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TOWARD INDONESIA'S ZERO LEPROSY 2030: KEY LESSONS FROM EPIDEMIOLOGICAL TRENDS IN PAPUA 2020-2024

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ORIGINAL RESEARCH REPORT

TOWARD INDONESIA'S ZERO LEPROSY 2030: KEY LESSONS FROM EPIDEMIOLOGICAL TRENDS IN PAPUA 2020-2024

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ABSTRACT

Papua, the easternmost province of Indonesia, has consistently reported the highest number of new leprosy cases and leprosy-related disabilities for decades. Despite this burden, no comprehensive study in recent years has systematically examined the epidemiological trends of leprosy in Papua using large datasets. This study provides an updated analysis of leprosy elimination efforts and evaluates the province's readiness to achieve the Zero Leprosy 2030 target. A retrospective descriptive epidemiological review was conducted using secondary data from the routine health information system of Papua Province from 2020 to 2024. Extracted variables included demographic characteristics, new case reports, diagnostic classification, disability grade, case-finding method, and clinical outcomes. Data were analyzed descriptively and presented in tables and figures to illustrate temporal trends. Between 2020 and 2024, a total of 3,909 new leprosy cases were reported, with fluctuating case detection rates. Multibacillary (MB) leprosy predominated, particularly among males, although females also contributed a substantial proportion of MB cases. Child cases showed an increasing trend, accounting for up to 20% of all new cases. Most cases were detected at Grade 0, with passive case finding as the dominant detection method. Treatment outcomes showed that approximately 70% of patients were released from treatment annually, but relapse and default remained considerable. These findings highlight that Papua is still far from reaching the Zero Leprosy 2030 goal. Strengthening active case finding, improving treatment adherence, reducing stigma, and enhancing reporting and evaluation systems are urgent priorities. Sustained political commitment from local leadership will be crucial to ensure the successful implementation of these strategies.

Keywords: Leprosy in Papua; elimination; tropical disease; tropical dermatology; epidemiological trend

Highlights

1. Provides updated five-year epidemiological evidence from Papua to guide intervention and strengthen political commitment toward Zero leprosy 2030.
2. Highlights critical target populations to address and gap on data reporting and evaluation.

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INTRODUCTION

Despite the goal of achieving zero leprosy by 2030, the disease remains a significant public health concern, particularly in tropical countries. In 2023, a total of 182815 new cases were reported globally, with a new case detection rate of 22.7 per million population (WHO, 2024). Among those numbers, Brazil, India, and Indonesia reported more than 10,000 new cases, together accounting for 79.3% of new cases detected globally. With those numbers, Indonesia persistently becomes one of the countries with the highest leprosy cases, with 6,156 new cases reported in 2024 (Ministry of Health, Republic of Indonesia, 2024).

Recognizing the urgency, Indonesia is actively working toward eradicating Leprosy through the rigorous implementation of the National Leprosy Elimination Action Plan (RAN) for 2023–2027 (Ministry of Health, Republic of Indonesia, 2023). Despite the positive outcomes, including a decrease in new cases and elimination in several regions, Leprosy is still a highly threatening disease in the eastern parts of Indonesia (Pieter & Grijsen, 2022; Siregar et al., 2024). Notably, Papua the easternmost province in Indonesia that was recently divided into four provinces and facing geographical, cultural and infrastructural challenges consistently reported the highest new leprosy cases and leprosy-related disabilities in Indonesia since decades (Ministry of Health, Republic of Indonesia, 2024). Based on current data, cases in Papua represent the primary obstacle to achieving the 2030 target of zero leprosy.

Leprosy is a curable disease; however, multiple factors contribute to its persistence. These include limited access to healthcare facilities, low community knowledge about leprosy, and high perceived stigma, all of which hinder health-seeking behavior among people affected by the disease (Darmi et al., 2024; Dharmawan et al., 2022; Pieter & Grijsen, 2022). In addition, the population distribution and geographic challenges in Papua posed major obstacles to effective data reporting and program evaluation.

In recent years, there has been no comprehensive study systematically examining the epidemiological trends of leprosy in Papua using large datasets. Such research is crucial to understand patterns of infection, identify at-risk populations, and evaluate the effectiveness of existing programs. Given the persistently high number of cases in Papua, this study provides a timely analysis of the current leprosy elimination efforts and assesses the province's readiness to contribute and support the goal of Zero Leprosy by 2030.

MATERIALS AND METHODS

This study is a retrospective descriptive epidemiological review using secondary data from the routine health information system of Papua Province from 2020 to 2024. In the beginning of 2022, Papua Province was administratively divided into four provinces: Central Papua, South Papua, Papua Pegunungan, and Papua Province (Ministry of Home Affairs of Indonesia, 2023). Consequently, data from 2023 onward reflected only the regions that remained within Papua Province. All residents of Papua Province diagnosed with leprosy between 2020 and 2024 were included as the study sample. All extracted data were analyzed without sampling. The variables examined included demographic characteristics, reported cases, diagnostic classification, grade of disability, type of case finding, and clinical outcomes. Age was categorized into two groups: children (<15 years) and adults (≥15 years). Data were recorded in Microsoft Excel and analyzed descriptively to generate frequency distributions and percentages (Microsoft, 2023). Results are presented in tables and figures to illustrate year-to-year trends.

RESULTS

Epidemiological trends of new cases

From 2020 to 2024, a total of 3,909 new leprosy cases were reported provincially, corresponding to the new case detection rate (CDR). Figure 1 shows that the number of cases fluctuated, peaking in 2021 (1,236 cases) and dropping significantly in 2022 (371 cases). The CDR followed an irregular pattern in line with the number of new cases: it remained stable at 30–40 per 100,000 population from 2020 to 2021, declined sharply in 2022, increased markedly in 2023, and fell again in 2024. In 2022, an administrative restructuring was announced in which the Indonesian government divided Papua into several provinces, with the changes officially implemented in 2023. This restructuring directly affected the denominator

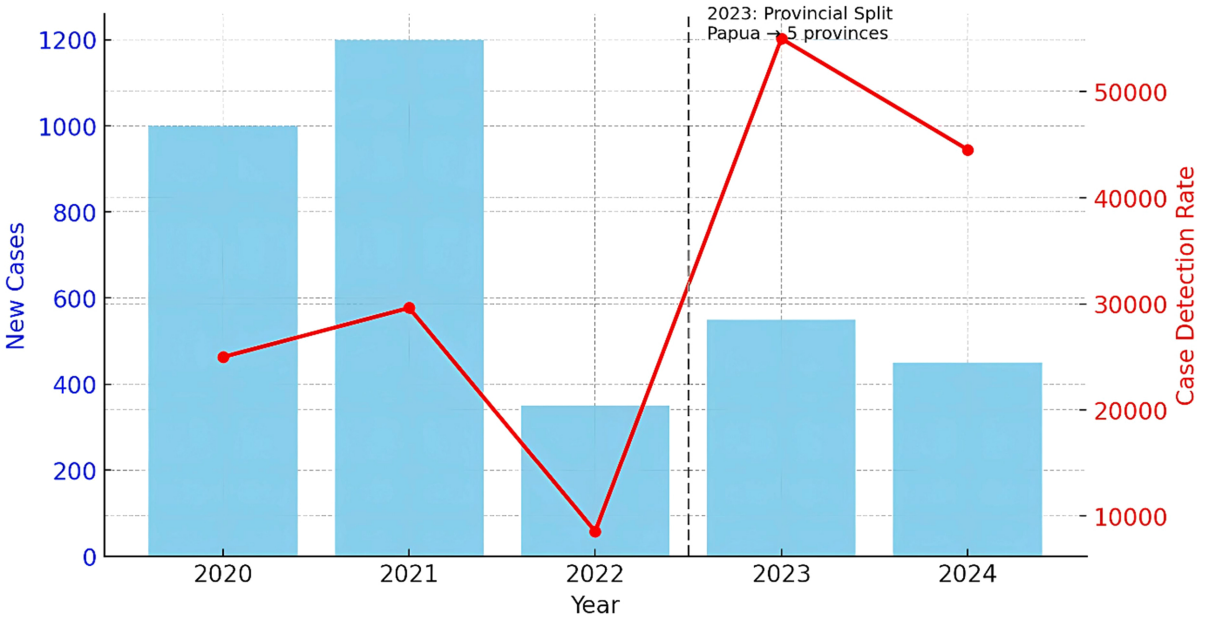


Figure 1. The distribution of new cases corresponding to CDR 2020–2024.

population used to calculate the CDR. However, when new cases were disaggregated by district/city and year Figure 3, the regions that remained under Papua Province consistently represented the high-burden pockets of leprosy.

Characteristics of the new cases

Further details on the characteristics of new cases are presented in Table 1. Across all years, multibacillary (MB) leprosy cases consistently predominated, accounting for 70–80% of all new cases, with a total of 3,049 cases (78%) over the five-year period. Males were affected more frequently each year, particularly in MB cases, although females also represented a considerable proportion of MB cases. Conversely, females consistently showed a slightly higher proportion of paucibacillary (PB) cases each year. This pattern was observed in both children and adults. Although approximately 70% of cases occurred among adults, the proportion of new cases in children showed an increasing trend from 2020 to 2024, comprising up to 20% of all new cases. Over the five years, 555 (14%) new child cases with MB and 329 (8%) with PB were recorded. Regarding disability grade, most new cases were detected at Grade 0, although Grade 1 and Grade 2 cases continued to be reported.

Case finding type

Figure 2 illustrates the case-finding methods used, in accordance with government recommendations. From 2020 to 2024, voluntary screening (passive case finding) was the dominant method for detecting new cases and increased steadily from approximately 70% in 2020 to 90% in 2024. Active screening fluctuated between 10–15% in the early years but declined to nearly zero by 2024. Contact tracing accounted for 15% of new cases in 2020 but dropped sharply to less than 5% from 2021 onward, contributing almost no new cases by 2024. School-based screening was the least utilized method. Its highest contribution was in 2021, when it accounted for 4% of the total new cases.

Treatment outcomes

Table 2 presents the treatment outcomes, showing that adults accounted for the majority of cases with Release From Treatment (RFT), approximately 70% annually since 2020. However, in 2022, there was a sharp decline, with fewer than 40% achieving RFT as the treatment outcome. Among children, the percentage remained relatively stable across the years, contributing about 6–9% of all RFT cases. Default outcomes accumulated over five years accounted for 30%

Table 1. Epidemiological and clinical characteristics of the leprosy cases in Papua 2020–2024.

	2020		2021		2022		2023		2024		TOTAL	
	PB	MB	PB	MB	PB	MB	PB	MB	PB	MB	PB	MB
VARIABLE	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Total New Cases	1,022		1,236		371		816		464		3,909	
Case detection Rate	30.88		37.35		10.65		98.5		56.01			
WHO Type												
PB	232 (23%)		311 (25%)		50 (13%)		167 (20%)		100 (22%)		860 (22%)	
MB	790 (70%)		925 (75%)		321 (87%)		649 (80%)		364 (78%)		3,049 (78%)	
Age												
Children	75 (7%)	130 (7%)	135 (11%)	167 (14%)	14 (4%)	52 (4%)	137 (17%)	120 (15%)	42 (9%)	86 (19%)	329 (8%)	555 (14%)
Adult	157 (15%)	660 (65%)	176 (14%)	758 (61%)	36 (10%)	269 (73%)	112 (14%)	529 (65%)	58 (13%)	278 (60%)	539 (14%)	2,494 (64%)
New Cases based on Sex												
Male	103 (10%)	482 (47%)	139 (11%)	564 (46%)	21 (6%)	194 (52%)	60 (7%)	409 (50%)	41 (9%)	236 (51%)	364 (9%)	1,885 (48%)
Female	129 (13%)	308 (30%)	172 (14%)	361 (29%)	29 (8%)	127 (34%)	107 (13%)	240 (29%)	59 (13%)	128 (28%)	496 (13%)	1,164 (30%)
New Cases on Children												
Male	35 (17%)	72 (34%)	72 (24%)	87 (29%)	8 (12%)	30 (45%)	25 (14%)	74 (42%)	25 (20%)	52 (41%)	165 (19%)	315 (36%)
Female	40 (20%)	58 (27%)	63 (21%)	80 (26%)	6 (9%)	22 (33%)	30 (17%)	46 (26%)	17 (13%)	34 (27%)	164 (19%)	240 (27%)
New Cases on Adult												
Male	68 (8%)	410 (50%)	67 (7%)	477 (51%)	13 (4%)	164 (54%)	35 (5%)	335 (52%)	16 (5%)	184 (55%)	199 (7%)	1,570 (52%)
Female	89 (11%)	250 (11%)	109 (12%)	281 (30%)	23 (8%)	105 (34%)	77 (12%)	194 (30%)	42 (13%)	94 (28%)	340 (11%)	924 (30%)
Disability grade												
Grade 0												
Children	80 (8%)	120 (13%)	125 (11%)	163 (15%)	14 (4%)	52 (15%)	55 (7%)	117 (15%)	42 (9%)	85 (19%)	316 (9%)	537 (15%)
Adult	151 (16%)	600 (63%)	157 (14%)	678 (60%)	36 (10%)	255 (71%)	112 (14%)	504 (64%)	58 (13%)	272 (60%)	514 (14%)	2,309 (63%)
Grade 1												
Children	0 (0%)	3 (10%)	0 (0%)	6 (50%)	0 (0%)	0 (0%)	0 (0%)	1 (9%)	0 (0%)	0 (0%)	0 (0%)	10 (17%)
Adult	1 (3%)	26 (87%)	1 (8%)	5 (42%)	0 (0%)	4 (100%)	0 (0%)	10 (91%)	0 (0%)	2 (100%)	2 (3%)	47 (80%)
Grade 2												
Children	0 (0%)	5 (24%)	0 (0%)	2 (10%)	0 (0%)	0 (0%)	0 (0%)	1 (9%)	0 (0%)	0 (0%)	0 (0%)	8 (13%)
Adult	4 (19%)	12 (57%)	4 (19%)	15 (71%)	0 (0%)	7 (100%)	0 (0%)	10 (91%)	0 (0%)	2 (100%)	8 (13%)	45 (74%)

of the total outcomes of leprosy cases. The data did not clearly specify the classification of other outcomes (e.g., transferred, died, or incomplete reporting), although these peaked in 2020, 2023, and 2024. Relapse outcomes were concerning in the adult group, with a noticeable surge in 2022 (33%). Overall, 5% of MB cases relapsed during the five-year period. While RFT outcomes remained relatively stable among children, there were instances of default and unusual data in 2022, when 6% of MB cases had relapse as the recorded outcome.

DISCUSSION

This study described the epidemiological trends and treatment outcomes of leprosy cases in the province with the highest leprosy burden in Indonesia, as well as the progress made toward achieving the zero leprosy commitment by 2030. Over the five-year period from 2020 to 2024, the trend of new cases fluctuated but remained the highest compared to other regions in Indonesia. While several countries and some parts of Indonesia have shown significant declines in new cases or have reached elimination or eradication thresholds (Huang, Lee, & Lin, 2021; Liu, 2024; Samosir et al., 2023; Shanks, 2025, WHO, 2024), other countries, including Indonesia; particularly the eastern regions, continue to face challenges in moving toward elimination goals (Dien et al., 2023; Pieter & Grijsen, 2022; Siregar et al., 2024). From 2020 to 2024, Papua Province contributed the highest number of new leprosy cases nationally, with a total of 3,909 cases higher than the

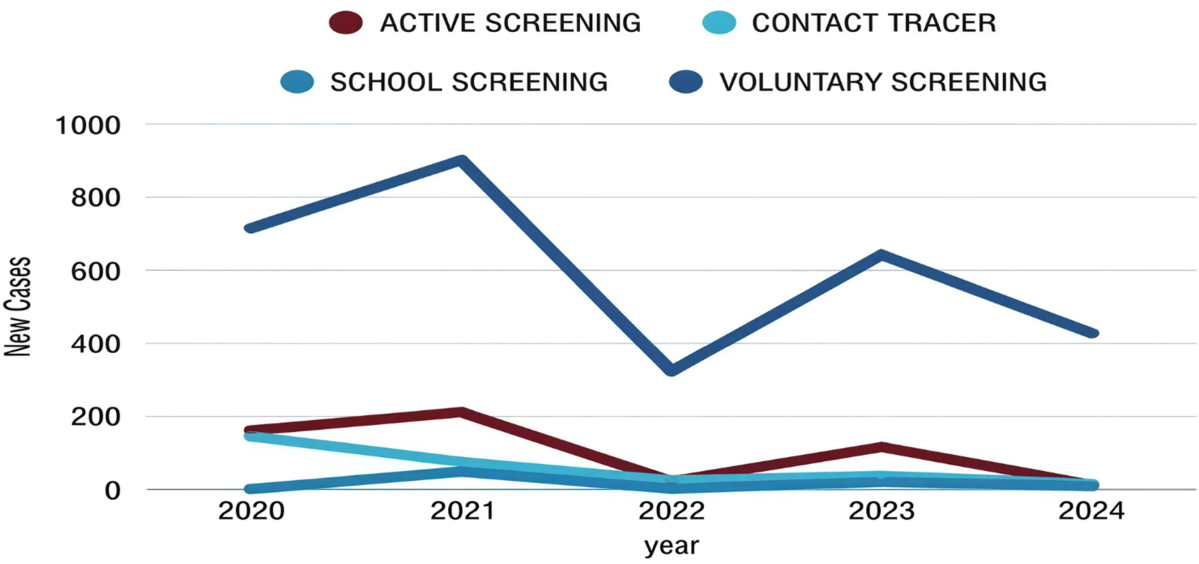
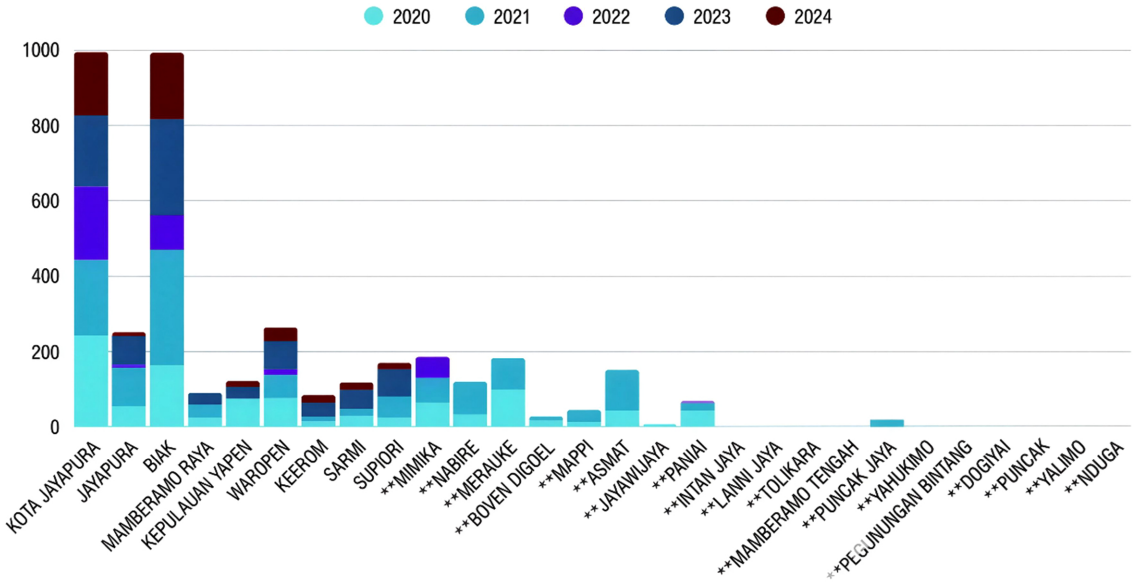


Figure 2. Distribution of the type of new cases finding 2020–2024.



** All regions that no longer governed by Papua Province since 2023

Figure 3. Proportion of new cases distributed based on the city/regency in Papua province 2020–2024.

National standard (Ministry of Health, Republic of Indonesia, 2024). Jayapura City and Biak Regency emerged as persistent hotspots, together accounting for nearly half of all new cases during this period.

Our analysis revealed an irregular pattern in which the annual number of new cases and Case Detection Rate (CDR) fluctuated. This pattern raises concerns about the possibility of under-detection, underreporting, or fragmented information system (Putri et al., 2025). Several factors may have contributed to these fluctuations, including disruptions in health services during the COVID-19 pandemic (Krismawati et al., 2021; Pieter & Grijsen, 2022). Moreover, starting 2023, an administrative restructuring took place in Papua Province, whereby the Indonesian government divided the province into four new provinces: Papua, Central Papua, Highland

Table 2. Proportion of treatment outcomes 2020–2024.

	2020		2021		2022		2023		2024		TOTAL	
	PB	MB	PB	MB	PB	MB	PB	MB	PB	MB	PB	MB
VARIABLE	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Release From Treatment												
Children	75 (5%)	140 (10%)	92 (8%)	97 (8%)	10 (2%)	37 (7%)	66 (7%)	90 (9%)	13 (6%)	18 (8%)	256 (6%)	382 (9%)
Adult	109 (8%)	601 (43%)	164 (14%)	671 (56%)	28 (5%)	131 (24%)	114 (12%)	453 (46%)	18 (8%)	89 (41%)	433 (10%)	1,945 (45%)
Default												
Children	8 (1%)	82 (6%)	10 (1%)	25 (2%)	3 (1%)	14 (3%)	16 (2%)	26 (3%)	2 (1%)	1 (0%)	39 (1%)	148 (3%)
Adult	24 (2%)	254 (18%)	15 (1%)	81 (1%)	11 (2%)	72 (13%)	32 (3%)	126 (13%)	4 (2%)	41 (19%)	86 (2 %)	574 (28%)
others												
Children	1 (0%)	8 (1%)	0 (0%)	4 (0%)	0 (0%)	2 (12%)	3 (0%)	6 (1%)	1 (0%)	0 (0%)	5 (0%)	20 (0%)
Adult	5 (0%)	85 (6%)	1 (0%)	39 (3%)	2 (0%)	13 (2%)	5 (1%)	45 (5%)	3 (1%)	19 (9%)	16 (0%)	201 (5%)
relaps												
Children	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	34 (6%)	0 (0%)	1 (0%)	0 (0%)	0 (0%)	0 (0%)	35 (1%)
Adult	0 (0%)	6 (0%)	0 (0%)	8 (1%)	10 (2%)	180 (33%)	0 (0%)	6 (1%)	0 (0%)	8 (4%)	10 (0%)	208 (5%)

Papua, and South Papua (Ministry of Home Affairs of Indonesia, 2023). As a result, several large regencies and cities such as Mimika, Nabire, and Merauke were no longer under the administration of Papua Province. This restructuring further complicates the interpretation of the trends, as it altered the population denominator used to calculate the CDR and affected case detection figures in 2023 and 2024, which showed a decline since 2022. While there is no official root of cause contributes to lower number of cases finding and CDR in 2022, 2023 and 2024, the administrative transition likely contributed to decreased case-finding activities due to budgetary adjustments and program realignment. In 2023, WHO released technical guidance on interruption of transmission and elimination of leprosy disease that emphasized the important of high-quality data collection and reporting (WHO, 2024). Thus, prioritizing data collection and reporting is crucial if Papua want to boost the elimination progress.

Over the five-years period, the majority of new cases were classified as Multibacillary (MB), accounting for 70-80% of the total, with males predominating each year. This finding is consistent with most research on the epidemiology of leprosy globally (WHO, 2024), ranging from highly endemic countries such as Brazil (da Silva et al., 2023), to countries nearing elimination such as Argentina (Ogunsumi et al., 2021). It also aligns with a body of research reporting the predominance of MB cases and male patients (Pescarini et al., 2018; Utap et al., 2024; Wang et al., 2023). A higher proportion of MB cases underscores delayed case detection and increased infectiousness. This problem is compounded by the predominance of MB cases among males. Previous studies have suggested that male MB patients contribute substantially to ongoing transmission, partly due to health-seeking behaviors that are less consistent compared to females. Cultural barriers, including patriarchal norms that perceive illness as a sign of weakness, further discourage men from seeking care promptly (da Silva et al., 2023). Consequently, men are more strongly associated with delayed case detection, which in turn contributes to higher case of disability (Samosir et al., 2023). From our data, 33 male patients were reported with Grade 2 disability.

Although adult males with MB leprosy were the dominant group, cases among females and children are also critical indicators of elimination progress. In this study, females also show a high proportion of MB cases. Leprosy in women carries a compounded burden, as it affects their ability to fulfill daily roles, increases stigma, and impacts family care (Meadows & Davey, 2022). Previous studies have also linked maternal education with better outcomes in leprosy management (Gonçalves et al., 2018; Prakoeswa et al., 2021). The rising proportion of children cases reaching 20% of all new cases over five years and the number of children with MB type dominated 14% of total cases is concerning

where it signals ongoing transmission and a failure to interrupt the chain of infection (Hutahaean et al., 2023; Reza et al., 2022; de Assis et al., 2018). Childhood leprosy imposes catastrophic consequences, including financial strain on families and long-term impacts of stigma, bullying, and disability (Hutahaean et al., 2023; Rusmawardiana, Fifa, & Sari, 2021). Strengthening active case finding, particularly through school-based screening, and integrating leprosy detection with maternal and child health program may offer a promising strategy to address these challenges. In addition, raising parents and community awareness about leprosy is essential to reduce stigma and improve early treatment as children is the most vulnerable to getting infected by leprosy.

Most of the new cases were detected at disability grade 0, which suggests a positive direction toward a successful early detection. Leprosy, however, remains a highly stigmatized disease, with extensive evidence showing that stigma from self-stigma to community-level stigma affects mental health, alters lifestyle and personality, and reduces quality of life (Dien et al., 2023; Mohamad, Suryadi, & Dharsono, 2025; Nasir et al., 2022; Tosepu et al., 2018; Willis et al., 2024) The predominance of grade 0 cases may also contribute to low external stigmatization, as the absence of visible disability reduces the likelihood of community identification. Nevertheless, this finding requires careful interpretation, as it could also reflect underreporting or weak implementation of case finding programs.

A contextual factor in Papua that may contribute to delay detection is the tendency to normalize leprosy within families. Papuan families often provide strong support to relatives affected by leprosy, as extended family ties and a strong sense of community are central to their social structure. At the same time, a community's close-knit nature can be a hurdle, as families may conceal the diagnosis to protect relatives from stigma (Romadhon, 2020; Santosa et al., 2024). While these norms can benefit affected individuals by ensuring acceptance and care within the household, they may also discourage disclosure and delay health-seeking, thereby slowing progress toward leprosy elimination in Papua Island overall. Families may recognize the need for medical care but avoid accessing services out of fear of community exposure.

Treatment outcomes over five-year period showed that many patients completed therapy, but overall treatment success was merely moderate due to high rates of default and relapse. The relapse rate was particularly concerning, suggesting challenges with adherence, drug effectiveness, and program monitoring. Improving treatment success is a critical indicator for reducing new cases and interrupting transmission. Factors associated with defaults and relapses include adverse effects and drug resistance, as highlighted in studies from Papua reporting difficulties with regimens, particularly dapsone (Antonius et al., 2018; Krismawati et al., 2025; Reba, 2021). More broadly, classic barriers to long-term treatment adherence such as knowledge, treatment fatigue, perceived belief, sitgma, and forgetfulness (Altice et al., 2019; Meadows & Davey, 2022). In this study, we could not clarify the high proportion of outcomes categorized as "other," which may include migration, death, or incomplete reporting. Nonetheless, the size of this category underscores the need to strengthen reporting systems to reduce data errors. Generally, these outcome patterns highlight serious gaps in adherence, program monitoring, and data quality in Papua Province, which require urgent intervention to safeguard Indonesia's goal of zero leprosy by 2030.

Improving active case finding is essential for reducing incidence, halting transmission, and preventing disability progression (Susanti et al., 2018). In this study, voluntary (passive) screening consistently accounted for 70–90% of detections, while active screening and contact tracing contributed only a small proportion. The limited detection from active case finding reflects a missed opportunity for early diagnosis. Strengthening active case finding has been identified as a priority by the Indonesian government in its leprosy elimination strategy (Ministry of Health, Republic of Indonesia, 2020). Further research is needed to clarify whether the low yield of active screening reflects limited program implementation or a genuine lack of cases detected. Regardless, given the severe consequences of leprosy including disability, stigma, reduced quality of life, and premature mortality (Marpaung, Ernawati, & Dwivania, 2022; Menaldi et al., 2022) accelerating active case finding must be prioritized, especially as the target year for zero leprosy, 2030, is fast approaching.

Strength and limitations

This is the first study to use the five-year latest dataset of Leprosy cases across Papua province regions that can provide evidence on the epidemiological trends of leprosy in Papua. The key limitation is the reliance on retrospective data, which lacked essential variables such as age distribution, ethnicity, and socioeconomic status. This constrains the ability to generate tailored strategies. Future research with more granular data is urgently needed to inform precision public health approaches in leprosy elimination.

CONCLUSION

The findings indicated that Papua remains far from achieving the Zero Leprosy 2030 target. Although program improvements could place the province on the path toward elimination, reaching the goal by 2030 is still unlikely. Persistent MB dominance, rising cases among women, ongoing childhood transmission, contextual challenges, and poor treatment outcomes underscore the need for stronger strategies. Key priorities should include early detection through active case finding, strengthening treatment adherence, stigma reduction initiatives, and improvements in health system reporting and evaluation. Crucially, sustained political commitment from local leaders will be essential to ensure effective implementation of these priority programs.

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Conflict of interest

This study has no conflict of interest

Ethical approval

This study was reviewed by The Health research ethics committee of Health polytechnic of Jayapura and has been approved for ethical research on March 4th, 2025 with the letter number: 125/KEPK-J/III/2025

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Author contribution

VS is the principal investigator to manage the administrative and lead the research activities. VS contributed on concept, analyzed and interpreted the data and wrote the findings of the research and final approval of the article. DR and AS conducted the literature review, helped the data collection, contributed to interpreting and writing the findings.

Data availability

N/A

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