SURVEILLANCE REPORT

Tuberculosis burden in Southern province, Zambia, 2004 to 2013: Analysis of routine Tuberculosis surveillance data

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Citation style for this article:
Hadunka F, Kumar R, Chilembo NW, Jacobs CN, Hamoonga R, Chinyonga J, Michelo C. Tuberculosis Burden in Southern Province, Zambia, 2004 to 2013: Analysis of Routine Tuberculosis Surveillance Data. Health Press Zambia Bull. 2017;1(1) [Inclusive page numbers]

Tuberculosis (TB) burden in Zambia is high (410/100,000 population incidence in 2013), but few data at subnational level for monitoring trends in incidence, case fatality rate (CFR), or district distribution are available and routinely collected surveillance data are not regularly analysed. The aim of this work was to determine the TB trends in incidence, treatment failure, HIV testing and positivity, and fatalities in Southern Province, Zambia, during the period 2004 to 2013.

Print and electronic TB registers in Southern Province were reviewed. The data were entered into MS Excel and descriptive analyses were performed. The annual incidence of TB by district and for Southern Province was calculated using population projections from Central Statistical Office. The proportion of TB patients tested for HIV was calculated. Additionally, the proportion of TB patients who tested positive for HIV in each year.

The results indicated a 42% decline in TB incidence from 425/100,000 persons in 2004 to 248/100,000 in 2013. Incidences of TB in by districts varied from year to within the districts. Percentage of sputum-positive TB patients with a negative sputum smear result after completing two months of rifampicin-based therapy improved from 86% (2008) to 88% patients (2013). Percentage of sputum positive TB patients with a negative sputum smear result after six months of the same regimen increased from 86% (2008) to 95% (2013). Percentage of all TB patients who were tested for HIV increased from 78% in 2008 to 96.5% in 2013, while HIV positivity among those tested decreased from 73% (2008) to 65% (2013). CFR among TB patients fluctuated from 7% in 2008 to 5% in 2012 and 8% in 2013.

Although Southern Province experienced overall improvements in trends in TB incidence, cure rates, and HIV testing and positivity, TB CFR remained above the MOH target of 5%. Factors associated with TB mortality in Southern Province require further investigation.

Introduction

In 2013, an estimated nine million people developed TB and 1.5 million died from the disease globally, 360,000 of whom were HIV positive [1]. Over half (56%) of the nine million people with TB were from Southeast Asia and the Western Pacific Region. India and China accounted for 24% and 11% of the total, respectively [1]. In 2013, the treatment success rate continued to be high at 86% among all new TB cases and the HIV testing rate increased to over 75% in 2013 globally [1]. Although TB is slowly declining each year with an estimated 37 million lives being saved between 2000 and 2013 through effective diagnosis and treatment, TB remains a global challenge [1].

An estimated 1.1 million (13%) of the 9 million people who developed TB in 2013 were HIV positive [1]. In combination, HIV and TB enhance each other's progress [1]. People who are infected with HIV are 21 – 34 times likely to become infected with TB depending on the stage of HIV [1,3] as HIV lowers the immune system [4]. Previous research in India [8], Russia [12], Chile [15], Ethiopia [13], and Zambia [10] reported that there is no marked difference on TB treatment outcomes between HIV positive and HIV negative TB patients.

A further 25% of the globally estimate of TB patients in 2013 were from the African region, which also had the highest rates of cases and deaths relative to the population [1]. The African continent also accounts for more than 20% of the TB/HIV co- infection, with more than 30% of these from the sub-Saharan region [1,5].

In Zambia, the incidence of TB has been declining from 591/100,000 in 2004 to 500/100,000 in 2008, 421/100,000 in 2012 and 410/100,000 in 2013 [1, 16, 14, 15]. Zambia has an HIV prevalence of 14.5% distributed among both males and females. Approximately 67% are co-infected with TB [6]. Southern Province is equally affected by HIV with a prevalence of 14.7%. The rural districts are less affected than the urban ones [6, 11].

However, the HIV disease burden is in Zambia is also among the highest globally [17]. And there are few data on the proportion of TB patients who are co-infected with HIV, or the percentage of TB patients who die while on treatment. Although the national TB burden was high in Zambia in 2013 [1], there are few data on the prevalence, incidence, or distribution of tuberculosis and no previous analysis of routinely collected surveillance

data has been conducted in Southern province.

In a country with a high burden of TB and HIV, local data are important to inform clinical management recommendations for HIV- TB co-infected patients to reduce morbidity and mortality. The results of this review may be used at various levels of health care to inform targeted and cost effective decisions concerning medical supplies, drugs, and lab testing by policy makers and medical practitioners. Less than a quarter of health institutions have laboratory facilities able to diagnose TB while almost all the health facilities can treat TB.

The objectives of this study were to determine the trends in TB incidence, cure rates, HIV testing and positivity, and case fatalities in Southern Province, Zambia from 2004 to 2013.

Methods:

A descriptive analysis was carried out on secondary data, which were routinely collected at the health facility level in Zambia's Southern Province. Only Livingstone district is urban while the rest of the districts are peri-urban and rural. The TB surveillance system in Southern Province is a paper-based from community level to the first level hospital becoming electronic from the district to national level. This surveillance system is passive from the community to first level hospital becoming active from the district to national level. (Figure 1)

Secondary data were extracted from the paper based and electronic TB registers which included children, women and men of all age groups. All cases diagnosed with and recorded as TB patients regardless of their sputum result and treated from 2004 to 2013 were included. TB/HIV officers extracted routinely collected TB data from both manual and electronic registers kept at the provincial medical office.

The surveillance case definition of a suspected case of pulmonary tuberculosis was any person who presented to any health facility in Southern Province between January 2004 and December 2013 with a cough of more than two weeks in duration with any of the following: night sweats, weight loss, fever, lymphadenopathy, general fatigue, loss of appetite. A confirmed case of tuberculosis was defined as any suspected case with any of the three sputum samples that were collected consecutively and testing

positive for tubercle bacilli with Zeil-Nielsen (ZN) stain.

Sputum conversion rate was defined as the percentage of TB patients who were originally sputum positive and tested sputum negative, after completing two months of treatment. Cure rate was defined as the TB patients who were originally sputum positive and tested sputum negative after completing six months of treatment. Death rate was calculated as the percentage of all TB patients who died while on treatment, regardless of their sputum result at diagnosis.

Data on geographical location of patients, sputum results, HIV status, and outcomes of treatment were collected; however, no laboratory tests were done although some cases of TB had sputum results available while others did not. Using a data extraction tool in MS Excel, all the data from all TB cases routinely documented and notified as positive between 2004 and 2013 regardless of laboratory confirmation were extracted.

The annual incidence (per 100,000 persons) of TB for each district was calculated using total population of each district for that year as given by the Central Statistical Office. The overall incidence of TB for Southern Province was calculated by adding all the reported TB cases for all the districts for each year and dividing this by the total population of Southern Province. The percentage of sputum-positive TB patients who recorded a sputum-negative result after two and six months of Rifampicin-based therapy was calculated.

The percentage of TB patients who died while on treatment, the proportion of TB patients who were tested for HIV, and the proportion of TB patients who tested positive for HIV were calculated.

Ethical waiver was obtained from the UNZABREC Ethics committee.

Results:

During the period under review, it was observed that the incidence of TB declined gradually by 42% from 425/100,000 population in 2004 to 248/100,000 in 2013 (Table 1). TB is prevalent in all districts of Southern Province with some districts having higher incidences than others. The district incidences also varied from year to year in the period under review 2004 – 2013.

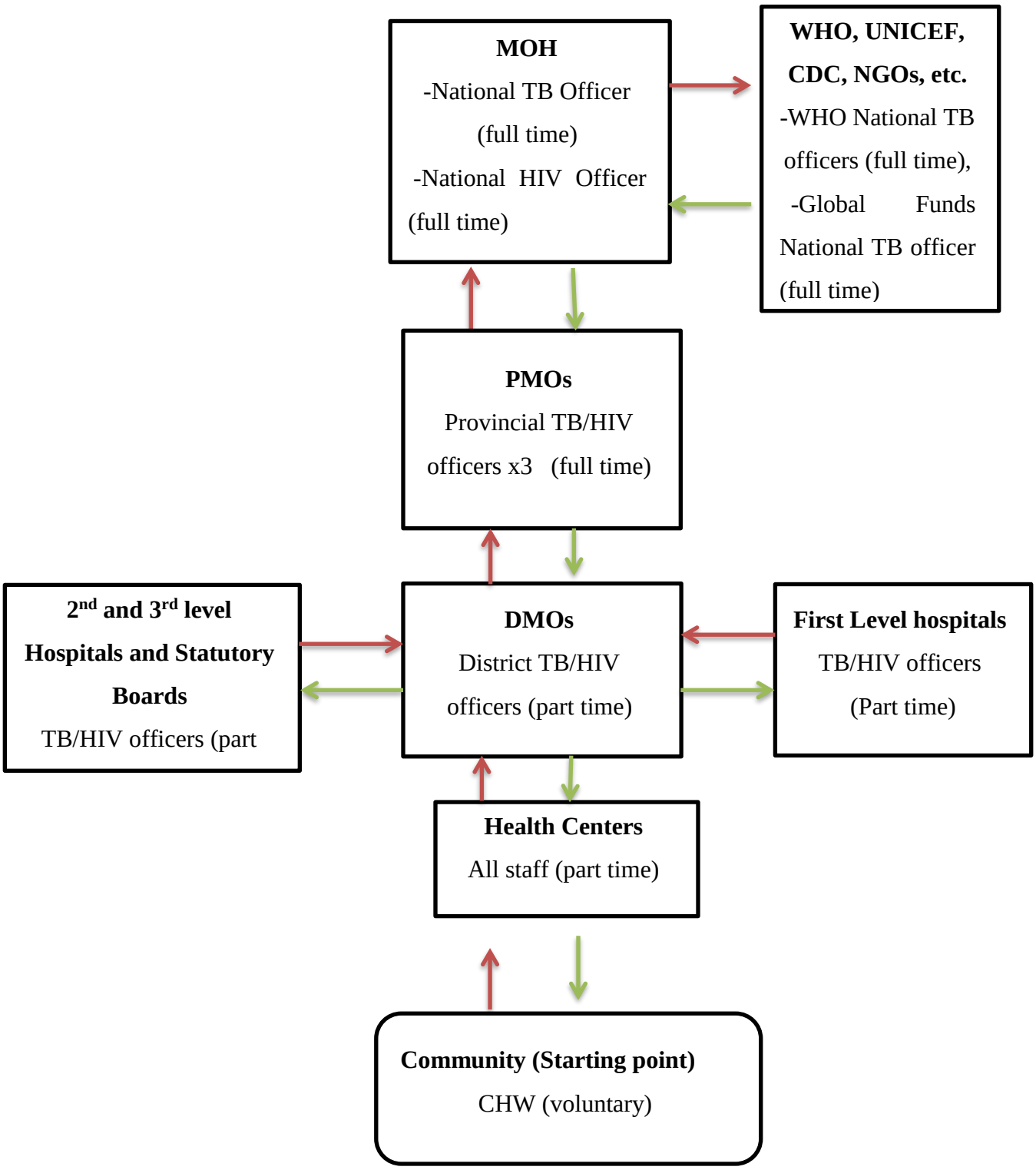

Figure 1. Summary of Southern Province Tuberculosis Surveillance System flow chart with red arrow for reporting while green arrow for feedback

Analysis of the sputum results revealed that the percentage of sputum conversion (sputum positive TB patients who recorded a negative sputum smear result after completing two months of Rifampicin-based therapy), increased from 86% in 2008 to 88% patients in 2013 (Figure 2). The percentage of cure rate (sputum positive TB patients who recorded a negative sputum smear result after completing six months of rifampicin-based therapy), increased from 86% in 2008 to 95% in 2013 (Figure 2).

A review of the HIV testing data showed that the percentage of total TB patients who were tested for HIV at the time of TB diagnosis increased from 78% in 2008 to 96.5% in 2013. Among the total tested for HIV, the percentage of those who tested HIV positive decreased from 73% in 2008 to 65% in 2013. The case fatality rate (CFR) among the patients on TB therapy in Southern Province decreased from 7% in 2008 to 5% in 2012 then went up to 8% in 2013 Zambia.

Discussion

The overall trends of TB incidence and treatment failure and HIV positivity declined over the study period in Southern province, while the HIV testing rate and TB cure rate increased. The case fatality rate fluctuated above the ministry of health (MoH) target rate throughout the period under review.

The provincial 2013 TB incidence declined to just over half of the 2006 incidence, while some district-specific incidences increased as others declined by different proportions. The declining incidences are consistent with the national decline in incidence and a global decline in TB incidences [1, 2, 15]. We hypothesize that this decline could be attributed to improved TB treatment regimen leading to reduced sputum positive cases in

Table 1Reported Cases of Any Tuberculosis by District in Southern Province, Zambia, 2004 – 2009

CASES										
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Choma	849	1178	1073	994	956	1050	1029	1002	926	650
Gwembe	34	79	64	54	54	109	120	100	79	77
Itezhi tezhi	88	114	73	177	139	115	0	0	0	0
Kalomo	232	378	468	407	348	417	411	483	220	267
Kazungula	43	260	194	152	142	104	106	122	113	103
Livingstone	909	1373	1483	1586	1630	1410	1361	1184	1189	971
Mazabuka	744	983	849	802	822	84	1007	993	847	681
Monze	577	750	967	1102	1072	874	868	958	723	680
Namwala	71	184	302	191	219	137	139	127	140	123
Siavonga	433	444	490	530	543	530	610	593	532	291
Sinazongwe	242	199	157	150	126	178	141	132	143	151
Total	4222	5942	6120	6145	6051	5008	5792	5694	4912	3994

the community spreading the disease. The decline in incidence could also be attributed to improved accessibility to anti-retroviral therapy, leading to overall improved cellular immunity of the population living with HIV.

The percentage of sputum conversions and cure rates increased to just over 75% over study period. This increase is consistent with global picture as shown in the WHO annual TB report of 2015. This increase in sputum conversions and cure rates could be due the introduction of the rifampicin-based, short and effective therapy, which encourages adherence to treatment.

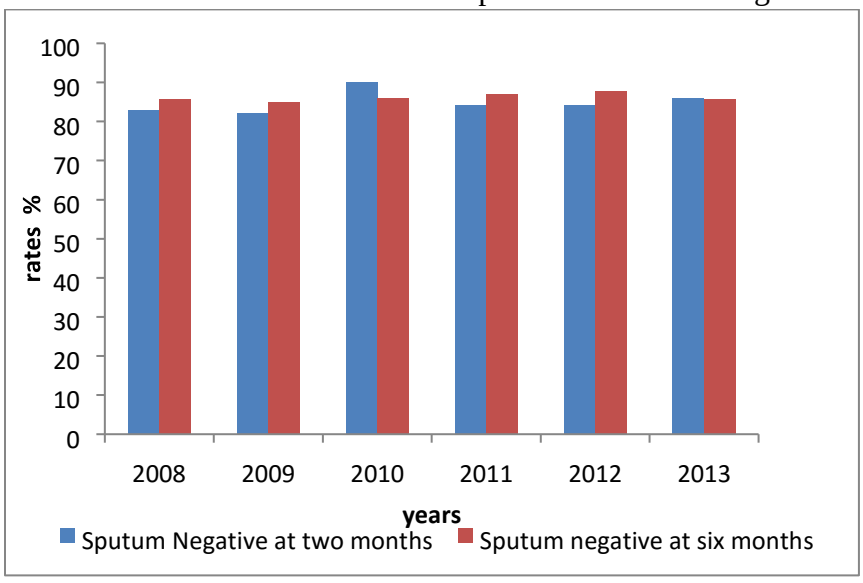

Figure 2 Proportion of Patients with Sputum Smear-Positive Tuberculosis (TB) with a Negative Sputum Smear after Two Months and After Six Months of Anti-TB Therapy – South Province, Zambia, 2008-2013

Almost all TB patients were tested for HIV during the study period, and the proportion of those who tested positive for HIV among those tested in Southern Province reduced from 75% to 67% over the study period. The improved HIV testing rates could be due to the availability of antiretroviral drugs provided with support of The United States President's Emergency Plan for AIDS Relief (PEPFAR) and an increase in the numbers of patients currently on ART by more than three times in the period under review. The reduction in HIV positivity among TB patients could be due to increasing numbers of people tested, thereby increasing the total population at risk. However, the decrease in HIV positivity in Southern Province could also reflect a true decrease in the HIV prevalence of the general population in Zambia [6,7].

The CFR among TB patients on TB therapy though not consistent throughout the period under review remained above the MOH target throughout the study period. This result is contrary to the expected finding of reduced TB CFR, considering improved case management of TB with the rifampicin-based regime. Important to note as a study limitation is that the cause death on TB treatment is not the same as TB-caused death. This CFR defined is deaths while on TB treatment, which may not be a true reflection of death due to TB infection.

No laboratory tests were done as secondary data were analysed, additionally not all cases of tuberculosis had sputum results available, and less than a quarter of all health facilities in southern province have laboratory facilities. The limitation mentioned above may not have much influence on this study because secondary data was analysed to give us an idea of what happened over this period. The national TB reports show similar declining incidences in other provinces [8].

Despite the limitations, the study appears to have a number of strengths as these results describe trends as they were recorded over time. Therefore, this study may provide new information on outcomes of TB treatment as the results suggest that improving outcome of treatment by increasing HIV testing among TB patients, increasing ART uptake among HIV infected TB patients and ensuring all TB drugs are in place may not necessarily reduce TB mortality.

The possible causes of the persistent case fatality rate of over 5% in a situation where all the other parameters have improved could be due to various reasons including existence of Multi Drug Resistance TB, poor adherence to treatment by some patients. The health and lives of the people may be improved by investigating further the factors affecting TB mortality and using this information to improve case management of TB patients.

Our findings of declining incidences suggest the effectiveness of control measures and case management. This seems to indicate that even with the improvement in the prevention and treatment of tuberculosis, both morbidity and mortality due to tuberculosis still occurs in Southern province and that routinely collected data can be analysed and help in informed decision making and guiding policy.

Public health officials at district, province, and national levels in Zambia should

regularly analyse routinely collected TB data to use for planning and policy direction. Surveillance officers at the district level should work closely with health facilities and local laboratories to maintain and update electronic TB registers to enable regular analysis. Although incidence trends in Southern Province cannot be generalized to the whole country, other provinces use a similar surveillance system and should routinely analyse their data to monitor the effectiveness of TB management.

Further analytical studies should be pursued to understand risk factors associated with TB mortality in Zambia and why CFR in Southern Province has remained above MOH target level of 5%.

Acknowledgements

This study was made possible by the Ministry of Health (MOH), Centers for Disease Control and Prevention (CDC), Presidents Emergency Plan for Aids Relief (PEPFAR) through the support to the Zambia Field Epidemiology Training Program (ZFETP). We would also like to thank the District Health Department staff, especially TB/HIV officers for assistance in collecting the data. Dorothy L. Southern provided scientific writing guidance and critically reviewed this manuscript. I sincerely thank Dr Henry Kip Bagget for all the guidance during the development of this manuscript.

CDC authorship disclaimer: "The findings and conclusions in this report are those of the author(s) and do not necessarily represent the official position of the Centers for Disease Control and Prevention."

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