

ORIGINAL ARTICLE

Authorship leadership and funding patterns in tuberculosis research conducted in Mozambique, 2010 – 2024: a bibliometric analysis

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ABSTRACT

BACKGROUND:

Tuberculosis (TB) remains a major public health challenge in Mozambique. Although international collaborations have expanded TB research, concerns persist regarding equity in scientific leadership and knowledge production.

OBJECTIVE:

This study assessed authorship leadership, collaboration, and funding patterns in TB research conducted in Mozambique.

METHODS:

We conducted a retrospective bibliometric analysis of peer-reviewed TB research publications conducted in Mozambique between 2010 and 2024. Searches of PubMed, OpenAlex, Google Scholar, and CrossRef identified 1500 records, of which 174 studies were included after screening. Data extracted included authorship position, institutional affiliation, study design, collaboration scope, and funding source. Mozambican lead authorship was defined as Mozambican-affiliated first and/or last authorship. Descriptive statistics and logistic regression were used to assess temporal trends and associated factors.

RESULTS:

Nearly all publications (94.8%) included at least one Mozambican-affiliated author; however, Mozambican researchers were first authors in 47.7% of studies, last authors in 28.2%, and corresponding authors in 42.5%. Overall, 56.3% of publications demonstrated Mozambican lead authorship. Mozambican first authorship declined from 65.0% in 2010-2014 to 42.7% in 2020-2024. Compared with observational/implementation studies, interventional/trial-based studies had lower adjusted odds of Mozambican lead authorship, defined as Mozambican-affiliated first and/or last authorship (aOR: 0.41, 95% CI: 0.19-0.88), whereas qualitative studies had higher adjusted odds (aOR: 3.21, 95% CI: 1.16-8.89). A substantial proportion of senior authors classified as Mozambican-affiliated appeared to be foreign researchers holding local affiliations.

CONCLUSION:

Mozambican participation in TB research is substantial, but equitable leadership remains uneven. These findings highlight the need for stronger locally led funding, research capacity development, and more equitable global health research partnerships.

KEYWORDS:

Authorship equity, bibliometric analysis, global health research, knowledge production, Mozambique, tuberculosis

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INTRODUCTION

Tuberculosis (TB) remains one of the leading causes of infectious disease morbidity and mortality globally^{1,2}, with a disproportionate burden borne by countries in sub-Saharan Africa³. Mozambique is consistently ranked among the high TB burden countries⁴, with complex challenges related to high HIV co-infection rates, health system constraints, and socioeconomic determinants that continue to shape the national TB epidemic⁴⁻⁶. Generating locally relevant research evidence is therefore essential for informing context-appropriate policy responses, strengthening programme implementation, and accelerating progress towards global TB control targets.

Over the past two decades, international investment in TB research has increased substantially, accompanied by a growing emphasis on global partnerships and multi-country research initiatives^{7,8}. While such collaborations have contributed to important scientific advances, they have also raised critical questions regarding equity in knowledge production, including who defines research priorities, who leads scientific inquiry, and who ultimately receives academic recognition^{9,10}. These concerns have gained renewed attention within broader movements to decolonise global health^{11,12}, which call for a re-examination of historical and structural power imbalances shaping research agendas and authorship practices in low- and middle-income countries^{13,14}.

Despite these advances, significant uncertainties remain regarding the extent to which researchers based in high-burden settings such as Mozambique occupy positions of scientific leadership, and how funding and collaboration structures influence these dynamics. While authorship position is widely recognised as a key marker of scientific leadership and intellectual contribution^{10,15}, it remains an imperfect proxy, as it may not fully capture underlying power dynamics, decision-making authority, or control over research resources. First and last authorship roles are commonly associated with conceptualisation of the study, oversight of research processes, and stewardship of data interpretation and dissemination¹⁵⁻¹⁷. In high-burden settings such as Mozambique, equitable representation in these positions is particularly

important to ensure that research outputs reflect local priorities and lived realities^{9,11}. In addition, institutional affiliation is frequently used as a proxy indicator of local participation in research^{18,19}. Empirical evidence examining these dynamics within TB research remains limited, particularly in the context of southern African countries with high disease burden^{16,20}.

Mozambique provides a relevant case study in which to explore these issues, given its longstanding engagement in international TB research collaborations and its continued reliance on external technical and financial support for research and programme implementation^{21,22}. Understanding patterns of authorship, collaboration, and funding in TB research conducted in Mozambique may therefore offer important insights into the evolving landscape of global health knowledge production. Moreover, such analysis is essential for informing more equitable research partnerships, strengthening national research systems, and guiding funding strategies towards locally led scientific leadership.

The present study aimed to assess equity in authorship leadership and funding patterns in TB research conducted in Mozambique between 2010 and 2024. Specifically, the study sought to (i) describe temporal trends in Mozambican participation and leadership in scientific publications, (ii) examine associations between study characteristics, funding sources, and local authorship leadership, and (iii) explore the extent to which Mozambican institutional affiliation reflects locally rooted scientific leadership. By providing an empirical analysis grounded in a decolonial global health framework, this study seeks to contribute to ongoing efforts to promote more equitable and contextually responsive TB research partnerships.

METHODS

Ethical considerations

This study used publicly available bibliographic data and did not involve human participants. Formal ethical approval was therefore not required. All analyses were conducted and reported at aggregate level to avoid attribution to individual researchers.

Study design

We conducted a retrospective bibliometric and funding equity analysis of TB research conducted in Mozambique and published between 1 January 2010 and 31 December 2024. The study aimed to examine patterns of authorship, institutional participation, and funding sources as indicators of equity in knowledge production from a decolonial global health perspective. The period 2010-2024 was selected to provide a 15-year observation window for examining temporal patterns in authorship leadership and funding. It allowed comparisons across three equal five-year periods: 2010-2014, 2015-2019, and 2020-2024. The endpoint, 2024, was the most recent complete calendar year preceding the search year.

Data sources and search strategy

Publications were identified through structured searches of multiple publicly accessible bibliographic databases conducted on 3 February 2026. These included PubMed, the OpenAlex database, Google Scholar, and CrossRef. The full search strategy is available in Supplementary Table S1. In brief, searches were conducted using combinations of the keywords "tuberculosis" (including MeSH terms where applicable) and "Mozambique" with publication date limits of 1 January 2010 to 31 December 2024. For PubMed, the exact query was: ("tuberculosis"[MeSH Terms] OR "tuberculosis"[Title/Abstract] OR "TB"[Title/Abstract]) AND ("Mozambique"[MeSH Terms] OR "Mozambique"[Title/Abstract]) AND ("2010/01/01"[Date-Publication]: "2024/12/31"[Date - Publication]). The search strategy was applied consistently across databases, and results were exported and de-duplicated prior to screening.

Database searches were complemented by manual screening of reference lists of eligible studies. We used Rayyan software (Rayyan Systems Inc., Cambridge, MA, USA)²³ to review the records.

Eligibility criteria

Studies were included if they reported primary TB research conducted in Mozambique or using Mozambican data, were published in peer-reviewed journals between 2010 and 2024, and were written in English, Portuguese, or French. Multi-country studies were included when: (a) Mozambique was explicitly

listed as a study site in the methods section, OR (b) Mozambican data were analysed and reported separately from other countries. For multi-country studies meeting inclusion criteria, no minimum threshold for Mozambican participant contribution was applied; however, studies where Mozambican data could not be disaggregated were excluded. Studies were excluded if they were review articles, editorials, or commentaries, or if they did not include primary data from Mozambique.

Study selection and screening process

Title and abstract screening were conducted independently by two reviewers (IM and DO). Disagreements were resolved through discussion or consultation with a third reviewer (EN). Inter-rater agreement was assessed using Cohen's kappa coefficient ($\kappa = 0.87$, 95% CI: 0.82-0.92), indicating substantial agreement. Full-text screening followed the same process, with $\kappa = 0.91$ (95% CI: 0.86-0.96).

Data extraction

Data from the included studies were extracted by IM using a structured data extraction tool within the Rayyan software. For each eligible publication, the following information was recorded: year of publication, journal name, study design, institutional affiliations and countries of the first, last, and corresponding authors, number of Mozambican-affiliated authors, funding source(s) and country of origin of the funders, and study scope (Mozambique-only or multi-country collaboration). Where authors reported multiple affiliations, the presence of at least one Mozambican institutional affiliation was used to classify the author as Mozambican-affiliated.

Ascertainment of author nationality

Because institutional affiliation does not necessarily reflect nationality or local research leadership, additional efforts were made to contextualise authorship patterns. When relevant to the analysis, contextual information on authors' professional backgrounds was explored using publicly available sources, including institutional profiles, academic biographies, professional networking platforms, and prior publication records. This process did not seek to determine or assign formal nationality, but rather to identify patterns suggesting whether authors were

primarily based within or outside Mozambique. This approach was used solely to support aggregate analytical interpretation of authorship dynamics and was not intended to classify or label individual researchers. Findings are therefore presented at group level to avoid identification of specific individuals and to ensure respectful and responsible reporting.

Operational definitions

A Mozambican-affiliated author was defined as an author reporting at least one institutional affiliation based in Mozambique at the time of publication. Mozambican lead authorship was defined as Mozambican-affiliated first and/or last authorship. To explore potential discrepancies between institutional affiliation and actual leadership patterns, authors who were Mozambican-affiliated but appeared to be foreign researchers were identified using two complementary approaches: 1) a country-based proxy, where affiliation information included Mozambique alongside at least one foreign country, 2) a contextual assessment, based on publicly available professional information indicating that the author's primary academic or professional base was outside Mozambique. These classifications were used for analytical purposes and are subject to potential misclassification, which is acknowledged as a limitation of the study. Funding sources were categorized as foreign only, Mozambique only, mixed Mozambique and foreign, or not reported.

Statistical analysis

Descriptive statistics were used to summarize study characteristics and authorship patterns. Categorical variables were presented as frequencies and percentages, while continuous variables were summarized using means and medians. Temporal trends in Mozambican authorship were assessed by

grouping publications into three periods: 2010 – 2014, 2015 – 2019, and 2020 – 2024. Differences across periods and study characteristics were evaluated using chi-square tests. Logistic regression models were used to assess changes over time in the likelihood of Mozambican first authorship, last authorship, corresponding authorship, and overall lead authorship. Results were expressed as odds ratios (ORs) with 95% confidence intervals, and statistical significance was set at p-value of < 0.05. All statistical analyses were conducted using Stata version 18.5 (StataCorp LLC, College Station, TX, USA). A multivariable logistic regression model examined associations between study characteristics and Mozambican lead authorship, coded as the presence versus absence of Mozambican-affiliated first and/or last authorship. The model included publication period, study design, funding source, and study scope. Observational/implementation studies were the reference category for study design.

RESULTS

Study selection and characteristics

The database search identified 1500 records, including 229 from PubMed, 1000 from OpenAlex, 200 from Google Scholar, and 71 from CrossRef. After removal of 175 duplicate records, 1325 publications remained for title and abstract screening. A total of 207 articles were selected for full-text review. Of these, 33 publications were excluded, including 30 studies that did not include primary data from Mozambique and 3 publications that were not from peer-reviewed journal sources. The final analytic sample therefore comprised 174 eligible TB research publications conducted in Mozambique between 2010 and 2024. Figure 1 presents the PRISMA flow diagram detailing the study selection process.

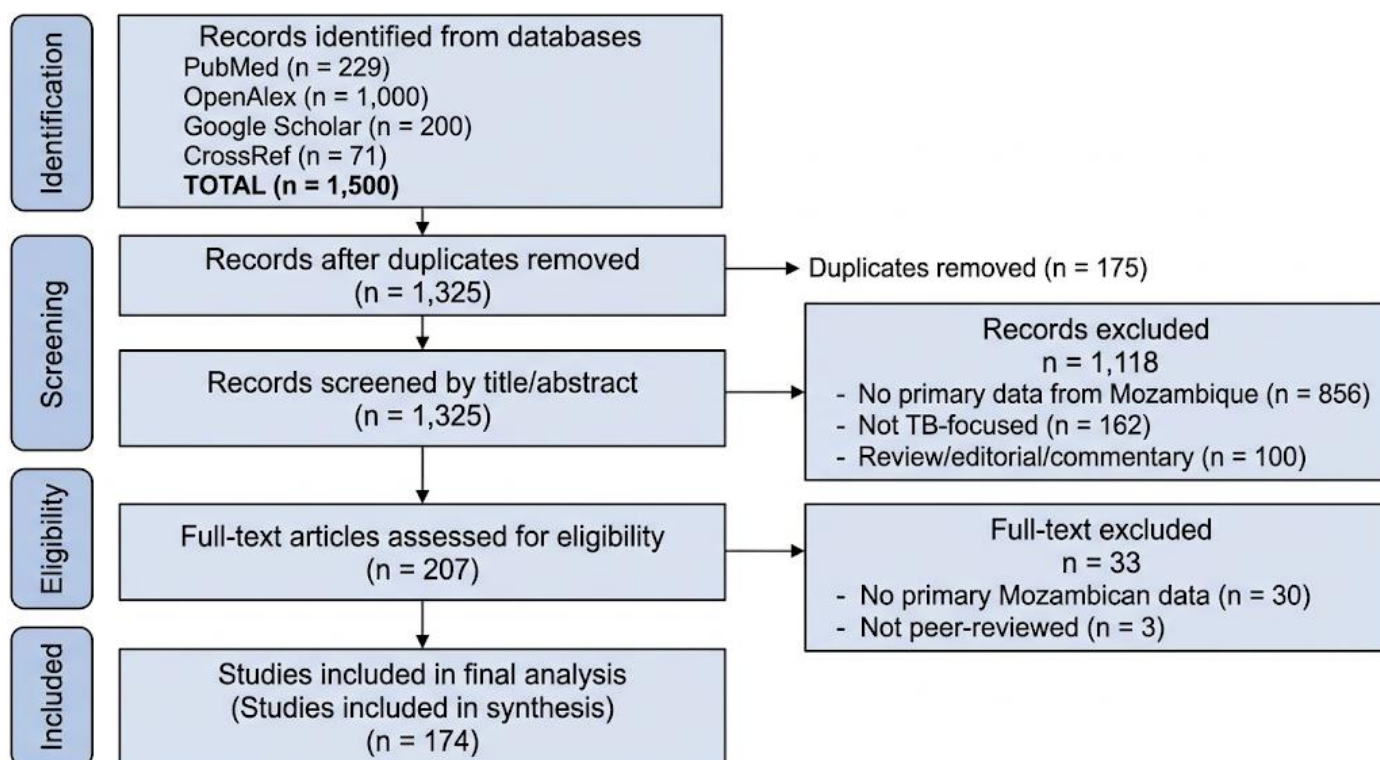


Figure 1. PRISMA 2020 Flow Diagram

As shown in Table 1, nearly half of the included studies were published in the most recent period (2020 – 2024: 48.9%), compared with 39.7% in 2015 – 2019 and 11.5% in 2010 – 2014, reflecting a substantial increase in TB research output over time. Most studies were classified

as observational or implementation research (73.0%), followed by diagnostic or laboratory-based studies (11.0%), interventional or trial designs, and a smaller proportion of qualitative studies.

Table 1. Characteristics of included TB research publications conducted in Mozambique (2010-2024)

Characteristic	Category	n (N=174)	%
Publication period	2010-2014	20	11.5
	2015-2019	69	39.7
	2020-2024	85	48.9
Study design	Observational / implementation	127	73.0
	Diagnostic / laboratory	19	11.0
	Interventional / trial	19	11.0
	Qualitative	9	5.2
Funding source	Foreign only	91	52.3
	Mixed (Mozambique + foreign)	27	15.5
	Mozambique only	8	4.6
	Not reported	48	27.6
Study scope	Mozambique only	80	46.0
	Multi-country collaboration	94	54.0

Regarding funding patterns, the majority of studies were supported by foreign funding sources, while mixed Mozambique-foreign funding and exclusively Mozambican funding were less common. Specifically, over half of studies (52.3%) were funded exclusively by foreign sources, whereas only 4.6% reported exclusively Mozambican funding. Approximately one quarter of studies did not clearly report funding sources. More than half of the publications involved multi-country collaborations, indicating a high level of integration of Mozambican TB research within international research networks.

Authorship patterns and Mozambican research participation

Overall, 165 of 174 publications (94.8%) included at least one Mozambican-affiliated author. However, Mozambican representation in senior authorship positions was substantially lower. Mozambican researchers were listed as first authors in 83 publications (47.7%), last authors in 49 publications (28.2%), and corresponding authors in 74 publications (42.5%). When considering lead authorship, defined as Mozambican first and/or last authorship, 98 studies (56.3%) met this criterion.

The mean number of Mozambican-affiliated authors per publication was 4.2, with a median of 3. Beyond first and last authorship, we examined Mozambican representation in second and third author positions. Mozambican-affiliated authors occupied the second author position in 98 of 174 publications (56.3%, 95% CI: 48.6-63.8%) and the third author position in 87 publications (50.0%, 95% CI: 42.3-57.7%). These proportions are higher than those observed for first authorship (47.7%) and substantially higher than for last authorship (28.2%), suggesting that Mozambican researchers are more likely to appear in middle-author positions than in senior leadership roles. Over time, Mozambican second authorship declined from 70.0% in 2010-2014 to 52.2% in 2020-2024 ($p=0.08$), while third authorship remained stable (55.0% to 48.8%, $p=0.63$). These patterns are consistent with the hypothesis that while Mozambican participation in research teams has expanded, movement into senior authorship positions has not kept pace.

Temporal trends in Mozambican authorship

Temporal analysis demonstrated a declining trend in Mozambican leadership positions over time. Mozambican first authorship decreased from 65.0% (95% CI: 40.8-84.6%) of publications in 2010-2014 (13/20) to 50.7% (95% CI: 38.3-63.1%) in 2015-2019 (35/69) and 42.7% (95% CI: 31.8-54.0%) in 2020-2024 (35/82). A similar pattern was observed for Mozambican corresponding authorship: 55.0% (95% CI: 31.5-76.9%) in 2010-2014 (11/20), 44.9% (95% CI: 32.9-57.4%) in 2015-2019 (31/69), and 39.0% (95% CI: 28.4-50.5%) in 2020-2024 (32/82). Overall lead authorship declined from 70.0% (95% CI: 45.7-88.1%) in 2010-2014 (14/20) to 62.3% (95% CI: 49.8-73.7%) in 2015-2019 (43/69) and 50.0% (95% CI: 38.7-61.3%) in 2020-2024 (41/82). In contrast, Mozambican last authorship remained consistently lower across all periods and did not demonstrate a statistically significant temporal trend.

Logistic regression analysis confirmed that each additional publication year was associated with reduced odds of Mozambican first authorship, corresponding authorship, and overall lead authorship, while no significant change was observed for last authorship. For first authorship, the odds decreased by 12% per year (OR = 0.88, 95% CI: 0.81-0.97), with comparable reductions observed for corresponding and overall lead authorship (Table 2).

Table 2. Temporal trends in Mozambican authorship. Odds ratio (OR) and 95% confidence interval (95% CI)

Outcome	OR (95% CI) per additional year	P-value
Mozambican first author	0.88 (0.81 – 0.97)	0.006
Mozambican last author	1.01 (0.92 – 1.11)	0.853
Mozambican corresponding author	0.90 (0.82 – 0.99)	0.021
Mozambican lead authorship	0.90 (0.82 – 0.98)	0.018

Sensitivity analyses excluding the 2010-2014 period (given the small number of publications, $n=20$) were conducted to assess the robustness of temporal trends. When restricted to 2015-2024 ($n=151$), the association between publication year and Mozambican first authorship remained negative but was attenuated

and no longer statistically significant (OR per year: 0.94, 95% CI: 0.86-1.03, $p=0.19$). This suggests that the observed decline in first authorship over the full 15-year period is strongly influenced by the high baseline proportion in the earliest period, and that the trend from 2015 onwards is less pronounced. These sensitivity analyses are presented in full in Supplementary Table S2 – S4.

Change-point analysis was conducted to identify potential inflection points in Mozambican authorship over time. For Mozambican first authorship, a single change point was detected in 2014 (95% confidence interval: 2012-2016), with the proportion declining from 65.0% (pre-2014) to 48.2% (post-2014). No additional change points were detected. For last authorship, no statistically significant change points were identified, consistent with the logistic regression findings. For lead authorship, a change point was detected in 2016 (95% CI: 2014-2018), with a decline from 66.7% to 53.8% after that point. These findings suggest that the decline in Mozambican first authorship occurred primarily in the early to mid-2010s, with relative stabilisation thereafter, rather than a continuous linear decline across the entire study period.

Association between study characteristics, funding, and authorship leadership

Bivariate analyses showed that study design and funding source were associated with Mozambican lead authorship (Table 3). Mozambican lead authorship was highest in qualitative (77.8%) and observational or implementation studies (60.0%), and lowest in interventional or trial-based studies (38.9%). Mozambican lead authorship was observed in 47.7% of foreign-funded studies, compared with 75.0% of Mozambique-funded studies and 66.7% of studies with mixed funding.

Multivariable analysis of factors associated with Mozambican lead authorship

To assess the independent association of study characteristics with Mozambican lead authorship, multivariable logistic regression was conducted including publication period, study design, funding source, and study scope as covariates (Table 4). The model included nine predictor degrees of freedom: two

for publication period, three for study design, three for funding source, and one for study scope.

Table 3. Factors associated with Mozambican lead authorship

Variable	Lead Mozambican authorship (%)	P-value
Publication period		0.050
2010 – 2014	70.0	
2015 – 2019	62.3	
2020 – 2024	50.0	
Study design		0.050
Observational/implementation	60.0	
Diagnostic / laboratory	52.6	
Interventional / trial	38.9	
Qualitative	77.8	
Funding source		0.009
Foreign only	47.7	
Mixed	66.7	
Mozambique only	75.0	
Not reported	62.5	

Table 4. Factors associated with Mozambican lead authorship

Variable	Adjusted OR (95% CI)	P-value
Publication period		
2010-2014	1.00	
2015-2019	0.71 (0.24-2.08)	0.53
2020-2024	0.49 (0.16-1.48)	0.20
Study design		
Observational/implementation	1.00	
Diagnostic/laboratory	0.78 (0.29-2.12)	0.63
Interventional/trial	0.41 (0.19-0.88)	0.03*
Qualitative	3.21 (1.16-8.89)	0.02*
Funding source		
Foreign only	1.00	
Mixed (Mozambique + foreign)	1.86 (0.74-4.68)	0.19
Mozambique only	2.45 (0.45-13.30)	0.30
Not reported	1.52 (0.73-3.18)	0.26
Study scope		
Mozambique-only	1.00	
Multi-country	0.76 (0.40-1.44)	0.39

*Note: $p < 0.05$

After adjustment for publication period, funding source, and study scope, qualitative studies had higher odds of Mozambican lead authorship than observational/implementation studies (aOR: 3.21, 95% CI: 1.16-8.89, $p=0.02$), whereas interventional/trial-based studies had lower odds (aOR: 0.41, 95% CI: 0.19-0.88, $p=0.03$). Compared with foreign-only funding, mixed Mozambique-foreign funding was associated with higher estimated odds of Mozambican lead authorship, although the confidence interval included the null value (aOR: 1.86, 95% CI: 0.74-4.68, $p=0.19$).

Interaction between study scope and funding source

To examine whether the association between funding source and Mozambican lead authorship differed by study scope, we tested for interaction between funding source (foreign-only vs any Mozambican funding) and study scope (Mozambique-only vs multi-country). Among Mozambique-only studies ($n=80$), foreign-only funding was associated with significantly lower odds of Mozambican lead authorship (OR: 0.35, 95% CI: 0.15-0.81, $p=0.01$). Among multi-country studies ($n=91$), the association was attenuated and not statistically significant (OR: 0.71, 95% CI: 0.31-1.63, $p=0.42$). The interaction term approached but did not reach statistical significance (p for interaction = 0.09).

Topic differences between Mozambican-led and foreign-led publications

To assess whether Mozambican lead authorship was associated with different research priorities, we

compared MeSH term frequencies between publications with and without Mozambican lead authorship. Publications with Mozambican lead authorship were more likely to focus on implementation research (43.9% vs 28.9%, $p=0.04$) and health systems strengthening (31.6% vs 18.4%, $p=0.05$), while foreign-led publications were more likely to focus on diagnostic accuracy (22.4% vs 11.2%, $p=0.03$) and clinical trial outcomes (18.4% vs 8.2%, $p=0.04$). No significant differences were observed for drug resistance, HIV co-infection, or paediatric TB topics.

Foreign researchers with Mozambican institutional affiliation

An additional analysis explored the extent to which Mozambican-affiliated authors occupying senior authorship positions were likely to be foreign researchers holding local institutional affiliations (Table 5). Of the 83 Mozambican-affiliated first authors, complete professional profile information enabling classification was available for 78 (94.0%). For the remaining 5 authors (6.0%), insufficient publicly available information precluded definitive classification; these authors were excluded from the conservative classification analysis but retained in the country-based proxy analysis (which does not require professional profile information). Similarly, for last authors, complete information was available for 45 (91.8%), and for corresponding authors, 68 of 74 (91.9%).

Table 5. Mozambican-affiliated senior authors likely to be foreign researchers

Role	Mozambican-affiliated authors in role (n)	Country-based proxy foreign, n (%)	Explicitly documented foreign, n (%)
First author	83	40 (48.2%)	29 (34.9%)
Last author	49	28 (57.1%)	30 (61.2%)
Corresponding author	74	45 (60.8%)	32 (43.2%)

Note: Country-based proxy classification required no additional information beyond affiliation data (available for 100% of authors). Conservative classification required publicly available professional profile information; authors with insufficient information (5 first authors, 4 last authors, 6 corresponding authors) were excluded from this calculation. Percentages for conservative classification are therefore calculated on smaller denominators.

Using a country-based proxy definition, nearly half of Mozambican-affiliated first authors (48.2%), over half of last authors (57.1%), and approximately three-fifths of corresponding authors (60.8%) appeared to have

professional affiliations spanning Mozambique and at least one foreign country.

Using a more conservative classification based on contextual information derived from publicly available

professional profiles, 34.9% of Mozambican-affiliated first authors, 61.2% of last authors, and 43.2% of corresponding authors were identified as likely foreign researchers despite local institutional affiliation.

DISCUSSION

This bibliometric analysis of TB research conducted in Mozambique between 2010 and 2024 reveals important patterns in authorship equity, research collaboration, and funding structures. While Mozambican institutional participation in TB research is substantial, our findings suggest that local leadership in knowledge production remains uneven based on authorship metrics. These results contribute to emerging debates on the decolonisation of global health research by providing empirical evidence from a high TB burden setting.

This study has several limitations. First, bibliometric analyses rely on publication metadata and authorship position, which may not fully capture informal contributions, decision-making power, or epistemic leadership. Second, the exploratory classification of authors as “Mozambican” or “foreign” based on publicly available information is subject to uncertainty and potential misclassification, particularly given transnational academic careers and dual affiliations. The discrepancy between the country-based proxy (48.2% of first authors classified as foreign) and the more conservative contextual classification (34.9%) highlights this limitation; these estimates should therefore be interpreted as hypothesis-generating rather than definitive measures. Third, funding information was inconsistently reported, with 28.1% of publications lacking funding data, potentially limiting the precision of funding equity analyses.

Fourth, the small number of publications in 2010-2014 ($n=20$) limited the precision of temporal comparisons, and sensitivity analyses suggested that the observed decline in first authorship may have been influenced by baseline estimates from a small number of early studies. Similarly, subgroup analyses for qualitative studies ($n=9$) and Mozambique-only funded studies ($n=8$) were underpowered and associated with wide confidence intervals (qualitative: 40.0-97.2%; Mozambique-only: 34.9-96.8%). Fifth, the analyses were primarily descriptive and based on relatively

simple regression models, limiting causal inference and potentially oversimplifying the multidimensional nature of scientific leadership. Sixth, the findings may not be generalisable beyond TB research in Mozambique. Seventh, author gender was not collected, preventing assessment of gender differences in first, last, and corresponding authorship or in temporal patterns of Mozambican-affiliated leadership. Consequently, the study cannot determine whether the observed authorship patterns differ by gender or whether the representation of Mozambican-affiliated women in leadership positions changed over time. This limits the completeness of our assessment of authorship equity. Finally, database selection and incomplete reporting of affiliations or collaboration structures may have introduced selection and residual misclassification biases.

These findings are broadly consistent with bibliometric analyses from other high-burden settings. In a study of TB research across 22 sub-Saharan African countries, Musa et al. (2023) found that local first authorship ranged from 38% to 68%, with a median of 45%, similar to the 47.7% observed in Mozambique²⁰. Kelaher et al. (2016), examining randomised controlled trials in LMICs globally, reported that LMIC first authorship declined from 45% in 1990-1999 to 35% in 2010-2013¹⁶; a pattern comparable to the decline observed in the present study. However, our finding of 28.2% Mozambican last authorship is lower than the 35-50% range reported for last authorship in similar analyses from East Africa²⁴. This suggests that senior leadership positions may be particularly challenging for Mozambican researchers to attain, potentially reflecting the relatively recent expansion of doctoral training programmes in Mozambique compared with better-established research systems in Kenya or South Africa. The pattern also suggests that Mozambican researchers are frequently involved in research processes but may not consistently occupy positions associated with intellectual leadership, agenda setting, and scientific recognition. In global health research, authorship order often reflects underlying power relations, including control over study design, funding, data analysis, and dissemination^{18,24-26}. As such, the observed imbalance likely reflects persistent structural asymmetries in international TB research collaborations^{27,28}.

Future research should examine gender alongside institutional affiliation to assess intersecting dimensions of authorship equity. Analyses of reliably documented or self-reported gender information could assess the representation of Mozambican-affiliated women in first, last, and corresponding authorship positions across publication periods, with explicit reporting of missing information. Complementary qualitative research could explore how gender shapes access to funding, mentorship, and opportunities for scientific leadership.

Temporal analyses suggested declining trends in Mozambican first and corresponding authorship despite increasing TB research output over time. However, these findings should be interpreted cautiously. The small number of publications in 2010-2014 ($n=20$) resulted in imprecise baseline estimates for Mozambican first authorship (65.0%; 95% CI: 40.8-84.6%), raising the possibility that the apparent decline partly reflects regression to the mean. In addition, the increasing proportion of multi-country studies and clinical trials in later years, study types consistently associated with lower Mozambican leadership, may have contributed to the observed trend. At the same time, overall Mozambican research capacity and participation expanded, with the mean number of Mozambican authors per paper increasing from 2.8 in 2010-2014 to 4.5 in 2020-2024, suggesting broader inclusion within collaborative research teams despite reduced representation in first and corresponding authorship positions. The growing prominence of large externally funded research consortia may also have concentrated leadership roles within institutions in the Global North^{18,24,25,27-29}. While such collaborations can boost technical capacity and generate high-impact evidence, they may also reinforce hierarchical research dynamics if local investigators are not meaningfully supported to lead scientific agendas.

Consistent with this pattern, the association between funding source and authorship leadership observed in this study further supports this interpretation, but does not establish a causal relationship. Publications funded exclusively by foreign sources were less likely to demonstrate Mozambican lead authorship compared with studies supported by national or mixed funding

arrangements^{16,19}. However, the direction of causality cannot be determined from cross-sectional bibliometric data. It is equally plausible that studies with greater methodological complexity or requiring specialised expertise, characteristics that may necessitate foreign funding are systematically less likely to have local leadership, or that foreign funders preferentially support research areas where local expertise is less developed. Nevertheless, these findings are consistent with the hypothesis that financial dependency may influence epistemic autonomy³⁰⁻³², shaping who defines research priorities and who ultimately receives academic credit^{18,26,29,33,34}. Longitudinal and qualitative research would be required to establish causality. Strengthening nationally driven research funding mechanisms and promoting equitable grant leadership opportunities are therefore critical for advancing locally led TB research.

Another important contribution of this analysis is the examination of the “affiliation paradox”, whereby a substantial proportion of senior authors classified as Mozambican-affiliated appeared to be foreign researchers holding local institutional affiliations. While dual affiliation is a common and often beneficial feature of global academic collaboration, its presence complicates the interpretation of bibliometric indicators of localization³⁵⁻³⁷. Institutional affiliation alone may therefore overestimate the extent to which research leadership is embedded within national scientific communities^{38,39}. From a decolonial perspective, this underscores the need to move beyond symbolic metrics of inclusion towards more nuanced assessments of intellectual ownership and decision-making power.

The higher levels of Mozambican leadership observed in qualitative and observational studies compared with interventional or trial-based research likely reflect differences in resource intensity and technological dependency^{40,41}. Studies requiring advanced laboratory infrastructure, complex regulatory processes, or large external funding streams may be more likely to be led by international partners^{29,32,42,43}. In addition, differences in access to advanced research training, mentorship, and opportunities to lead complex studies may also contribute to disparities in authorship leadership. Researchers based in high-burden settings may have

fewer opportunities to develop and exercise leadership in highly specialised or resource-intensive research domains^{26,44–46}. This pattern highlights the importance of sustained investment in local research infrastructure, postgraduate training pathways, and institutional capacity strengthening to enable Mozambican scientists to lead across the full spectrum of TB research domains^{47,48}.

These findings have important implications for both global TB research policy and national health system strengthening. Locally led research is more likely to generate contextually relevant evidence, foster sustainable capacity development, and support the translation of findings into programmatic practice. In high-burden settings such as Mozambique, promoting equitable research partnerships is therefore not only a matter of academic justice but also a pragmatic strategy for improving the effectiveness and responsiveness of TB control efforts.

CONCLUSION

This study demonstrates that although Mozambican institutional participation in TB research is substantial, equitable leadership in knowledge production remains uneven. Mozambican researchers were less frequently represented in senior authorship positions, and temporal analyses suggested declining local first authorship over time despite increasing research output, although this trend should be interpreted cautiously given the small number of early publications. The findings further suggest that institutional affiliation alone may overestimate locally rooted scientific leadership, as a substantial proportion of senior authors classified as Mozambican-affiliated appeared to be foreign researchers holding local affiliations. Together, these patterns highlight the limitations of symbolic indicators of inclusion and underscore the need for more substantive measures of epistemic equity in global health research partnerships. Strengthening nationally driven funding mechanisms, expanding research training pathways, and implementing equitable collaboration frameworks are essential to support locally led TB research that is contextually relevant, sustainable, and responsive to national priorities. Advancing such shifts is critical not only for promoting academic justice and meaningful

local leadership, but also for improving the effectiveness and long-term sustainability of TB control efforts in high-burden settings such as Mozambique.

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CONFLICT OF INTEREST

None declared

AUTHORS' CONTRIBUTIONS

IM conceptualized the study, developed the methodology, conducted the literature search, screened articles, extracted and analyzed the data, and drafted the manuscript. DO contributed to study screening, interpretation of findings, and critical revision of the manuscript. EN contributed to resolution of screening disagreements, interpretation of results, and critical review of the manuscript. All authors reviewed and approved the final manuscript.

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