Cancer survival: principles, methods and applications
1 – 5 July 2019

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 Missy 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 Bernard Rachet
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
		Maja Niksic
14:15-15:15	**Session 11**	Impact on cancer survival estimates of using different life tables
		Laura Woods
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
		Sara Benitez Majano
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
12:30-13:30	*Seminar*	*Brian Rous - Recent developments in ICD-Oncology and the WHO classification of tumours*
13:30-15:00	**Session 16**	Missing data in cancer survival analysis
		Edmund Njeru Njagi & Clémence Leyrat
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**	The Mortality-to-Incidence Ratio (M/I) Libby Ellis
16:15-17:15	**Session 23**	Cancer survival - participants' case studies All students and faculty; facilitated by Aimilia Exarchakou

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 Manuela Quaresma
10:00-11:00	**Session 26**	Excess hazard regression models: general principles and practical advice Aurélien Belot & Camille Maringe
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 Jacques Estève
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 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

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

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

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

Session 4

Population-based cancer survival: concepts and estimation

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

- 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.

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

- Importance of age standardisation
- Age-standardisation methods
- 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 for net survival estimation

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Session 12

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 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

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

Session 15

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.

Session 16

Missing data in cancer survival analysis

- Missing data, a recurrent problem: not to be ignored!
- Missing data mechanisms
- *Ad hoc* methods for handling missing data
- Multiple imputation
- Application of multiple imputation in cancer survival analysis

Session 17

Practical 5 – 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.

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

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

- 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.

Session 21

Secondary measures of cancer survival

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

Session 22

The Mortality-to-Incidence Ratio (M/I)

- Review of cancer incidence and mortality rates, and survival probabilities
- The increasing use of the complement of the M/I ratio (1-M/I ratio) as a proxy measure for cancer survival
- Why this use of the M/I ratio is mistaken, both in principle and in practice
- Assessment of the extent to which trends in the complement of the M/I ratio reflect trends in cancer survival

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

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
- Universal Health Coverage
- World Cancer Declaration 2013 and WHO policy on non-communicable diseases

Session 30

Tools for survival analyses

- Availability and compatibility of software packages for population-based survival analysis in Stata, SAS or R
- Implementation of survival analysis packages in public-use databases
- Availability of life tables and other tools for survival analysis
- Residual questions about theoretical issues covered during the course