

# Swiss Epidemiology Winter School 2023



## Competing Risks and Multi-state Models

19–21 January 2024

### Faculty

**Dr. Michael Crowther**

Red Door Analytics, Stockholm, Sweden

**Dr. Caroline Weibull**

Clinical Epidemiology Division, Department of Medicine Solna, Karolinska Institutet, Stockholm, Sweden and Red Door Analytics, Stockholm, Sweden

### Venue

**CH – 3823 Wengen | SWITZERLAND**

Hotel Edelweiss ([map](#))

### Course description

This course will focus on how to analyse and interpret data in the competing risk, and the more general, multi-state model setting. Competing risks models play an increasingly important role for predicting absolute risks of disease and prognosis using time to event data. An overarching goal of this course is to provide a solid introduction to important concepts in the presence of competing risks (e.g., which quantities can be estimated and what they represent) as well as practical aspects of estimation. Multi-state models provide an extension to the competing risks situation, enabling modelling of complex disease pathways. By modelling transitions between disease states, accounting for competing events at each transition, we can gain an improved understanding of a patient's prognosis and how risk factors impact over the whole disease pathway. Throughout the course we will place emphasis on the use of flexible parametric survival models that incorporate restricted cubic splines on the log hazard or log cumulative hazard scale. This will include models with time-dependent effects (non-proportional hazards). We will focus on obtaining clinically useful and directly interpretable predictions, which are particularly useful for more complex models, but also describe the challenges and various approaches to calculating them. We will also discuss assumptions of the models, including the Markov assumption and how this can be relaxed. Real-world examples will be presented and discussed. The course will be taught using Stata making use of the multistate and merlin packages.

### Course objectives

By the end of this course participants will have:

- An understanding of how to fit and interpret flexible parametric survival models, including modeling of time-dependent effects.
- An understanding of competing risks models and how to estimate cumulative incidence functions non-parametrically and using parametric models.

### Contact:

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- An understanding of how to construct, analyse and interpret a multi-state model.
  - An understanding of the variety of useful measures that can be obtained from multistate models.
  - Practical experience of fitting the models using Stata®.
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**Course audience**

Course participants should be familiar with standard survival models, such as the Cox model and/or parametric survival models (e.g. Weibull) and interested in extending their knowledge to the more complex issues of competing risks and multistate models. The course will include theory but emphasis is placed on applying and interpreting the methods.

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**Course outline**

The course runs over three days and consist of lectures and computer practical sessions.

We start in the morning by reviewing the previous day. During the extended afternoon break, participants review course materials, catch up on email, or ski. We reconvene at 4:30 pm for the computer sessions.

**Thursday, 18 January 8:00 am – 12:00 pm | 4:30 pm – 6:30 pm**

- Brief review of time-to-event data including the Cox model
- Flexible parametric survival models
- Modelling competing risks
- Estimating cumulative incidence functions

**Friday, 19 January 8:00 am – 12:00 pm | 4:30 pm – 6:30 pm**

- Introduction to multi-state models
- The illness death model
- The Markov assumption
- Stacked versus separate models
- Estimating contrasts between groups

**Saturday, 20 January 8:00 am – 12:00 pm | 1:00 pm – 3:00 pm**

- Expected length of stay in different states
  - Resetting the clock and semi-Markov models
  - Standardisation in multi-state models
  - Real-world examples using multi-state models
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**Credits** 1.0 ECTS

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**Course materials** Bring a portable computer. A course license for Stata® will be available to install before arrival. Participants will receive digital copies of all course material. Onsite University of Bern IT staff provides support upon e-mail ([it@ispm.unibe.ch](mailto:it@ispm.unibe.ch)) request.

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**Course fee**

PhD Bern Students:	CHF 350
PhD Students:	CHF 700
Academic:	CHF 900
Industry:	CHF 2000

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**Registration** Register on the [Winter School website](#). Pre-Registration starts 29 August 2022 at 12:00 pm (CET).

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**Accomodation** Book your accommodation separately. Please see [recommendations for special prices](#)

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