

Logistic Regression

November 1–2, 2022

Campus Biotech H4.02.A, Geneva

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1. Abstract

Logistic regression (LR) is the established model for analyzing a binary outcome variable (e.g., 0=absence, 1=presence; 0=male, 1=female). As in ordinary regression with continuous outcomes, the goal of LR is to find linear relationships between the binary outcome and a number of predictor variables, which may reflect experimental manipulations and/or observational measurements. Despite this conceptual similarity, LR is dramatically different from ordinary regression in terms of statistical assumptions, parameter estimation, parameter interpretation, and model diagnostics. LR is a special case of the generalized linear model (GLM), and has close connections to the analysis of frequency tables (e.g., chi-square analysis). Even more generally, these methods belong to the domain of categorical data analysis.

This workshop provides an in-depth look at LR with an emphasis on practical application through the R statistical software. In the first part, we will discuss the general problem of analyzing categorical data, such as simple proportions, 2×2 frequency tables, $K \times K$ frequency tables, and tables of arbitrary dimensions (log-linear analysis). In the second part, we focus on LR in particular, moving from simple models with one binary predictor to the general case of multiple categorical and continuous predictors. Special emphasis will be placed on effect interpretation with both numerical and visual methods (e.g., logistic decision curves). The third part will consist of either a practical R part or a discussion of multilevel logistic regression (to be decided).

2. Audience and format

This workshop is aimed at researchers in social sciences who wish to deepen their understanding of categorical data analysis and logistic regression in particular. Prior experience with logistic learning is helpful but not required for following the workshop. Understanding of basic linear regression concepts (e.g., ANOVA, multiple regression) and chi-square analysis is required. Familiarity with R is strongly recommended but not necessary to follow the theoretical lectures. All scripts are integrated directly into the

lectures. The first part/day will cover proportion tests, chi-square analysis, log-linear analysis, and logistic regression. The second part/day will cover either an R practical or a discussion of multilevel logistic regression (to be decided).

3. Material and R

All workshop material (slides, data, scripts) will be shared in downloadable format in advance of the workshop. R scripts will load data sets directly from the internet, so no data needs to be saved on your computer. If you wish to run the R scripts, you will need to have installed a recent version of R (<https://www.r-project.org/>), as well as the packages listed below. The fast way to do this is by first selecting a mirror/location to download packages from, followed by directly running this line of code:

```
install.packages(c("car", "DescTools", "dplyr", "lme4", "lmerTest", "plyr", "vcd", "vcdExtra", "visreg"))
```

For Mac users, remember to check the option “install dependencies” when installing a package, as this will automatically install any secondary packages that the package depends upon. For PCs this option is switched on by default.

4. Detailed program

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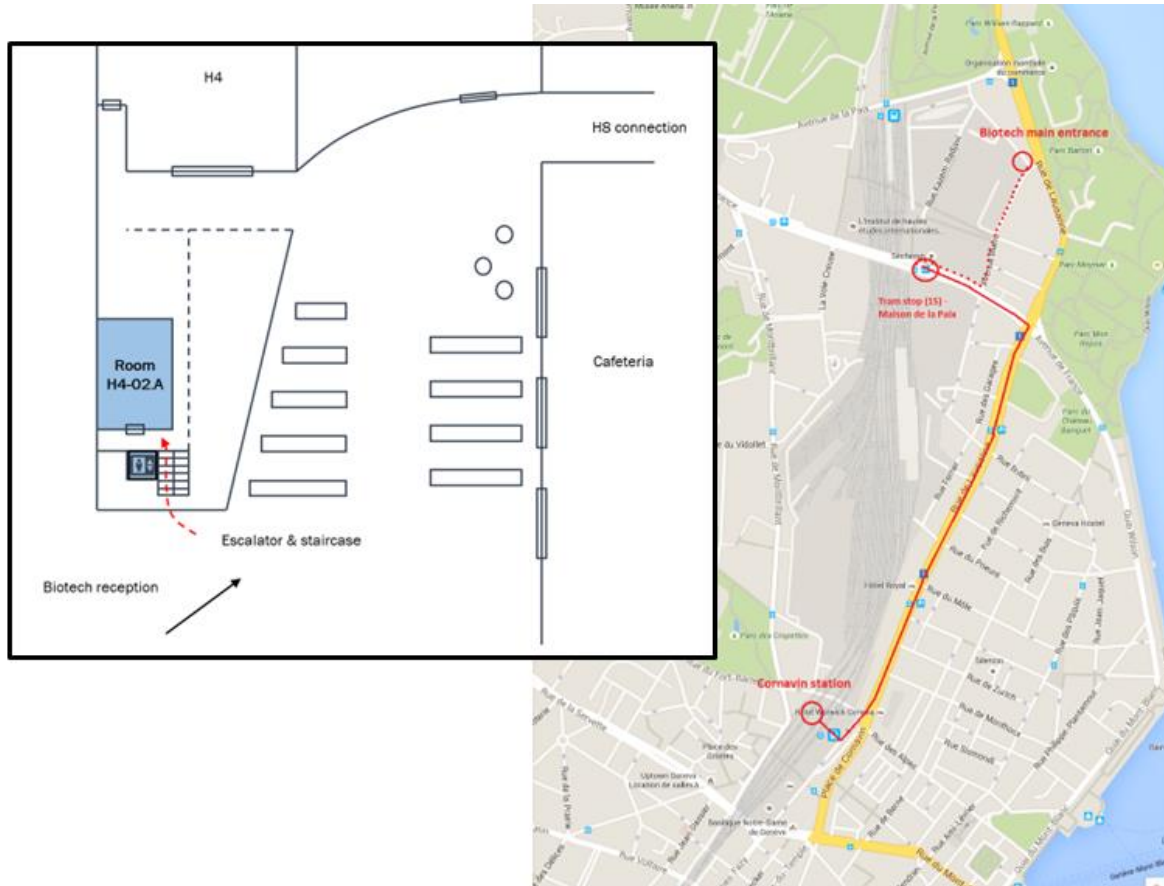
13:00 – 14:00:	Proportions and chi-square analysis
14:00 – 14:15:	Break
14:15 – 15:15:	Log-linear analysis
15:15 – 15:30:	Break
15:30 – 16:30:	Logistic regression I
16:30 – 16:45:	Break
16:45 – 18:00:	Logistic regression II

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09:00 – 12:00:	R practical OR multilevel logistic regression
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5. Directions

The course takes place at H4.02.A at Campus Biotech, which is a small container building to the left side of Uni Mail. From Cornavin train station, it can be reached easily by taking the 15 tram line (direction: Palettes) to the stop Maison de la Paix. See map below for detailed directions:



6. Registration

Please register at <https://formulaire.unige.ch/cisa/survey/index.php/589774?lang=en> by **Tuesday October 25th**

Applicants will be selected based on individual needs and motivation statement. Priority will be given to the members of the CISA doctoral school and postdoctoral program. A mail with the outcome of the selection process will be sent to all applicants on October 26th.

7. Contact

For any inquiries, you can write to education-cisa@unige.ch