Racial and ethnic colorectal cancer patterns affect the cost-effectiveness of colorectal cancer screening in the United States

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**Record Status**
This is a critical abstract of an economic evaluation that meets the criteria for inclusion on NHS EED. Each abstract contains a brief summary of the methods, the results and conclusions followed by a detailed critical assessment on the reliability of the study and the conclusions drawn.

**Health technology**
The health interventions examined in the study were two programmes for screening for colorectal cancer (CRC): annual faecal occult blood testing (FOBT) and flexible sigmoidoscopy (FS) every 5 years versus colonoscopy (COL) every 10 years starting at age 50 years and ending at age 85 years.

**Type of intervention**
Screening.

**Economic study type**
Cost-effectiveness analysis.

**Study population**
The study referred to the hypothetical general population of individuals at average risk for CRC. Average risk was defined by exclusion as individuals without a personal or family history of CRC, adenomatous polyps, or inflammatory bowel disease. Sub-group analysis was conducted on Asians, blacks, Latinos and whites.

**Setting**
The setting was primary care. Data for the model input parameters were derived from sources in the USA.

**Dates to which data relate**
The effectiveness evidence was gathered from economic modelling studies published between 1996 and 1998. The primary studies would have pre-dated these. The price year was not reported and no dates for resource consumption were given.

**Source of effectiveness data**
The effectiveness evidence came from a review of published studies.

**Modelling**
A previously published decision model was used to calculate the costs and benefits of the screening programmes in a cohort of 100,000 individuals aged 50 years over a period of 35 years. The model was populated with assumptions on effectiveness and cost data derived from published evidence.

**Outcomes assessed in the review**
The model input parameters were taken from a previous model (see "Other Publications of Related Interest" below) apart from the data on the racial and ethnic sub-groups. Selected model inputs were years required for a new invasive
cancer to progress to late-stage cancer; years before late-stage CRC is detected; proportion of cancers detected in the early stage; sensitivity for polyps and CRC and specificity of FOBT; sensitivity and specificity of FS and COL; rate of colonoscopy-induced perforation of the large bowel, and COL-induced mortality. Additional to the initial model, racial and ethnic differences in colorectal cancer incidence, the proportion of left-sided cancers, and the proportion of early cancers were included.

**Study designs and other criteria for inclusion in the review**

The study designs of the primary studies were not reported. However two data sources were mentioned: the California Cancer Registry, and the Surveillance, Epidemiology and End Results (SEER) Cancer Incidence Public-Use Database 1973-1996.

**Sources searched to identify primary studies**

Not stated.

**Criteria used to ensure the validity of primary studies**

Not stated.

**Methods used to judge relevance and validity, and for extracting data**

Not stated.

**Number of primary studies included**

Not stated.

**Methods of combining primary studies**

Not stated.

**Investigation of differences between primary studies**

Not stated.

**Results of the review**

It was estimated that it would take 2 years for a new invasive cancer to progress to late-stage cancer.

It was estimated that it would take 2 years before late-stage CRC is detected.

The proportion of cancers detected in the early stage was estimated to be between 33% and 36%.

The sensitivity of FOBT was 10% for polyps and 60% for CRC.

The specificity of FOBT was 90%.

The sensitivity and specificity of FS/COL were 90% and 98%, respectively.

The rate of COL-induced perforation of the large bowel was 7 in 10,000.

The COL-induced mortality was 5 in 100,000.

The California Cancer Registry estimates (SEER estimates in brackets) of the proportion of Colorectal Cancers occurring before age 50 were 13 (8.6) for Asians, 10.7 (10.6) for blacks, 13.7 (11.1) for Latinos and 5.4 (5.5) for
whites.

The average annual age-specific CRC incidence rates per 100,000 persons ranged from 18.4 at 45 years to 371 at 85 years for Asian patients, from 23.2 to 482 for black patients, from 10.2 to 272 for Latino patients, and from 16.0 to 493 for white people.

**Measure of benefits used in the economic analysis**
The benefit measure used in the economic analysis was life-years saved with the screening strategy. It was derived from the decision model. Future benefits were discounted at 5% per year.

**Direct costs**
Please see "Other Publications of Related Interest" below for references with more information. A 5% discount rate was used because the costs were incurred over a period of time longer than two years. Unit costs were not reported separately from quantities of resources used. The health service costs included in the economic evaluation were FS, COL, FOBT, treatments of patients with early cancer, late cancer, colonoscopy-induced perforation, and treatment of patients who died after COL. The cost/resource boundary adopted in the analysis was not reported. No source was reported for either cost or resource use data. Total costs were calculated using the decision model. No price year was reported.

**Statistical analysis of costs**
Costs were treated deterministically.

**Indirect Costs**
Indirect costs were not included.

**Currency**
US dollars ($).

**Sensitivity analysis**
The authors assessed the impact of varying the polyp incidence rate on the estimated cost-effectiveness ratios.

**Estimated benefits used in the economic analysis**
The life years saved with the screening programmes were not reported. Only cost-effectiveness ratios were reported: see "Synthesis of costs and benefits" below.

**Cost results**
Not reported.

**Synthesis of costs and benefits**
Average cost-effectiveness ratios were calculated to combine the costs and benefits of the two screening programmes. No incremental analysis was performed.

The average cost per life year saved with annual FOBT/FS (compared to 'do nothing'), assuming 5-year polyp dwell (and 10-year polyp dwell), was $18,888 ($17,415) for Asian patients, $13,338 ($11,844) for black patients, $25,598 ($23,578) for Latino patients, and $15,524 ($13,756) for white patients. The authors noted that "cost-effectiveness estimates for blacks would have been even lower had not the life expectancy estimates for this group been lower than
for the others”.

The cost per life year saved with COL every 5 years assuming 5-year polyp dwell (and 10-year polyp dwell), was $33,334 ($16,198) for Asian patients, $21,595 ($9,777) for black patients, $42,311 ($22,301) for Latino patients, and $26,297 ($11,842) for white patients.

The variation in polyp incidence rate did not greatly affect the study results. The authors stated that 35-year screening programmes beginning in blacks at age 42 years, in whites at age 44 years, and in Asians at age 46 years were more cost-effective than a 35-year screening programme starting in Latinos at age 50 years.

**Authors’ conclusions**

The authors concluded that "estimates of cost-effectiveness of screening each racial or ethnic group with sigmoidoscopy and FOBT or colonoscopy starting at age 50 were within the $40,000-$60,000 per year-of-life-saved upper cost limit considered acceptable for preventive strategies". Generally, screening was more cost-effective among blacks, followed by whites, Asians, and Latinos. This order reflected the average annual age-specific CRC incidence rates.

**CRD COMMENTARY - Selection of comparators**

The authors did not discuss the choice of the interventions that were compared in the analysis. Other technologies and other combinations of technologies were available for the screening of CRC. You, as a user of this database, should decide whether FS/FOBT and COL are widely used health interventions in your own setting.

**Validity of estimate of measure of effectiveness**

The analysis of effectiveness was based on data derived from published studies and databases. The designs of the primary studies were not reported and it was not clear whether the authors considered the impact of differences across primary studies when estimating the effectiveness.

**Validity of estimate of measure of benefit**

Life years were used as the benefit measure in the economic analysis and were obtained from a decision model the details of which were published in a different paper. Discounting was relevant because the horizon of the study was 35 years. The use of life years enhances the comparability of the benefits of the study interventions with those of other health problems. It would have been useful to have reported them.

**Validity of estimate of costs**

The perspective adopted in the study was not stated and it was not clear whether all relevant categories of costs were included in the analysis. Overall, few details were reported since the model was derived from another paper. Unit costs and the quantities of resources used were not analysed separately and the sources of cost and resource consumption data were not reported. The price year was not given, thus making reflation exercises in other settings difficult. Costs were treated deterministically and were quite specific to the study setting.

**Other issues**

The authors did not carry out a systematic comparison of their findings with those from other studies and did not perform sensitivity analyses. As a result, the external validity of the analysis is quite low. The study used data from the state of California, and thus the conclusions of the study may not be generalisable to the whole US population. The authors noted that their model did not discriminate between patients of high, moderate, or average risk for CRC. The authors discussed the appropriate use of FS in relation to racial and ethnic CRC patterns.

**Implications of the study**
The study discussed the cost-effectiveness of CRC screening in racial and ethnic groups, but the authors pointed out that a preliminary key issue was whether eligible Americans do undergo screening for CRC. Thus the main implication of the study was that screening should be encouraged among those patients who may receive the greatest benefits from the intervention.

**Source of funding**
Supported by grant KO7CA74974 from the National Cancer Institute and a grant from the V Foundation (Cary, NC) (to CPT).

**Bibliographic details**

**PubMedID**
11231939

**Other publications of related interest**


**Indexing Status**
Subject indexing assigned by NLM

**MeSH**
Adult; African Americans; Aged; Aged, 80 and over; Colorectal Neoplasms /diagnosis /ethnology; Cost-Benefit Analysis; Ethnic Groups; European Continental Ancestry Group; Humans; Mass Screening /economics; Middle Aged; Registries; United States

**AccessionNumber**
22001000609

**Date bibliographic record published**
31/10/2003

**Date abstract record published**
31/10/2003