

**AN EMPIRICAL EVALUATION OF
PERIOD SURVIVAL ANALYSIS
USING DATA FROM THE CANADIAN
CANCER REGISTRY**

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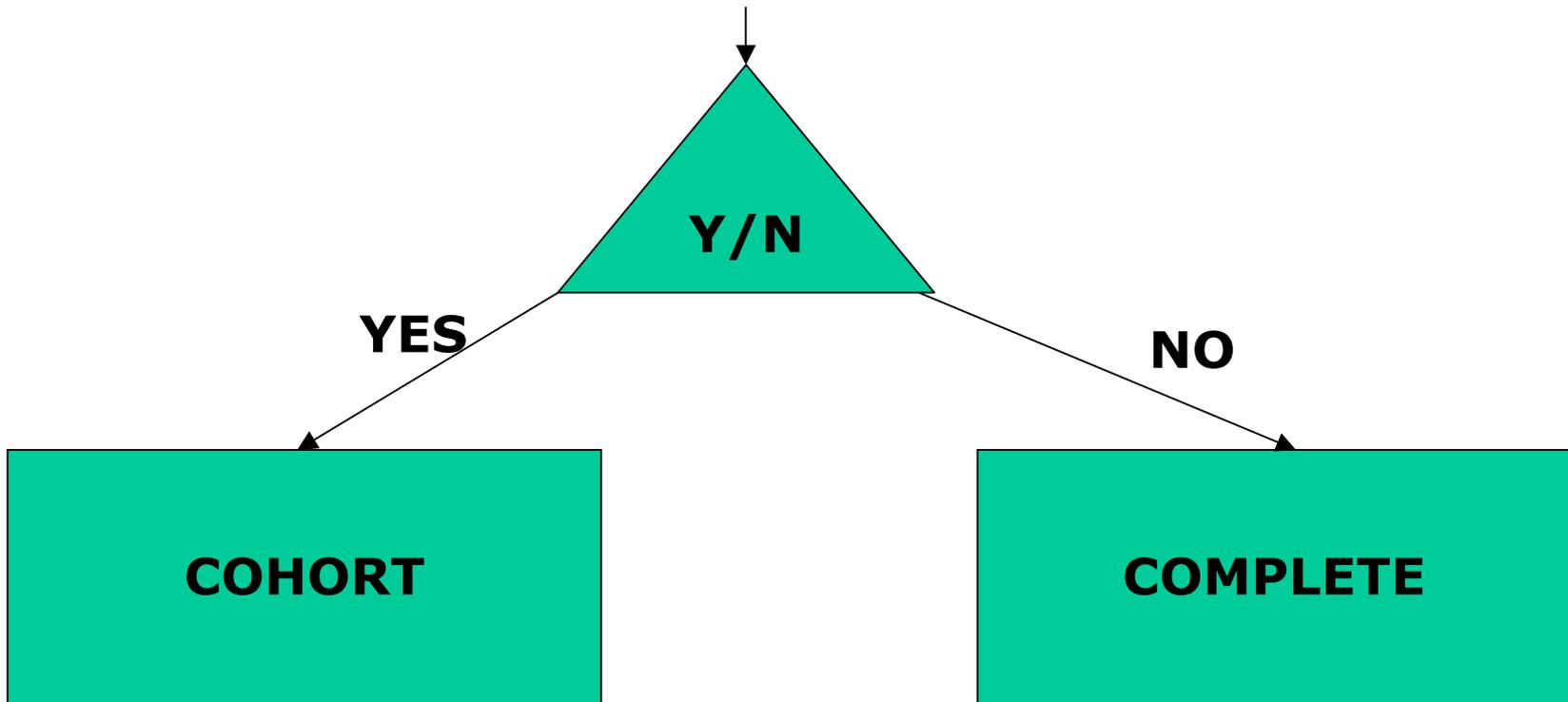
Introduction

- Long-term survival rates are important outcome measures of people with cancer
- They are widely used to monitor progress in cancer care over time, or to compare quality of care between different populations
- The traditional method of estimating such survival figures is related to a cohort approach

Traditional Cohort-based Survival Analysis Methods

Includes only people diagnosed within defined calendar year(s)

Restrict the analysis to cases with the potential to be followed over the full follow-up period of interest?



Cohort-based Analysis

- Long-term cohort-based survival estimates pertain to the survival experience of people diagnosed many years ago
- Where there has been a subsequent change in survival, these estimates will not reflect the long-term survival outlook of newly diagnosed cases

Period Survival Analysis

- Exclusively reflects the survival experience in the most recent period for which data is available
- The rationale for this approach is analogous to that of the use of period life tables to estimate current life expectancy

Period Survival Analysis

- Introduced by H Brenner in 1996 as a way to generate more up-to-date estimates of long-term survival than provided by traditional cohort-based methods
- Although the method appears promising, it has been empirically evaluated for adult cancers almost exclusively using data from the Finnish Cancer Registry

Study Objective

To provide an empirical evaluation of the performance of period analysis in comparison to traditional methods of survival analysis (i.e., cohort, complete) for predicting future five-year cancer survival using data from the Canadian Cancer Registry

Canadian Cancer Registry

- Canadian Cancer Registry (CCR) is a dynamic, person-oriented database containing cases diagnosed from 1992 onward
- Maintained by Statistics Canada
- Based on tumour records from every provincial/territorial cancer registry

Methods

- Five-year relative survival estimates were derived by period and traditional methods of analysis using data available at the conclusion of 1997
- The extent to which these estimates agreed with the survival observed for cancer cases diagnosed in 1997 was then quantified
- The squared differences were used to quantify agreement
- The 15 major cancer sites were analysed

Example Survival Calculation

Interval	Conditional Survival	Cumulative Survival
0-1	P_1	P_1
1-2	P_2	$P_1 P_2$
2-3	P_3	$P_1 P_2 P_3$
3-4	P_4	$P_1 P_2 P_3 P_4$
4-5	P_5	$P_1 P_2 P_3 P_4 P_5$

Follow-up Year

Method	Diagnosis Year	1992	1993	1994	1995	1996	1997
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Cohort	1992	1	1, 2	2, 3	3, 4	4, 5	5
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Complete	1992	1	1, 2	2, 3	3, 4	4, 5	5
	1993		1	1, 2	2, 3	3, 4	4, 5
	1994			1	1, 2	2, 3	3, 4
	1995				1	1, 2	2, 3
	1996					1	1, 2
	1997						1

Period	1992						5
	1993						4, 5
	1994						3, 4
	1995						2, 3
	1996						1, 2
	1997						1

NOTE: The numbers within the cells represent year(s) of follow-up since diagnosis.

Comparison of 5-year RSR (%) using different survival methods

Cancer site	Actual*	Cohort	Complete	Period
Prostate	92.5	86.0	88.2	90.4

* Based on cases diagnosed in 1997; other results based on data theoretically available at end of 1997.

Squared differences of actual survival and predicted survival

Cancer site	Cohort	Complete	Period
Prostate	43	19	4

Squared differences of actual survival and predicted survival

Cancer site	Cohort	Complete	Period
Prostate	43	19	4
N.H.L.	22	23	9
Breast	16	11	3
Colorectal	9	6	2
Stomach	8	4	1

Squared differences of actual survival and predicted survival

Cancer site	Cohort	Complete	Period
Skin Melanoma	6	5	2
Cervix uteri	6	0	0
Leukemia	3	0	4
Kidney, renal pelvis	1	0	3
Bladder	1	0	0

Squared differences of actual survival and predicted survival

Cancer site	Cohort	Complete	Period
Ovary	0	1	4
Brain	0	0	3
Lung	0	0	0
Corpus uteri	0	0	0
Pancreas	0	0	0
TOTAL	116	70	36

Summary of Results

- Period analysis was observed to be superior to, or comparable with, cohort analysis in predicting the average five-year relative survival observed later for virtually all individual cancer sites studied
- Complete analysis estimates were generally observed to be in between the cohort and period values
- The improvement in survival estimation was most pronounced for prostate cancer
- Where period estimates did not match the eventually observed value they were predominantly on the lower side

Conclusion

The period method of survival analysis:

1. provides more up-to-date estimates of five-year survival than do traditional cohort-based methods
2. may be considered a useful alternative or supplement in the analysis of cancer registry data

Additional Information

- Paper has been accepted in the journal *Annals of Epidemiology*
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