

# Cancer survival: principles, methods and applications

27 June – 1 July 2016

LONDON  
SCHOOL of  
HYGIENE  
& TROPICAL  
MEDICINE



MONDAY	Session	Activity
9:00-9:30		Registration (tea and coffee will be available)
9:30-10:15		<a href="#"><u>Introduction and logistics</u></a> Michel Coleman
10:15-11:00	<b>Session 1</b>	<a href="#"><u>Cancer survival research and cancer policy - 1</u></a> Michel Coleman
11:00-11:30		Morning Coffee
11:30-12:15	<b>Session 2</b>	<a href="#"><u>Population-based measures of cancer burden</u></a> Melanie Morris
12:15-13:15	<b>Session 3</b>	<a href="#"><u>Introduction to survival analysis</u></a> Bernard Rachet
13:15-14:00		Welcome lunch in South Courtyard
14:00-15:30	<b>Session 4</b>	<a href="#"><u>Population-based cancer survival: concepts and estimation</u></a> Maja Pohar Perme
15:30-16:00		Afternoon Tea
16:00-17:00	<b>Session 5</b>	<a href="#"><u>Practical 1: Introduction</u></a> Student groups with faculty
TUESDAY	Session	Activity
8:30-9:00	<b>Session 6</b>	<a href="#"><u>Questions and Answers from Day 1</u></a> All students and faculty
9:00-10:30	<b>Session 7</b>	<a href="#"><u>Population-based cancer survival: data quality and quality control</u></a> Claudia Allemani/Rhea Harewood
10:30-11:00		Morning Coffee
11:00-12:30	<b>Session 8</b>	<a href="#"><u>Practical 2: Estimating cancer survival</u></a> Student groups with faculty

12:30-13:30	Lunch break	
13:30-14:15	<b>Session 9</b>	<a href="#"><u>Age-standardisation of cancer survival</u></a> Patrick Muller
14:15-15:15	<b>Session 10</b>	<a href="#"><u>Impact on cancer survival estimates of using different life tables</u></a> Devon Spika
15:15-15:45	Afternoon Tea	
15:45-17:00	<b>Session 11</b>	<a href="#"><u>Practical 3: Impact on cancer survival estimates of using different life tables</u></a> Student groups with faculty
<b>WEDNESDAY</b>		
08:30-9:00	<b>Session 12</b>	<a href="#"><u>Questions and Answers from Day 2</u></a> All students and faculty
9:00-10:00	<b>Session 13</b>	<a href="#"><u>Period analysis and “prediction” of survival</u></a> Sara Benitez Majano
10:00-10:30	Morning Coffee	
10:30-12:00	<b>Session 14</b>	<a href="#"><u>Practical 4: Period analysis and “prediction” of survival</u></a> Student groups with faculty
12:00-13:00	Lunch break	
13:00-14:30	<b>Session 15</b>	<a href="#"><u>Modelling net survival</u></a> Paul Dickman
14:30-15:15	Course photograph followed by tea break	
15:15-17:00	<b>Session 16</b>	<a href="#"><u>Practical 5: Modelling net survival</u></a> Student groups with faculty
<b>THURSDAY</b>		
8:30-9:00	<b>Session 17</b>	<a href="#"><u>Questions and Answers from Day 3</u></a> All students and faculty
9:00-10:30	<b>Session 18</b>	<a href="#"><u>Crude probability of death: estimation and applications</u></a> Paul Dickman
10:30-11:00	Morning Coffee	

11:00-12:00	<b>Session 19</b>	<a href="#"><u>Secondary measures of cancer survival</u></a> Paul Dickman
12:00-13:00		Lunch break
13:00-14:30	<b>Session 20</b>	<a href="#"><u>Missing data and the estimation of cancer survival</u></a> Bernard Rachet
14:30-15:00		Afternoon Tea
15:00-16:30	<b>Session 21</b>	<a href="#"><u>Practical 6: Handling missing data in survival analysis</u></a> Student groups and faculty
16:30-17:30	<b>Session 22</b>	<a href="#"><u>Cancer survival - participants' case studies</u></a> All students and faculty; facilitated by Audrey Bonaventure

FRIDAY	Session	Activity
8:30-9:00	<b>Session 23</b>	<a href="#"><u>Questions and Answers from Day 4</u></a> All students and faculty
9:00-10:00	<b>Session 24</b>	<a href="#"><u>Data visualisation: funnel plots and mapping for cancer survival</u></a> Manuela Quaresma
10:00-11:00	<b>Session 25</b>	<a href="#"><u>Excess hazard regression models: general principles and practical advice</u></a> Aurelien Belot/Camille Maringe
11:00-11:30		Morning Coffee
11:30-12:30	<b>Session 26</b>	<a href="#"><u>International comparisons of cancer survival</u></a> Claudia Allemani
12:30-13:30		Lunch in South Courtyard
13:30-14:30	<b>Session 27</b>	<a href="#"><u>Cancer patient survival as a possible evaluation of medical performance: a historical viewpoint</u></a> Jacques Esteve
14:30-15:30	<b>Session 28</b>	<a href="#"><u>Cancer survival research and cancer policy - 2</u></a> Michel Coleman
15:30-16:00	<b>Session 29</b>	<a href="#"><u>Tools for survival analyses</u></a> All students and faculty

## Outline of contents of each session

### Introduction and logistics

- Objectives of course
- Introduction of faculty members
- Introduction of course participants
- Outline of course structure
- Presentation of course materials
- Announcements

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### Session 1

#### Cancer survival research and cancer policy – 1

- Why do we study cancer survival? An introduction to the wider public, public health and health policy applications
- The public interest and communication with the public
- Evaluation of cancer treatment and cancer survival in the population setting
- Evaluation of cancer control policy

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### Session 2

#### Population-based measures of cancer burden

- Introduction to concept of cancer burden
- The need for population-based cancer registry data for incidence and survival
- Principles of population-based measures of cancer burden
- Review of incidence, prevalence, mortality
- Introduction to survival
- Relationship between measures of cancer burden

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### Session 3

#### Introduction to survival analysis

- Introduction to time-to-event data
- Definition of the survival and hazard functions
- Actuarial and Kaplan-Meier methods for estimation of the survival function
- Poisson regression
- Cox proportional hazard model

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## Session 4

### Population-based cancer survival: concepts and estimation

- Cause of death information and population mortality tables
- Observed survival
- Crude and net survival
- Relative survival ratio
- Methods of estimation
- Specific aspects in net survival estimation

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## Session 5

### Practical 1 – Introduction

- This session will include an introduction to Stata and setting up for practicals 2-6
- The session will be led by one of the course faculty and tutors will be available to provide assistance

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## Session 6

### Questions and Answers from Day 1

- An informal question-and-answer session on any topic covered on the first day. All students and faculty will be invited to participate

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## Session 7

### Population-based cancer survival: data quality and quality control

- Background to population-based cancer registration: regional and national registries, general and specialised registries
- Registration systems: sources of data, active and passive follow-up
- Data quality indicators for survival
- Purpose of quality controls:
  - to ensure robust comparisons of survival
  - to document data quality for external review
- Types of quality controls:
  - on variables (compliance with a study protocol)
  - on records (logical coherence)
  - on data sets (frequency distributions, summary measures,...)
- Improving comparability through standard coding approaches to topography, morphology and stage

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## **Session 8**

### **Practical 2 – Estimating cancer survival**

- This practical session will take place in a computer room, where participants will have the opportunity to do practical exercises around the themes discussed in the accompanying lecture. A practical lead will facilitate the session and tutors will be on hand to provide assistance. Exercise solutions will be provided during the session.

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## **Session 9**

### **Age Standardisation of cancer survival**

- Importance of age standardisation
- Age-standardisation method
- Example of application and interpretation
- Choice of standard cancer population
- Extension to multi-factor standardisation

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## **Session 10**

### **Impact on cancer survival estimates of using different life tables**

- Life tables as a cross-sectional summary of recent mortality
- Role of life tables in net survival estimation
- Utility of life tables for population sub-groups in net survival estimation
- Appropriate selection of life tables in net survival estimation

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## **Session 11**

### **Practical 3 - Impact on cancer survival estimates of using different life tables**

- This practical session will take place in a computer room, where participants will have the opportunity to do practical exercises around the themes discussed in the accompanying lecture. A practical lead will facilitate the session and tutors will be on hand to provide assistance. Exercise solutions will be provided during the session.

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## **Session 12**

### **Questions and Answers from Day 2**

- An informal question-and-answer session on any topic covered on the second day. All students and faculty will be invited to participate

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## **Session 13**

### **Period analysis and “prediction” of survival**

- Cohort, complete and period approaches to cancer survival analysis
- Principles and theoretical basis of period analysis: analogy with expectation of life
- Application and interpretation of period survival estimates
- Developments in period analysis, including hybrid analysis

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## **Session 14**

### **Practical 4 – Period analysis and “prediction” of survival**

- This practical session will take place in a computer room, where participants will have the opportunity to do practical exercises around the themes discussed in the accompanying lecture. A practical lead will facilitate the session and tutors will be on hand to provide assistance. Exercise solutions will be provided during the session.

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## **Session 15**

### **Modelling net survival**

- Outcome in survival analysis can be expressed as either a survival proportion or mortality rate (hazard)
- Net mortality can be estimated and modelled in a cause-specific or relative survival framework. We model on the hazard scale; cause-specific or excess.
- Three modelling approaches will be presented and their close similarities highlighted; Cox regression, Poisson regression, and flexible parametric models. The latter two can be used to model both cause-specific and excess mortality whereas Cox regression cannot.
- The three approaches are conceptually very similar
- The proportional hazards assumption

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## **Session 16**

### **Practical 5 – Modelling net survival**

- This practical session will take place in a computer room, where participants will have the opportunity to do practical exercises around the themes discussed in the accompanying lecture. A practical lead will facilitate the session and tutors will be on hand to provide assistance. Exercise solutions will be provided during the session.

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## **Session 17**

### **Questions and Answers from Day 3**

- An informal question-and-answer session on any topic covered on the third day. All students and faculty will be invited to participate

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## **Session 18**

### **Crude probability of death: estimation and applications**

- Introduction to the concept of competing risks.
- Net survival, and net probabilities of death, are estimated for a hypothetical world where one cannot die of causes other than the cancer of interest.
- One can also estimate so-called crude probabilities, which represent the probability of dying of a specific cancer in the real world (where it's possible to die of other causes).
- Estimating crude probabilities in a life table framework (implemented in -strs-).
- Estimating crude & net probabilities of death in a model-based framework.
- In which world should we work (real or hypothetical)?

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## **Session 19**

### **Secondary measures of cancer survival**

- Cure models
- Estimating the number of avoidable premature deaths
- Estimating loss in life expectancy

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## **Session 20**

### **Missing data and the estimation of cancer survival**

- Missing data, a recurrent problem: not to be ignored!
- Missing data mechanisms
- Methods for handling missing data
- Multiple imputation
- Modelling of excess hazard and net survival in the presence of incomplete data

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## **Session 21**

### **Practical 6 – Handling missing data in survival analysis**

- This practical session will take place in a computer room, where participants will have the opportunity to do practical exercises around the themes discussed in the accompanying lecture. A practical lead will facilitate the session and tutors will be on hand to provide assistance. Exercise solutions will be provided during the session.

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## **Session 22**

### **Cancer survival - participants' case studies**

This session offers course participants the opportunity to raise unresolved questions or practical problems in cancer survival research that they may have encountered, for discussion with faculty and other participants.

You are invited to offer a short presentation. The presentation may be based on analysis of your own data, but you may also want to raise a theoretical or applied question about cancer survival – this may involve theory, statistics, computing, data quality, public health or health policy. If many presentations are offered, faculty members will make a selection. Three slides (maximum!) and five minutes to make your point, with 5-10 minutes' wider discussion, depending on the number of proposed presentations.

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## **Session 23**

### **Questions and Answers from Day 4**

- An informal question-and-answer session on any topic covered on the fourth day. All students and faculty will be invited to participate

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## **Session 24**

### **Data visualisation: funnel plots and mapping for cancer survival**

- User needs and demands for data
- Outcome indicators and interpretation of ranked results
- Principles of mapping cancer survival
- Mapping temporal change and the impact of policy changes on survival
- Principles of funnel plots for institutional comparison
- Application of funnel plots to explore regional and temporal variations in cancer survival and related measures

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## **Session 25**

### **Excess hazard regression models: general principles and practical advice**

- General principles of regression models
- Advantages and drawbacks of regression models
- Practical advice on model building strategy
- Selection and presentation of meaningful results from regression models

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## **Session 26**

### **International comparisons of cancer survival**

- EUROCARE, CONCORD and other international collaborative studies
- Importance of age standardisation
- "Low-resolution", "high-resolution" and "patterns of care" studies
- Impact of data quality and bias on the interpretation of international differences in survival
- The issue of national representativeness

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## **Session 27**

### **Cancer patient survival as a possible evaluation of medical performance: a historical viewpoint**

- Early history (1950s): loss of life expectancy; the probability of cure; relative survival
- The competing risk approach and the misunderstandings and confusion between concepts that resulted from its introduction
- Estimation of marginal net survival and the need for adequate concepts: the Pohar-Perme estimator vs stratification
- The multivariate model and its validation
- Which survival measure for which objective?

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## **Session 28**

### **Cancer survival research and cancer policy – 2**

- Are cancer survival statistics of any use for public health and health policy?
- Confidentiality and consent in cancer registration
- Public health and policy impact of ethnic, socio-economic and international comparisons of cancer survival
- World Cancer Declaration 2013 and WHO policy on non-communicable diseases

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## **Session 29**

### **Tools for survival analyses**

- Availability and compatibility of software packages for the estimation of cancer survival STNS, SURV3, RELSURV, STREL, SEER\*Stat, STRS, ... in Stata, SAS or R
- Implementation of survival analysis packages in public-use databases such as SEER\*Stat (USA) and the Cancer Information System (UK)
- Availability of life tables and other tools for survival analysis
- Residual questions about theoretical issues covered during the course

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