

Cancer Care Ontario

The use of colorectal cancer mortality as an endpoint for survival and screening evaluation:

Is Ontario's data up to the challenge?

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Outline

- When cause of death matters
- Issues with cause of death coding
- The cause-specific death classification (Howlader et al)
- What does Ontario's data show?
- Conclusions & next steps

When cause of death matters...

- When measuring progress of population-based screening programs

- **“The goal(s) of ColonCancerCheck are :**

- To reduce deaths from colorectal cancer through an organized screening program;...”

-Ontario Ministry of Health website

- When calculating cause-specific survival

- A measure of net survival (cancer survival in the absence of other causes of death)
 - Used when life tables are not available for relative survival

Ontario medical certificate of death (Form 16)

CAUSE OF DEATH			
CAUSE OF DEATH	11. Part I	I	Approximate interval between onset & death
	Immediate cause of death	(a) <i>due to, or as a consequence of</i>	
	Antecedent causes, if any, giving rise to the immediate cause (a) above, stating the underlying cause last	(b) <i>due to, or as a consequence of</i>	
		(c) <i>due to, or as a consequence of</i>	
Part II Other significant conditions contributing to the death but not causally related to the immediate cause (a) above	II		
12. If deceased was a female, did the death occur: <input type="checkbox"/> during pregnancy (including abortion and ectopic pregnancy) <input type="checkbox"/> within 42 days thereafter <input type="checkbox"/> between 43 days and 1 year thereafter			
13. Was the deceased dead on arrival at the hospital? <input type="checkbox"/> Yes <input type="checkbox"/> No		14. Was there a surgical procedure within 28 days of death? <input type="checkbox"/> Yes <input type="checkbox"/> No	15. Date of surgery (m/d/y)
16. Reason for surgery and operative findings			
Autopsy particulars	17. Autopsy being held? <input type="checkbox"/> Yes <input type="checkbox"/> No	18. Does the cause of death stated above take account of autopsy findings? <input type="checkbox"/> Yes <input type="checkbox"/> No	19. May further information relating to the cause of death be available later? <input type="checkbox"/> Yes <input type="checkbox"/> No
Accidental or violent death (if applicable)	20. If accident, suicide, homicide or undetermined (specify)	21. Place of injury (e.g. home, farm, highway, etc.)	22. Date of injury (m/d/y)
	23. How did injury occur? (describe circumstances)		

Extensive literature can be divided into two:

- The certifying physician/coroner
 - Needs complete, accurate information about the deceased's medical history
 - Needs to understand how to fill out the form correctly!
- The vital statistics registrar
 - Needs to have complete, accurate data on the form
 - Needs to understand the ICD coding rules

Percy & Dolman, 1978

- 1,246 cancer-related US death certificates sent to seven countries to code according to ICD-8:
 - England, West Germany, France, Norway, Canada, USSR, US
- Selection of underlying cause of death differed for at least one country in 47% of certificates
- With the US code as the gold standard, differences ranged from 12% (Canada) to 27% (W Germany)
- All countries coded more death certificates to cancer than the US (89.6-93.4 vs. 87.3)

Common problems

1. Determining whether a site is primary or secondary, especially when site is qualified as “metastatic”
2. Interpretation of “Primary site unknown”
3. Relationship of certain diseases, especially heart and other circulatory diseases, to a malignant neoplasm
4. Determining whether a condition in Part I is a complication of a procedure for cancer not mentioned in Part I
5. Multiple sites

Percy & Muir, 1988

- Repeated the study with 6 of the previous countries and the same 1,234 US death certificates

Table 1. Comparison of codes for underlying cause between the six original countries^a

Coded by	% Differences	
	Three-digit level	Four-digit level
ICD-8	47	53
ICD-9	30	38

^a United States, Canada, USSR, England and Wales, France, and Federal Republic of Germany.

- Has this been repeated again for ICD-10?

Defining cancer-specific survival

- Howlader et al created a cause-specific death classification (CSDC) variable based on
 - Cause of death
 - Sequence number (only 1 tumour, or first of 2+ tumours)
 - Site of original cancer diagnosis
 - Co-morbidities
- They used SEER data for 2.3 million patients from 1992 to 2004, followed-up to 2005
 - Excluded DCOs, cases without microscopic confirmation, unknown cause of death, etc.

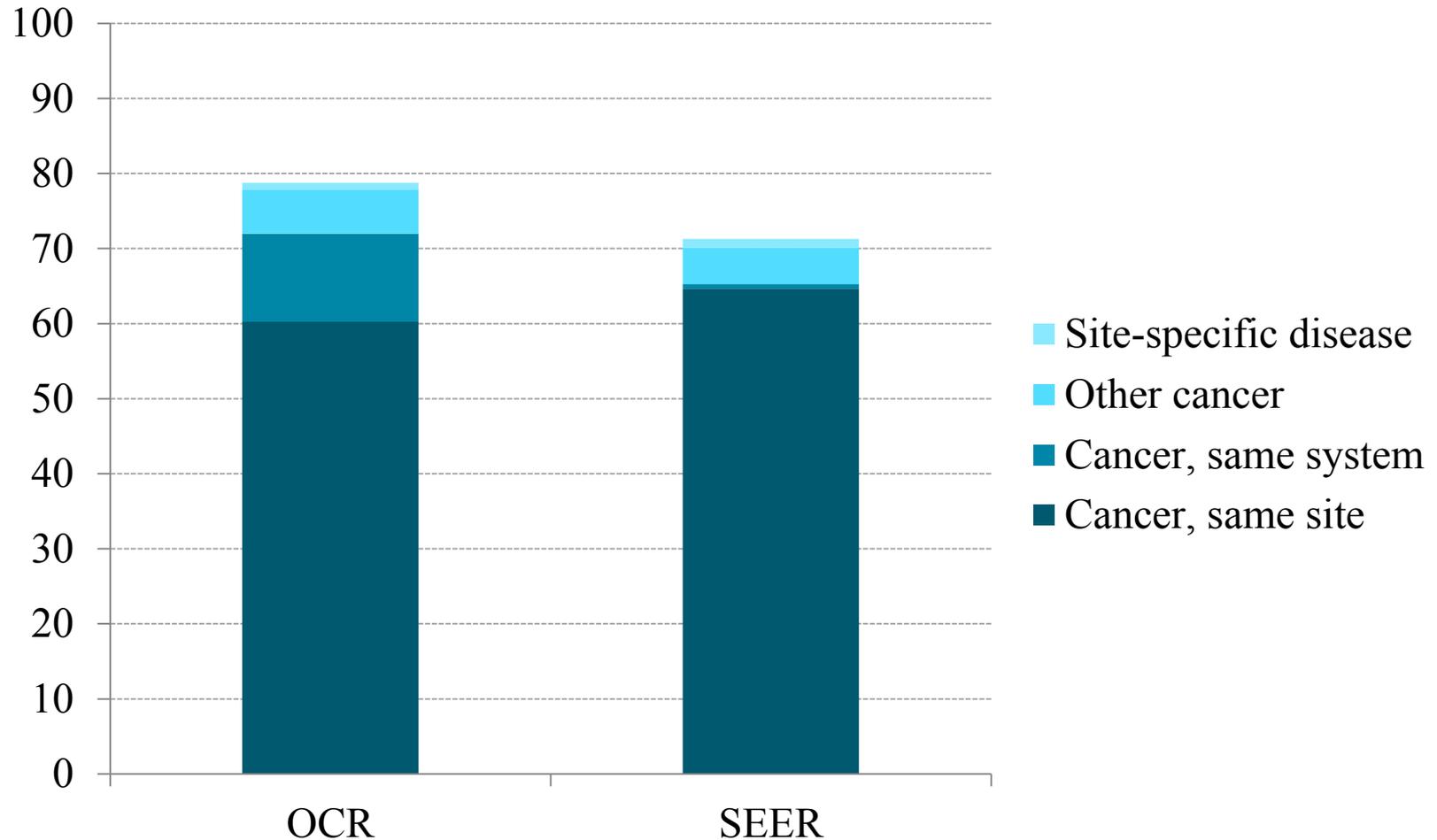
CSDC definition for colorectal, only one tumour

1. AIDS and cancer: B21
2. Cancer of same diagnosis site
 - C18, C19, C20, C78.5, D01.0-D01.2, D12, D37.4, D37.5
3. Cancer of same body system
 - C17, C21, C26, D37.1-D37.3, D37.6-D37.9
4. Any other cancer: C00-D48
5. Site-specific disease
 - K20.0-K31.9, K35.0-K38.9, K51.0-K57.9, K62.0-K63.9, K65.0-K66.9, K92

The Ontario Cancer Registry

- Ontario currently has a population of 12.8 million
 - 38.7% of the Canadian population
- The OCR is population-based
 - Incidence from 1964; mortality from 1950
 - Unique cancer registration methods
 - Passive registration
 - Reliant on administrative records created by others
 - Computerized record linkage and automated medical logic
 - 65,830 malignant incident cases diagnosed in 2009

CSDC agreement for colorectal cancer



37,474 cases in Ontario met criteria for inclusion

Related to cause-/site-specific agreement?

- Sex
- Age at death
- Was the patient seen in a specialized treatment center?
- Was the patient seen for colorectal cancer in a hospital?
- ICD coding system for death
- Autopsy
 - Yes, affected cause; Yes, no effect; No
- Death in hospital
 - Yes, cancer-/site-specific admission; Yes, other admission; No

For cause-specific agreement

- Complicated model, with many interactions!
- Better agreement with
 - Death in hospital with a cancer admission
 - Being seen in a treatment centre for colorectal cancer
 - Younger age at death
 - No autopsy
 - Females
 - Being seen in a hospital for colorectal cancer
 - ICD-9

For site-specific agreement

- Simpler model with no interactions
- Better agreement with
 - Death in hospital with a site-specific admission
 - ICD-10
 - No autopsy
 - Being seen in a treatment centre for colorectal cancer

Back to Problem 4

Problem 4. *Determining whether a condition in Part I is a complication of a procedure for cancer not mentioned in Part I*

CERTIFICATE 517

- I(a) Myocardial infarction (immediate)
- II Post operative left pneumonectomy cancer lung

Four countries selected lung cancer from Part II of certificate 517 as the underlying cause of death, and three countries coded the heart disease.

Proposed solution. The new rules state (2d):

Certain conditions that are common post-operative complications (pneumonia (any type), haemorrhage, thrombophlebitis, embolism, thrombosis, infarction) can be considered as direct sequels to an operation unless it is stated to have occurred 4 or more weeks before death.

Welch & Black, 2002

- Decided to see how cause of death had been attributed in patients who died within 1 month of cancer-directed surgery
- Analyzed SEER patients diagnosed 1994-1998 with one of 19 cancers who died within one month of diagnosis and had received cancer-directed surgery.
- Found that among the 4,135 patients meeting this criteria, the proportion not attributed to cancer was 41%, and ranged from 13% (cervical) to 81% (laryngeal).
- For colorectal, the proportion was 42% (719/1,695).

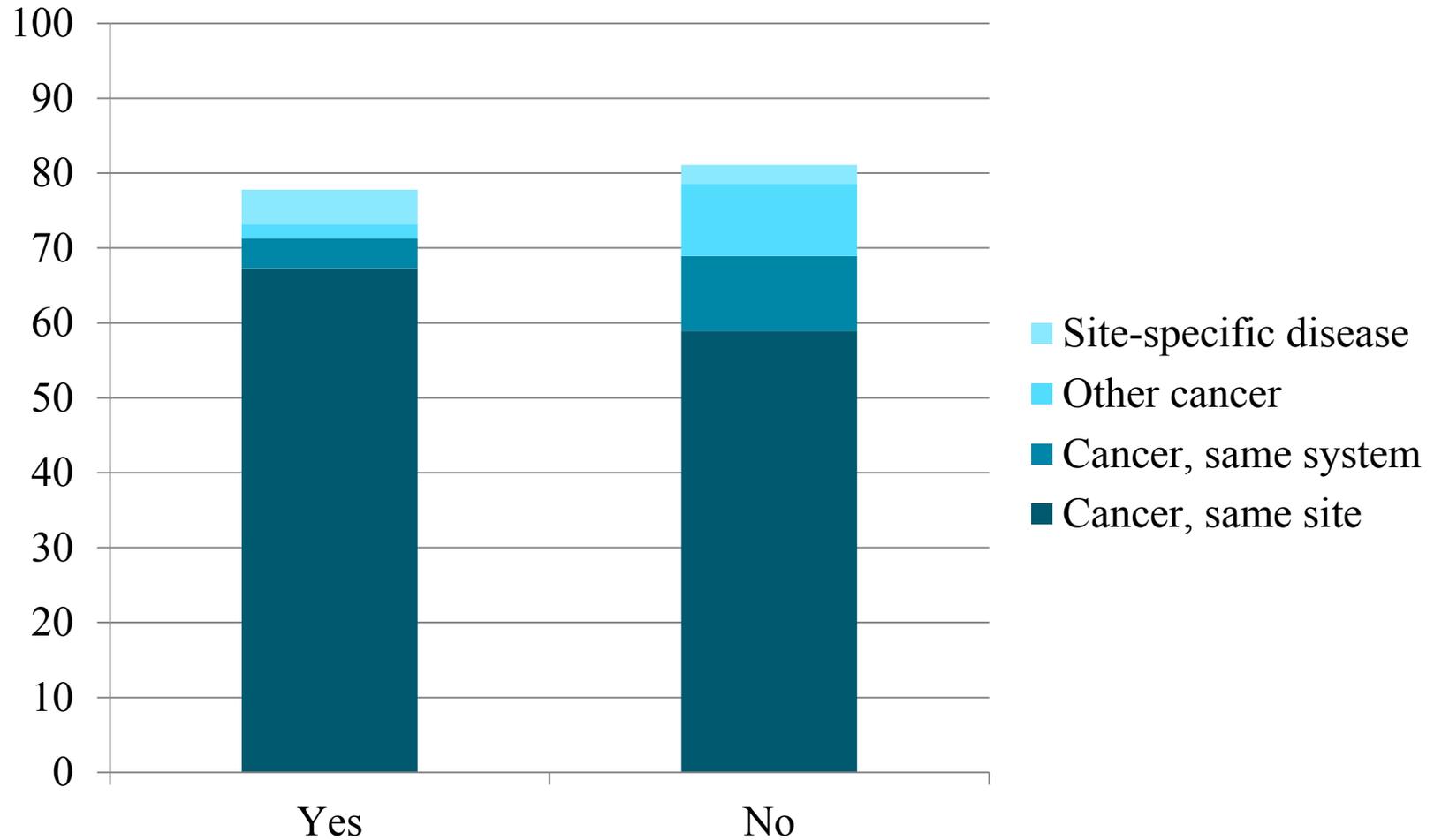
Ontario treatment data

- Treatment data in the OCR has been coded according to the Canadian Classification of Health Interventions (CCI) since April 2002.
- CCO has its definition of colorectal cancer-directed surgery; independently, the International Cancer Benchmarking Partnership (ICBP) reviewed the CCI codes and created its own definition. They have been combined.
 - Both lists: 34
 - CCO only: 18
 - ICBP only: 6

Ontario results

- 433 colorectal cancer patients were diagnosed between April 2002 and November 2009 and died within 30 days of their diagnosis.
- Of these, 153 (35%) had colorectal cancer-directed surgery.
- Of these, 119 (78%) had CSDC agreement.
 - Circulatory system was given as the cause of death for 53% of those disagreeing.

Cancer-directed surgery?



Is Ontario's Data up to the Challenge?

- Given the high percentage of cases with system-specific deaths codes, CCO should consider using the CSDC proposed by Howlader et al for screening evaluation.
- Among cases with strong evidence that their death should be coded to colorectal cancer, there still exists disagreement.
- These analyses should be repeated for other cancers, especially breast, lung, prostate and cervix.

References

- Howlader N, Ries LA, Mariotto AB, Reichman ME, Ruhl J, Cronin KA (2010). Improved estimates of cancer-specific survival rates from population-based data. *JNCI* 102(20):1584-98.
- Percy C, Dolman A (1978). Comparison of the coding of death certificates related to cancer in seven countries. *Public Health Reports* 93(4) 335-50.
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- Welch HG, Williams CB (2002) Are deaths within 1 month of cancer-directed surgery attributed to cancer? JNCI 94(14): 1066-70.

Colorectal cancer

