Should you screen for Colorectal Cancer (CRC) in your country?

A Global Cost-Utility Analysis

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Should you screen for Colorectal Cancer (CRC) in your country?

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Based on two studies carried out for the WHO.
ANSWER is always

It depends on availability, incidence, costs and efficacy of screening and treatment.
COST-UTILITY RATIO = net cost per averted Disability Adjusted Life Year (DALY)

\[
\text{Intervention COST} - \text{Rx SAVINGS*} = \text{Averted DALYs**}
\]

* Rx without program less Rx costs with program

* * mortality + morbidity gains
WHO rules of thumb

Cost Saving: \( \text{Treatment savings} > \text{Intervention Costs} \)

Very Cost Effective: \( \text{CpDALY} < \text{GNP per capita} \)

Cost Effective: \( \text{GNP per capita} < \text{CpDALY} < 3 \times \text{GNP per capita} \)

NOT Cost Effective: \( \text{CpDALY} > 3 \times \text{GNP per capita} \)
Incidence of CRC per 100,000

Incidence is highly correlated with the degree of economic development.
% Receiving Treatment (2000) by WHO region

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Modeling

Very few Randomised Controlled Trials of Colorectal-screening :-
Unlike Pharmaceutical Industry, there are few industrial incentives to fund trials, which in any case would take 8-15 years to report results.

Rely on Models : INTEGRATING EPIDEMIOLOGICAL, MEDICAL, ECONOMIC, DEMOGRAPHIC, BIOLOGICAL DATA--

Model polyp maturation time (range 5-39 years) and Sensitivity & specificity of screening interventions (USA Office of Health Technology, Wagner et al 1996).
Treatment Interventions

- Surgery (Stages I-III)
- Radiotherapy (Stages II-III)
- Chemotherapy (Stages II-III).

Quantities obtained from USA Medicare data by stages

Age-specific coverage from WHO Global Burden of Disease estimates.
Screening Interventions: (ages 50-80) or one-off age 50

- Fecal Occult Blood Test (FOBT) – annually or bi-annually
- Sigmoidoscopy (SIG) - 5 years
- FOBT annually & SIG every 5 years
  followed by Colonoscopy on positives
- Colonoscopy (COL) - 10 years, can remove polyps during same examination

1. Increases survival time due discovering cancers at earlier stages
2. Decreases cancer incidence due to removal of polyps
Predicted Decrease in Incidence from screening Males aged 50-80

MODELS

FOBT1
SIG5
COL10
FOB1SIG5
FOBT2
DRECT5
Predicted Decrease in Incidence from one-off screening of Females aged 50
Predicted Decrease in Case Fatality Rates from screening Males aged 50-80
States:

- Can are cancers stages I-IV
- S are cancer survivors w & w/o sequelae
- S are "susceptibles"
- D are "persons who died"

Transitions:

- ix1 is cancer incidence rate
- fx is case fatality from Cancer
- rx1 is Cancers remission rate
- m is "background mortality" (excluding fx)
Disability Weights (DW) of Cancer

Calculated from weighted time of stay in the following stages:

DIAGNOSIS & Rx (DW=0.2)
WATCHFUL WAITING (DW=0.2)
METASTESIS (DW=0.75)
TERMINAL (DW=0.81)
From Permanent Colostomy (DW=0.21 over lifetime) as a result of

a) perforation during colonoscopy (incidence=1.28/1000) plus mortality losses (incidence 0.128/1000)

b) surgical intervention for treatment of cases (incidence= 9.2%)
DiagnosCc
Colonoscopy Costs

Colonoscopy

Labour & Facility Costs vary
Drugs & Medical Devices are similar
RESULTS: AMRA:(USA&CANADA) Incremental Cost Effectiveness Ratio (ICER) of adding screening to 100% Treatment levels using 3% discount rate (GNP per capita $32,000: yr 2000 prices)

No Sig Diff between Interventions

Range of Costs per Life Year (US$ in 2000) Estimates from Literature

- Cost-Saving
- $0 - $5k
- $5k - $10k
- $10 - $20k
- $20k +
COST per DALY ($)

Neurosurgery for Brain Tumor $173,000

Lower CHOL by drugs
Breast Ca Screening
Kidney Transplant
Hip replacement
GP smoking cessation
Lower CHOL by diet

DIFFERENT METHODOLOGIES

COLRECTAL CANCER SCREENING
Adding any screening programme to the current high treatment levels will be very cost-effective.
SEARD region (GDP per capita $1,990) (2005 price levels)

<table>
<thead>
<tr>
<th></th>
<th>Cost per million</th>
<th>Averted DALYS per million</th>
<th>ICER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rx Only</td>
<td>$310,000</td>
<td>868</td>
<td>$362 very cost-effective</td>
</tr>
<tr>
<td>Sigmoidoscopy age 50 + Rx</td>
<td>$510,000</td>
<td>891</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$200,000</td>
<td>23</td>
<td>$8,695 not cost-effective</td>
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TREAT don’t SCREEN
**AFRE region (GDP per capita $2,154)**

<table>
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<th>Cost per million</th>
<th>Averted DALYS per million</th>
<th>ICER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rx Only</td>
<td>$350,000</td>
<td>1,031</td>
<td>$337 very cost-effective</td>
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<tr>
<td>Colonoscopy age 50 + Rx</td>
<td>$650,000</td>
<td>1,151</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$300,000</td>
<td>120</td>
<td>$2,500 cost-effective</td>
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TREAT then maybe SCREEN

FIRSTLY Provide Treatment Facilities

.....

If extra resources become available.... once in a lifetime screening may be cost-effective in some regions

- Need analysis by country as decisions are made at country and not regional level
Suggested thresholds ???

Colonoscopy every ten years or one-off at age 50 is not cost-effective

- IF Incidence Rate is less than 14/100,000
- IF GNP per capita is less than 7333$ at 2014 prices.
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