TB in the Pacific: Emerging themes and implications for global TB control

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TB Adviser, Secretariat of the Pacific Community
TB Symposium: Advances in tuberculosis: Australian and regional perspectives
Melbourne, Australia
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Overview

1. Epidemiology of TB in the Pacific Islands region
   (a. Current situation: 2010-2011 data, b. Trends since the year 2000)*

2. Brief overview of the epidemiology of TB in Papua New Guinea, Kiribati and Solomon Islands

3. Successes in TB management

4. Challenges in TB management

1. Epidemiology of TB in the Pacific Islands region
Descriptive epidemiology of TB (2011)

- 16,534 cases of TB notified (14,893: 90% in Papua New Guinea; 741: 4.5% in Solomon Islands and Kiribati combined)

- Case notification rate of 165/100,000 population

- Highest case notification rates in Kiribati, Marshall Islands and Papua New Guinea (334, 253 and 216/100,000 population respectively)

- Case detection rate of 85% (range 38-110%)

- Treatment success rate (ss+ve) of 63% (range 58-100%)

- Number of cases co-infected with HIV: 537 (531 in PNG, 3 in Fiji, 1 each in French Polynesia, Marshall Islands and Palau; 31% of all cases tested)

- Number of MDR-TB cases detected: 18 (15 in Papua New Guinea, 1 each in Palau, Marshall Islands and Federated States of Micronesia. Estimate is 825; 780 in PNG and 45 for other Pacific Island countries and territories)
TB case notification rates in the Pacific Island countries and territories, 2011

- Wallis and Futuna: 15
- Vanuatu: 44
- Tuvalu: 107
- Tonga: 9
- Tokelau: 0
- Solomon Islands: 72
- Samoa: 11
- Papua New Guinea: 216
- Palau: 58
- Northern Mariana Islands: 52
- Niue: 69
- New Caledonia: 21
- Nauru: 49
- Federated States of Micronesia: 145
- Marshall Islands: 253
- Kiribati: 334
- Guam: 42
- French Polynesia: 24
- Fiji: 24
- Cook Islands: 6
- American Samoa: 4

Case notification rate (all forms) per 100,000 population.
<table>
<thead>
<tr>
<th>Area/ Country / State</th>
<th>Rate (per 100,000 pop.)</th>
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<tbody>
<tr>
<td>Pacific</td>
<td>165</td>
</tr>
<tr>
<td>Timor Leste</td>
<td>380</td>
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<tr>
<td>Indonesia</td>
<td>132</td>
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<tr>
<td>Philippines</td>
<td>206</td>
</tr>
<tr>
<td>Hawaii</td>
<td>8</td>
</tr>
<tr>
<td>New Zealand</td>
<td>7</td>
</tr>
<tr>
<td>Australia</td>
<td>5</td>
</tr>
<tr>
<td>Rank</td>
<td>Disability Adjusted Life Years</td>
</tr>
<tr>
<td>------</td>
<td>--------------------------------</td>
</tr>
<tr>
<td>1</td>
<td>Lower respiratory infections</td>
</tr>
<tr>
<td>2</td>
<td>Diabetes</td>
</tr>
<tr>
<td>3</td>
<td>Diarrhoeal diseases</td>
</tr>
<tr>
<td>4</td>
<td><strong>Tuberculosis</strong></td>
</tr>
<tr>
<td>5</td>
<td>Malaria</td>
</tr>
<tr>
<td>6</td>
<td>Ischemic heart disease</td>
</tr>
<tr>
<td>7</td>
<td>Pre-term birth complications</td>
</tr>
<tr>
<td>8</td>
<td>Asthma</td>
</tr>
<tr>
<td>9</td>
<td>HIV/AIDS</td>
</tr>
<tr>
<td>10</td>
<td>Meningitis</td>
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Regional Strategy to Stop Tuberculosis in the Western Pacific: 2011-2015

Available at: http://www.wpro.who.int/publications/PUB_9789290615217.htm
Regional TB Strategy

• **Vision:** To achieve elimination of TB as a public health problem (by 2050)*

• **Goal:** To reduce by half the prevalence and mortality from all forms of TB by 2015, relative to the levels in 2000

*Elimination is defined as having an incidence of less than 1 case per million population*
Number of TB cases notified in the Pacific Islands region and linear trend over time, 2000-2011
TB cases notification rates in the Pacific Islands region over time, 2000-2011

- TB case notification rate (all forms - PNG excluded)
- TB case notification rate (all forms - PNG included)
- Linear (TB case notification rate (all forms - PNG excluded))
- Linear (TB case notification rate (all forms - PNG included))
TB case notification rate by sub-region and Pacific, 2000 and 2011

TB case notification rate per 100,000 population

- Micronesia: 102.7 (2000), 139.3 (2011)
- Melanesia: 159.8 (2000), 177.4 (2011)
TB case notification rates in the Pacific Island countries and territories, 2000 and 2011
Largest decrease - New Caledonia

Case notification rate decreased by 53%
Largest decrease - Northern Mariana Islands

Case notification rate decreased by 52%
Largest increase - Marshall Islands

- Case detection rate (all forms) increased by 100%
- TB case notification rate (all forms) increased by 285%
Treatment success and case detection

<table>
<thead>
<tr>
<th>Year</th>
<th>Treatment success: sputum smear positive</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>PNG included</td>
</tr>
<tr>
<td>2009</td>
<td>75%</td>
</tr>
<tr>
<td>2010</td>
<td>63%</td>
</tr>
</tbody>
</table>
The gap is narrowing, but not quickly enough.
Universal access to diagnosis for all
Closing the gap - Western Pacific region

[Graph showing trends in incidence and notifications over time]
Incidence, prevalence and mortality

- No change in mortality rate (39/100,000 population)
- Slight decrease in incidence rate (267-258/100,000 population; 3%)
- Slight decrease in prevalence rate (415-396/100,000 population; 5%)
Incidence, prevalence and mortality
(without data from PNG)
Prevalence and mortality - Western Pacific Region
2. Brief overview of the epidemiology of TB in Papua New Guinea, Kiribati and Solomon Islands
Papua New Guinea
Papouasie-Nouvelle-Guinée
Papua New Guinea

**Case detection rate (all forms)**

- **2000**: 56
- **2001**: 65
- **2002**: 56
- **2003**: 62
- **2004**: 60
- **2005**: 58
- **2006**: 57
- **2007**: 66
- **2008**: 64
- **2009**: 52
- **2010**: 61
- **2011**: 61

**Proportion successfully treated**

- **2000**: 63
- **2001**: 67
- **2002**: 53
- **2003**: 58
- **2004**: 65
- **2005**: 71
- **2006**: 73
- **2007**: 39
- **2008**: 65
- **2009**: 71
- **2010**: 58

**Treatment success (ss+ve)**

- **2000**: 63
- **2001**: 67
- **2002**: 53
- **2003**: 58
- **2004**: 65
- **2005**: 71
- **2006**: 73
- **2007**: 39
- **2008**: 65
- **2009**: 71
- **2010**: 58
Treatment success rates: PNG vs other countries in Western Pacific region
Unsuccessful treatment outcomes (ss+ve)

Unsuccessful treatment outcomes as a proportion of all unsuccessful outcomes

- Died
- Failed
- Defaulted
Unsuccessful treatment outcomes (retreatment)

Unsuccessful treatment outcomes as a proportion of all unsuccessful outcomes

- Died
- Failed
- Defaulted
Papua New Guinea

Rate per 100,000 population with 95% CI for incidence

TB case notification rate
Estimated TB incidence
Number of TB case notifications and TB case notification rate from 2000 to 2011 in Kiribati.

Kiribati
Kiribati

Rate per 100,000 population, showing 95% CI for incidence

TB case notifications
Estimated TB incidence
Solomon Islands

TB case notifications and case notification rate per 100,000 population from 2000 to 2011.

- **Number of TB case notifications**
  - 2000: 300
  - 2001: 275
  - 2002: 250
  - 2003: 275
  - 2004: 300
  - 2005: 325
  - 2006: 350
  - 2007: 375
  - 2008: 375
  - 2009: 375
  - 2010: 375
  - 2011: 375

- **TB case notification rate per 100,000 population**
  - 2000: 73
  - 2001: 68
  - 2002: 58
  - 2003: 65
  - 2004: 73
  - 2005: 83
  - 2006: 75
  - 2007: 78
  - 2008: 78
  - 2009: 74
  - 2010: 70
  - 2011: 63

The data shows a general increase in TB case notifications and a corresponding increase in the notification rate from 2000 to 2005. Thereafter, the notification rate decreased until 2010, followed by a slight increase in 2011.
Solomon Islands

Proportion detected

Case detection rate (all forms)

Proportion successfully treated

Treatment success (ss+ve)
3. Successes in TB management
Successes in TB management

- Case detection and case notification rates have increased (case detection has increased by 20%, case notification rates increased by 13%, since the year 2000)
- Large sustained declines in TB case notifications in New Caledonia and Commonwealth of the Northern Mariana Islands
- Effective management of MDR-TB in general in the Northern Pacific, and when isolated cases are identified in the Southern Pacific
- TB-diabetes collaborative activities implemented in many countries, with published policy recommendations
- Treatment success rate is high in many Pacific Island countries (81% have ss+ve treatment outcomes >=80%)
- Adaptive models of TB care (i.e. malaria microscopists trained to do sputum smear microscopy in Vanuatu, young unemployed people trained to provide DOT in Kiribati)
- Better use of TB data to inform policy and practice (assessment of Pacific data, strengthened M&E, wider range of data variables collected, operational research)
Successes in TB management

- A number of regional activities/collaborations to assist NTPs:
  - 1. **PATLAB**: Pacific TB Laboratory Network: each national TB laboratory is paired with a Reference laboratory (for culture, DST, Xpert, external quality assessment)
  - 2. **Regional technical assistance**: Five medical and technical officers in the region; two with region wide responsibility (CDC, SPC, WHO). The Union; staff in Auckland and Singapore- support TB, lung health and operational research.
  - 3. **Pooled procurement mechanism**: For second line TB drugs. Housed in WHO WPRO (regional GLC). SLDs and associated technical assistance free to many countries.
  - 4. **Regional funding mechanisms**: Global Fund regional TB grants (11 countries)
TB – DM in the Pacific

<table>
<thead>
<tr>
<th>Pacific Island country/territory</th>
<th>Rate per 100,000 population</th>
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<tbody>
<tr>
<td>Tuvalu</td>
<td>122</td>
</tr>
<tr>
<td>Papua New Guinea</td>
<td>212</td>
</tr>
<tr>
<td>Federated States of Micronesia</td>
<td>133</td>
</tr>
<tr>
<td>Marshall Islands</td>
<td>254</td>
</tr>
<tr>
<td>Kiribati</td>
<td>339</td>
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</tbody>
</table>

Rate per 100,000 population
1. Kiribati:
   • Case control study to assess the association between TB and diabetes (with nested cohort of TB patients followed through to treatment completion)
   • Modelling the effect of an increased diabetes prevalence on TB incidence

2. Republic of Marshall Islands:
   • Diagnosis, treatment and outcomes of diabetic versus non-diabetic TB patients in Ebeye
   • Contact investigation among household members of smear-positive pulmonary TB cases in Ebeye: relationship to diabetes mellitus status
   • Implementation of standards for the management of TB and diabetes in Ebeye
   • TB case detection in the diabetes clinic in Ebeye

3. Fiji:
   • Screening TB patients for diabetes mellitus
## USAPI Standards for the Management of Tuberculosis & Diabetes

### Screening for DM in Persons with Active TB

**STANDARD 1** Every person with TB over the age of 18 should be screened for DM

**Guideline 1.1** The diagnosis of DM may be made using one of the following criteria:
- A fasting plasma glucose ≥ 126 mg/dl
- A random plasma glucose ≥ 200 mg/dl
- A hemoglobin A1C ≥ 6.5%

**Guideline 1.2** Abnormal glucose values should be verified with a repeat test in patients who have no symptoms of DM

**Guideline 1.3** Rifampin can elevate blood glucose in TB patients. Glucose testing should be repeated after 2–4 weeks of TB treatment, or if symptoms of hyperglycemia develop while on TB treatment.

### Treating TB in Persons with DM

**STANDARD 5** Ensure that TB treatment is appropriately adjusted in persons with DM

**Guideline 5.1** Ensure that TB medications are properly dosed

5.1.1 Check creatinine for diabetic nephropathy, and if present, adjust the frequency of PZA and EMB according to A1B-CDC guidelines

5.1.2 Administer INH to prevent INH-induced peripheral neuropathy (10–25 mg/day)

**Guideline 5.2** Observe closely for TB treatment failure in persons with DM

5.2.1 Be aware of poor absorption of some TB meds in DM

5.2.2 Manage the many interactions between TB and DM meds

5.2.3 Be aware of a possible slight increase in TB drug resistance in persons with DM and active TB

**Guideline 5.3** “Assure the Cure”

5.3.1 Consider extending treatment to 9 months for persons with DM, especially those patients with concomitant disease or delayed sputum clearance. Patients with DM have relative immune suppression and often a higher burden of TB disease.

5.3.2 Upon completion of therapy, obtain sputum for AFB smear and culture

5.3.3 Evaluate patients at 6 months and one year after treatment for evidence of relapse

### Managing DM in Persons with Active TB

**STANDARD 6** Glucose testing should be repeated in TB clinic during TB therapy

**Guideline 6.1** TB patients with a diagnosis of DM should have their blood glucose checked at least weekly for the first 4 weeks, and less frequently thereafter if the diabetes is well controlled. (Monthly blood glucose measurement during TB treatment is recommended)

**STANDARD 7** Use the frequent contact in clinic with TB patients to help manage DM

**Guideline 7.1** There should be a glucometer in every TB clinic for monitoring blood glucose

**Guideline 7.2** All clinic staff should reinforce lifestyle changes at TB clinic visits

**Guideline 7.3** If available, refer persons with DM to the Diabetes clinic for long-term diabetes care. Ensure the DM clinician is aware of TB diagnosis and TB medications.

**STANDARD 8** Use the frequent DOT contact with TB patients to help manage DM

**Guideline 8.1** DOT workers should encourage lifestyle changes at every patient encounter

8.1.1 Dietary changes and physical activity are the most important in this effort

8.1.2 DOT workers should use structured culturally-appropriate diabetes educational materials

**Guideline 8.2** Consider delivering DM meds with TB meds via DOT for selected poorly-controlled persons with DM who have suspected non-adherence to diabetic medications

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**Abbreviations**

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tr>
<td>AFB</td>
<td>acid-fast bacilli</td>
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<tr>
<td>ATSB</td>
<td>American Thoracic Society Board</td>
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<tr>
<td>DM</td>
<td>diabetes mellitus</td>
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<tr>
<td>DOT</td>
<td>directly observed treatment</td>
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<td>EMB</td>
<td>ethambutol</td>
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<td>IGRA</td>
<td>interferon gamma release assay</td>
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<td>INH</td>
<td>isoniazid</td>
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<td>LTBI</td>
<td>latent TB infection</td>
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<tr>
<td>PZA</td>
<td>pyrazinamide</td>
</tr>
<tr>
<td>TB</td>
<td>tuberculosis</td>
</tr>
<tr>
<td>TST</td>
<td>tuberculin skin test</td>
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<td>USAPI</td>
<td>United States Associated Pacific Islands</td>
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Refined 12-01-2010 by the membership of the Pacific Islands Tuberculosis Controllers Association and the Pacific Chronic Disease Coalition. Developed by Curity International Tuberculosis Center through funding provided by the National Institutes of Health (National Institute of Minority Health and Health Disparities) via the Centers for Disease Control and Prevention (Division of Diabetes Translation and Division of Tuberculosis Elimination).
4. Challenges in TB management
Challenges in TB management

- MDR / XDR-TB in Papua New Guinea and MDR-TB in Micronesia
- Further support to improve TB management in Papua New Guinea (implementation of DOTS, access to care, tx success, implementation of the basics while implementing the programmatic management of MDR-TB, strong operational research component)
- Infection control (neglected area; nosocomial transmission of MDR-TB)
- Diabetes mellitus a prominent risk factor, especially in Micronesia (programmatic challenges)
Challenges in TB management

- Need to better understand the epidemiology of TB at the regional and national levels, and tailor interventions accordingly.

- Contribution of active TB case finding not well understood, high risk groups in Pacific context need definition.

- Elimination strategies need to be discussed; feasible in some countries, but how to achieve this?

- National Governments need to maintain some infrastructure for a national TB programme (applicable to countries with low rates of TB and many other competing public health priorities).
MDR-TB in the Pacific

The map illustrates the distribution of MDR-TB cases in the Pacific region. The number of cases is indicated by the size of the orange circles, with larger circles representing more cases. The legend on the right side of the map explains the scale:

- 1 to 10 cases
- 11 to 20 cases
- 21 to 30 cases
- 30 to + cases

Key locations and cases include:
- Palau (Belau): 41 cases
- Federated States of Micronesia: 15 cases
- Marshall Islands: 15 cases
- Papua New Guinea: 20 cases
- Kiribati: 1 case
- Tuvalu: 1 case
- Samoa: 1 case
- Wallis & Futuna: 1 case
- Tokelau: 1 case
- Cook Islands: 2 cases
- Niue: 5 cases
MDR-TB in Chuuk State, FSM

Islands of Hope: Building Local Capacity to Manage an Outbreak of Multidrug-Resistant Tuberculosis in the Pacific

A single case of multidrug-resistant tuberculosis (MDR-TB) can overwhelm the technical and financial capacity of small TB programs. May 2010 marks the first known case of MDR-TB in Chuuk, FSM. A lack of funding and staff training hampered the response efforts. Detailed reporting caused prolonged transmission among household contacts. Several approaches were needed to build technical capacity and to mitigate the MDR-TB crisis in Chuuk, and the Chuuk TB outbreak demonstrates the importance of maintaining TB control programs in the world. This paper focuses on Chuuk, Micronesia, where the outbreak occurred in 2007.

Marylou C. Timun

Multi-drug Resistant Tuberculosis in Chuuk State, Federated States of Micronesia, 2008-2009

Fred B. Tuberculosis Clinician, Chuuk Department of Health Services, Wena, Chuuk, FM 86

Abstract

Multi-drug resistant tuberculosis (MDR-TB) is a growing public health concern, particularly for those where rates of tuberculosis infection are extremely high. In May 2008, a cluster of patients were identified in Chuuk State, Federated States of Micronesia. A multi-agency investigation eventually uncovered over 31 cases, and over 100 latent TB infections. Inconclusive investigations resulted in a change of case definition... The findings in this report are based on data contributed by local and national-level stakeholders.

References


Multi-drug resistant tuberculosis (MDR-TB) is defined as tuberculosis infection that is resistant to two or more of the above-mentioned drugs. This infection is more costly, drug treatment for MDR-TB is approximately $20,000 for a single comparison as compared to $200 for treating regular TB.
The four States of Federated States of Micronesia: Yap, Chuuk, Pohnpei, and Kosrae
MDR-TB in Chuuk State, FSM

- During April 2007–June 2008, four cases of laboratory-confirmed MDR-TB were reported in Chuuk

- Three (75%) of 4 patients had died

- 2-year-old child and mother with MDR-TB → evidence of recent transmission

- No second line drugs were available as of June 2008
MDR-TB in Chuuk State, FSM

- Strain A resistant to INH, RIF, PZA, EMB, and Streptomycin
  - Primary resistance. Likely imported

- Strain B resistant to INH, RIF, and Ethionamide
  - Secondary resistance. Circulating strain resistant to INH and Ethionamide; acquired RIF resistance

Two distinct, simultaneous MDR-TB outbreaks on Weno Island
MDR-TB in Chuuk State, FSM

- Regional response involved an Epi-AID, Dept. of Interior funds for second line drugs, digital chest x-ray machine, technical assistance, human resource capacity building, regional collaboration between all agencies

- A total of 42 MDR-TB cases have been notified (to June, 2013)

- Large proportion are female and children (69% female; 45% children)

- Treatment outcomes to date are good: 91% treatment success

- Extensive TB contact tracing programme, with 99 MDR-TB contacts treated by DOT for one year with a fluoroquinolone based regimen (No new cases among treated contacts; among untreated contacts, 40 genotypically/ epidemiologically linked cases of MDR-TB have been identified)

- Programmatic management of MDR-TB can work well in a resource limited setting, given the right support and conditions. In areas where political commitment exists, and re-exposure to MDR is limited, preventing MDR by treating exposed close contacts is effective (papers in progress)
Active case finding

• In the Pacific context, who are the high risk groups and what evidence do we have to define these groups?

• Some groups that have been defined are:
  – TB contacts, particularly children aged under 5 years of age and immuno-suppressed
  – People living with HIV
  – People with diabetes
  – Outer island populations?
  – People living in urban settlements
  – People living in TB ‘hotspots’
  – Prisoners
Conclusions

- TB remains an issue of public health importance in the Pacific
- Rates vary greatly between Pacific Island countries
- Steady decline noted in New Caledonia and Northern Mariana Islands
- Countries in Polynesia may head towards TB elimination in the future
- Other countries such as Papua New Guinea, Kiribati, Marshall Islands and Solomon Islands require a more focussed public health response (evidence based)
- MDR/ XDR-TB, the association between TB and diabetes mellitus, and evidence based active case finding strategies are challenges for TB management in the Pacific context
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• Dr Paul Aia (NTP, Papua New Guinea)