of getting sick, the seriousness of the illness, the benefits of taking action, and the obstacles they face affect their health choices. SCT highlights that believing in oneself, learning by watching others, and getting support from people around us are key factors in keeping up healthy habits. Combining these two theories helps us better understand how people prevent

TB by linking what they believe with the social factors that influence their actions.

Earlier studies have shown that each theory is helpful in understanding how people behave towards TB and other infectious diseases. However, only a small number of studies have looked at how well both frameworks can predict outcomes when they are combined into one model. In Indonesia, there haven't been many studies that check the validity of using an integrated model for urban TB patients with advanced statistical methods like PLS-SEM. This study aimed to create and test a combined model of behaviors that help prevent TB by using key ideas from the HBM and SCT. This study looks at how different factors are connected for TB patients getting treatment at 17 health centers in the city of Surakarta, Indonesia. It explores how feelings of threat, benefits, obstacles, confidence in oneself, support from others, intentions to act, and preventive actions are linked to each other. The integrative model is expected to help our understanding by connecting two big ideas about how people behave regarding their health. It also offers real proof for creating health promotion plans that focus on people's situations, are based on solid ideas, and aim to empower individuals. These plans are intended to boost confidence, improve social support, and help people consistently adopt behaviors that prevent TB.

The HBM Theory says that how people see their risk of getting sick, how serious they think the illness is, and what they believe are the benefits and challenges of taking preventive steps can help explain their health actions (Rosenstock, 1974; Champion & Skinner, 2008). On the other hand, the SCT looks at how our actions, belief in ourselves, watching others, support from society, and changes around us affect our health-related behaviors (Bandura, 1986, Bandura, 2004). Both theories have been widely used in health research, but they each have weaknesses when used alone. The HBM focuses a lot on understanding the risks to our thinking and decision-making, but it doesn't explain as well how social and environmental factors help us start and keep up certain behaviors. On the other hand, the SCT explained how people behave and learn from others, focusing less on how they see the risks and benefits of diseases.

When it comes to stopping tuberculosis, how serious people think the disease is and how likely they think they are to get it can affect their behavior to prevent it. However, feeling capable of taking preventive actions and having support from friends and family aren't fully covered by

the HBM alone. On the other hand, SCT focuses more on how people control themselves and interact with others, but it pays less attention to how they think about risks. This study combines the HBM and SCT to better explain how people can prevent tuberculosis. Unlike earlier research that looked at these ideas one at a time, this new plan puts together ideas about how people see threats, benefits, and obstacles, as well as their confidence in themselves, support from others, and their plans to act, all in one clear model. As far as we know, not many studies have actually tested this combined HBM-SCT approach with urban TB patients in Indonesia. This combination is the main new idea in this study and helps improve our understanding of tuberculosis behavior.

This study helps us understand what affects people's actions to prevent TB. It also gives useful ideas for creating targeted programs that can encourage both individuals and communities to adopt these preventive behaviors. By including mental and social factors in TB prevention plans, the results of this study could lead to major changes in how TB is prevented in Indonesia and other countries with high rates of TB.

METHOD

Study Design and Location

This research utilized an analytical cross-sectional framework to explore the causal connections between psychosocial variables derived from the HBM and SCT. This approach was selected because it is well-suited for grasping the dynamics of inter-variable interactions and forecasting preventative actions through PLS-SEM. PLS-SEM is particularly efficient for addressing exploratory theoretical frameworks, non-parametric data, and various latent constructs (Hair, J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., Danks, N. P., & Ray, S. Hair, J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., Danks, N. P., & Ray, 2021; Joseph F. Hair, G. Thomas M. Hult, Christian Ringle, 2022). The investigation was carried out at 17 Puskesmas throughout Surakarta City, located in Central Java, Indonesia. These facilities cater to urban demographics with varying socioeconomic backgrounds, high population density, and considerable mobility, all of which affect the spread of tuberculosis and related preventive measures.

Population and Inclusion Criteria

The intended group consisted of patients with pulmonary TB who were registered at 17 health centers in Surakarta. As per the TB patient records from January to October 2025, there were

595 individuals with active or past TB treatment. From this, 325 people who met the specific criteria were chosen using proportional random sampling. The criteria for inclusion were being at least 18 years old, having been diagnosed with pulmonary TB in the past year, currently receiving or having finished treatment, living in the area served by the health centers, and having given written consent. Patients with serious health issues that made it difficult to communicate or those with cognitive difficulties were not part of the study.

Sampling Method

The selection of samples was conducted using a two-step proportional random method. Initially, participants were chosen in proportion to the number of TB cases reported at each Puskesmas. Subsequently, individual participants were randomly picked from the patient records to guarantee a representative sample from every health facility.

Variables and Measurement

Seven hidden ideas were looked into: Social Support, Perceived Threat, Perceived Benefits, Perceived Barriers, Self-Efficacy, Behavioral Intention, and Tuberculosis Preventive Behavior. The TBPB idea was created as a second-level reflective construct with two main parts: primary prevention and secondary prevention. All items were rated using a 5-point scale, going from "strongly disagree" at 1 to "strongly agree" at 5, where higher scores showed stronger beliefs or improved preventive actions. For the barriers idea, the scoring was flipped, where higher scores meant fewer obstacles.

Instrument and Content Validity

The assessment tool was modified based on established questionnaires and customized to the Indonesian setting regarding TB prevention. The modification procedure included translation in both directions, discussions among a panel of experts, and a readability assessment to guarantee both conceptual and semantic consistency. The validity of the content was appraised by six specialists in public health, health promotion, and TB management employing Aiken's V and the CVI. Elements that had Aiken's V values.

TBPB is described as a complex idea made up of two simpler parts. This understanding comes from the concept that each part shows a common aspect of preventing tuberculosis. Thus, we anticipate that changes in both primary and secondary prevention will occur simultaneously

Table 1. Operationalization of Study Constructs

Construct	Dimension	Number of Items	Sample Item	Source
Perceived Threat (Threat)	Perceived susceptibility and perceived severity of TB transmission and consequences	6	"I am concerned that TB may spread to my family members if preventive measures are not followed."	Adapted from Health Belief Model (Rosenstock, 1974; Champion & Skinner, 2008)
Perceived Benefits (Benefit)	Perceived effectiveness and usefulness of TB preventive actions	3	"Practicing cough etiquette can reduce TB transmission."	Adapted from Health Belief Model (Champion & Skinner, 2008)
Perceived Barriers (Barriers)	Perceived obstacles and difficulties in performing TB preventive behaviors	3	"Maintaining TB preventive practices is difficult in my daily activities."	Adapted from Health Belief Model (Champion & Skinner, 2008)
Self-Efficacy	Confidence in the ability to perform and maintain TB preventive behaviors	5	"I am confident that I can consistently practice TB prevention measures."	Adapted from Social Cognitive Theory (Bandura, 1986)
Social Support	Emotional, informational, and appraisal support from family, peers, and health workers	12	"My family encourages me to follow TB prevention recommendations."	Adapted from Social Support Theory and MSPSS framework (Zimet et al., 1988)
Behavioral Intention (Intention)	Readiness and commitment to engage in TB preventive behaviors	4	"I intend to consistently follow TB prevention recommendations in the future."	Adapted from Theory of Planned Behavior (Ajzen, 1991)
Tuberculosis Preventive Behavior (TBPB)	Primary prevention (5 items) and secondary prevention (5 items)	10	"I use a mask when necessary to prevent TB transmission."	Adapted from TB prevention guidelines and previous TB behavior studies (WHO; Putra et al., 2020)
TBPB (Second-order Construct)	Higher-order construct reflected by Primary Prevention and Secondary Prevention dimensions	2 dimensions	Reflects overall tuberculosis preventive behavior	Developed based on TB prevention framework and empirical validation in this study

based on the overall level of behavior aimed at preventing tuberculosis. As noted by Hair and colleagues, the repeated indicator method was used to evaluate the reflective-reflective hierarchi-

cal component model in PLS-SEM.

Pilot Testing and Reliability

A preliminary examination was carried

out involving 30 tuberculosis patients who were not part of the primary study group. The findings from this preliminary analysis indicated that every item had item-total correlations exceeding 0.36 and a Cronbach's alpha of 0.70 or higher, demonstrating adequate internal consistency and reliability. There were no items eliminated after the preliminary testing.

Bias Control and Data Quality

Procedural steps were taken to reduce common method bias. This included giving neutral directions, maintaining the anonymity of respondents, and mixing up the sequence of questionnaire questions. Statistically, bias was managed through the Full Collinearity VIF test and by identifying outliers. For missing data that was less than 5%, median values were used to fill in the gaps. Every model satisfied the fit index standards, showing that the model fit was acceptable.

Statistical Analysis

Data was examined utilizing SmartPLS 4.0. The assessment of the measurement model comprised evaluations of factor loadings, composite reliability, AVE of at least 0.50, and discriminant validity assessed through the HTMT below 0.85 and the Fornell-Larcker standard (Fornell & Larcker, 1981; Henseler et al., 2015). The evaluation of the structural model included an analysis of collinearity.

Ethical Considerations

Ethical permission for this research was given by the Health Research Ethics Committee at Dr. Moewardi General Hospital in Surakarta. The research followed the guidelines established in the Helsinki Declaration from 1964 and its updates. All participants provided written informed consent, and their data privacy was safeguarded by using anonymous codes and storing files with password protection.

Reporting Standards

This research followed the guidelines for mental health reporting with the use of PLS-SEM, as outlined by Hair et al. (2021) and Sarstedt, Ringle, and Hair (2022). The findings were organized methodically in the Results and Discussion parts, starting with details about the respondents, then moving on to the assessment of the measurement model, analysis of the structural model, and mediation analysis within the combined HBM-SCT framework.

RESULT AND DISCUSION

Sociodemographic characteristics of respondents

Table 1 provides details about the backgrounds of the 325 people who responded. A big portion of the respondents were men, with many being in the age range of 31 to 45 years old, and most had finished high school. A large number of them worked in factories or shops, earned a monthly salary between IDR 2,000,000 and 3,000,000, and were married. Additionally, 56.6% of the respondents had been receiving treatment for TB for a period of 3 to 6 months.

Table 2. Sociodemographic characteristics of respondents (n = 325)

Characteristics	n (%)
Gender	
Male	212 (65.2)
Female	113 (34.8)
Age group (years)	
18–30	54 (16.6)
31–45	112 (34.5)
46–60	108 (33.2)
>60	51 (15.7)
Education level	
Primary school	48 (14.8)
Junior high school	113 (34.8)
Senior high school	127 (39.1)
College/university	37 (11.3)
Occupation	
Factory or shop worker	129 (39.7)
Self-employed	54 (16.6)
Civil servant	27 (8.3)
Housewife	68 (20.9)
Unemployed	47 (14.5)
Monthly income (IDR)	
<2,000,000	79 (24.3)
2,000,000–3,000,000	141 (43.4)
>3,000,000	105 (32.3)
Marital status	
Married	257 (79.1)
Single/divorced/widowed	68 (20.9)
Length of TB treatment (months)	
<3 months	61 (18.8)
3–6 months	184 (56.6)
>6 months	80 (24.6)

Descriptive statistics of latent constructs

Descriptive statistics were computed for every latent construct prior to assessing the measurement and structural models. According to Table 3, the average scores varied from 2.63 to 3.91 on a five-point Likert scale, suggesting that responses across the constructs were at moderate to high levels.

Self-efficacy showed the highest mean score, indicating that respondents generally reported strong confidence in performing TB preventive behaviors. In contrast, perceived barriers had the lowest mean score, suggesting that barriers to TB prevention were perceived at a relatively lower level compared with other constructs. These descriptive findings provide an initial overview of respondents' psychosocial characteristics and TB preventive behavior before further analysis using PLS-SEM.

Following the detailed analysis, the assessment of the measurement and structural models took place through the PLS-SEM method. Figure 1 displays the PLS algorithm model, illustrating the standardized outer loadings along with the inner path coefficients that resulted from the estimation procedure.

The following evaluation examined the measurement framework to verify the depend-

ability of indicators, the coherence of internal elements, and the validity of constructs prior to analyzing the structural connections.

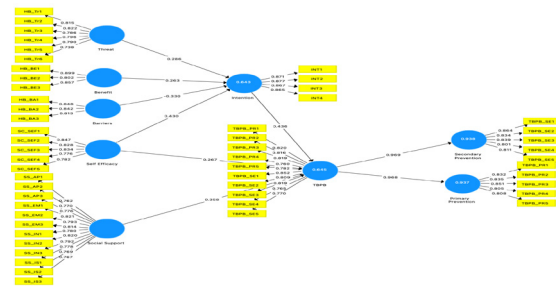


Figure 1. PLS Algorithm Model showing relationships among study constructs.

Measurement Model Evaluation

Prior to examining the suggested structural connections among the concepts in the study, the measurement model was evaluated for the reliability of indicators, consistency within the model, convergent validity, discriminant validity, and collinearity. The outcomes of the measurement model evaluation are shown in Tables 4 and 5.

As illustrated in Table 4, each construct demonstrated sufficient reliability and convergent validity. All loadings, along with the values of Cronbach's alpha, CR, and AVE, met the sug-

Table 3. Descriptive statistics of latent constructs (n = 325)

Construct	Mean	SD	Min	Max
Social Support	3.74	0.58	2.25	4.75
Perceived Threat	3.62	0.61	1.83	4.83
Perceived Benefits	3.87	0.59	2.17	4.83
Perceived Barriers	2.63	0.63	1.17	4.50
Self-Efficacy	3.91	0.60	2.00	4.83
Intention	3.85	0.55	2.00	4.75
TB Preventive Behavior	3.79	0.58	2.00	4.83

Note: Mean and SD are based on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree)

Table 4. Summary of measurement model evaluation

Construct	Loading Range	Cronbach's α	CR	AVE
Threat	0.738–0.822	0.881	0.910	0.627
Benefit	0.802–0.899	0.814	0.889	0.729
Barriers	0.813–0.848	0.783	0.873	0.697
Self-Efficacy	0.776–0.847	0.872	0.907	0.662
Social Support	0.762–0.821	0.944	0.951	0.620
Intention	0.865–0.877	0.893	0.926	0.757
Primary Prevention	0.805–0.851	0.884	0.915	0.683
Secondary Prevention	0.801–0.864	0.887	0.917	0.689
TBPB	—	0.938	0.947	0.643

gested standards. The complete loading matrix at the item level is available in Supplementary Table S1. Following the evaluation of reliability and convergent validity, discriminant validity was examined with the HTMT. The findings are presented in Table 5.

Table 5. Discriminant Validity Assessment (HTMT)

Construct Pair	HTMT
Barrier–Benefit	0.068
Barrier–Intention	0.540
Intention–TBPB	0.747
Self-Efficacy–TBPB	0.658
Social Support–TBPB	0.552
Threat–TBPB	0.421

The HTMT values were in the range of 0.068 and 0.747 lower than 0.85 threshold, thus the discriminant validity was deemed acceptable. Moreover, from the cross-loading analysis, all indicators loaded highest on their corresponding constructs; hence, all indicators had satisfied. Full cross-loading matrix can be found in Supplementary Table S2.

Once the practicality of the measurement

model was established, the following action was to evaluate the structural model. The findings from the structural model evaluation can be found in Table 6, which includes path coefficients, confidence intervals at 95%, t-values, and p-values.

Every proposed relationship was confirmed, with p-values less than 0.05. The most potent predictor of intention was self-efficacy, whereas social support indicated a notable direct impact on tuberculosis preventive behavior. Perceived barriers had a considerable adverse effect on intention. At the same time, intention was a significant predictor of tuberculosis preventive behavior, highlighting its mediating position between cognitive beliefs and preventive measures. Figure 2 illustrates the streamlined bootstrapped structural model to offer a clear visual summary of the relationships.

The mediation analysis showed that intention played a key role in how perceived threat, perceived benefits, perceived barriers, and self-efficacy influenced tuberculosis preventive behavior. All the indirect effects were important, and the ranges of confidence around these effects did not cover zero. That self-efficacy had the strongest unique indirect effect through intention, which shows that intention is important in turning personal confidence into preventive actions.

Table 6. Structural Model Assessment

Path	β	95% CI	t-value	p-value
Perceived Threat → Intention	0.286	0.208–0.352	7.823	<0.001
Perceived Barriers → Intention	-0.330	–0.398––0.262	9.551	<0.001
Perceived Benefits → Intention	0.263	0.203–0.327	8.078	<0.001
Self-Efficacy → Intention	0.430	0.361–0.499	12.335	<0.001
Intention → TBPB	0.436	0.346–0.509	10.480	<0.001
Self-Efficacy → TBPB	0.267	0.194–0.351	6.837	<0.001
Social Support → TBPB	0.358	0.290–0.428	10.175	<0.001

Note: β = standardized path coefficient; CI = confidence interval; TBPB = tuberculosis preventive behavior.

Table 7. Mediation Analysis

Indirect Path	β	95% CI	t-value	p-value
Perceived Threat → Intention → TBPB	0.125	0.082–0.165	5.918	<0.001
Perceived Benefits → Intention → TBPB	0.115	0.081–0.147	6.614	<0.001
Perceived Barriers → Intention → TBPB	0.144	–0.185––0.106	6.979	<0.001
Self-Efficacy → Intention → TBPB	0.188	0.141–0.233	8.026	<0.001

Note: β = standardized indirect effect; CI = confidence interval; TBPB = tuberculosis preventive behavior.

Table 8. Explanatory Power, Effect Size, and Predictive Relevance of the Structural Model

Endogenous Construct	R ²	Main Predictors	f ² (Effect Size)	Q ² (Predictive Relevance)
Intention	0.64	Threat, Benefits, Barriers, Self-Efficacy	0.12–0.35 (small–medium)	0.41 (strong)
TB Preventive Behavior	0.64	Intention, Self-Efficacy, Social Support	0.10–0.28 (small–medium)	0.47 (strong)

Note: R² shows the proportion of variance explained by the predictors; f² values between 0.02–0.15 and 0.15–0.35 represent small and medium effects, respectively. Q² > 0 shows predictive relevance.

The R squared values and Q squared values were checked to determine how well the model explains the data and how accurately it can predict future outcomes. Results are shown in Table 8

As shown in Table 8, the endogenous constructs had strong explanatory power, with R² values of 0.64, meaning the predictors accounted for 64% of the variation in Intention and Tuberculosis Preventive Behavior. The effect sizes for f² ranged from small to medium, indicating that each external variable played an important role in the model. Moreover, every Q² value was higher than zero, which shows that the model has strong predictive power and reinforces the reliability of the suggested structural model. Moreover, all Q² values were higher than what would be expected by chance, which shows that the model has strong predictive power and supports the reliability of the proposed structural model.

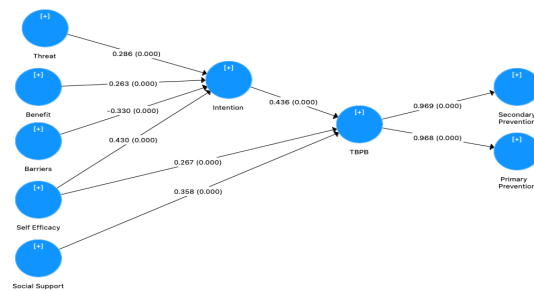
The SRMR and NFI were used to assess how well the overall model fits, along with evaluations of its explanatory and predictive power. These results are shown in Table 9.

Table 9. Model Fit Assessment

Index	Value	Recommended
SRMR	0.051	<0.08
NFI	0.910	>0.90

As shown in Table 9, the SRMR value was 0.051, which is below the recommended guideline of 0.08, meaning the model fit is considered good. The NFI value of 0.910 is higher than the minimum standard of 0.90, which shows that the model fits the data well. These results show that the structural model works well enough for the whole thing.

In Figure 2, only the significant standardized path coefficients were shown between key constructs to enhance clarity and readability of the model.

**Figure 2.** Simplified bootstrapped structural model showing standardized path coefficients (β) and significance levels ($p < 0.05$)

Summary of Results

The findings of this study confirmed all the expected relationships, thereby supporting the proposed combination of the Health Belief Model and the Social Cognitive Theory. Self-efficacy and intention were the most significant factors, indicating that belief in one's ability to perform actions and the motivation to take action were key elements in preventing tuberculosis. Moreover, social support played a key role in improving the execution of behaviors, highlighting the importance of personal relationships in maintaining preventive measures. These results together gave a solid foundation for discussing the theoretical and practical implications later on.

Discussion

This study's findings indicate that combining the Health Belief Model with the Social Cognitive Theory offers a complete understanding of TB prevention behaviors among TB patients at urban primary health centers in Surakarta, Indonesia. The combined model accounted for 64% of the differences in people's behavior to prevent tuberculosis, showing that taking preventive steps is largely influenced by a mix of beliefs, motivation, and support from others. This finding matches earlier studies on tuberculosis that looked at either the health belief model or the social cognitive theory alone, because it shows that beliefs alone aren't enough to predict preventive actions

— you also need to consider how people control their behavior and the environment around them. Similar evidence has also come from studies in Asia and sub-Saharan Africa, showing that self-efficacy and social support together play a key role in helping TB patients follow treatment and prevent the spread of the disease. (Ahorlu et al., 2018; Bui et al., 2020; M.) K. Gebremariam et al., 2021)

People's sense of threat and the benefits they see greatly influence their intention to take action. This result matches the idea from the Health Belief Model, which says people are more likely to take action if they feel they are at risk of getting sick and believe that preventive steps will help them. (Champion & Skinner, 2008; Rosenstock, 1974) Patients who understood how much risk they were facing and saw the benefits of taking preventive actions were more willing to follow advice like using masks, practicing good cough hygiene, and finishing their treatments. These results match earlier studies that show high perceived susceptibility and benefits are strong reasons for people to follow TB prevention and treatment plans in different groups. (Fatimah et al., 2020; Kigozi et al., 2017; Legesse et al., 2021; Li et al., 2020) However, people's perception of barriers had a big negative effect on their intention, showing that things like stigma, lack of time, and work demands are still major reasons people don't take part in prevention efforts. (Mackenzie et al., 2022; Sulistyowati et al., 2021) This pattern also supports the meta-analysis by Carpenter (2010), which found that perceived barriers are one of the strongest factors that lead to not taking action on health issues.

Self-efficacy is the main factor that has the strongest influence, and it affects TB preventive behavior both directly and through other ways. This result matches Bandura's idea that believing in one's ability to succeed affects how motivated, persistent, and able someone is to keep going when facing challenges (Bandura, 1986; Glanz et al., 2015). People who are more confident in their ability to follow prevention steps are more likely to keep doing them, even when things get tough. Social support was really important because it helped keep people motivated and made it easier to overcome challenges by offering encouragement and practical help from family, friends, and community health workers. Studies in other low- and middle-income countries have found that emotional and informational support helps people follow their treatment and keep good habits over time. (Ahorlu et al., 2018; R. B. Gebremariam et al., 2021b; R. Putra et al., 2022) These

results also support the SCT idea of reciprocal determinism, where a person's belief in their own abilities and a supportive environment work together to influence behavior. So, to fight TB better, we need to teach people about it and also support the relationships and communities that help keep prevention efforts going.

In this study, behavior intention partially mediates the relationships between a cognitive belief and TB preventive behavior, consistent with the logic of the TPB and IBM, which positions intention as the proximal predictor of action. (Ajzen, 1991; Fishbein & Yzer, 2003) However, the persistence of significant direct effects from self-efficacy suggests that only intention is insufficient to ensure behavior execution. This result shows a form of complementary mediation, (Zhao et al., 2010) suggesting that intention and self-efficacy jointly function as volitional and motivational mechanisms translating cognition into behavior. In practical terms, while intention reflects readiness to act, self-efficacy and social support provide the capacity and reinforcement necessary to sustain these intentions over time.

The implications of these results are significant for TB prevention programs. Strengthening self-efficacy should be prioritized through structured counseling that incorporates action planning, problem-solving, and mastery experiences during clinical encounters. Furthermore, community-based interventions, including family members and health cadres, can provide emotional and practical support to sustain preventive behavior outside the clinic setting. Communication strategies should also address perceived barriers and focus on the tangible benefits of preventive actions, particularly among working-age adults who face time and stigma constraints. Previous studies in Indonesia and other Asian countries have shown that multicomponent interventions integrating risk-benefit communication, efficacy-building sessions, and social support networks can significantly improve TB-related health behaviors. (Fatimah et al., 2020; R. B. Gebremariam et al., 2021a; R. Putra et al., 2022)

Although this study shows a lot of promise, there are a few things that limit its effectiveness. The study used a cross-sectional approach, which makes it hard to determine cause and effect. Also, the data were provided by participants themselves, which could lead to biased responses due to memory issues or the desire to appear more favorable. The sample included only urban TB patients, which means the results might not apply to people living in rural or semi-urban areas. Future research should use long-term or interven-

tion-based studies to examine cause-and-effect relationships and ensure consistent measurement across different groups of people. These studies should also include clear, measurable factors like how well patients follow treatment plans or how effectively their coughing improves. (Hair et al., 2021; Joseph F. Hair, G. Thomas M. Hult, Christian Ringle, 2022) Although there are some limitations, this study offers strong evidence to support theories about promoting tuberculosis prevention and care in urban areas of Indonesia.

In general, the integration of HBM and SCT has proven effective in identifying the psychosocial determinants of TB preventive behavior. These results show that increasing self-efficacy and strengthening social support are essential to bridging the gap between knowledge and action. Integrating psychosocial constructs into TB health promotion strategies can improve preventive practices, increase patient empowerment, and support Indonesia's progress toward achieving the "WHO End TB" Strategy targets.

However, there are a number of caveats to the findings in this study. However, the first limitation is that the study was undertaken among patients with tuberculosis in urban primary healthcare settings in Surakarta, Central Java; hence, the findings may not be completely generalisable to rural settings or other regions of Indonesia. These sociobehavioral determinants of tuberculosis prevention may vary in urban and rural settings, given differences in health care availability, educational attainment, socioeconomic contextual features, and social support structures. Moreover, Indonesia is a country with high diversity of culture, social, and language, that possibly affects health beliefs, social norms, stigma, and preventive practices towards tuberculosis. Therefore, the relationships documented in this study should be seen through the lens of the specific urban setting of the research. Future research is recommended to validate the integrated HBM-SCT framework in other geographical regions and culture to improve its generalisability.

CONCLUSION

This study combined the Health Belief Model and Social Cognitive Theory to understand the factors that influence TB patients in urban Surakarta, Indonesia, to take preventive actions against TB. The study shows that factors like self-efficacy, how much someone feels threatened, and having social support are important in predicting both the intention and the actual behavior of preventing tuberculosis. Self-efficacy was the

best at predicting someone's intention, and social support helped a lot in making sure the behavior actually happened. The results show that it's important to focus not just on thinking patterns like how threatening a situation seems or how beneficial it might be, but also to strengthen people's ability to control their actions through help from others and programs that build confidence.

The study also showed that just having a good intention isn't enough to make someone take action to prevent something. It stressed that better ways are needed to help people feel confident in their ability to act and to keep them supported by others over time. These results show that to work well, TB prevention efforts need to encourage people's personal drive and also have strong support from outside sources. So, efforts should not just teach people about the dangers of TB but also give them the belief and tools they need to start and keep up good habits that prevent TB in the long run. Based on the results, some suggestions are made to improve tuberculosis prevention in urban areas of Indonesia. TB prevention programs need to include methods that help people feel more confident in their ability to take action, like offering organized counseling, helping them create plans for their actions, and giving them opportunities to practice and succeed during medical visits. Health education should focus on helping patients feel confident in their ability to take care of their health and follow preventive actions, like using masks correctly and covering their mouth when they cough.

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DECLARATION OF GENERATIVE AI

This manuscript received limited assistance from an AI-based language tool (Quillbot and ChatGPT) for language refinement and grammar checking. The authors critically reviewed and finalized all content and accept full responsibility for the published work. No AI tools were used in data analysis or the interpretation of findings.

DECLARATION OF COMPETING INTEREST

The authors declare no conflicts of interest related to the research activities or the publication of the study findings.

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