

Comparison of 7 estimators of up-to-date survival

Guy HÉDELIN

Alireza MOGHADDAM

March 13th 2009

Workshop Paris

- **Important for clinicians and public health professionals**
- Reflecting the prognostic of new diagnosed patients
- Tacking into account the new treatments

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- complete method for up-to-date survival
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- 5 years period analysis
- Esteve's model (one coefficient per year)
- Esteve's model with polynomial of time
- Model-based period analysis

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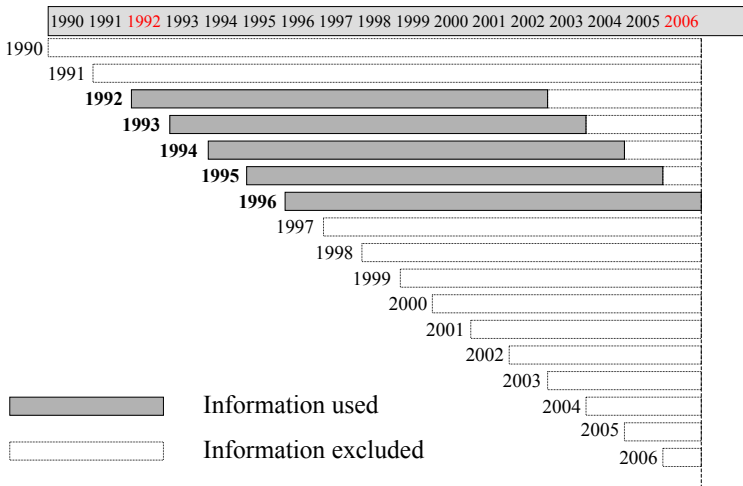
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Complete method for up-to-date survival

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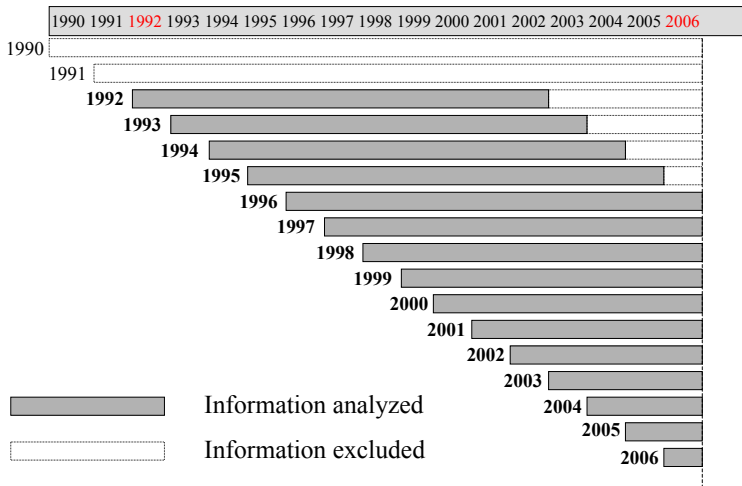
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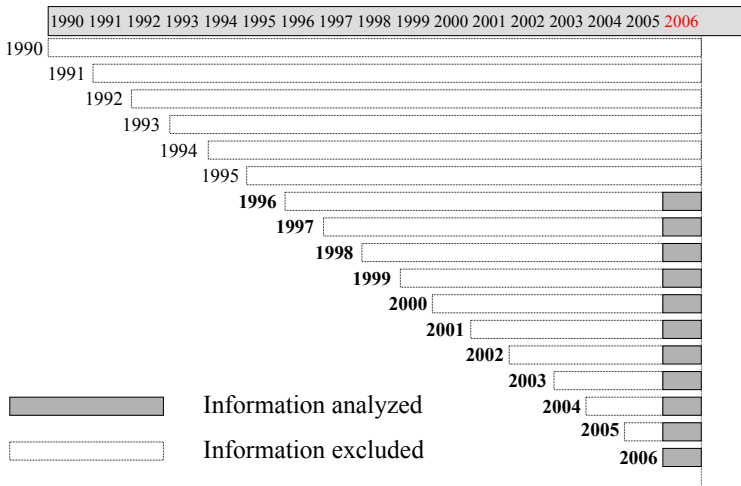
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5 years period analysis

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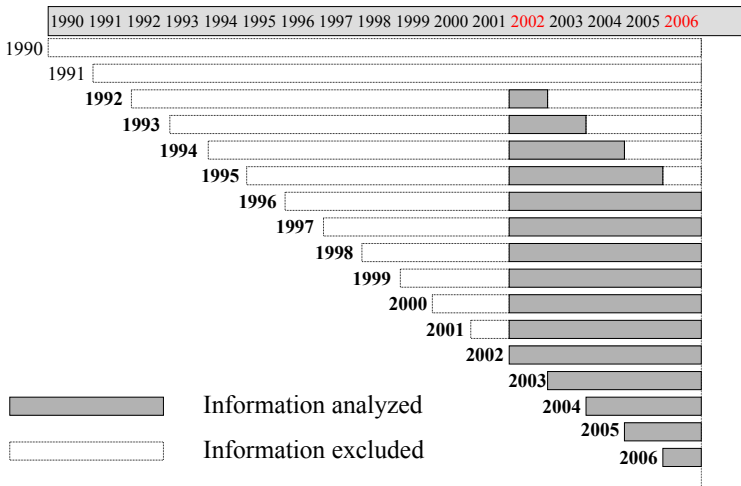
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Esteve's model w/o polynomial of time

Model-based period analysis

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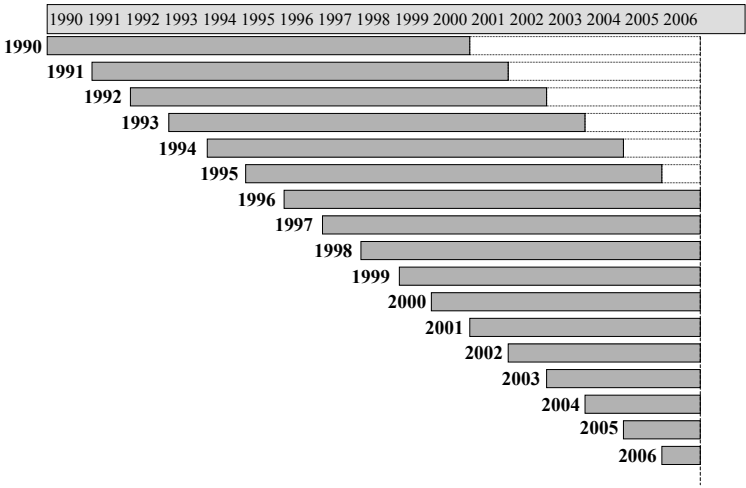
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Estève's model one parameter for each diagnostic year

Esteve's model with polynolial of time a polynomial of the year
of diagnostic

model-based period analysis a polynomial of the period year

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 - No information on the statistical qualities of the estimators
 - Biais, precision, coverage
 - Susceptibility to censorship

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- **Two broad types: long survival** (breast cancer type) and **short survival** (lung cancer type)
- **Death from cancer: Weibull** (short survival) and **Log-normal** (long survival)
- **Death from other cause: piecewise exponential** from death mortality tables
- **Censorship: Uniform** (from 0 to 30% before either 10 year follow-up or date of analysis)
- **Cure: Binomial**
- 200 samples of 1050 individuals each and 1000 samples of same size
- **improvement over time** of cure and longer survival for those who die (over 15 years, the net survival at 10 year improved from 0.058 to 0.241 for short survival and from 0.464 to 0.670 for long survival)

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- R statistical software
 - ad-hoc code
 - function for late entry
 - Relsurv package (Pohar)

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- **Biais:** difference between the mean 10 year survival and the theoretical value
- **Precision:** variance of the estimates
- **Coverage:** proportion of samples which 95% confidence interval contains the theoretical value
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10 year theoretical survival: **0.241**

method	mean	standard error	coverage
cohort	0.084	0.015	0.0
complete	0.125	0.015	0.0
period 5	0.169	0.023	16.5
period 1	0.202	0.057	85.5
period (polynomial)	0.198	0.033	72.2
Esteve (1 year class)	0.231	0.074	89.5
Esteve (polynomial)	0.239	0.047	93.8

Short survival: Distance to the theoretical value

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Proportion of estimates at less than 0.05 or 0.10 of the theoretical value

method	0.05	0.10
period 1	52	86
period (polynomial)	54	95
Esteve (1 year class)	49	82
Esteve (polynomial)	70	96

Short survival: Distribution

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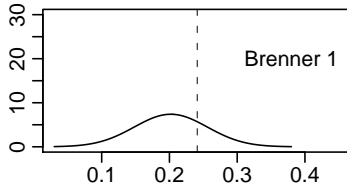
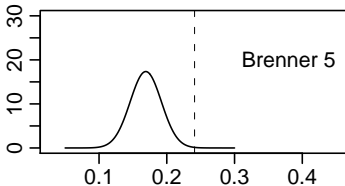
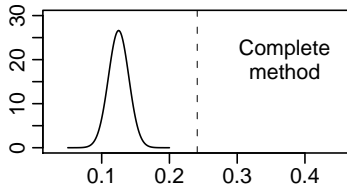
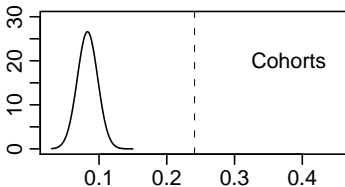
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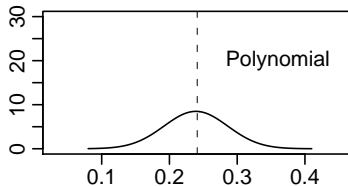
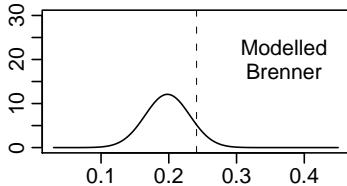
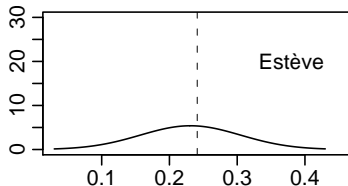
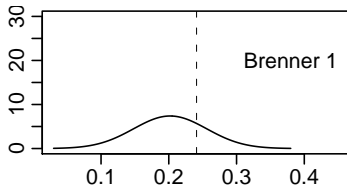
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Long survival: Characteristics of the estimators

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10 year theoretical survival: **0.670**

method	mean	standard error	coverage
cohort	0.490	0.027	0.0
complete	0.543	0.021	0.0
period 5	0.597	0.028	23.5
period 1	0.626	0.061	90.5
period (polynomial)	0.637	0.030	83.5
Esteve (1 year class)	0.729	0.118	86.3
Esteve (polynomial)	0.695	0.037	91.0

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method	0.05	0.10
period 1	50	92
period (polynomial)	54	95
Esteve (1 year class)	72	99
Esteve (polynomial)	73	98

Long survival: Distribution

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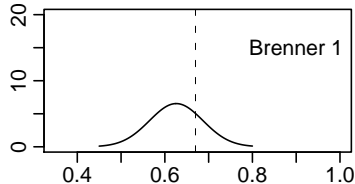
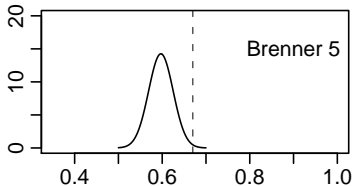
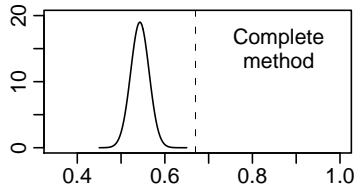
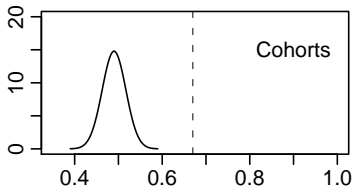
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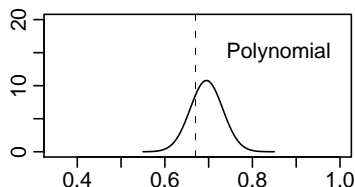
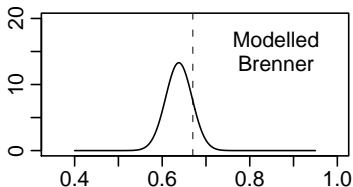
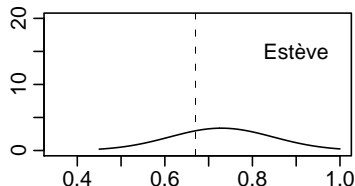
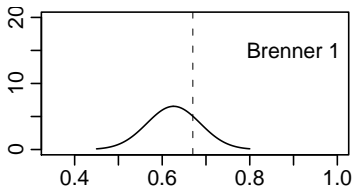
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Short survival: Influence of censorship

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proportion censorship	Estève	Estève polynomial	model-based period
0	0.231 <i>0.074</i>	0.239 <i>0.047</i>	0.198 <i>0.033</i>
5	0.231 <i>0.074</i>	0.239 <i>0.048</i>	0.197 <i>0.033</i>
10	0.230 <i>0.074</i>	0.236 <i>0.048</i>	0.194 <i>0.035</i>
15	0.231 <i>0.075</i>	0.234 <i>0.049</i>	0.191 <i>0.036</i>
20	0.230 <i>0.076</i>	0.235 <i>0.051</i>	0.191 <i>0.039</i>
25	0.227 <i>0.077</i>	0.220 <i>0.050</i>	0.181 <i>0.037</i>
30	0.226 <i>0.079</i>	0.214 <i>0.051</i>	0.174 <i>0.039</i>

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proportion censorship	Estève	Estève polynomial	model-based period
0	0.729 <i>0.118</i>	0.695 <i>0.037</i>	0.638 <i>0.030</i>
5	0.729 <i>0.119</i>	0.695 <i>0.038</i>	0.637 <i>0.030</i>
10	0.729 <i>0.119</i>	0.696 <i>0.038</i>	0.639 <i>0.031</i>
15	0.729 <i>0.119</i>	0.695 <i>0.038</i>	0.637 <i>0.031</i>
20	0.731 <i>0.119</i>	0.696 <i>0.038</i>	0.639 <i>0.032</i>
25	0.731 <i>0.119</i>	0.697 <i>0.039</i>	0.640 <i>0.032</i>
30	0.730 <i>0.120</i>	0.696 <i>0.039</i>	0.638 <i>0.033</i>

Model-based methods are best

Esteve's model with time polynomial and model-base period analysis are quite equivalent with sometimes better qualities in short survival for Esteve's model

In registries the censorship is low enough to not substantially influence the quality of the model-based methods

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