The Economics of Tuberculosis Control in PNG and the Torres Strait

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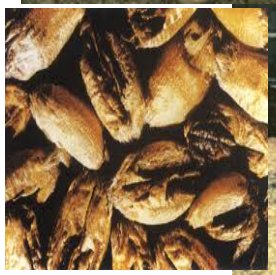




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PNG Health and Tuberculosis (TB) Facts

High Prevalence of TB:

- 430 per 100,000 pop in PNG
- 197 per 100,000 pop in Western Pacific Region
- 6 per 100,000 pop in Australia

High prevalence of multidrug resistant TB in PNG

- 25% of Australian MDR-TB cases from the TS islands

Low level of expenditure on health

- Total expenditure on health per capita:
  - 71 (Int'l $, 2009) in PNG
  - 3,382 (Int'l $, 2009) in Australia
- Total expenditure on health as % of GDP (2009):
  - 3.1% in PNG; 8.5% in Australia

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Current TB Control Strategy in PNG

Directly Observed Treatment Short Course (DOTS) Program

- Treatment lasts about 6 months
- Risk of drug resistance in TB strain if inconsistent or partial treatment
- Current DOTS coverage is about 14% in PNG

What is the cost and benefit of expanding DOTS?

We focus only on South Fly District

- Pop size: about 50,000 people (about 7 mill people in PNG)
- <5km to TS islands
- Free movement allowed for "traditional activities"
- There were 59,003 movements in 2008-09 (about 162/day)
    - 98% of movements are by PNG citizens, possibly due to the "health gradient"

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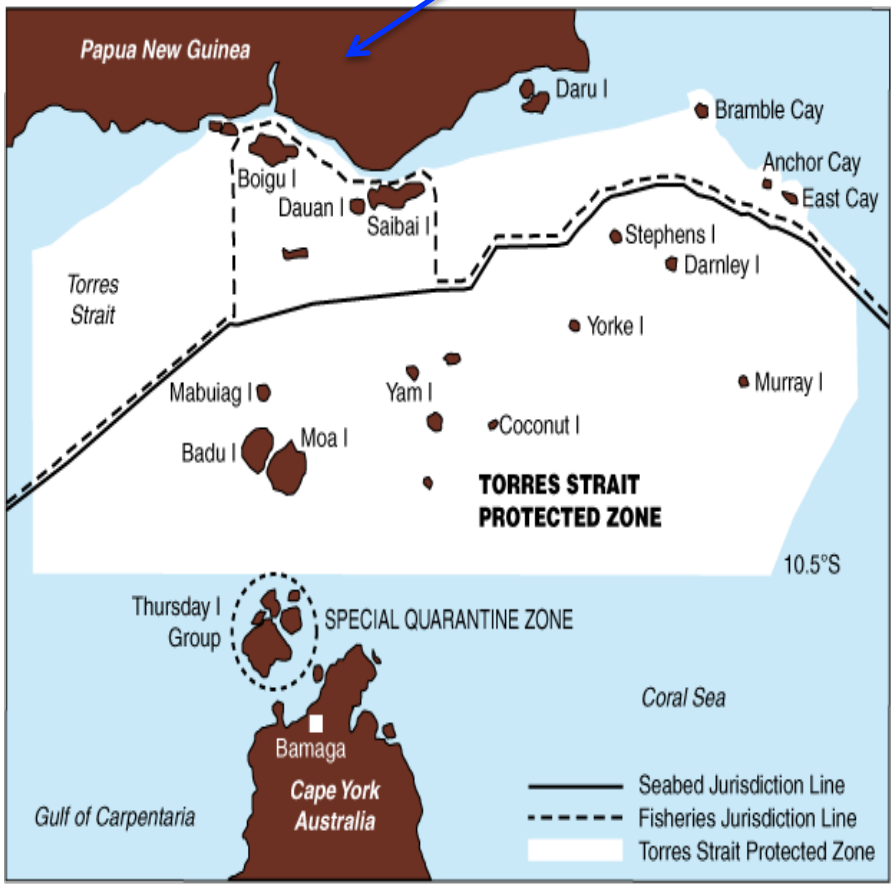
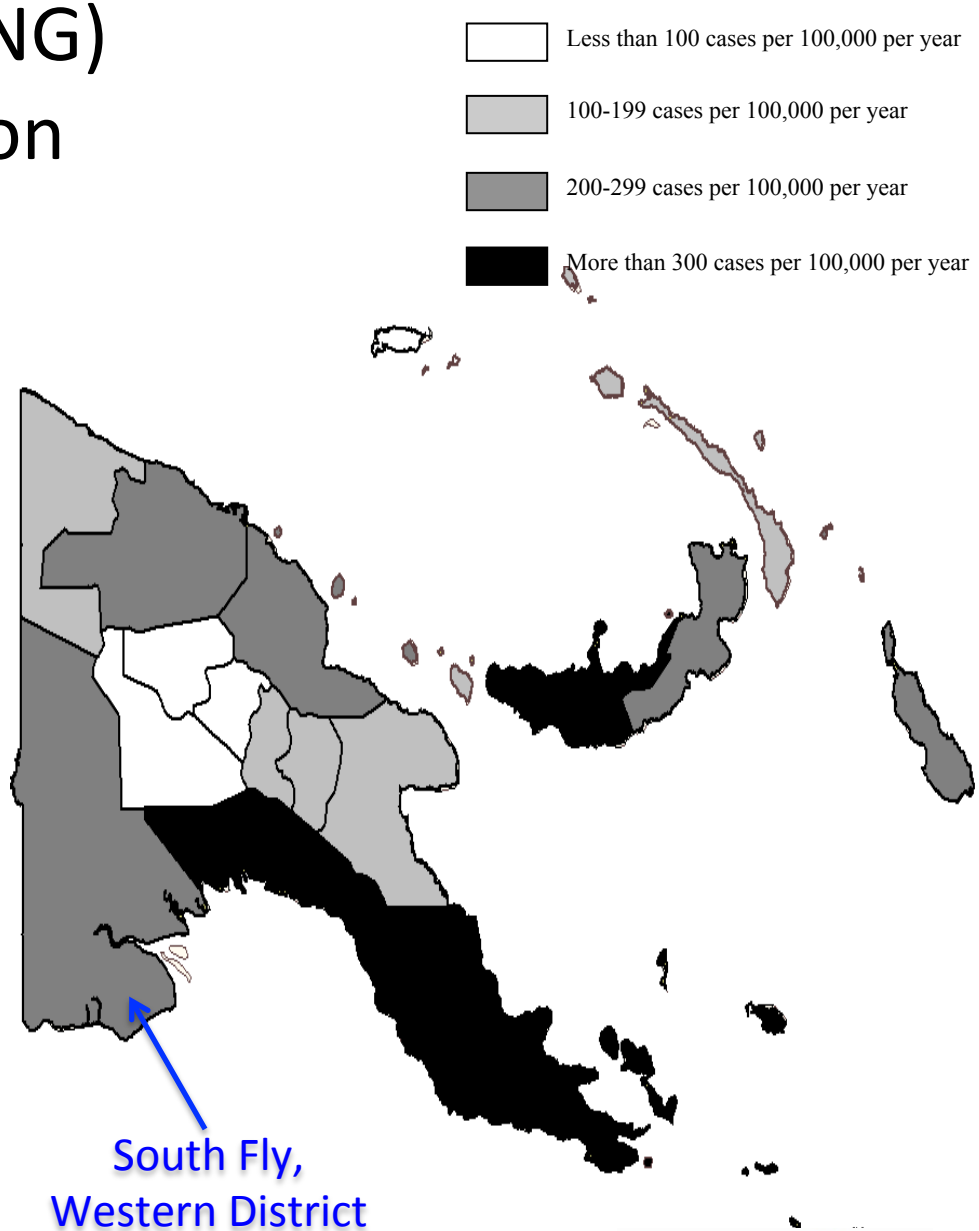
The Papua New Guinea (PNG) and Torres Strait (TS) Region





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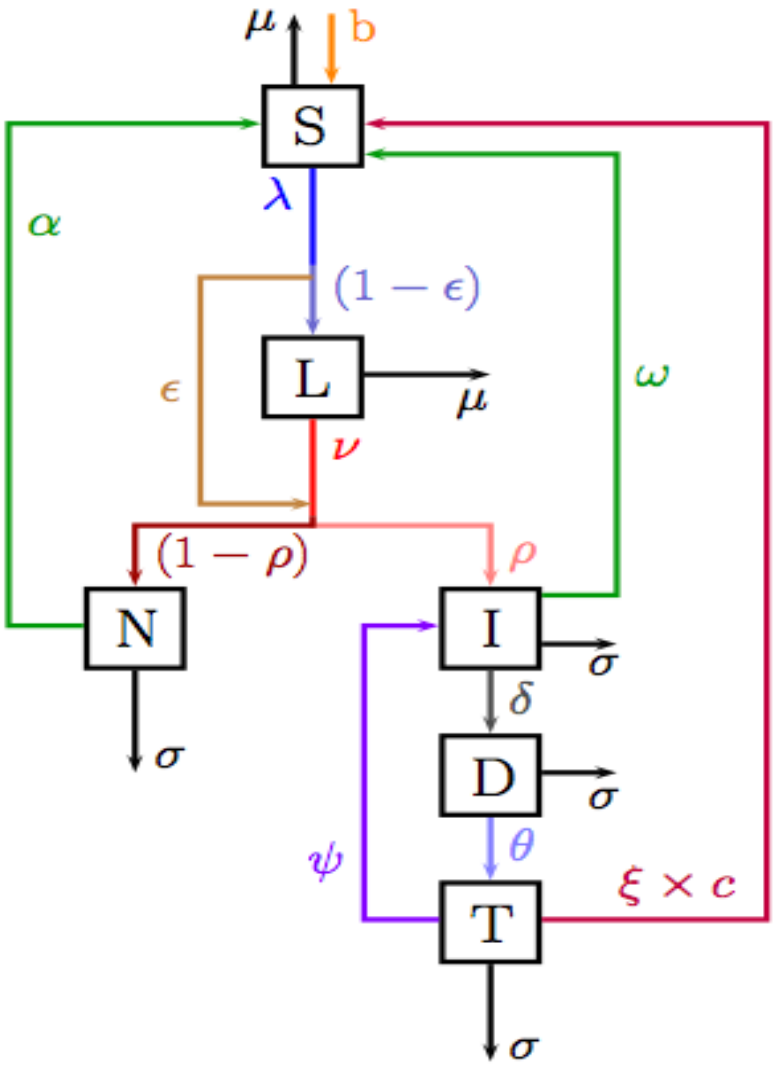
The Epidemiological and Economic Models

Epidemiological Model:
Not taking into account HIV co-infection and MDR.



S: Susceptible

L: Latent Infectious

N: Non-infectious

I: infectious

D: Detected

T: Treatment applied

Economic Model (1): Interventions: Expanding minimum DOTS from 2012 to 2050: Baseline: 0% coverage of DOTS

Benefit in Quality-Adjusted Life Year (QALY) gained

- QALYs in one year = 1* Q

  where Q = 1 if full health; Q = 0.71 – 0.74 with active TB

- Quality-Adjusted Life Expectancy at age *a* is defined: $$QALE = \sum_{t=a}^{a+L} Q_t$$

  where L is the residual life expectancy of the individual at age a

- Discounted QALE: $$DQALE = \sum_{t=a}^{a+L} \frac{Q_t}{(1+r)^{t-a}}$$

  where r is the discount rate

- Quality-Adjusted Life Year (QALY) gained due to interventions

$$QALYgained = \sum_{t=a}^{a+L_i} \frac{Q_t^i}{(1+r)^{t-a}} - \sum_{t=a}^{a+L} \frac{Q_t}{(1+r)^{t-a}}$$

where Q_t^i and Q_t are vectors of health-related quality of life weights generated by the epidemiological model with and without interventions

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Economic Model (2):

Conversion:

- Convert QALY into dollars:
  - PPP Converted GDP Per Capita in PNG: $Int'l 2,826.08
  - Note: Australian Willingness to pay per QALY is $Int'l 43,456.06

Cost :

- Diagnostics, treatment of infectious TB and the TB program (regional proxies but no hospitalization cost)
- Total cost per patient varies across the level of coverage (regional proxies and WHO data):
  - 463 - 1,100 $Int'l for the first treatment
  - 562 - 1,200 $Int'l for follow-up treatment (if needed)

  Discount rate: 3% per annum; all valued in $Int'l 2005 price

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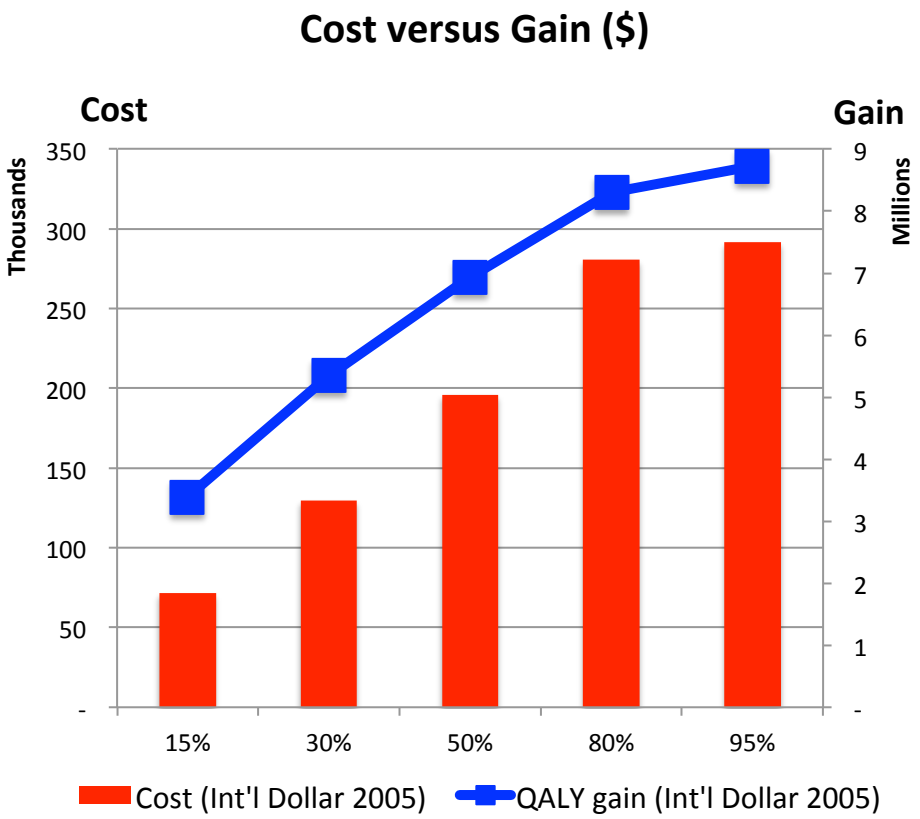
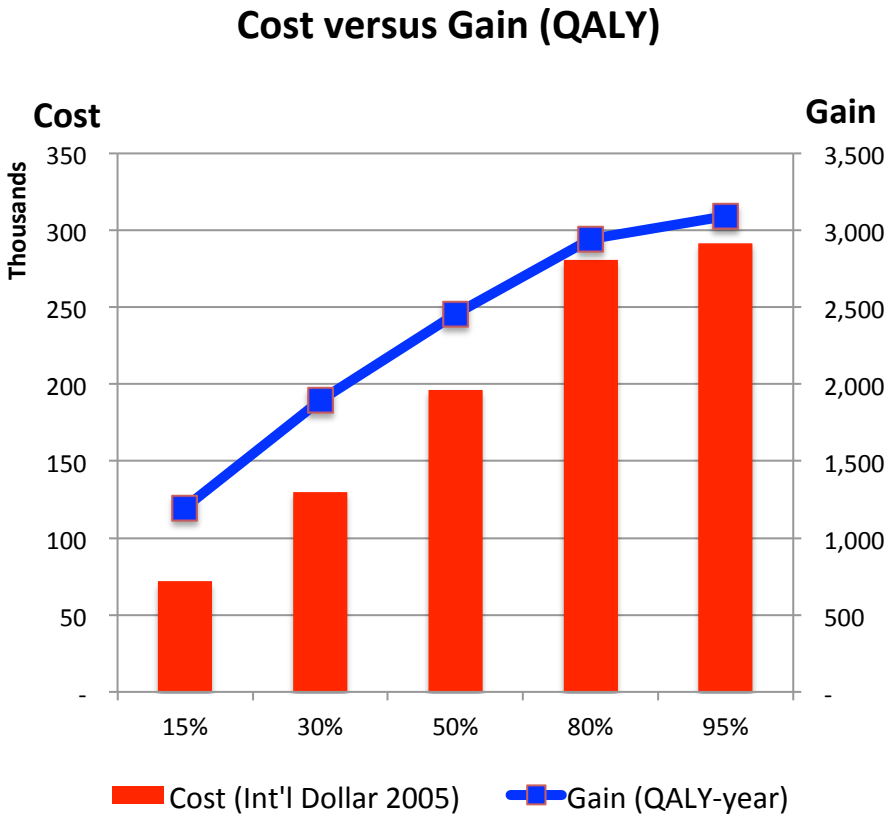
Cost versus Gain of expanding DOTS: 2012-50

($Int'l 2005 price)





Average cost per QALY is about $Int 6

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Net Gain and Cost

Unit: $US 2011

Coverage level	15%	30%	50%	80%	95%
Gain	4,771,413	7,531,547	9,785,420	11,712,607	12,297,608
Cost	101,213	183,089	276,431	395,505	411,107
Net gain	4,670,200	7,348,457	9,508,990	11,317,103	11,886,501
UNDISCOUNTED COST					
SOUTH FLY DISTRICT					
Total cost	179,937	326,817	490,624	693,578	716,327
Yearly cost	4,614	8,380	12,580	17,784	18,367
PAPUA NEW GUINEA					
Total cost	21,592,439	39,217,993	58,874,857	83,229,347	85,959,237
Yearly cost	553,652	1,005,590	1,509,612	2,134,086	2,204,083
Yearly cost per capita	0.08	0.15	0.22	0.32	0.33

In 2010: PNG per capita Health expenditure: USD $54

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What's missing?

- Costs and gains of non-infectious active TB patients are not counted.
- Modeling and costs and gains of MDR and HIV/TB co-infection (and cross-border effects) need to be added.
- More accurate measures of the cost of the TB program per unit in PNG (both inside and outside of the South Fly region).
- Parameters/calibration of cross-border movements needs to be verified.
- Clear life-expectancy tables in PNG.
- Parameter values and age-structure (current and changing over time) in the epidemiological and economic models.
- DALY and productivity comparative measures are needed.

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Thanks for listening!

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