Cancer survival: principles, methods and applications
11 – 15 July 2022

MONDAY	Session	Activity
9:00-9:30		Registration (tea and coffee will be available)
9:30-10:15		Introduction and logistics Michel Coleman
10:15-11:00	**Session 1**	Cancer survival research and cancer policy - 1 Michel Coleman
11:00-11:30		Refreshment Break
11:30-12:15	**Session 2**	Population-based measures of cancer burden Melissa Matz
12:15-13:15	**Session 3**	Introduction to survival analysis Veronica Di Carlo
13:15-14:00		Welcome lunch in South Courtyard
14:00-15:00	**Session 4**	Population-based cancer survival: concepts and estimation Melissa Matz
15:00-15:30		Refreshment Break
15:30-16:00	**Session 5**	Practical 1: Set-up and introduction Student groups with faculty
16:00-17:30	**Session 6**	Practical 2: Estimating cancer survival Student groups and faculty
TUESDAY	**Session**	**Activity**
8:30-9:00	**Session 7**	Questions and Answers from Day 1 All students and faculty
9:00-10:30	**Session 8**	Net survival and crude mortality Maja Pohar Perme
10:30-11:00		Refreshment Break
11:00-12:30	**Session 9**	Population-based cancer survival: data quality and quality control Claudia Allemani
12:30-13:30		Lunch break

13:30-14:15	**Session 10**	Age-standardisation of cancer survival Naomi Ssenyonga
14:15-15:15	**Session 11**	Impact on cancer survival estimates of using different life tables Veronica Di Carlo
15:15-15:45		Refreshment Break
15:45-17:15	**Session 12**	Practical 3: Impact on cancer survival estimates of using different life tables Student groups with faculty

WEDNESDAY	Session	Activity
08:30-9:00	**Session 13**	Questions and Answers from Day 2 All students and faculty
9:00-10:00	**Session 14**	Period analysis and "prediction" of survival Pamela Minicozzi
10:00-10:30		Refreshment Break
10:30-12:00	**Session 15**	Practical 4: Period analysis and "prediction" of survival Student groups with faculty
12:00-13:30		Lunch break
13:30-15:00	**Session 16**	Missing data in cancer survival analysis Helen Fowler
15:00-15:30		Refreshment Break
15:30-17:15	**Session 17**	Practical 5: Handling missing data in survival analysis Student groups with faculty

THURSDAY	Session	Activity
8:30-9:00	**Session 18**	Questions and Answers from Day 3 All students and faculty
9:00-10:30	**Session 19**	Modelling net survival Paul Dickman
10:30-11:00		Refreshment Break

11:00-12:30	**Session 20**	Practical 6: Modelling net survival
		Paul Dickman
12:30-13:30		Lunch break
13:30-14:45	**Session 21**	Secondary measures of cancer survival
		Paul Dickman
14:45-15:15		Refreshment Break
15:15-16:15	**Session 22**	Mortality-to-incidence ratio: not a valid proxy for cancer survival
		Michel Coleman
16:15-17:15	**Session 23**	Cancer survival - participants' case studies
		All students and faculty; facilitated by Fabio Girardi

FRIDAY	**Session**	**Activity**
8:30-9:00	**Session 24**	Questions and Answers from Day 4
		All students and faculty
9:00-10:00	**Session 25**	Data visualisation: funnel plots and mapping for cancer survival
		Speaker and precise title to be confirmed
10:00-11:00	**Session 26**	Excess hazard regression models: general principles and practical advice
		Speaker and precise title to be confirmed
11:00-11:30		Refreshment Break
11:30-12:30	**Session 27**	International comparisons of cancer survival
		Claudia Allemani
12:30-13:30		Lunch in South Courtyard
13:30-14:30	**Session 28**	Cancer patient survival as a possible evaluation of medical performance: a historical viewpoint
		Speaker and precise title to be confirmed
14:30-15:30	**Session 29**	Cancer survival research and cancer policy - 2
		Michel Coleman
15:30-16:00	**Session 30**	Tools for survival analysis
		All students and faculty

Outline of the contents of each session

Introduction and logistics

- Objectives of the 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 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
- Parametric and semi-parametric methods for estimation of the survival function

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Session 4

Population-based cancer survival: concepts and estimation

- Measures of survival experienced by a cohort of cancer patients
- Non-parametric estimation of net survival

- Data settings
- Principles and implications of relative survival setting for estimating net survival
- Net survival estimation in practice

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

Session 6
Practical 2 – Estimating cancer survival

- In this session, participants will have the opportunity to do practical exercises based on the themes discussed in the accompanying lecture. A practical lead will facilitate the session, and tutors will be on hand to provide assistance. Solutions will be provided during the session.

Session 7
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

Session 8
Net survival and crude mortality

- Introduction to the competing risks analysis
- The various concepts in relative survival
- The link between non-parametric estimation and modelling
- Specific aspects in net survival and crude mortality estimation

Session 9
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 control:

- to ensure robust comparisons of survival
  - to document data quality for external review
- Types of quality control:
  - 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 10
Age Standardisation of cancer survival

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

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Session 11
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 12
Practical 3 - Impact on cancer survival estimates of using different life tables

- In this session, participants will have the opportunity to do practical exercises based on the themes discussed in the accompanying lecture. A practical lead will facilitate the session, and tutors will be on hand to provide assistance. Solutions will be provided during the session.

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Session 13
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 14

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 15

Practical 4 – Period analysis and "prediction" of survival

- In this session, participants will have the opportunity to do practical exercises based on the themes discussed in the accompanying lecture. A practical lead will facilitate the session, and tutors will be on hand to provide assistance. Solutions will be provided during the session.

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Session 16

Missing data in cancer survival analysis

- Missing data, a frequent problem: not to be ignored
- Missing data mechanisms
- Methods for handling missing data
- Multiple imputation
- Application of multiple imputation in cancer survival analysis

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Session 17

Practical 5 – Handling missing data in survival analysis

- In this session, participants will have the opportunity to do practical exercises based on the themes discussed in the accompanying lecture. A practical lead will facilitate the session, and tutors will be on hand to provide assistance. Solutions will be provided during the session.

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Session 18

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 19

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

Session 20

Practical 6 – Modelling net survival

- In this session, participants will have the opportunity to do practical exercises based on the themes discussed in the accompanying lecture. A practical lead will facilitate the session, and tutors will be on hand to provide assistance. Solutions will be provided during the session.

Session 21

Secondary measures of cancer survival

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

Session 22

Mortality-to-incidence ratio: <u>not</u> a valid proxy for cancer survival

- Mistaken in principle, misleading in practice
- Not comparable between cancers, countries or calendar periods, or by time since diagnosis
- The (1 – M/I ratio) is indefensible as a proxy for cancer survival: no quality control, no correction for background mortality, no estimation of "cure", avoidable deaths, …

Session 23

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.

Session 24

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

Session 25

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

Session 26

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

Session 27

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

Session 28

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?

Session 29

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

Session 30

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