



| <b>MONDAY</b>  | <b>Session</b>               | <b>Content</b>  |
|----------------|------------------------------|---|
| 9:00-9:30      |                              | Registration (tea and coffee in South Courtyard)  |
| 9:30-10:15     | <b>Session 0</b><br>Manson   | <a href="#">Introduction and logistics</a><br>Michel Coleman                                |
| 10:15-11:00    | <b>Session 1</b><br>Manson   | <a href="#">Cancer survival research and cancer policy - 1</a><br>Michel Coleman            |
| 11:00-11:30    |                              | Refreshment break (South Courtyard)   |
| 11:30-12:15    | <b>Session 2</b><br>Manson   | <a href="#">Population-based measures of the cancer burden</a><br>Melissa Matz              |
| 12:15-13:00    | <b>Session 3</b><br>Manson   | <a href="#">Introduction to survival analysis</a><br>Veronica Di Carlo                      |
| 13:00-14:15    |                              | Welcome lunch (South Courtyard)   |
| 14:15-15:00    | <b>Session 4</b><br>Manson   | <a href="#">Population-based cancer survival: concepts</a><br>Melissa Matz                  |
| 15:00-15:30    |                              | Refreshment break (South Courtyard)   |
| 15:30-16:30    | <b>Session 5</b><br>Room 365 | <a href="#">Practical 1: Set-up, introduction and downloads</a><br>Participants and faculty |
| 16:30-17:30    | <b>Session 6</b><br>Room 365 | <a href="#">Practical 2: Estimating cancer survival</a><br>Participants and faculty         |
| 17:30-18:00    | <b>Session 7</b><br>Room 365 | <a href="#">Questions and answers from Day 1</a><br>Participants and faculty                |
| <b>TUESDAY</b> | <b>Session</b>               | <b>Content</b>  |
| 9:00-10:30     | <b>Session 8</b><br>Manson   | <a href="#">Relative survival analysis</a><br>Maja Pohar Perme                              |
| 10:30-11:00    |                              | Refreshment break (South Courtyard)   |

|             |                   |  |
|-------------|-------------------|--|
| 11:00-12:30 | <b>Session 9</b>  | <a href="#">Population-based cancer survival: data quality and quality control</a><br>Manson<br>Claudia Allemani   |
| 12:30-13:30 |                   | Lunch break (on your own)  |
| 13:30-14:15 | <b>Session 10</b> | <a href="#">Age-standardisation of cancer survival</a><br>Manson<br>Naomi Ssenyonga  |
| 14:15-15:15 | <b>Session 11</b> | <a href="#">Life tables of background mortality and their impact on survival estimates</a><br>Manson<br>Veronica Di Carlo  |
| 15:15-15:45 |                   | Refreshment break (South Courtyard)  |
| 15:45-17:15 | <b>Session 12</b> | <a href="#">Practical 3: Net survival estimation, and the impact of life tables of background mortality on the estimates</a><br>Room 365<br>Participants and faculty |
| 17:15-18:00 | <b>Session 13</b> | <a href="#">Questions and answers from Day 2</a><br>Room 365<br>Participants and faculty   |

## **WEDNESDAY**   **Session**   **Content**

|             |                   |   |
|-------------|-------------------|---|
| 9:00-10:30  | <b>Session 14</b> | <a href="#">Period analysis and “prediction” of survival</a><br>Manson<br>Pamela Minicozzi                        |
| 10:30-11:00 |                   | Refreshment break (South Courtyard)   |
| 11:00-12:30 | <b>Session 15</b> | <a href="#">Practical 4: Period analysis and “prediction” of survival</a><br>Room 365<br>Participants and faculty |
| 12:30-13:30 |                   | Lunch break (on your own)   |
| 13:30-15:00 | <b>Session 16</b> | <a href="#">Missing data in cancer survival analysis</a><br>Manson<br>Helen Fowler                                |
| 15:00-15:30 |                   | Refreshment break (South Courtyard)   |
| 15:30-17:15 | <b>Session 17</b> | <a href="#">Practical 5: Handling missing data in survival analysis</a><br>Room 365<br>Students and faculty       |
| 17:15-18:00 | <b>Session 18</b> | <a href="#">Questions and answers from Day 3</a><br>Room 365<br>Participants and faculty                          |

| <b>THURSDAY</b> |                               |  |
|-----------------|-------------------------------|--|
|                 | <b>Session</b>                | <b>Content</b>   |
| 9:00-10:30      | <b>Session 19</b><br>Manson   | <a href="#">Modelling net survival</a><br>Paul Dickman   |
| 10:30-11:00     |                               | Refreshment break (South Courtyard)  |
| 11:00-12:30     | <b>Session 20</b><br>Room 365 | <a href="#">Practical 6: Modelling net survival</a><br>Participants and faculty  |
| 12:30-13:30     |                               | Lunch break (on your own)  |
| 13:30-14:45     | <b>Session 21</b><br>Manson   | <a href="#">Secondary measures of cancer survival</a><br>Paul Dickman  |
| 14:45-15:15     |                               | Refreshment break (South Courtyard)  |
| 15:15-16:00     | <b>Session 22</b><br>Manson   | <a href="#">Questions and answers from Day 4</a><br>Participants and faculty   |
| 16:00-17:15     | <b>Session 23</b><br>Manson   | <a href="#">Cancer survival – participants' case studies</a><br>Facilitated by Fabio Girardi   |
| <b>FRIDAY</b>   |                               |  |
|                 | <b>Session</b>                | <b>Content</b>   |
| 9:00-10:00      | <b>Session 24</b><br>Manson   | <a href="#">Non-parametric estimation and modelling in relative survival</a><br>Maja Pohar Perme   |
| 10:00-11:00     | <b>Session 25</b><br>Manson   | <a href="#">Mortality-to-incidence ratio: not a valid proxy for cancer survival</a><br>Michel Coleman  |
| 11:00-11:30     |                               | Refreshment break (South Courtyard)  |
| 11:30-12:30     | <b>Session 26</b><br>Manson   | <a href="#">International comparisons of cancer survival</a><br>Claudia Allemani   |
| 12:30-13:30     |                               | Farewell lunch (South Courtyard)   |
| 13:30-14:30     | <b>Session 27</b><br>Manson   | <a href="#">Cancer patient survival as a possible evaluation of medical performance: a historical viewpoint</a><br>Speaker and title to be confirmed |
| 14:30-15:30     | <b>Session 28</b><br>Manson   | <a href="#">Cancer survival research and cancer policy - 2</a><br>Michel Coleman   |
| 15:30-16:00     | <b>Session 29</b><br>Manson   | <a href="#">Tools for survival analysis</a><br>Participants and faculty  |

## Outline of the contents of each session

### Session 0

#### 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 the cancer burden

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

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### Session 4

#### Population-based cancer survival: concepts

- Definition of all-cause survival
- Definition of net survival
- Introduction to the cause-specific survival setting
- Introduction to the relative survival setting

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### Session 5

#### Practical 1 – Set-up, introduction and downloads

- 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 other faculty members will be available to provide assistance

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## **Session 6**

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

- In this session, you will have the opportunity to do practical exercises based on the themes discussed in the accompanying lecture. A practical leader will facilitate the session, and faculty members will provide assistance. Solutions will be provided during the session.

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## **Session 7**

### **Questions and answers from Day 1**

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

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## **Session 8**

### **Relative survival analysis**

- Introduction to competing risks analysis
- The various concepts in relative survival: overall survival, crude mortality, net survival, relative survival ratio
- Non-parametric estimators of relative survival measures
- Specific aspects of estimation

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## **Session 9**

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

- Data quality and quality control: an essential component of epidemiological research
- Background to population-based cancer registration: regional and national registries, general and specialised registries
- Registration systems: sources of data; active and passive follow-up
- Purpose of data quality indicators for cancer survival
  - ✓ to document data quality for external review
  - ✓ to ensure robust comparisons of survival
- Types of quality control:
  - ✓ on each variable (compliance with the study protocol)
  - ✓ on each record (logical coherence of variables)
  - ✓ on each data set (frequency distributions, summary measures, ...)
- Improving comparability through standard approaches to coding of topography, morphology and stage

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## **Session 10**

### **Age-standardisation of cancer survival**

- Importance of age standardisation
- Age-standardisation methods
- Examples of application and interpretation of age-standardised estimates
- Choice of standard weights
- Extension to multi-factor standardisation, e.g., a cancer survival index

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## **Session 11**

### **Life tables of background mortality and their impact on survival estimates**

- Life tables – an historical note
- Description of main indicators
- Smoothing techniques – from abridged to complete life tables
- Life tables for population sub-groups
- Role of life tables in the estimation of net survival

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## **Session 12**

### **Practical 3 – Net survival estimation, and the impact of life tables of background mortality on the estimates**

- In this session, you will have the opportunity to do practical exercises based on the themes discussed in the accompanying lecture. A practical leader will facilitate the session, and faculty members will 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 participants and faculty will be invited to contribute.

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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, you will have the opportunity to do practical exercises based on the themes discussed in the accompanying lecture. A practical leader will facilitate the session, and faculty members will 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 that should not 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, you will have the opportunity to do practical exercises based on the themes discussed in the accompanying lecture. A practical leader will facilitate the session, and faculty members will 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 participants and faculty will be invited to contribute.

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## **Session 19**

### **Modelling net survival**

- The outcome in survival analysis can be expressed either as a survival proportion or as a 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 20**

### **Practical 6 – Modelling net survival**

- In this session, you will have the opportunity to do practical exercises based on the themes discussed in the accompanying lecture. A practical leader will facilitate the session, and faculty members will provide assistance. Solutions will be provided during the session.

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## **Session 21**

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

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

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## **Session 22**

### **Questions and answers from Day 4**

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

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## **Session 23**

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

This session offers the opportunity for you to raise any question or practical problem in cancer survival research that you may have encountered, for open discussion with faculty and other participants.

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## **Session 24**

### **Net survival – non-parametric and modelled estimates**

- The link between non-parametric estimation and modelling
- Specific issues and pitfalls of relative survival

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## **Session 25**

### **Mortality-to-incidence ratio: not 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
- Globocan and Global Burden of Disease estimates – extrapolation and models
- 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”, or of avoidable premature deaths, etc.

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## **Session 26**

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

- EURO CARE, CONCORD and other international collaborative studies
- “Low-resolution”, “high-resolution” and “patterns of care” studies
- Importance of centralised quality control and analysis
- Importance of appropriate life tables, statistical techniques and age-standardisation
- Impact of data quality and bias on the interpretation of international differences in survival
- Deployment of survival comparisons in national and international strategies for cancer control

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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
- WHO policy on non-communicable diseases, the Sustainable Development Goals and the Global Initiative for Childhood Cancer

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## **Session 29**

### **Tools for survival analyses**

- Availability 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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