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**SOURCES AND PERCEIVED EFFECTIVENESS OF
TUBERCULOSIS INFORMATION AMONG
COMMUNITIES IN COLD SPOT AREAS OF JAMBI
MUNICIPALITY, INDONESIA**

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ABSTRACT

Background: Health communication plays a pivotal role in tuberculosis (TB) prevention, especially in low-incidence (cold spot) areas. Identifying trusted information sources can inform more targeted and impactful interventions. This study aimed to describe sources of TB information obtained and perceived as effective, stratified by age, sex, and education. **Method:** A community-based cross-sectional survey was conducted from February to April 2025 in six urban villages across four subdistricts of Jambi Municipality. Using multi-stage random sampling, 430 residents aged ≥ 18 years were interviewed face-to-face with a structured questionnaire. Data were analyzed using descriptive statistics and Chi-square tests to examine differences in information sources by demographic variables. **Result:** Of the respondents (mean age 45.5 ± 13.96 years; 70.7% female), 79.3% reported having heard of TB. The most common sources of TB information were personal networks (50.1%), health workers (29.9%), and teachers (21.1%). Younger adults (18–34 years) preferred digital platforms including Instagram (14.3%) and TikTok (10.7%), whereas older adults (≥ 55 years) relied more on health workers. Perceived effectiveness varied: health workers (78.6%), personal networks (44.4%), and television (41.9%) were rated highest. These patterns suggest that communication strategies should be tailored to demographic preferences. The prominence of health workers among older and less educated groups reflects trust in traditional sources, while digital media appeal to younger and more educated individuals. A dual-channel approach may enhance TB awareness in cold spot areas. **Conclusion:** A combination of health worker outreach and targeted digital campaigns may be effective in engaging younger and educated audiences, while community-based channels remain essential for older populations.

Keywords: tuberculosis, health communication, information sources, cold spot areas, cross-sectional survey

INTRODUCTION

Tuberculosis (TB) remains a global health challenge despite being a preventable and curable disease. The WHO End TB Strategy target to reduce incidence by 50% by 2025 has not yet been achieved. The Global TB Report 2024 estimated 10.8 million TB cases, with 1.25 million deaths in 2023, making TB the leading cause of death from a single infectious disease (Anon., 2025b).

Indonesia ranks second in the world after India in terms of TB burden, accounting for approximately 10% of global cases. In 2023, the incidence reached 387 per 100,000 population with an estimated 131,000 deaths. Although improvements in case notification have been observed, around 26% of TB cases are estimated to remain undiagnosed (World Health Organization, 2024). This highlights TB as a continuing serious national health problem.

In Jambi Province, TB treatment coverage increased from 39% in 2022 to 62% in 2024; however, this achievement remains below the target (Anon., 2022a). Spatial analysis identified several urban villages in Jambi Municipality as cold spot areas, defined as regions with relatively low case notification during the 2021–2023 period.

A study in Bangladesh revealed that low TB notification in cold spots is closely linked to under-detection. Spatial variations in notification are strongly influenced by service access, program coverage, health system performance, and socioeconomic factors (Magalhães and Medronho, 2017; Rood et al., 2019). The cold spot phenomenon may reflect either genuinely low transmission or under-ascertainment due to limited health-seeking behavior, diagnostic access, or reporting. Knowledge, attitudes, behaviors, and service literacy may serve as indicators that explain the formation of “pseudo” cold spots. Thus, measurement of information sources and health literacy can serve as proxies to understand under-ascertainment mechanisms.

In TB control, health information sources play an essential role in enhancing community literacy, reducing stigma, and encouraging treatment-seeking and adherence (Shannon, Millar and Moore, 2024; Sveinbjornsdottir et al., 2024). Evidence indicates that low literacy increases the risk of delayed health care access (Nogueira et al., 2018). TB campaigns have proven effective in raising public awareness and increasing case notifications (Caruso et al., 2025).

Studies on TB information sources have been conducted in several Asian and African countries (Chizimba et al., 2015; Karki, Singh and Khanal, 2018; Pengpid and Peltzer, 2019; Mittal, Singh and Kumar, 2023), but such studies are lacking in Indonesia, particularly in cold spot areas. Previous studies have shown variations in TB knowledge, attitudes, and behaviors based on demographics, education level, and community information sources (Uchenna et al., 2014; Ma et al., 2015; Shamu et al., 2019; Anguyo et al., 2025). Sociodemographic aspects must be considered when designing communication strategies and TB prevention and control efforts (Pengpid et al., 2016). Therefore, a disaggregated analysis of TB information sources is necessary to ensure effective planning and implementation of TB programs (Uchenna et al., 2014; Anguyo et al., 2025). This study aimed to describe TB information sources obtained by communities and assess their perceived effectiveness based on age, sex, and education.

METHOD

This research employed a community-based cross-sectional survey conducted from February to April 2025 in six TB cold spot urban villages in Jambi Municipality. Cold

spot classification was determined through spatial autocorrelation analysis (global Moran's Index and local LISA) during 2021–2023.

The study population comprised residents of Jambi Municipality. Inclusion criteria were: aged ≥ 18 years, residing in Jambi Municipality for at least six months prior to the survey. Exclusion criteria were: previously or currently diagnosed with TB by a physician or health worker, relocation, refusal to participate, severe illness, absence during visits, or inability to communicate in Indonesian.

The minimum required sample size was 422 individuals ($\alpha=5\%$, good knowledge/attitude/behavior proportion=50%, margin of error=5%, and 10% non-response rate). A total of 430 respondents were successfully interviewed.

Sampling applied a multi-stage random sampling technique. Proportional allocation of respondents per village was based on population size. The process included three steps: (1) random selection of neighborhood units (RT) from the identified cold spot villages; (2) systematic random sampling of households, with one household randomly chosen if multiple families lived in a single dwelling; (3) simple random selection of one respondent per household. If a selected household was unoccupied or declined participation, the next household was chosen.

Data collection was conducted through face-to-face interviews using a structured questionnaire adapted from previous studies (Al Khalili et al., 2022; Kaaffah et al., 2023). Enumerators received prior training and a pilot test was conducted with 30 respondents outside the study area.

Data were analyzed using STATA 13. Descriptive statistics were presented as counts and proportions. Chi-square tests were applied to examine differences in information sources by demographic variables (age, sex, education). A p-value < 0.05 was considered statistically significant.

Ethical approval was obtained from the Jambi Polytechnic Health Ethics Committee (No. LB.02.06/2/118/2025).

RESULT

Among the 430 respondents, the majority were female (70.70%), aged 35–54 years (50.00%), Jambi Malay ethnicity (63.49%), had completed senior high school (44.19%), were housewives (48.84%), and were married (82.33%). The mean age was 45.6 years ($SD=13.96$). Most respondents (77.4%) reported monthly income $\leq$ IDR 3,000,000, with a median of IDR 2,500,000 (IQR: 1,500,000–3,000,000). Approximately 64.88% lived in households with ≤ 4 members, with an average of 4 persons ($SD=1.67$). Most respondents (86.05%) accessed primary health care facilities.

Table 1. Characteristics of Respondents

Variable	Frequency (f)	Percentage (%)
Sex		
Male	126	29.30
Female	304	70.70
Age (years)		
18-34	101	23.49
35-54	215	50.00
≥ 55	114	26.51
Ethnic		
Jambi Malay	273	63.49
Javanese	42	9.77

Minangkabau	26	6.05
Bataknese	4	0.93
Palembang Malay	23	5.35
Buginese	2	0.47
Banjarese	5	1.16
Sundanese	31	7.21
Chinese	17	3.95
Arabic	6	1.39
Bornean	1	0.23
Education		
Not/not yet in school	13	3.02
Did not complete elementary school	21	4.88
Completed elementary school	68	15.81
Completed junior high school	99	23.02
Completed senior high school	190	44.19
Completed D1/D2/D3	8	1.86
Completed university	31	7.21
Occupation		
Not working	30	6.98
Housewife	210	48.84
Student	9	2.09
Civil servant/army/police/state/regional-owned enterprise employee	7	1.63
Private employee	15	3.49
Self-employed	84	19.53
Farmer/labor/driver/domestic worker	51	11.86
Professional	1	0.23
Pensioner	4	0.93
Other	19	4.42
Marital Status		
Unmarried	35	8.14
Married	354	82.33
Divorce	12	2.79
Widow/widower	29	6.74
Wage (IDR per month)		
≤3 million	333	77.44
>3 million	97	22.56
Number of household members		
≤4	279	64.88
>4	151	35.12
The nearest health facility		
Primary health care	370	86.05
Hospital	27	62.80
Clinic	23	53.50
Private medical practitioner/midwifery practitioner	3	0.69
Other	7	1.63

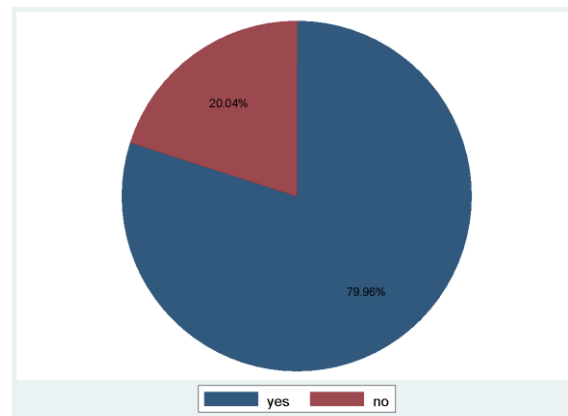


Figure 1. Proportion of respondents who reported being aware of TB

Based on Figure 1, 341 respondents (79.96%) reported being aware of TB. Among these, the most frequently cited initial sources of TB information were family (50.15%), health workers (29.91%), and teachers (21.11%). In terms of perceived effectiveness, health workers (78.60%), family (44.42%), and television (41.86%) ranked highest. Detailed proportions of sources obtained and perceived as effective are shown in Figure 2.

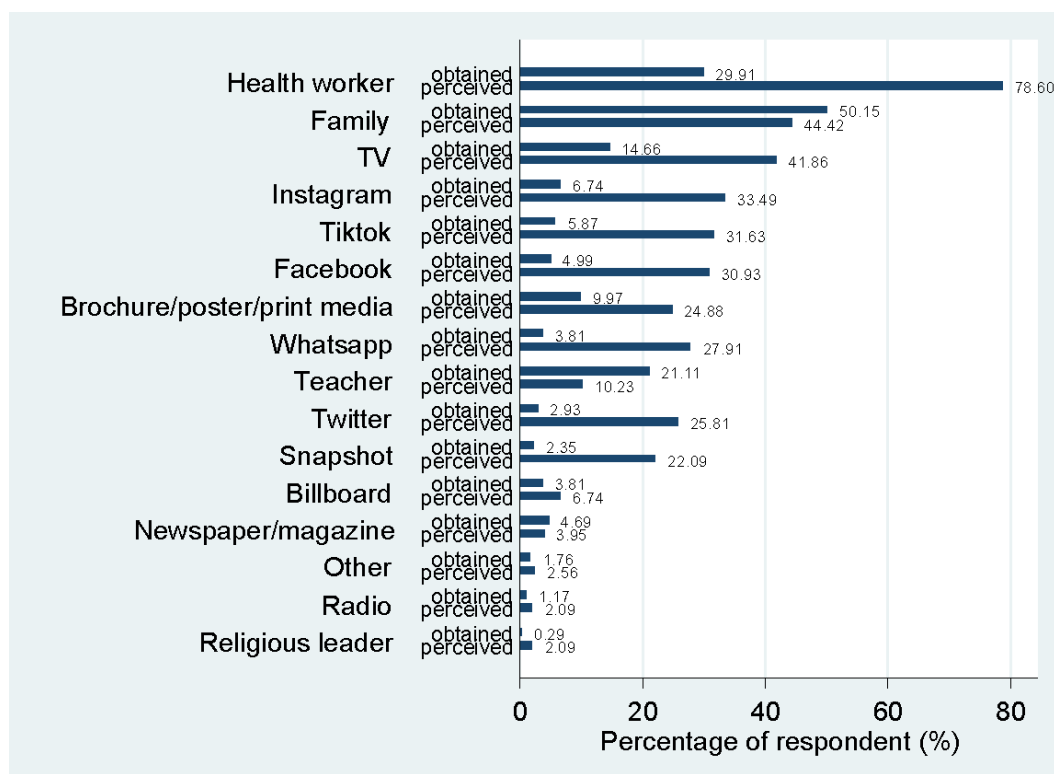


Figure 2. Proportion of TB Information Sources Obtained and Perceived as Effective

Information Sources by Sex

Table 2 shows that men more frequently obtained TB information from newspapers/magazines, television, and brochures/posters/print media compared to women ($p < 0.05$). Television was the primary source for men (20.59%). Regarding

perceived effectiveness, billboards were more frequently considered effective by men (11.11%) than women (4.93%; $p=0.021$).

Table 2. Sources of TB Information Obtained and Perceived as Effective by Sex

Source of information	Obtained					Perceived				
	Male		Female		P value	Male		Female		P value
	n	%	n	%		n	%	n	%	
Newspaper/magazine	11	10.78	5	2.09	0.001	7	5.56	10	3.29	0.274
Radio	2	1.96	2	0.84	0.379	3	2.38	6	1.97	0.789
Television	21	20.59	29	12.13	0.044	53	42.06	127	41.78	0.956
Billboard	6	5.88	7	2.93	0.194	14	11.11	15	4.93	0.021
Brochure/poster/print media	16	15.69	18	7.53	0.022	39	30.95	68	22.37	0.062
Health worker	29	28.43	73	30.54	0.697	95	75.40	243	79.93	0.298
Family	45	44.12	126	52.72	0.147	48	38.10	143	47.04	0.090
Religious leader	1	0.98	0	0	0.127	5	3.97	4	1.32	0.081
Teacher	25	24.51	47	19.67	0.317	18	14.29	26	8.55	0.075
Twitter	3	2.94	7	2.93	0.995	36	28.57	75	24.67	0.401
Facebook	6	5.88	11	4.60	0.619	44	34.92	89	29.28	0.250
Instagram	7	6.86	16	6.69	0.955	45	35.71	99	35.57	0.529
Snapshot	2	1.96	6	2.51	0.759	25	19.84	70	23.03	0.469
TikTok	6	5.88	14	5.86	0.993	41	32.54	95	31.25	0.794
Whatsapp	4	3.92	9	3.77	0.945	36	28.57	84	27.63	0.844
Other	3	2.94	3	1.26	0.279	3	2.38	8	2.63	0.881

Information Sources by Age

Younger respondents (18–34 years) tended to obtain information through social media such as Instagram (14.29%), TikTok (10.71%), Facebook (9.52%), and Twitter (7.14%), whereas older respondents (≥ 55 years) relied more heavily on health workers (35.37%). In terms of perceived effectiveness, social media was rated most effective among younger adults (e.g., Instagram 61.39%, TikTok 56.44%, Facebook 51.49%, Twitter 44.55%), while older adults trusted more traditional sources such as health workers (85.09%), family (53.51%), television (50.88%), and newspapers (8.77%). Details are presented in Table 3.

Table 3. Sources of TB Information Obtained and Perceived as Effective by Age

Source of information	Obtained							Perceived						
	18-34		35-54		≥ 55		P value	18-34		35-54		≥ 55		P value
	n	%	n	%	n	%		n	%	n	%	n	%	
Newspaper/magazine	1	1.19	8	4.57	7	8.54	0.083	0	0.00	7	3.26	10	8.77	0.003
Radio	1	1.19	1	0.57	2	2.44	0.433	1	0.99	5	2.33	3	2.63	0.665
Television	6	7.14	31	17.71	13	15.85	0.076	25	24.75	97	45.12	58	50.88	0.00
Billboard	2	2.38	6	3.43	5	6.10	0.427	6	5.94	13	6.05	10	8.77	0.603
Brochure/poster/print media	7	8.33	16	9.14	11	13.41	0.481	13	12.87	69	32.09	25	21.93	0.001
Health worker	13	15.48	60	34.29	29	35.37	0.004	64	63.37	177	82.33	97	85.09	0.000

Family	38	45.24	87	49.71	46	56.10	0.372	32	31.68	98	45.58	61	53.51	0.005
Religious leader	0	0.00	0	0.00	1	1.22	0.206	0	0.00	5	2.33	4	3.51	0.188
Teacher	20	23.81	36	20.57	16	19.51	0.770	9	8.91	20	9.30	15	13.16	0.484
Twitter	6	7.14	4	2.29	0	0.00	0.018	45	44.55	54	25.12	12	10.53	0.000
Facebook	8	9.52	9	5.14	0	0.00	0.018	52	51.49	64	29.77	17	14.91	0.000
Instagram	12	14.29	9	5.14	2	2.44	0.005	62	61.39	62	28.84	20	17.54	0.000
Snapshot	4	4.76	4	2.29	0	0.00	0.127	39	38.61	46	21.40	10	8.77	0.000
Tiktok	9	10.71	11	6.29	0	0.00	0.012	57	56.44	61	28.37	18	15.79	0.000
Whatsapp	6	7.14	7	4.00	0	0.00	0.054	45	44.55	59	27.44	16	14.04	0.000
Other	2	2.38	4	2.29	0	0.00	0.378	3	2.97	6	2.79	2	1.75	0.815

Information Sources by Education Level

Differences also emerged based on education level (Table 4). Respondents with higher education more frequently reported obtaining information from television (18.8%), brochures/posters/print media (14.2%), teachers (25.89%), and billboards (5.6%). Conversely, those with lower education relied more on health workers (85.57%) and family (53.23%) as effective sources ($p < 0.01$). Respondents with higher education considered social media, particularly Instagram (41.92%), TikTok (39.74%), and Facebook (36.24%), as effective sources.

Table 4. Sources of TB Information Obtained and Perceived as Effective by Education Level

Source of information	Obtained					Received				
	Low n	%	High n	%	P value	Low n	%	High n	%	P value
Newspaper/ magazine	3	2.08	13	6.60	0.053	7	3.48	10	4.37	0.639
Radio	0	0.00	4	2.03	0.085	5	2.49	4	1.75	0.593
Television	13	9.03	37	18.78	0.013	90	44.78	90	39.30	0.252
Billboard	2	1.39	11	5.58	0.047	13	6.47	16	6.99	0.831
Brochure/poster / print media	6	4.17	28	14.21	0.002	50	24.88	57	24.89	0.997
Health worker	45	31.25	57	28.93	0.645	172	85.57	166	72.49	0.001
Family	79	54.86	92	46.70	0.138	107	53.23	84	36.68	0.001
Religious leader	0	0.00	1	0.51	0.393	4	1.99	5	2.18	0.889
Teacher	21	14.58	51	25.89	0.012	18	8.96	26	11.35	0.414
Twitter	4	2.78	6	3.05	0.885	40	19.90	71	31.00	0.009
Facebook	5	3.47	12	6.09	0.274	50	24.88	83	36.24	0.011
Instagram	7	4.86	16	8.12	0.237	48	23.88	96	41.92	0.000
Snapshot	4	2.78	4	2.03	0.653	37	18.41	58	25.33	0.086
Tiktok	6	4.17	14	7.11	0.255	45	22.39	91	39.74	0.000
Whatsapp	4	2.78	9	4.57	0.395	47	23.38	73	31.88	0.051
Other	0	0.00	6	3.05	0.034	0	0.00	11	4.80	0.002

DISCUSSION

The diversity of TB information sources in Jambi Municipality reflects significant demographic differences across age, sex, and education. While most respondents reported awareness of TB, their information sources varied. Family and health workers were the most common sources, while social media was more prominent among younger generations (Bashorun et al., 2020; (Mushtaq et al., 2011). Adequate knowledge is crucial to reduce stigma and encourage treatment adherence, consistent with findings that low health literacy correlates with delayed health care access (Gong et al., 2018).

This study demonstrates that health communication about TB in cold spot areas such as Jambi is significantly shaped by demographic characteristics, particularly age and education. Younger respondents (18–34 years) showed strong preferences for social media platforms such as Instagram and TikTok, not only as information sources but also as the channels they considered most effective. In contrast, older respondents (≥ 55 years) placed more trust in health workers, family, and traditional media such as television and newspapers. These patterns align with other findings showing that age and education play a key role in shaping health information-seeking behavior, with younger and more educated individuals more active on digital platforms, while older and less educated groups rely on interpersonal interactions (Ausserhofer et al., 2022; Wiedermann et al., 2025).

Perceptions of effectiveness further reinforced this segmentation: health workers were rated most effective by older respondents (85.09%), while social media was trusted more by younger respondents (e.g., Instagram 61.39%). A study in Switzerland supported these findings, showing that increasing age was positively associated with reliance on television, print media, radio, and physicians as primary health information sources. In this context, a dual-channel communication approach is both relevant and strategic (Diaz Hernandez, Fischer and Zeller, 2024). Combining digital campaigns tailored for younger, educated audiences with interpersonal approaches through health workers for older populations could improve both the reach and effectiveness of TB messaging.

This study also reinforces the view that reliance on the internet as the sole health information source may exacerbate access inequities (Jacobs, Amuta and Jeon, 2017). As suggested by Chizimba et al. (2015), TB interventions in low-case areas should incorporate diverse information channels (Chizimba et al., 2015). For the authors, these findings emphasize that health communication must be designed not only on scientific evidence but also with attention to social context and local preferences. Such flexible and diverse approaches may enhance health literacy, reduce stigma, and strengthen treatment adherence more equitably.

Limitations of this study include the cross-sectional design, which restricts causal inference, and the use of self-reported interview data, which may be subject to bias. Further longitudinal studies are recommended to strengthen these findings.

Tailored TB communication strategies are therefore necessary. Digital campaigns should target younger populations, while interpersonal approaches through health workers remain essential for older groups.

CONCLUSION

Preferences for TB information sources are influenced by age and education. Social media is effective for younger and more educated groups, whereas health workers and traditional media are more trusted by older and less educated populations. A dual-channel approach may inclusively enhance TB awareness in cold spot areas.

REFERENCES

- Anguyo, R.O.D.D.M., Mukama, S.C., Bindeeba, D.S., Senyimba, C., Ezajobo, S., Nakawesi, J.S., Mugisa, A., Nakubulwa, S.K., Namitala, E. and Mulebeke, R., 2025. Knowledge of Tuberculosis Prevention Across Eight Districts in Central Uganda: An Analysis of Lot Quality Assurance Sampling Survey Data. *Risk Management and Healthcare Policy*, pp.719–738. <https://doi.org/https://doi.org/10.2147/RMHP.S494335>.
- Anon. 2022a. *Dashboard – TBC Indonesia*. [online] Available at: <<https://tbindonesia.or.id/dashboard-tb-indonesia/>> [Accessed 28 December 2022].
- Anon. 2025b. *Global Tuberculosis Report 2024*. [online] Available at: <<https://www.who.int/teams/global-programme-on-tuberculosis-and-lung-health/tb-reports/global-tuberculosis-report-2024>> [Accessed 18 May 2025].
- Ausserhofer, D., Wiedermann, W., Becker, U., Vögele, A., Piccoliori, G., Wiedermann, C.J. and Engl, A., 2022. Health information-seeking behavior associated with linguistic group membership: latent class analysis of a population-based cross-sectional survey in Italy, August to September 2014. *Archives of Public Health*, 80(1), p.87. <https://doi.org/https://doi.org/10.1186/s13690-022-00847-w>.
- Caruso, E., Parmer, J., Allen, L., Maiuri, A., Mangan, J., Bouwkamp, B. and DeLuca, N., 2025. Process and Outcome Evaluation of the Centers for Disease Control and Prevention’s Think. Test. Treat TB Health Communications Campaign, United States, March–September 2022. *Public Health Reports®*, 140(1), pp.13–21. <https://doi.org/https://doi.org/10.1177/0033354924126>.
- Chizimba, R., Christofides, N., Chirwa, T., Singini, I., Ozumba, C., Sikwese, S., Banda, H.T., Banda, R., Chimbali, H. and Ngwira, B., 2015. The association between multiple sources of information and risk perceptions of tuberculosis, Ntcheu District, Malawi. *PLoS One*, 10(4), p.e0122998. <https://doi.org/https://doi.org/10.1371/journal.pone.0122998>.
- Diaz Hernandez, L., Fischer, R. and Zeller, A., 2024. Health information, what do people search and where? a cross-sectional online survey study in the adult Swiss population. *Plos one*, 19(10), p.e0312120. <https://doi.org/https://doi.org/10.1371/journal.pone.0312120>.
- Jacobs, W., Amuta, A.O. and Jeon, K.C., 2017. Health information seeking in the digital age: An analysis of health information seeking behavior among US adults. *Cogent social sciences*, 3(1), p.1302785. <https://doi.org/https://doi.org/10.1080/23311886.2017.1302785>.
- Kaaffah, S., Kusuma, I.Y., Renaldi, F.S., Lestari, Y.E., Pratiwi, A.D.E. and Bahar, M.A., 2023. Knowledge, Attitudes, and Perceptions of Tuberculosis in Indonesia: A Multi-Center Cross-Sectional Study. *Infection and drug resistance*, 16, pp.1787–1800. <https://doi.org/10.2147/IDR.S404171>.
- Karki, D.K., Singh, B.K. and Khanal, P.K., 2018. Contribution of media on knowledge generation about tuberculosis in Palpa district, Nepal. *International Journal of Community Medicine and Public Health*, 5(11), p.4690. <https://doi.org/https://doi.org/10.18203/2394-6040.ijcmph20184557>.
- Al Khalili, S., Al Yaquobi, F., Al Abri, B., Al Thuhli, K., Al Marshoudi, S., Al Rawahi, B. and Al-Abri, S., 2022. Assessing Oman’s knowledge, attitude and practice regarding tuberculosis: a cross-sectional study that calls for action. *International*

- Journal of Infectious Diseases*, 124, pp.S4–S11.
<https://doi.org/10.1016/J.IJID.2022.06.002>.
- Ma, E., Ren, L., Wang, W., Takahashi, H., Wagatsuma, Y., Ren, Y., Gao, F., Gao, F., Wang, W. and Bi, L., 2015. Demographic and socioeconomic disparity in knowledge about tuberculosis in Inner Mongolia, China. *Journal of Epidemiology*, 25(4), pp.312–320. <https://doi.org/https://doi.org/10.2188/jea.JE20140033>.
- Magalhães, M. de A.F.M. and Medronho, R. de A., 2017. Spatial analysis of Tuberculosis in Rio de Janeiro in the period from 2005 to 2008 and associated socioeconomic factors using micro data and global spatial regression models. *Ciencia & saude coletiva*, 22, pp.831–840.
<https://doi.org/https://doi.org/10.1371/journal.pone.0217836>.
- Mittal, V., Singh, V. and Kumar, H., 2023. Assessment of Knowledge, Attitude and Practice related to Tuberculosis among Rural and Urban Community of North India. *Indian Journal of Community Health*, 35(2), pp.222–226.
<https://doi.org/https://doi.org/10.47203/IJCH.2023.v35i02.016>.
- Nogueira, B.M.F., Rolla, V.C., Akrami, K.M. and Kiene, S.M., 2018. Factors associated with tuberculosis treatment delay in patients co-infected with HIV in a high prevalence area in Brazil. *PLoS One*, 13(4), p.e0195409.
<https://doi.org/https://doi.org/10.1371/journal.pone.0195409>.
- Pengpid, S. and Peltzer, K., 2019. Knowledge, attitudes, and practices regarding tuberculosis in Timor-Leste: results from the demographic and health survey 2016. *Journal of preventive medicine and public health*, 52(2), p.115.
<https://doi.org/https://doi.org/10.3961/jpmph.18.170>.
- Pengpid, S., Peltzer, K., Puckpinyo, A., Tiraphat, S., Viripromgool, S., Apidechkul, T., Sathirapanya, C., Leethongdee, S., Chompikul, J. and Mongkolchat, A., 2016. Knowledge, attitudes, and practices about tuberculosis and choice of communication channels in Thailand. *The Journal of Infection in Developing Countries*, 10(07), pp.694–703. <https://doi.org/https://doi.org/10.3855/jidc.6963>.
- Rood, E., Khan, A.H., Modak, P.K., Mergenthaler, C. and ..., 2019. A spatial analysis framework to monitor and accelerate progress towards SDG 3 to end TB in Bangladesh. *International Journal of Geo-Information*. [online]
<https://doi.org/https://doi.org/10.3390/ijgi8010014>.
- Shamu, S., Kuwanda, L., Farirai, T., Guloba, G., Slabbert, J. and Nkhwashu, N., 2019. Study on knowledge about associated factors of Tuberculosis (TB) and TB/HIV co-infection among young adults in two districts of South Africa. *PloS one*, 14(6), p.e0217836. <https://doi.org/https://doi.org/10.1371/journal.pone.0217836>.
- Shannon, C., Millar, B.C. and Moore, J.E., 2024. Improving Biomedical Science Literacy and Patient-Directed Knowledge of Tuberculosis (TB): A Cross-Sectional Infodemiology Study Examining Readability of Patient-Facing TB Information. *British Journal of Biomedical Science*, 81, p.13566.
<https://doi.org/https://doi.org/10.3389/bjbs.2024.13566>.
- Sveinbjornsdottir, G.M., Kamowa, D., Katundu, P.N. and Gizurason, S., 2024. Compliance and illiteracy when treating tuberculosis. *International Health*, 16(1), pp.126–128. <https://doi.org/https://doi.org/10.1093/inthealth/ihad077>.
- Uchenna, O.U., Ngozi, C.J., Oshi Daniel, C. and Charles, N., 2014. Assessment of tuberculosis-related knowledge, attitudes and practices in Enugu, South East Nigeria. *Journal of infectious Diseases and Immunity*, 6(1), pp.1–9.
<https://doi.org/10.5897/JIDI2011.0020>.

- Wiedermann, C.J., Barbieri, V., Lombardo, S., Gärtner, T., Rina, P., Eisendle, K., Piccoliori, G., Engl, A. and Ausserhofer, D., 2025. Health information use and trust: The role of health literacy and patient activation in a multilingual European region. *International Journal of Environmental Research and Public Health*, 22(4), p.570. <https://doi.org/https://doi.org/10.3390/ijerph22040570>.
- World Health Organization, 2024. *Tuberculosis profile: Indonesia*. World Health Organization.