Economic Considerations in RF and RHD Prevention

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Te Whare Wānanga o Tāmaki Makaurau

Synopsis

- Opportunity cost: the basis of economic comparisons
- Combining mortality and quality of life: QALYs
- Linking cost to outcomes: cost utility analysis (CUA)
- Criteria for a school-based RF prevention programme in CMDHB
- Economic evaluation of school clinics: what is the answerable question?
- Lifetime disease progression model
- If a reduction in incidence rate was attributable to the school clinic programme
  - Would this intervention be cost effective?
  - By whose criteria?
- Inputs to the economic model: cost pcpa, incidence, deaths, quality of life, effectiveness
- Economic outcomes: linking costs to clinical outcomes via CUA
- Uncertainties
- Criteria for a school clinic programme in CMDHB: fulfilled?
- Directions for future research

Opportunity Cost

- Whatever we spend on programme A, we can't spend on programme B

- Annual cost of RFPP in CMDHB (*ManaKidz* programme):
  - 25,000 kids age 5-12y at $280 pcpa = $7.0m p.a.

- Some potential alternative uses of these funds:
  - 14 new houses in south Auckland, at $500K each
  - 145 hospital admissions, at $4800 each
  - 14,000 outpatient appointments, at $500 each
  - 100,000 district nurse visits, at $70 each (e.g. secondary prevention)
  - 100,000 GP consultations, at $70 each (incl. Govt subsidy)

Quality adjusted life years (QALYs) gained

- A measure of the value of a programme or intervention
- Combines gains in life expectancy and quality of life
- One QALY = one year of life, adjusted for quality of life

- One year at 50% of full health = 0.5 QALYs
- One year at 80% of full health = 0.8 QALYs
- Advanced breast cancer: 5y at 65% health = 5x0.65 = 3.25 QALYs
- Post valve surgery: 10 years at 95% full health = 10x0.95 = 9.5 QALYs

- Used by PHARMAC to estimate the non financial *value* of new medicines

‘Cost utility’ analysis

- Used internationally to evaluate new interventions

- Cost per QALY gained (= ICER or ICUR)
  - E.g. a new oncology medicine costs $10,000 per patient more than the older medicine and provide 0.1 more QALYs per patient
- ICUR (cost per QALY) = $10,000/0.1 = $100,000
- The WHO would consider that this is good value in NZ
- PHARMAC would consider this is *not* good value in NZ

Criteria for a school clinic programme in CMDHB

• CRITERION	• PARAMETER
• Clear need?	• High RF incidence rate in the target group
• Practical?	• Yes
• Measurable outcomes?	• Yes: ARF admissions or notifications
• Effective?	• Likely, but still unproven
• Affordable?	•
• Value for money?	•

Economic evaluation of school clinics

- Is the school clinic intervention cost effective compared to usual primary care delivered by GPs?
- In high risk primary/intermediate schools
  - Age 5-12y
  - Baseline incidence rate 50 to 100 per 100,000
- Mostly Māori and Pacific children
- Annual cost >= $160 to $300 ppy
  - Depends on other services provided, e.g. treatment of skin disease
  - Focus on RF/RHD excludes other benefits [e.g. treatment of skin disease]

Effectiveness analysis findings

Scenario	Number of cases exposed/ person days exposed	Number of cases non-exposed/ person days not exposed	RF decline (proportion)	Lower confidence limit	Upper confidence limit	Statistical Significance
10 DHBs Schools with a sore throat component	79/ 34,798,158	52/ 18,960,113	**0.17**	-0.17	0.42	No
CMDHB Schools with a sore throat component	33/ 15,273,980	31/ 9,945,963	**0.31**	-0.13	0.58	No

Source: Interim Evaluation of the Sore Throat Management Component of the New Zealand Rheumatic Fever Prevention Programme: Quantitative Findings (MoH)

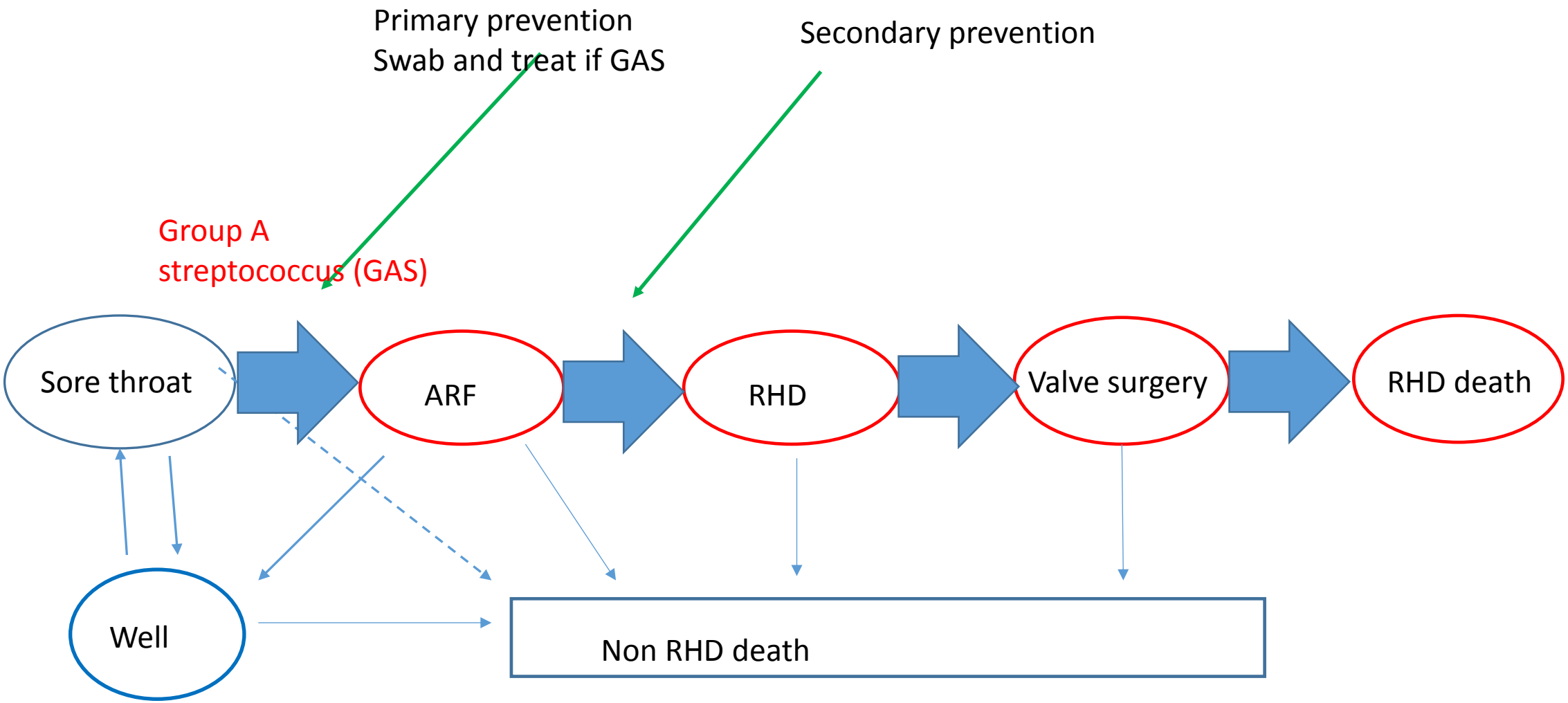
School intervention

- No clear evidence that it was more effective than usual care by GPs.
  - Underpowered and/or small effect?
  - Data collection ended June 2015

- The school intervention:
  - Doubled the annual number of throat swabs (increased cost)
  - Increased % of children treated with penicillin
  - Cost much more than GP visits (e.g. school nurse; training of lay workers)

- SO: under what conditions could it be cost effective?
  - Cost? Effectiveness? Incidence rate?

Lifetime disease progression model based on health states



Methods

- Lifetime economic Markov model of disease progression
- Patient-level linked data sets of ARF and RHD admissions and deaths
  - RF, RHD & surgery, deaths by underlying cause
- Follow individuals for 10 years after index (first) RF admission
- Costs from multiple sources
- Transition probabilities (between health states) from survival analyses

Our question: if the school clinic programme reduced admission rates, would it be cost effective?

Analysis of Counties Manukau DHB:

- Cost = $200 per child per year (conservatively)
- ARF incidence = 87.1 per 100,000 (measured in target schools)
- *Assumed* effectiveness of 30% (wide confidence intervals)
- **Cost per QALY gained would be about $90,000**
    - **11 QALYs per $m expenditure**

Cost effectiveness thresholds

The MoH does not have a threshold to determine cost effectiveness of interventions

PHARMAC uses cost utility analysis as one of nine criteria to base funding decisions

Weighted average for funded new pharms = $35,714 per QALY

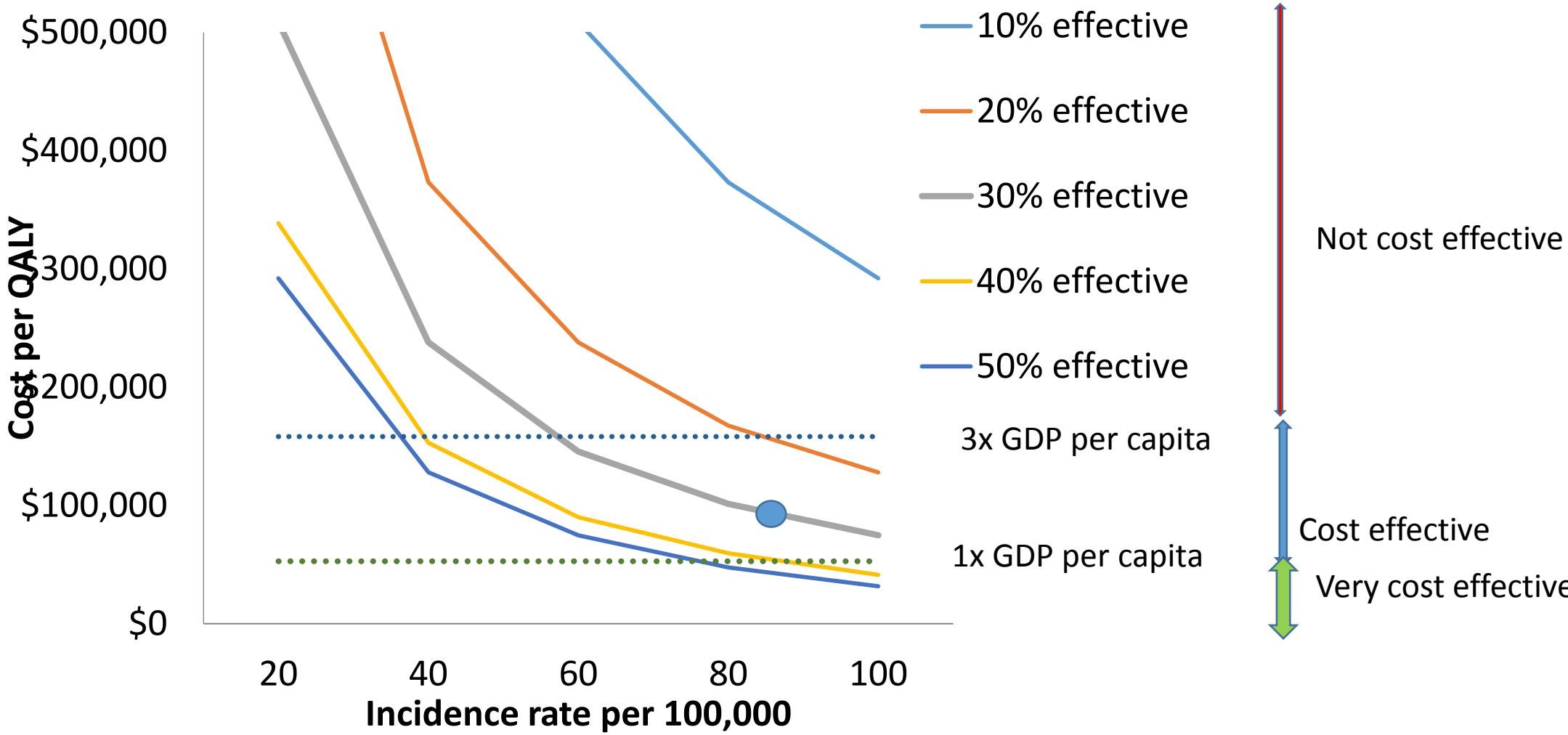
= 28 QALYs per million dollars spent on a medicine

WHO criteria:

- < 1 x GDP per capita = 'very cost effective' [GDP per capita = $52,735]
- 1 to 3 x GDP per capita = 'cost effective'

Annual cost per child	Effectiveness of school-based service				
	10%	20%	30%	40%	50%
	Cost per case averted				
$150	$761,013	$335,128	$174,816	$96,951	$52,124
$200	$1,316,491	$629,204	**$367,097**	$239,788	$168,387
$250	$1,871,969	$923,281	$559,378	$382,625	$284,649
$300	$2,427,447	$1,217,357	$751,659	$525,462	$400,912
	Cost per RHD death averted				
$150	$3,424,560	$1,899,057	$1,136,306	$678,655	$373,555
$200	$5,924,210	$3,565,491	**$2,386,131**	$1,678,515	$1,206,771
$250	$8,423,861	$5,231,924	$3,635,956	$2,678,375	$2,039,988
$300	$10,923,511	$6,898,358	$4,885,781	$3,678,235	$2,873,205
	Cost per QALY gained				
$150	$195,689	$81,388	$42,879	$24,066	$12,735
$200	$338,526	$152,807	**$90,043**	$59,522	$41,140
$250	$481,363	$224,225	$137,206	$94,978	$69,545
$300	$624,201	$295,644	$184,369	$130,434	$97,950

Cost per QALY as a function of ARF incidence rate and service effectiveness assuming a cost of $200 per child per year



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• Affordable?	• Yes, but high opportunity cost
• Value for money?	• Maybe: depends on effectiveness and cost (better information needed)

CONCLUSIONS

- The school RFPP is costly, so the opportunity cost is high
- It is likely to be moderately effective
  - More research is required
- There is much uncertainty in costs and effectiveness
- If it is 30% effective
  - it would be ‘cost effective’ but not ‘very cost effective’ by WHO standards
  - it would not be cost effective by PHARMAC’s standards
- Future directions (if funded!)
  - Re-measure effectiveness over a longer time period
  - Obtain more accurate costings
  - Repeat the analysis