

Cancer Care Coordinator (CCC) services in colon cancer: economic evaluation using discrete event simulation modelling

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Cancer Care Coordinator (CCC) services in colon cancer

Structure of presentation:

- Cancer care coordinator (CCC) intervention
- Modelling approach
- Input parameters and assumptions
- Results
 - Overall
 - Parameter uncertainty and heterogeneity
 - By socio-demographics
- Implications

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New Zealand context for CCC

- Cancer Care Coordinators (CCC) part of a NZ-wide strategy to improve access to, and the quality of, supportive care for cancer patients
- 2012 NZ Budget allocated \$33 million for better and faster services for cancer patients
 - \$16 million for care coordination nurses



Definition of the Problem

- Cancer patients can be treated by many, many different physicians, nurses and support workers during their cancer journey
- Patient anxiety and confusion
- Tasks (e.g. referrals) may be either neglected or replicated unnecessarily
- Patients can “fall through the gaps”

Intervention definition

The role of the cancer care coordinator (CCC) is to:

- act as a point of contact for patients and healthcare staff
- work with individual patients and their whānau (family) to provide information and support, and navigate them through the health system
- connect patients with necessary health services
- coordinate and track referrals and appointments
- act on delays in diagnosis and treatment

Economic evaluation of CCCs

Model population

- Colon cancer (Stage III)

Setting

- Hospital care

Perspective

- Health system (productivity costs excluded)

Year

- 2011

Time horizon

- Lifetime (age 110 years or death)
- Discounting 3% p.a. on costs and benefits

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Economic evaluation of CCCs contd

Intervention

- CCC clinical nurse specialist
- Diagnosis → surgery → chemotherapy

Comparator

- Ad hoc care coordination activities provided by various health personnel within the health sector in 2011 in the absence of a specified CCC role
- No one individual being responsible for tracking referrals and appointments and acting on delays

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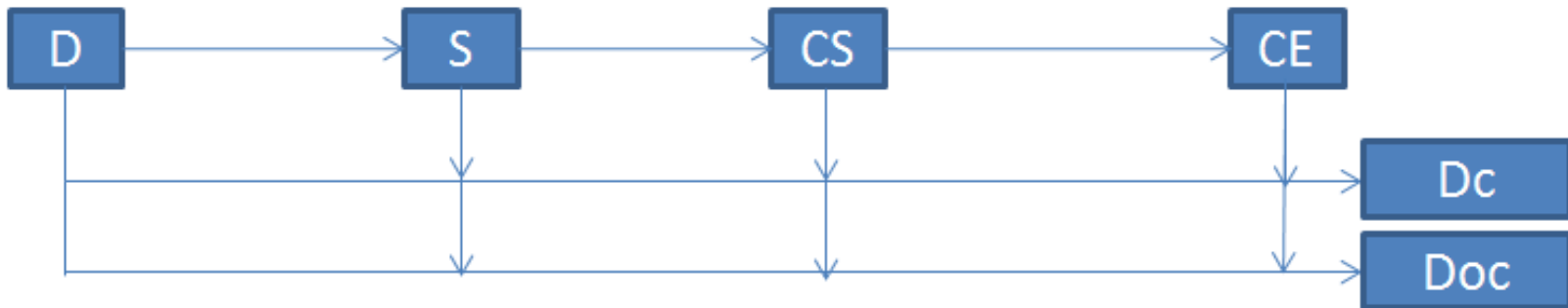
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CCC modelling approach

Discrete event micro-simulation; “time to event”

Competing discrete events occur at times randomly selected from pre-specified distributions

D = diagnosis; S = surgery; CS/CE = chemotherapy starts/ends; Dc = death from cancer; Doc = death from other causes



Methodology

Methodology as per Burden of Disease Epidemiology, Equity and Cost-Effectiveness (BODE3) programme protocols

<http://www.otago.ac.nz/wellington/research/bode3/>

Outcome

Health-Adjusted Life-Years (HALYs)

- Similar to QALYs but using complement of disability weights
- Allow for expected background morbidity (ethnic and age-specific pYLDs)

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Methodology: data sources

- Excess mortality rates (EMR) for stage III colon cancer from New Zealand cancer registry, varying by socio-demographic strata
- Mortality rates from New Zealand lifetables incorporating heterogeneity by socio-demographic strata
- Disability weights from 2010 Global Burden of Disease Study (NZ adaptation)
- Effect size of intervention from literature search and expert knowledge

Methodology: costs

- Health system costs from integrated Ministry of Health datasets of costs for New Zealand population
- Intervention costs from resource use survey and activity costing

Key input parameters

I. Effects on survival due to improved timeliness

I. Reduced time to surgery

- 0.2 days (sd 0.06)
- Associated with EMR reduction 0.997 (0.995 to 0.999)

II. Reduced time to chemotherapy

- 0.2 days (sd 0.06)
- Associated with EMR reduction 0.995 (0.994 to 0.997)

Key input parameters

2. Effects on survival due to increased coverage of chemotherapy

- Proportion previously surgery only who will now receive chemo 0.33 (sd 0.15)
- HR for chemo 0.77 (0.62 to 0.84); plus oxaliplatin 0.80 (0.66 to 0.98)

4. (Modest) improvements in patient quality of life

- RR for disability weight in diagnosis and treatment phase 0.67 (0.45 to 1.00)

Key input parameters: Costs

4. Costs

- CCC pre-surgery \$64 (sd \$18)
- CCC surgery to chemo \$5 (sd \$8)
- Social worker referrals \$402 (sd \$40)
- Dietician referrals \$116 (sd \$12)
- Increased chemotherapy costs \$17,812 (sd \$1781)

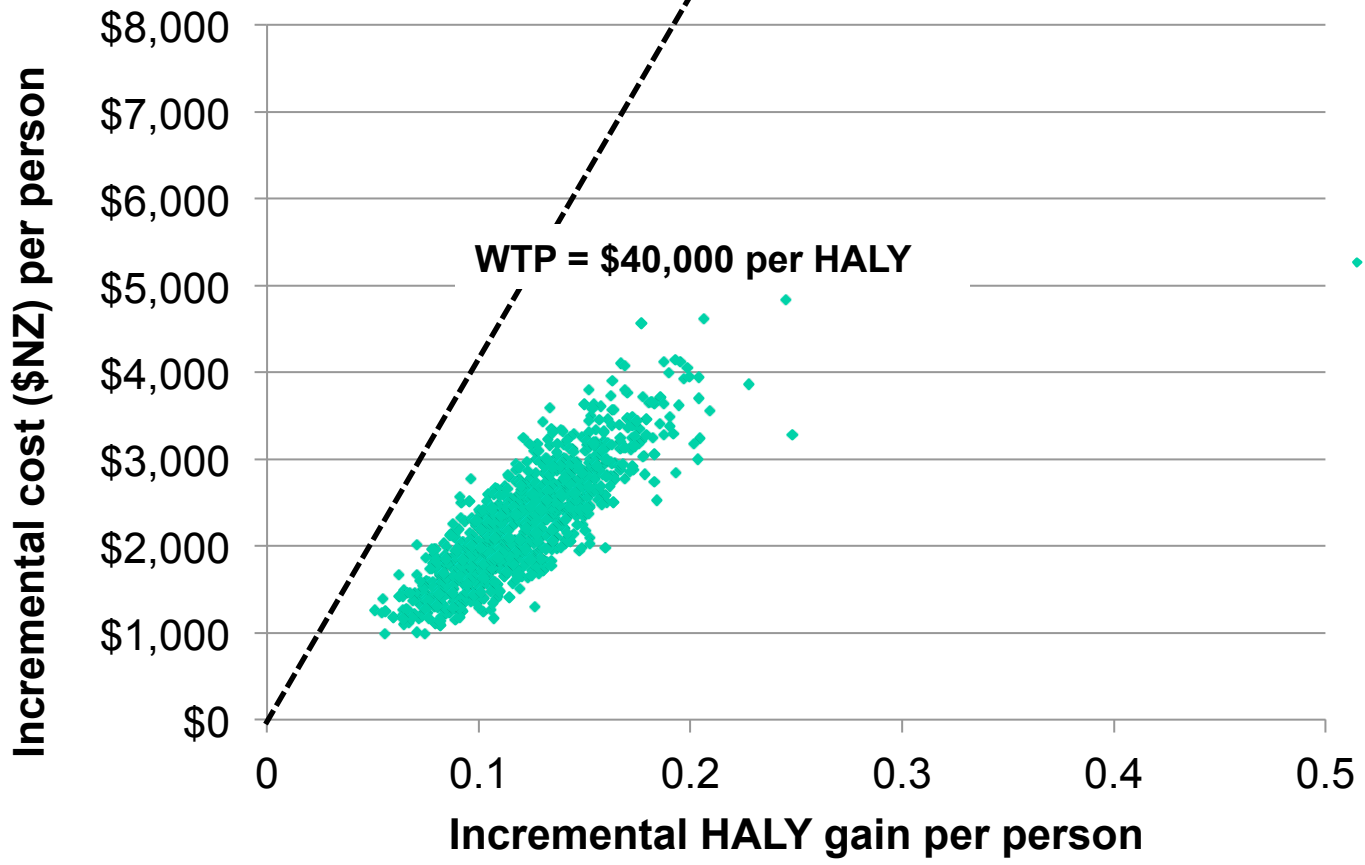
CCC results: cost-effectiveness planes

1. Averaged across heterogeneity and stochastic variation
 - shows parameter uncertainty only

2. Averaged over stochastic variation only
 - shows both parameter uncertainty and heterogeneity

Averaged across heterogeneity and stochastic variation

Total stage III colon cancer population



- Averaged over heterogeneity and stochastic variation, parameter uncertainty shown



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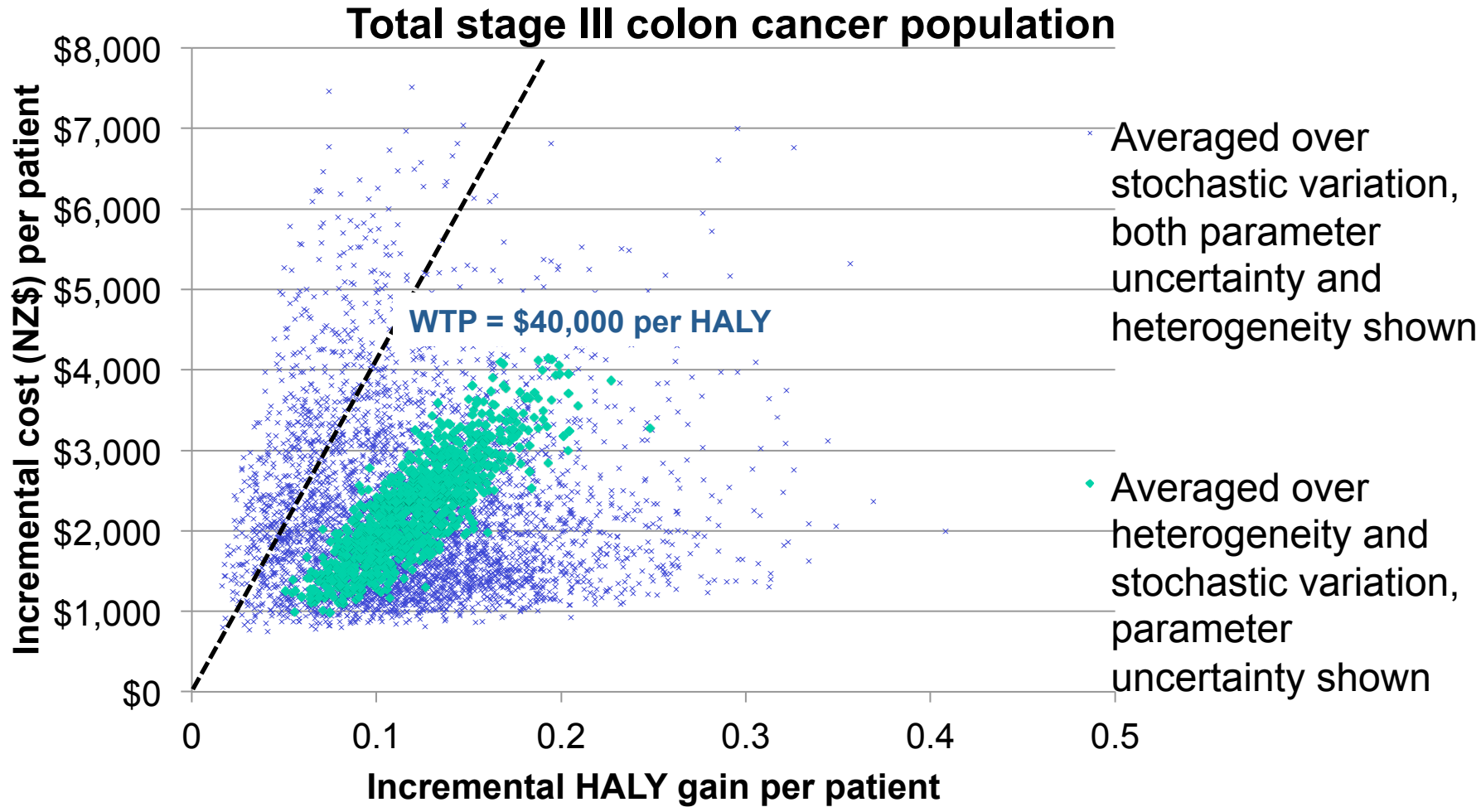
CCC results – Overall

	Incremental costs	Incremental HALYs	ICER (NZ\$ per HALY)
Averaged over heterogeneity and stochastic variation; parameter uncertainty only (Monte Carlo Simulation)			
Mean	\$ 2,271	0.121	\$ 18,881
2.5%	\$ 1,225	0.070	\$ 13,442
Median	\$ 2,226	0.119	\$ 18,786
97.5%	\$ 3,641	0.185	\$ 24,610

Conclusion

•Using ‘rule of thumb’ of GDP per QALY/HALY as threshold, CCC for stage III colon cancer appear cost-effective for all colon cancer patients combined – with good certainty.

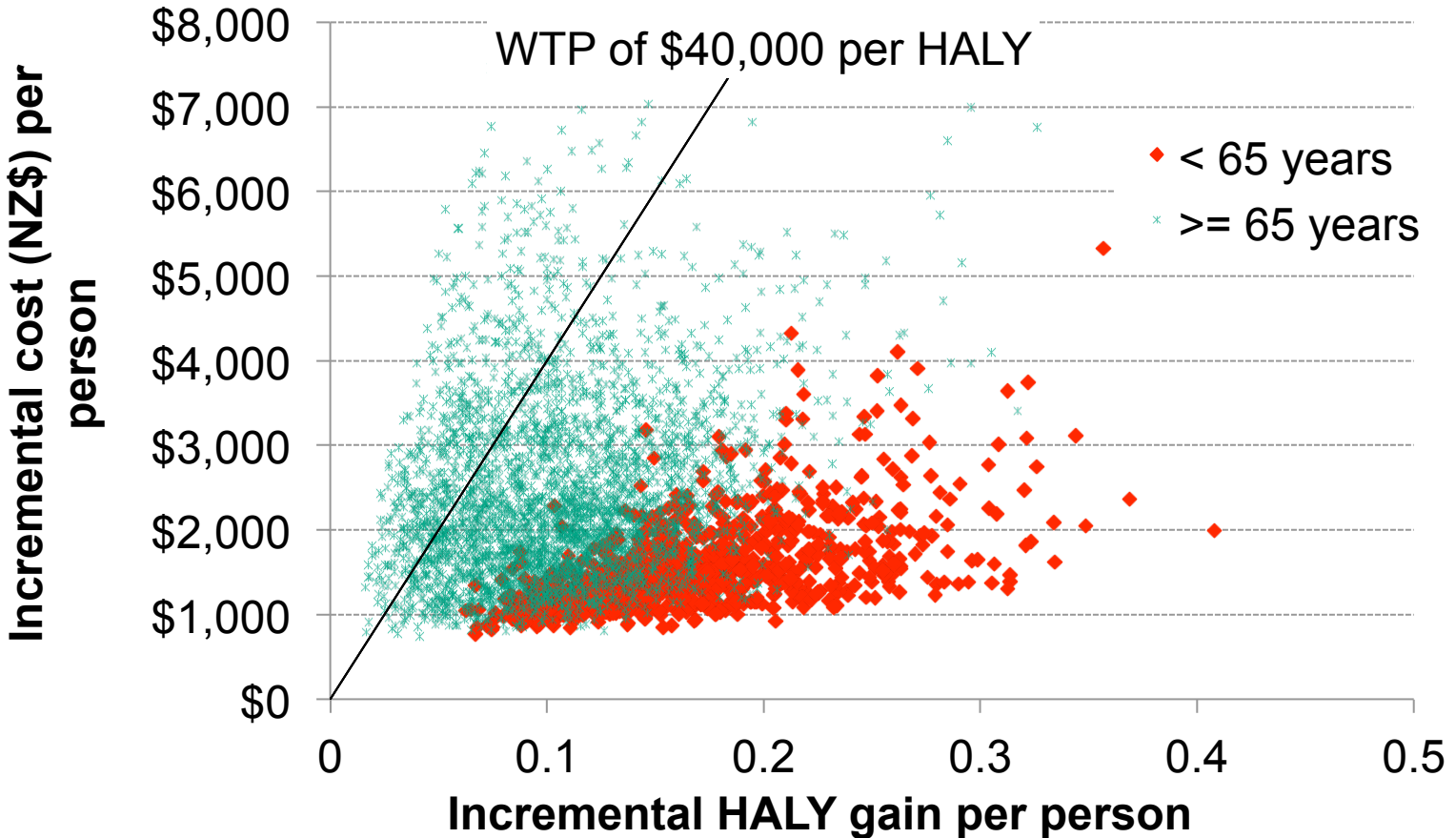
Showing both parameter uncertainty and heterogeneity



Conclusion:

There is substantial variation in HALYs gained, incremental cost and ICER across socio-demographics (i.e. heterogeneity)

Both heterogeneity and parameter uncertainty; by age



CCC results – by socio-demographics

Expected parameter value analysis

Population	Net cost per patient	HALYs gained per patient	ICER
Total	\$2250	0.111	\$20,200
By sex			
Males	\$2050	0.118	\$17,400
Females	\$2520	0.121	\$20,800
By age			
< 65 years	\$1620	0.172	\$9,400
≥ 65 years	\$2490	0.106	\$23,600
By ethnicity by age			
Māori	\$3420	0.171	\$20,000
< 65 years	\$2810	0.223	\$12,600
≥ 65 years	\$3730	0.147	\$25,300
Non-Maori	\$2220	0.118	\$18,800
< 65 years	\$1510	0.167	\$9,000
≥ 65 years	\$2420	0.104	\$23,300

Scenario analyses (selected)

	Inc Cost	Inc HALYs	ICERS
Set population morbidity (i.e. pYLDs) to zero (\approx QALYs)	\$2,250 (0%)	0.152 (37%)	\$14,800 (-27%)
Set all DWs (incl. pYLDs) to zero (= 'life years' gained)	\$2,250 (0%)	0.150 (35%)	\$15,000 (-26%)
Exclude improved quality of life impact of CCC	\$2,250 (0%)	0.100 (-10%)	\$22,400 (11%)
Exclude improved survival due to reduced time to surgery	\$2,240 (0%)	0.107 (-4%)	\$21,000 (4%)
Exclude improved survival due to reduced time to chemotherapy	\$2,130 (-5%)	0.084 (-24%)	\$25,200 (25%)
Exclude increased chemotherapy coverage	\$800 (-64%)	0.061 (-45%)	\$13,000 (-36%)

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Limitations

- Lack of established definition of CCC in New Zealand
- Limited information available on effect of CCC on timeliness, and effect of timeliness on survival
- Limited information on effects of CCC on chemotherapy coverage
- Addressed through:
 - expert knowledge elicitation
 - probabilistic sensitivity analysis with wide uncertainty
 - various scenario analyses -- ICERs consistently below \$25,000 per HALY

Implications contd

- CCC appear cost effective for stage III colon cancer patients, and more so for younger people
- In well-functioning existing cancer services (well coordinated, good timeliness), there will be less to gain from CCC
- If CCC resources are stretched, direct them first to:
 - Younger patients
 - Working on increasing coverage of known effective interventions, and time to these interventions

Acknowledgements

This work was performed as part of the Burden of Disease Epidemiology, Equity and Cost-Effectiveness (BODE3) programme

<http://www.otago.ac.nz/wellington/research/bode3/>



BODE3 receives funding from the New Zealand Health Research Council

BODE3 acknowledges the support of the New Zealand Ministry of Health in providing access to data



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