

# BMJ Open Correlates of HIV-TB co-infection and mental health of adults living in countries across sub-Saharan Africa: systematic review and meta-analysis protocol

Anthony Danso-Appiah,<sup>1,2</sup> Mishael Yankey ,<sup>3</sup> Isaac Kojo Appiah,<sup>4</sup> Welbeck Amoani Twum <sup>2</sup>

**To cite:** Danso-Appiah A, Yankey M, Appiah IK, *et al.* Correlates of HIV-TB co-infection and mental health of adults living in countries across sub-Saharan Africa: systematic review and meta-analysis protocol. *BMJ Open* 2025;**15**:e095280. doi:10.1136/bmjopen-2024-095280

► Prepublication history and additional supplemental material for this paper are available online. To view these files, please visit the journal online (<https://doi.org/10.1136/bmjopen-2024-095280>).

Received 18 October 2024  
Accepted 11 April 2025



© Author(s) (or their employer(s)) 2025. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ Group.

For numbered affiliations see end of article.

## Correspondence to

Professor Anthony Danso-Appiah;  
adanso-appiah@ug.edu.gh

## ABSTRACT

**Introduction** HIV and tuberculosis (TB) are two of the most devastating disease conditions of public health concern globally. A co-infection of the two diseases poses serious health challenges to patients including mental health problems, ranging from mild to severe, with differing outcomes. This systematic review aims to assess the correlates of HIV-TB co-infection and mental health of adults living in sub-Saharan Africa.

**Methods and analysis** We will conduct comprehensive database and non-database searches for studies (published and unpublished). We will search Google Scholar, PubMed, CINAHL, LILACS, JSTOR, Cochrane Library, SCOPUS, PsycINFO, HINARI and African Journals Online from inception to 31 May 2025, without restriction on language. We will also search the grey literature, including conference proceedings, preprint repositories, databases of dissertations, WHO and governmental databases. In the event where there is a need to contact experts and corresponding authors for further information, the review team will do so to enrich the content of the review. At least three reviewers will independently undertake study selection, data extraction and risk of bias assessment using validated tools. We will resolve discrepancies or disagreements through discussion. We will analyse dichotomous data as risk ratio, OR or proportion and continuous data as mean difference with their SD; all estimates will be presented with their 95% CI. Where applicable, we will determine SD from point estimates and the appropriate denominators assuming a binomial distribution. The magnitude of heterogeneity between the included studies will be assessed quantitatively using the index of heterogeneity ( $I^2$  statistic). The  $I^2$  values of 25%, 50% and 75% will be considered to represent low, moderate and significant heterogeneity. The significance of heterogeneity will be determined by the p value of the  $I^2$  statistic, and a p value of <0.05 will be considered as statistically significant. For studies with moderate to significant heterogeneity, the random-effects model will be used to obtain a pooled estimate of the outcome, and if heterogeneity is low, a fixed-effect model will be used.

## STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ This systematic review uses robust methods, best practices and reporting guidelines to attempt to synthesise evidence at the highest quality level possible on correlates of HIV-tuberculosis (TB) co-infection and mental health problems to provide unbiased age, sex, country and region-specific estimates.
- ⇒ The study uses a comprehensive search strategy (calibrated to ensure the strategy is both sensitive and specific) that combines a number of relevant databases and non-database sources to attempt to retrieve all relevant studies meeting the prespecified eligibility criteria.
- ⇒ The inclusion of observational studies (cohort, case-control and cross-sectional studies) allows for a thorough investigation of real world data and insights into long-term HIV-TB co-infection and mental health dynamics and associated social and economic impacts and implications, which randomised controlled trials are less suited to capture.
- ⇒ A possible limitation of this study could be the lack of quality data, including insufficient reporting of the methods and results of primary studies to be included in the systematic review.

**Ethics and dissemination** This systematic review will collate secondary research based on publicly available published and unpublished studies, and no ethical approval is required. However, an eligible study with serious ethical issues will be excluded and the reasons for exclusion documented. The review findings will be shared with key stakeholders, health authorities, agencies involved in the mental health of persons living with HIV-TB (PLHTB) co-infection, social services providers and policy implementers. The findings will be presented at scientific conferences and symposia. The final review report will be in the form of a scientific paper in a high-impact factor peer-reviewed journal.

**PROSPERO registration number** CRD42024572331.



## INTRODUCTION

The co-existence of HIV and tuberculosis (TB) is a major public health challenge worldwide.<sup>1</sup> Persons Living with HIV (PLHIV) have disproportionately high risk of dying when co-infected with TB even when on recommended treatment.<sup>2</sup> About 820 000 of the 10 million people who were infected with TB in 2019 were also living with HIV.<sup>3</sup> More than 160 000 PLHIV co-infected with TB died globally in 2022.<sup>4</sup>

Sub-Saharan Africa (SSA) accounts for the highest incidence and prevalence of HIV-TB co-infection, of which South Africa alone records 50% of all cases.<sup>5</sup> High levels of mental health conditions have been identified among persons living with HIV or TB or HIV-TB co-infection.<sup>6</sup> Persons living with HIV-TB (PLHTB) co-infection have a substantial adverse impact on their mental health outcomes.<sup>7</sup> Both standard assessments (using WHO tools) and self-assessments show that more than 70% of PLHTB have low quality of life (QoL).<sup>8</sup> Depression is one of the most common mental health challenges confronting PLHTB, with more than half of patients experiencing various forms of mental health problems.<sup>7</sup> Predictors of mental health disorders among co-infected patients have been found to include absence of family care, self-inflicted stigma and low socioeconomic status.<sup>9</sup>

Most deaths among PLHIV (about 20%) are as a result of co-infection with TB.<sup>10</sup> Advanced HIV infection with a decreased immune system increases the chances of TB co-infection, which in turn increases the chances of death among patients.<sup>11</sup> Within the sub-Saharan region, the prevalence of HIV among TB-infected persons was estimated to be around 32%.<sup>12</sup> There is a synergistic and bidirectional association between HIV-TB co-infection and mental health.<sup>13</sup> HIV-TB co-infection is a major risk factor for cognitive decline, and poor mental health has the propensity of increasing the risk of contracting HIV, TB or both with poor prognosis.<sup>14</sup> The effects of mental health outcomes on the detection and management of HIV and TB can be dire, while HIV and TB can independently and jointly affect the mental well-being and mental health outcomes of patients.<sup>15</sup>

An integrated service delivery for HIV, TB and mental health is critical in improving treatment outcomes and the QoL of patients.<sup>16 17</sup> Effective integrated service delivery is projected to avert over a million new HIV infections and 14 million TB infections and deaths by 2030.<sup>18</sup> There is a need to involve key stakeholders including clinicians, programme implementers, policy makers and patients to understand the effects of HIV on TB treatment and vice-versa and the implications for the provision of integrated services for co-infected persons.<sup>5</sup> This will contribute immensely to achieving the global targets of ending HIV and TB and associated morbidities.

### Rationale for this systematic review

The United Nations' sustainable development goals (SDGs) recognise the inter-relation between physical and mental health and the tendency for either of them

to derail the gains of the other.<sup>19</sup> Target 3.3 of the SDGs seeks to end HIV/AIDS and TB by the end of 2030. This target has become difficult to attain, especially after the COVID-19 global pandemic.<sup>20</sup> The impact of the COVID-19 pandemic further exacerbated the plights of persons living with HIV or TB, alone or co-infected. This negatively impacted the provision of services to patients and affected the achievement of the set target of 75% decline in HIV incidence.<sup>21</sup> Similarly, the pandemic in 2020 resulted in more than 1.3 million deaths from TB alone, a larger proportion being reported among PLHTB co-infection.<sup>21</sup> The SDG target 3.4 focuses on ensuring sound mental health for all, irrespective of one's physical and social state.<sup>22</sup> Only a few (<25%) of the WHO member states have been able to comprehensively integrate mental health as part of their health systems. This is woefully inadequate in addressing the global challenges posed by mental health and the capacity to achieving the goal of promoting mental health and well-being universally.<sup>23</sup>

Persons living with HIV-TB co-infection, particularly patients in SSA, experience a greater burden of mental health challenges than those with single infection.<sup>24</sup> Patients with HIV and TB co-infection are four times more likely to experience suicidal ideation<sup>25</sup> and poor psychological QoL compared with those with a single infection.<sup>26 27</sup> However, the presence of psychological disorders and their effects on the well-being of PLHTB is not well examined.<sup>28</sup> More than 10% of PLHTB co-infection were likely not to adhere to treatment, leading to extrapulmonary TB, especially among HIV patients with undisclosed status.<sup>29</sup> Mental health support is critical to keep persons with HIV-TB co-infection healthy and in care for better outcomes.<sup>30</sup> The rationale for conducting this systematic review is to provide stronger evidence on the impact of HIV-TB co-infection on patients' mental health and to recommend interventions, policies and programmes to ameliorate the challenges of PLHTB in SSA.

The research team conducted searches on PROSPERO and other databases including PubMed, Google Scholar, PsycINFO, African Journals Online and HINARI for ongoing or published systematic reviews on correlates of HIV-TB co-infection and mental health outcomes. Six systematic reviews were considered potentially closely related to this systematic review.<sup>6 31–35</sup> One systematic review covered SSA, but the focus was depression in adults living with HIV,<sup>31</sup> and another assessed the effects of mental health disorders among HIV patients in Ethiopia,<sup>32</sup> while the remaining four reviews focused on TB alone.<sup>6 33–35</sup> The only systematic review that investigated PLHTB co-infection and mental health was based on patients from one country (Ethiopia)<sup>36</sup> and not SSA.

This systematic review aims to answer the following questions: (1) What is the magnitude of mental health problems among persons co-infected with HIV and TB in countries across SSA? (2) What are the common mental health conditions reported by or identified in persons

with HIV-TB co-infection? (3) What are the correlates of HIV-TB co-infection and mental health problems in these persons? The specific objectives are: (1) to assess the magnitude of mental health problems among persons co-infected with HIV and TB in countries across SSA, (2) to identify the common mental health conditions among persons with HIV-TB co-infection and (3) to assess the correlates of HIV-TB co-infection and mental health problems.

## METHODS

This systematic review protocol has been prepared in line with the Cochrane Handbook.<sup>37</sup> We followed the methods and formats reported in earlier published works.<sup>38–48</sup> We have reported the review following the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) Extension for Protocols guidelines<sup>49</sup> (online supplemental file 1). The full review report will be guided by the PRISMA checklist and the PRISMA flow diagram to document the flow of studies during the searches and selection process<sup>50</sup> (online supplemental file 2). The review will adopt the Patient, Intervention, Comparison, Outcome, Study (PICOS) framework to comprehensively describe the population, intervention, control/comparator, outcomes and study types. The overall quality of evidence produced from this review will be assessed using the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) (<https://www.grade-workinggroup.org/>).<sup>51</sup> The full review is planned to take, on average, 6 months to complete, starting from 1 April to 31 August 2025.

### Patient and public involvement

The review questions and the outcomes have been developed with patient and public involvement to make sure what matters to the patient, their families and the general community was captured and included, and any choices were informed by their priorities, experiences and preferences in line with Guidance for Reporting Involvement of Patients and the Public.<sup>52</sup>

### Criteria for considering studies for inclusion in this systematic review

#### Type of studies

This review will consider observational studies, including cohort, case-control and cross-sectional studies that focused on correlates of HIV-TB co-infection and mental health problems in the SSA region. Given that this is not an intervention effectiveness review, randomised controlled trials (RCTs) and quasiexperimental studies will not be the focus. However, if an RCT provides any mental health correlates and has a well-defined denominator, such a study will be eligible for inclusion. Reviews, opinions, commentaries, case reports and case series will not be eligible for inclusion, although these documents may serve as sources for potentially eligible primary studies. Studies reporting a country or regional-level estimate

will not be eligible for inclusion as such studies do not have a well-defined source population. In instances where the results of a multicountry study have been lumped together and there is no way of disaggregating the data, such studies will be excluded from the meta-analysis. This section of the review has been reported along the formats used in earlier published works.<sup>42 45 50 52</sup>

### Participants

The eligible population for inclusion in this systematic review will be adults aged 18 years and above co-infected with HIV and TB, receiving medication or not and living in the SSA region. The HIV and TB status of participants should have been determined using a validated screening/diagnostic tool. For HIV, clinical and PCR,<sup>53</sup> and for TB, clinical<sup>54</sup> and PCR<sup>55</sup> diagnoses will be considered eligible for inclusion. Any special properties of the tools should have been reported. Participants should have been either registered at a recognised health facility providing antiretroviral therapy for HIV and standard services, and for TB, participants should be receiving their routine medications and standard care or not registered and not on any treatment. No restrictions will be placed on participants' gender, ethnicity or other demographic characteristics. The participants' inclusion section of this systematic review is in line with the reporting in earlier published works.<sup>56</sup>

### Intervention/exposure

This is not an intervention effectiveness review but rather HIV-TB co-infection as an exposure and its correlates with mental health.

### Comparator

Persons living with HIV alone or TB alone.

### Outcomes

#### Primary outcomes

The primary outcomes are:

- ▶ Magnitude of mental health problems (prevalence, incidence, disability etc) among persons with HIV-TB co-infection.
- ▶ The common mental health problems/conditions associated with HIV-TB co-infection.
- ▶ Correlates of HIV-TB co-infection and mental health problems.

The standardised Diagnostic and Statistical Manual of Mental Disorders 5 will be the main tool for the diagnosis of mental health conditions. However, given the paucity of data regarding which tool is most widely used across countries in SSA, the following tools will also be considered: Beck's Depression Inventory Scale,<sup>24</sup> Kessler Psychological Distress Scale,<sup>36</sup> Client Diagnostic Questionnaire,<sup>57</sup> The Montreal Cognitive Assessment,<sup>58</sup> Depression Anxiety Stress Scale-21<sup>59</sup> and International HIV Dementia Scale.<sup>60</sup> The mini-mental state examination<sup>61</sup> and Simioni Symptom Questions.<sup>62</sup>



## Secondary outcomes

The following secondary outcomes will be considered:

- ▶ Deaths associated with HIV-TB co-infection.
- ▶ QoL of PLHTB and people experiencing mental health problems assessed on the WHO Quality of Life (WHOQOL) tool<sup>63</sup> or any relevant QoL scales/tools will be considered.

## Searches for studies

### Electronic searches

We will search all relevant electronic databases for primary studies (published and unpublished) on HIV-TB co-infection, following standards in earlier research.<sup>47</sup> We will search PsycINFO, Google Scholar, PubMed, CINAHL, LILACS, JSTOR, Cochrane Library, SCOPUS, HINARI and African Journals Online from inception to 31 May 2025, without restriction on language. We will also search the grey literature including conference proceedings, preprint repositories, databases of dissertations, WHO and governmental databases. The key search terms to be used include 'HIV and TB co-infection', 'quality of

life', 'mental health disorder', 'mental health problem', 'HIV', 'tuberculosis', 'TB' and 'sub-Saharan Africa', 'SSA' etc, with all applicable synonyms, alternatives, both American and British spellings, as well as plural and singular terms (see [table 1](#) for full details). All SSA countries based on the Demographic and Health Survey Country List<sup>64</sup> will be included as individual search terms. The PubMed search strategy has been presented in [table 2](#). It will be adapted for the searches in the other databases.

### Other sources to be searched

We will hand search the reference lists of published systematic reviews and relevant studies on the subject. Where necessary, experts in the field will be contacted for information about completed but unpublished studies that could be included in the review.

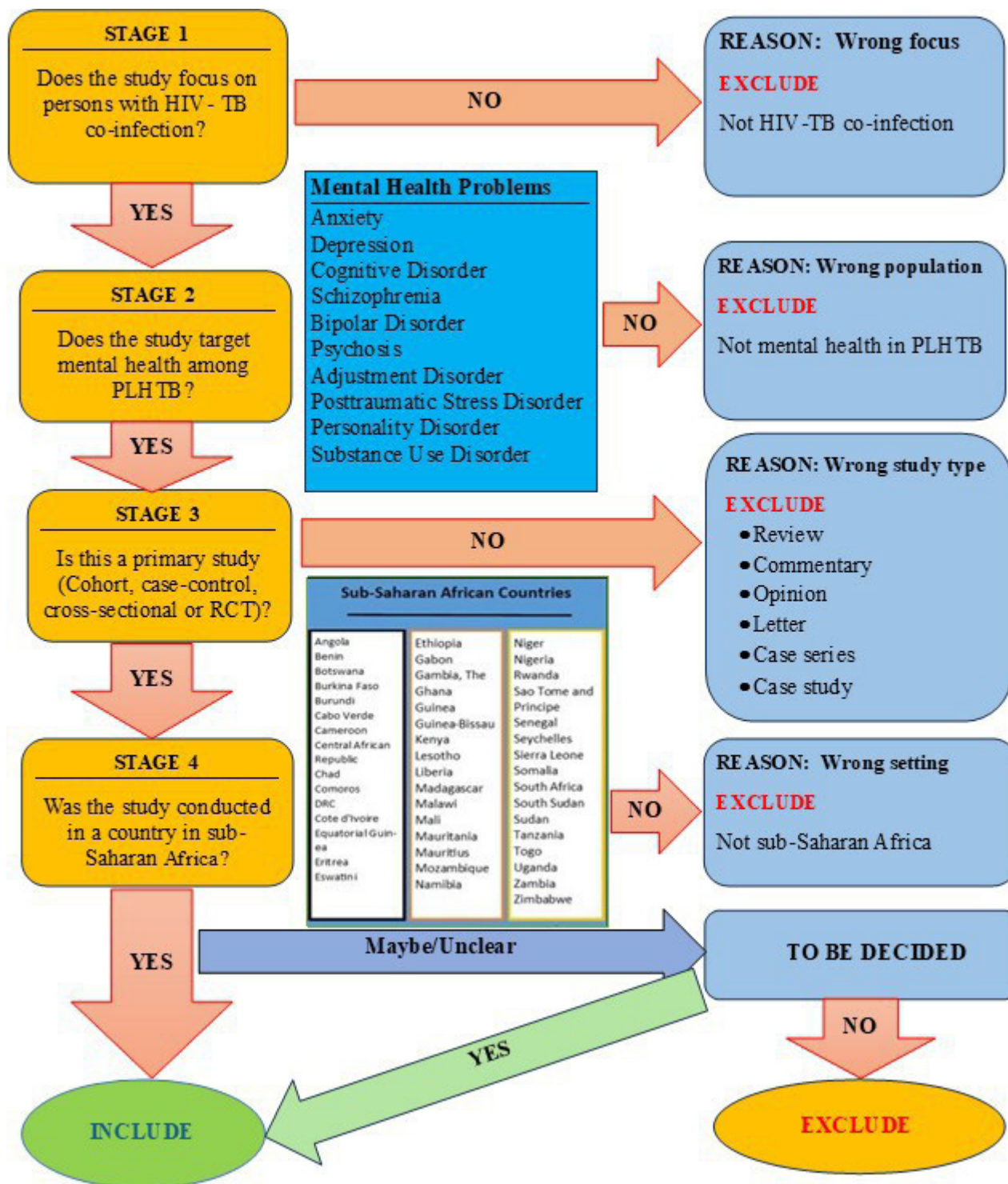
### Managing the search output and selecting studies

We will aggregate all the studies retrieved from the various sources (database and non-database sources) in Mendeley Reference Manager<sup>65</sup> (<https://www.mendeley.com>).

**Table 1** Search terms/concepts used for developing the search strategy

Concept 1	Concept 2	Concept 3	
HIV	Mental health problems	Sub-Saharan Africa	Madagascar
Human Immunodeficiency Virus	Mental health conditions	Angola	Malawi
Human Immune Virus	Mental health	Benin	Mali
AIDS	Mental wellbeing	Botswana	Mauritania
Acquired Immune Deficiency Syndrome	Psychological problems	Burkina Faso	Mauritius
Immunocompromised	Psychosocial problems	Burundi	Mozambique
TB	Obsessive compulsive disorder	Cameroon	Namibia
Tuberculosis	Post-traumatic stress disorder	Cape Verde	Niger
<i>Mycobacterium tuberculosis</i>	Schizophrenia	Central African Republic	Nigeria
	Substance abuse	Chad	Rwanda
	Suicidal ideation	Comoros	Sao Tome and Principe
	Psychopathy	Congo	Senegal
	Bulimia nervosa	Cote d'Ivoire	Seychelles
	Disruptive behaviour	Djibouti	Sierra Leone
	Dissocial disorder	Equatorial Guinea	Somalia
	Cognitive disorder	Ethiopia	South Africa
	Alzheimer disease	Gabon	Sudan
	Personality disorder	The Gambia	Swaziland
	Attention deficit hyperplasia disorder	Ghana	Tanzania
	Dysmorphic body disorders	Guinea	Togo
	Mania	Guinea-Bissau	Uganda
	Anxiety	Kenya	Zaire
	Psychosis	Lesotho	Zambia
	Dysthymia	Liberia	Zimbabwe
	Paranoia		
	Depression		
	Self-harm		
	Neurosis		
	Bipolar		
	Stress		
	Phobia		
	Dementia		
	Autism		
	Amnesia		
	Sociopathy		





**Figure 1** Study selection flow chart developed from the criteria for considering studies for inclusion in this review. PLH TB, persons living with HIV-TB; RCT, randomised controlled trial; SSA, sub-Saharan Africa; TB, tuberculosis.

results. The signalling questions have response options 'Yes', 'Probably Yes', 'Probably No', 'No' and 'No Information'. The risk of bias will be judged as 'low' for a domain with little or no concern about bias. Where there are some concerns about bias in a specific domain, but with no certainty of an important risk of bias, we will judge the domain as 'Some Concerns'. For domains with some important bias concerns, we will judge as 'High

risk'. Studies with suspected serious bias will be judged as having a 'very high risk of bias'. The results from the risk of bias assessment will be presented in a table with supporting statements from the primary studies. Disagreements between reviewers will be resolved through discussion. Where appropriate, the risk of bias tool developed by Hoy *et al*<sup>67</sup> (online supplemental file 4) will also be employed to assess the quality of prevalence studies. The

quality assessment tool for prevalence studies looks at the risk of bias in observational studies on four domains: selection bias, non-response bias, measurement bias and bias related to data analysis. Each domain will be judged on three levels: 'low', 'high' or 'unclear' risk of bias. The overall quality of evidence contributed by each study will be classified as 'low risk of bias' or 'high risk of bias'. Quality assessment will be done independently by at least two of the review team members, and any disagreements will be resolved through discussion.

#### Plan for data analysis and heterogeneity assessment

The findings from the characteristics of the included studies will be summarised narratively with the aim to answer questions pertaining to the PICOS elements including the type and characteristics of the participants/population, type of studies, interventions and outcomes of interest. A more robust analysis will be done using Stata V.18.0 (Stata Corp LLC, Texas, USA)<sup>68</sup> and Review Manager V.5.4.<sup>69</sup> Dichotomous data will be presented as OR or risk ratio, and for continuous outcome data, mean difference will be used together with SD for normally distributed data. All effect estimates will be expressed with their respective 95% CIs. Data that do not follow the normal distribution will be transformed using the logarithmic transformation and analysed using the normal distribution assumption. The magnitude of heterogeneity between included studies will be assessed quantitatively using the  $I^2$  statistic. The  $I^2$  values of 25%, 50% and 75% will be considered as representing low, moderate and significant heterogeneity, respectively.<sup>70</sup> The significance of heterogeneity will be determined by the p value of the  $I^2$  statistic, and a p value of <0.05 will be considered statistically significant. The random-effects model will be used to obtain pooled estimates of the outcome. Where a meta-analysis is not appropriate, a narrative synthesis will be conducted to summarise the evidence across studies and the results presented in tables.

#### Subgroup analysis

Where heterogeneity is determined to be appreciable, subgroup analyses will be performed to identify the possible sources of heterogeneity. Subgroup analysis will mainly be conducted around the PICOS domains and especially around the known potential confounding variables such as age, sex, study setting (hospital or community-based) and geographical location (Central, East, Southern and West Africa).

#### Handling missing and incomplete data

The authors of the primary studies will be contacted in the case of missing data on pertinent variables, where possible. Where authors are unable to provide the requested information or cannot be reached, missing data will not be imputed. Instead, the potential impact of missing data on the findings of the review will be discussed in the discussion.

#### Sensitivity analysis

Where data permits, sensitivity analysis will be conducted to assess the robustness of the review findings to outlier studies with unusually high weightings. This will involve re-running the meta-analysis by excluding studies one by one to determine the impact each study has on the overall effect estimate. Additionally, we will perform sensitivity analyses by excluding studies with high risk of bias and other key methodological characteristics deemed to have inherent flaws. This process will help to identify whether any single study or group of studies will not disproportionately influence the pooled estimates, thereby the review conclusions.

#### Grading the level of evidence

The quality of evidence for the primary and secondary outcomes will be assessed using the GRADE approach.<sup>71</sup> The GRADE system classifies the quality of evidence as high, moderate, low or very low based on the study design, risk of bias, consistency of results, directness of evidence, precision of estimates and potential publication bias. The certainty of evidence can be rated downward by one or two levels when there are serious or very serious concerns, respectively, in any of the domains.<sup>71 72</sup> The certainty of evidence can be rated upward for high-quality observational studies, although this is usually rarely done.<sup>72 73</sup> An *overall* rating of the certainty of the evidence for each outcome will be presented in a summary of findings table together with the study types, the number of studies and participants and the relative and absolute effects for each outcome.<sup>73</sup> Each outcome will be independently evaluated by two reviewers, and any discrepancies will be resolved through discussion or consultation with a third reviewer.

#### ETHICAL APPROVAL AND DISSEMINATION

This systematic review will use secondary data from published studies and no new data will be collected directly from human participants. As such, there are no direct ethical concerns related to data collection. Ethical considerations will focus on ensuring the integrity and transparency of the review process, including proper citation of sources, avoiding plagiarism, and reporting conflicts of interest. Studies with serious ethical issues will be removed from this systematic review, and the reasons for exclusion will be documented. Findings of the final review report will be disseminated through peer-reviewed journal publication and presentation at scientific conferences. It will also be shared with key stakeholders, including national and international health authorities in HIV and TB care, mental health authorities, health-care professionals and policy makers, HIV-TB and mental health advocates and the general population.

#### Author affiliations

<sup>1</sup>Centre for Evidence Synthesis and Policy, University of Ghana, Accra, Ghana

<sup>2</sup>Department of Epidemiology and Disease Control, School of Public Health, University of Ghana, Accra, Ghana

<sup>3</sup>Department of Health Policy, Planning and Management, School of Public Health, University of Ghana, Accra, Ghana

<sup>4</sup>Department of Biostatistics, School of Public Health, University of Ghana, Accra, Ghana

**Acknowledgements** This systematic review was prepared as part of the capacity-building initiative of the Centre for Evidence Synthesis and Policy (CESP), University of Ghana in partnership with the Africa Communities of Evidence Synthesis and Translation (ACEST), Accra, Ghana, that train health professionals and scientists in Low and Middle-Income Countries (LMICs) evidence synthesis and research translation. Welbeck Amoani Twum, Mishael Yankey and Isaac Kojo Appiah are PhD students at the School of Public Health, University of Ghana specialising in Evidence Synthesis and Translation; they are mentored by Prof. Anthony Danso-Appiah (Director, Centre for Evidence Synthesis and Policy, University of Ghana, Legon, Accra).

**Contributors** Protocol conceptualisation and design: AD-A, MY, IKA and WAT. Drafting the work or revising it critically for important intellectual content: AD-A, MY, IKA and WAT. Acquisition, analysis or interpretation of data: AD-A, MY, IKA and WAT. Agreement to be accountable for accuracy or integrity of all aspects of the work: AD-A, MY, IKA and WAT. Final approval of the version to be published: AD-A, MY, IKA and WAT. Guarantor of the review: AD-A.

**Funding** The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

**Competing interests** None declared.

**Patient and public involvement** Patients and/or the public were involved in the design, conduct, reporting or dissemination plans of this research. Refer to the Methods section for further details.

**Patient consent for publication** Not applicable.

**Provenance and peer review** Not commissioned; externally peer reviewed.

**Supplemental material** This content has been supplied by the author(s). It has not been vetted by BMJ Publishing Group Limited (BMJ) and may not have been peer-reviewed. Any opinions or recommendations discussed are solely those of the author(s) and are not endorsed by BMJ. BMJ disclaims all liability and responsibility arising from any reliance placed on the content. Where the content includes any translated material, BMJ does not warrant the accuracy and reliability of the translations (including but not limited to local regulations, clinical guidelines, terminology, drug names and drug dosages), and is not responsible for any error and/or omissions arising from translation and adaptation or otherwise.

**Open access** This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

#### ORCID iDs

Mishael Yankey <http://orcid.org/0000-0003-2586-7228>

Welbeck Amoani Twum <http://orcid.org/0000-0002-6448-5567>

## REFERENCES

- World Health Organization. TB-HIV co-infection Co-infection of TB and HIV: why is it important? WHO Myanmar factsheet special, Available: <http://www.searo.who.int/myanmar>
- Kegne TW, Anteneh ZA, Bayeh TL, et al. Survival Rate and Predictors of Mortality Among TB-HIV Co-Infected Patients During Tuberculosis Treatment at Public Health Facilities in Bahir Dar City, Northwest Ethiopia. *Infect Drug Resist* 2024;17:1385–95.
- World Health Organization. Global HIV Programme, 2024. Available: <https://www.who.int/teams/global-hiv-hepatitis-and-stis-programmes/hiv/treatment/tuberculosis-hiv>
- World Health Organization. Tuberculosis Tuberculosis Key Facts, 2023. Available: <https://www.who.int/news-room/fact-sheets/detail/tuberculosis>
- Olivier C, Luies L. WHO Goals and Beyond: Managing HIV/TB Co-infection in South Africa. *SN Compr Clin Med* 2023;5:1.
- Njie GJ, Khan A. Prevalence of Tuberculosis and Mental Disorders Comorbidity: A Systematic Review and Meta-analysis. *J Immigr Minor Health* 2022;24:1550–6.
- Deribew A, Deribe K, Reda AA, et al. Do common mental disorders decline over time in TB/HIV co-infected and HIV patients without TB who are on antiretroviral treatment? *BMC Psychiatry* 2013;13:1–6.
- Nabei JN, Bonful HA, Afari EA, et al. Predictors of quality of life of TB/HIV co-infected patients in the Northern region of Ghana. *BMC Infect Dis* 2024;24:396:396.
- Khamarko K, Janet Myers MJ. The Influence of Social Support on the Lives of HIV-Infected Individuals in Low-and Middle-Income Countries. 2013.
- Lelisho ME, Wotale TW, Tareke SA, et al. Survival rate and predictors of mortality among TB/HIV co-infected adult patients: retrospective cohort study. *Sci Rep* 2022;12:18360.
- Tesfaye B, Alebel A, Gebrie A, et al. The twin epidemics: Prevalence of TB/HIV co-infection and its associated factors in Ethiopia; A systematic review and meta-analysis. *PLoS One* 2018;13:e0203986.
- Gelaw YA, Williams G, Soares Magalhães RJ, et al. HIV Prevalence Among Tuberculosis Patients in Sub-Saharan Africa: A Systematic Review and Meta-analysis. *AIDS Behav* 2019;23:1561–75.
- Fabrazzo M, Cipolla S, Pisaturo M, et al. Bidirectional Relationship between HIV/HBV Infection and Comorbid Depression and/or Anxiety: A Systematic Review on Shared Biological Mechanisms. *J Pers Med* 2023;13:1689.
- Remien RH, Stirratt MJ, Nguyen N, et al. Mental health and HIV/AIDS: the need for an integrated response. *AIDS* 2019;33:1411–20.
- Poku OB, West NS, Eschliman EL, et al. Mental Health Problems Across the HIV Care Continuum for Adolescents Living with HIV in Sub-Saharan Africa: A Scoping Review. *AIDS Behav* 2023;27:2548–65.
- Sampson E A, Theresa A, Joseph R O. Evaluation of the Burden and Intervention Strategies of TB-HIV Co-Infection in West Africa. *J Infect Dis Epidemiol* 2020;6.
- Fukunaga R, Pierre P, Williams JK, et al. Prioritizing Mental Health within HIV and Tuberculosis Services in PEPFAR. *Emerg Infect Dis* 2024;30:e231726:1–5.
- UNAIDS. *Global AIDS strategy 2021-2026 — end inequalities*. End AIDS. 2021.
- Dybdahl R, Lien L. Mental health is an integral part of the sustainable development goals. *Prev Med Commun Health* 2018;1.
- United Nations in Ghana. Sustainable Development Goal 3: Good Health and Well-being, 2019. Available: <https://ghana.un.org/en/sdgs/3>
- United Nations. The Sustainable Development Goals Report, 2022. Available: <https://unstats.un.org/sdgs/report/2022/>
- Scorza P, Poku O, Pike KM. Mental health: taking its place as an essential element of sustainable global development. *BJPsych Int* 2018;15:72–4.
- Goodwin J, Zaman U. Editorial: Mental health stigma and UN Sustainable Development Goals. *Front Psychiatry* 2023;14:1190406.
- Jha DK, Jha J, Jha AK, et al. Quality of life among HIV-tuberculosis co-infected patients. *Perspect Clin Res* 2019;10:125–9.
- Momanyi RK, Kwobah EK, Owiti P, et al. Psychiatric morbidity among patients on treatment for tuberculosis at a tertiary referral hospital in Western Kenya. *PLoS One* 2024;19:e0302744.
- Hailu T, Yitayal M, Yazachew L. Health-Related Quality of Life and Associated Factors Among Adult HIV Mono-Infected and TB/HIV Co-Infected Patients in Public Health Facilities in Northeast Ethiopia: A Comparative Cross-Sectional Study. *Patient Prefer Adherence* 2020;14:1873–87.
- Butnaru T, Mihălaşan D, Ancuța C, et al. The impact on the quality-of-life dimensions amongst drug-resistant tb patients and tb-hiv co-infection – brief review.
- Tola HH, Shojaeizadeh D, Garmaroudi G, et al. Psychological distress and its effect on tuberculosis treatment outcomes in Ethiopia. *Glob Health Action* 2015;8:29019.
- Webb Mazinyo E, Kim L, Masuku S, et al. Adherence to Concurrent Tuberculosis Treatment and Antiretroviral Treatment among Co-Infected Persons in South Africa, 2008–2010. *PLoS ONE* 2016;11:e0159317.
- Carvalho MV de F, Taminato M, Bertolozzi MR, et al. Tuberculosis/HIV coinfection from the perspective of quality of life: scope review. *Rev Bras Enferm* 2021;74.
- Lofgren SM, Bond DJ, Nakasujja N, et al. Burden of Depression in Outpatient HIV-Infected adults in Sub-Saharan Africa; Systematic Review and Meta-analysis. *AIDS Behav* 2020;24:1752–64.
- Belayneh Z, Mekuriaw B, Mehare T, et al. Magnitude and predictors of common mental disorder among people with HIV/AIDS in Ethiopia: a systematic review and meta-analysis. *BMC Public Health* 2020;20:689.
- Lee G, Scuffell J, Galea JT, et al. Impact of mental disorders on active TB treatment outcomes: a systematic review and meta-analysis. *Int J Tuberc Lung Dis* 2020;24:1279–84.

- 34 Hayward SE, Deal A, Rustage K, *et al.* The relationship between mental health and risk of active tuberculosis: a systematic review. *BMJ Open* 2022;12:e048945.
- 35 Farooq S, Tunmore J, Comber R. Pharmacological or non-pharmacological interventions for treatment of common mental disorders associated with Tuberculosis: A systematic review. *Chron Respir Dis* 2021;18:14799731211003937.
- 36 Deribew A, Tesfaye M, Hailmichael Y, *et al.* Common mental disorders in TB/HIV co-infected patients in Ethiopia. *BMC Infect Dis* 2010;10:201.
- 37 Higgins JPT, Thomas J, Chandler J, *et al.* Cochrane Handbook for Systematic Reviews of Interventions version 6.4 (updated August 2023). 2023.
- 38 Danso-Appiah A, Utzinger J, Liu J, *et al.* Drugs for treating urinary schistosomiasis. *Cochrane Database Syst Rev* 2008;CD000053.
- 39 Koduah A, Baatiema L, de Chavez AC, *et al.* Implementation of medicines pricing policies in sub-Saharan Africa: systematic review. *Syst Rev* 2022;11:257.
- 40 Ganle JK, Baatiema L, Quansah R, *et al.* Barriers facing persons with disability in accessing sexual and reproductive health services in sub-Saharan Africa: A systematic review. *PLoS One* 2020;15:e0238585.
- 41 Danso-Appiah A, Olliaro PL, Donegan S, *et al.* Drugs for treating Schistosoma mansoni infection. *Cochrane Database Syst Rev* 2013;2013:CD000528.
- 42 Danso-Appiah A, Minton J, Boamah D, *et al.* Accuracy of point-of-care testing for circulatory cathodic antigen in the detection of schistosoma infection: systematic review and meta-analysis. *Bull World Health Organ* 2016;94:522–533A.
- 43 Danso-Appiah A, Eusebi P, Lo NC, *et al.* Optimal prevalence threshold for guiding the implementation of preventive chemotherapy in countries endemic for schistosomiasis: synthesis of evidence from mass drug administration programmes for developing this tool. *Infectious Diseases (except HIV/AIDS)* [Preprint]. 10.1101/2021.05.10.21256643 Available: <https://www.medrxiv.org/content/10.1101/2021.05.10.21256643v4>
- 44 Ohene-Adjei K, Asante KP, Akuffo KO, *et al.* Malaria vaccine-related adverse events among children under 5 in sub-Saharan Africa: systematic review and meta-analysis protocol. *BMJ Open* 2023;13:e076985.
- 45 Awini E, Agyepong IA, Owiredu D, *et al.* Burden of mental health problems among pregnant and postpartum women in sub-Saharan Africa: systematic review and meta-analysis protocol. *BMJ Open* 2023;13:e069545.
- 46 Danso-Appiah A, Owiredu D, Akuffo KO. Praziquantel-related visual disorders among recipients in mass drug administration campaigns in schistosomiasis endemic settings: Systematic review and meta-analysis protocol. *PLoS One* 2024;19:e0300384.
- 47 Abdulai M, Owiredu D, Boadu I, *et al.* Psychosocial interventions and their effectiveness on quality of life among elderly persons living with HIV in Africa South of the Sahara: Systematic review and meta-analysis protocol. *PLoS One* 2023;18:e0291781.
- 48 Danso-Appiah A, Akuffo KO, Owiredu D. Mental health problems in pregnant and postpartum women living with HIV in sub-Saharan Africa: Systematic review and meta-analysis protocol. *PLoS ONE* 2024;19:e0308810.
- 49 Page MJ, McKenzie JE, Bossuyt PM, *et al.* The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ* 2021;372:n71.
- 50 Liberati A, Altman DG, Tetzlaff J, *et al.* The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: explanation and elaboration. *J Clin Epidemiol* 2009;62:e1–34.
- 51 Schünemann HJ, Brennan S, Akl EA, *et al.* The development methods of official GRADE articles and requirements for claiming the use of GRADE - A statement by the GRADE guidance group. *J Clin Epidemiol* 2023;159:79–84.
- 52 Staniszweska S, Brett J, Simera I, *et al.* GRIPP2 reporting checklists: tools to improve reporting of patient and public involvement in research. *Res Involv Engagem* 2017;3:13.
- 53 Prakash S, Aasarey R, Priyatma. The development, evaluation, performance, and validation of micro-PCR and extractor for the quantification of HIV-1 & 2 RNA. *Sci Rep* 2024;14:8700.
- 54 Gill CM, Dolan L, Piggott LM, *et al.* New developments in tuberculosis diagnosis and treatment. *Breathe (Sheff)* 2022;18:210149.
- 55 Albuquerque YMM de, Lima ALM de A, Lins AK, *et al.* Quantitative real-time PCR (q-PCR) for sputum smear diagnosis of pulmonary tuberculosis among people with HIV/AIDS. *Rev Inst Med Trop Sao Paulo* 2014;56:139–42.
- 56 Imakando MM, Maya E, Owiredu D, *et al.* The burden of iatrogenic obstetric fistulas in Sub-Saharan Africa: Systematic review and meta-analysis protocol. *PLoS One* 2024;19:e0302529.
- 57 Mellins CA, Kauchali S, Nestadt DF, *et al.* Validation of the Client Diagnostic Questionnaire to Assess Mental Health in South African Caregivers of Children. *Clin Psychol Psychother* 2017;24:245–54.
- 58 Gluhm S, Goldstein J, Loc K, *et al.* Cognitive performance on the mini-mental state examination and the montreal cognitive assessment across the healthy adult lifespan. *Cogn Behav Neurol* 2013;26:1–5.
- 59 Gloster AT, Rhoades HM, Novy D, *et al.* Psychometric properties of the Depression Anxiety and Stress Scale-21 in older primary care patients. *J Affect Disord* 2008;110:248–59.
- 60 Rosca EC, Tadger P, Cornea A, *et al.* International HIV Dementia Scale for HIV-Associated Neurocognitive Disorders: A Systematic Review and Meta-Analysis. *Diagnostics (Basel)* 2021;11:1124.
- 61 Kurlowicz L, Wallace M. The Mini Mental State Examination (MMSE), 1999. Available: [www.hartfordign.org](http://www.hartfordign.org)
- 62 Joska JA, Witten J, Thomas KG, *et al.* A Comparison of Five Brief Screening Tools for HIV-Associated Neurocognitive Disorders in the USA and South Africa. *AIDS Behav* 2016;20:1621–31.
- 63 WHO. WHOQOL user manual programme on mental health division of mental health and prevention of substance abuse world health organization, 2012. Available: <https://www.who.int/tools/whoqol>
- 64 The DHS Program. Country List, Available: <https://dhsprogram.com/Countries/Country-List.cfm>
- 65 Mendeley. Mendeley Reference Manager, Available: <https://www.mendeley.com/reference-management/reference-manager>
- 66 Ouzzani M, Hammady H, Fedorowicz Z, *et al.* Rayyan-a web and mobile app for systematic reviews. *Syst Rev* 2016;5:210.
- 67 Hoy D, Brooks P, Woolf A, *et al.* Assessing risk of bias in prevalence studies: modification of an existing tool and evidence of interrater agreement. *J Clin Epidemiol* 2012;65:934–9.
- 68 Stata. StataCorp LLC, Available: <https://www.stata.com/company/>
- 69 RevMan | Cochrane Training, Available: <https://training.cochrane.org/online-learning/core-software/revman>
- 70 Thorlund K, Imberger G, Johnston BC, *et al.* Evolution of heterogeneity (I<sup>2</sup>) estimates and their 95% confidence intervals in large meta-analyses. *PLoS One* 2012;7:e39471.
- 71 Schünemann H, Brozek J, Guyatt G, *et al.* Handbook for grading the quality of evidence and the strength of recommendations using the GRADE approach. 2013;15.
- 72 Balshem H, Helfand M, Schünemann HJ, *et al.* GRADE guidelines: 3. Rating the quality of evidence. *J Clin Epidemiol* 2011;64:401–6.
- 73 Guyatt G, Oxman AD, Akl EA, *et al.* GRADE guidelines: 1. Introduction-GRADE evidence profiles and summary of findings tables. *J Clin Epidemiol* 2011;64:383–94.