Introduction to Target Trial Emulation

Target Trial Emulation (TTE) is a methodological approach for answering interesting causal research questions (like the effect of a chosen medical treatment on a given health outcome) from observational databases. In a TTE, the study is designed and the data analyzed almost as would be done in a hypothetical randomized controlled trial -- the target trial – which, if feasible, would be the ideal design to address the causal question. First, a protocol for the target trial is specified with components: eligibility criteria, treatment strategies, treatment assignment, follow-up time, outcomes, causal contrasts, and statistical analysis plan. Then, these components are reproduced as closely as possible in the protocol of the corresponding TTE. This includes among others careful alignment of the time ("time-zero") of eligibility assessment, initiation of treatments and start of follow-up. It also instructs on appropriate adjustments, both for confounding due to measured confounders and for informative censoring. A properly conducted TTE eliminates some time-related biases often encountered in observational studies, such as immortal time bias and selection bias due to left-truncation. As treatments in a TTE are not randomly assigned, there remains some residual confounding. This may be a lesser problem when the outcome (e.g. cancer) represents an unintended effect of the treatments (e.g. lipid-lowering drug).

Faculty of Medicine Postgraduate Education Unit (PGE) organizes a two-day course in the Autumn term, 2026. All doctoral researchers and researchers are welcome to attend the course. The number of participants is limited to 40 people.

Course leader: Biostatistician Eliisa Löyttyniemi, University of Turku,

Teachers: Emeritus professor Esa Läärä, University of Oulu

Biostatistician Terhi Kolari, University of Turku (terhi.kolari@utu.fi)

Credits: 1 ECTS, 11 h of lectures and practicals

Learning outcomes: After successful completion of the course, the student is able to describe the basic principles of target trial emulation, the relevant estimands (intention-to-treat and per-protocol effects) describing interesting causal effects on medical and public health interventions, and the major biases to be avoided in observational studies when aiming to obtain unbiased results on the estimands. In addition, the student has gained basic proficiency in using the tools available in the R environment for analyzing data from a target trial emulation.

Prerequisites: Basic knowledge in statistical methods as well as some experience in statistical modelling (like logistic and Cox regression) and the use of the R environment.

Requirements: Active participation in lectures, and practical sessions. Participants are given selected articles for pre-reading and homework.

Evaluation: Pass/Fail

Registration by 31st October, 2026: Doctoral researchers and students in Peppi (PGS_1880-3001). Researchers in RedCap: https://redcap.link/TTE

Contact: Biostatistician Terhi Kolari, terhi.kolari@utu.fi

Programme

Thursday 26.11.2026 -- Place: Dent1, Dentalia

09.00-10.30 Lecture I (1.5 x 45 min, including 15 min break): Motivation for target trial emulation. Interesting causal estimands in randomized controlled trials. Common biases in observational studies, and how to avoid them in TTE.

10.30-10.50 Break

10.50-12.10 Practical session I (2 x 45 min): Critical review of published articles; a conventional observational study and a TTE.

12.10-13.10 Lunch (not free)

13.10-14.55 Lecture II (2 x 45 min, including 15 min break): Principles of statistical analysis of data in a TTE; modelling the outcome, censoring and adherence, and the application of inverse probability weighting (IPW) .

Friday 27.11.2026 -- Place: Dent1, Dentalia

09.00-10.30 Practical session II (2 x 45 min): Computer practical – analysing TTE data in the R environment.

10.30-10.50 Break

10.50-12.10 Lecture III (1,5 x 45 min, including 10 min break): Further issues in the analysis of TTE data.

12.10-13.10 Lunch (not free)

13.10-14.30 Practical session III (1,5 x 45 min): Continuing computer practical in R

14.40-15.00 Lecture IV (0.5 x 45 min): Concluding remarks