

**Online live course (14.00 - 20.00 UK time)**

# Introduction to Zero Inflated GLMs and GLMMs with R - Using frequentist tools -

**Provided by: Highland Statistics Ltd**

## Key components:

- Analysis of count data, continuous data and proportional data with an excessive number of zeros.
- Applying zero-inflated Poisson, negative binomial, generalised Poisson, binomial and beta GLMs and GLMMs using glmmTMB. Applying Tweedie GLM(M)s and hurdle models using glmmTMB.
- Bonus material: If we were to design a similar field study or experiment, how many clusters, and how many observations per cluster should we sample?

## Course format

This online live course consists of six 6-hour online Zoom meetings representing a total of approximately 36 hours of work. Each module consists of short (non-mathematical) theory presentations, followed by exercises using real data sets.

All exercises and theory presentations are also available as on-demand video (and you can watch these later).

You are invited to apply the statistical techniques discussed during the course on your own data and if you encounter any problems, you can ask questions on a Discussion Board.

The course fee includes a 1-hour face-to-face video chat with the instructors.

**Dates:** 21, 24, 25, 26, 27 and 28 April 2023

- Live online teaching.
- 14.00 - 20.00 UK time.

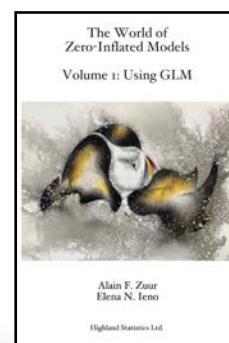
**Price:** £500

**Included: 1 hour face-to-face video chat about your data.**

## Instructors:

- Dr. Alain Zuur
- Dr. Elena Ieno

Authors of 12 books and providers of over 150 courses



## COURSE CONTENT

### Module 1 (Friday 21 April 2023)

- General introduction.
- Short revision of data exploration and linear regression in R.
- Introduction to matrix notation.
- Revision Poisson GLM for the analysis of count data.
- Introducing the negative binomial, generalised Poisson and Conway-Maxwell-Poisson GLMs for the analysis of count data.
- Model validation using DHARMA.

### Module 2 (Monday 24 April 2023)

- Theory presentation on zero-inflated models.
- Three exercises using the zero-inflated GLMs for the analysis of data sets with an excessive number of zeros in the count data.

### Module 3 (Tuesday 25 April 2023)

- Theory presentation on hurdle models for the analysis of zero-inflated count data. This presentation also covers zero-truncated models.
- One exercise using zero-altered Poisson and zero-altered negative binomial models for the analysis of count data with an excessive number of zeros.
- Theory presentation on the GLM with the Tweedie distribution.
- Application of a Tweedie GLM on zero-inflated continuous data. We will also explain the zero-altered Gamma model.

### Module 4 (Wednesday 26 April 2023)

- Revision of linear mixed-effects models.
- Exercise on linear mixed-effects models.
- Exercise using a zero-inflated Poisson GLMM to analyse count data.
- Exercise using a zero-inflated negative binomial GLMM to analyse count data.

### Module 5 (Thursday 27 April 2023)

- Exercise using a zero-inflated binomial GLMM to analyse proportional data.
- Exercise using a zero-inflated beta GLMM to analyse proportional.
- Exercise using a Tweedie GLMM and a zero-altered Gamma GLMM to analyse continuous data with an excessive number of zeros.

### Module 6 (Friday 28 April 2023)

- Catching up.
- Time allowing:
  - Bonus material: If we were to design a similar field study or experiment, how many clusters, and how many observations per cluster should we sample? In case we are not able to cover this section, it is also available as on-demand video.

**GENERAL INFORMATION**

**COURSE FEE: £500**

- Credit card payments are charged in GBP currency.
- VAT charge:
  - UK participants are charged 20% VAT.
  - Non-EU participants (including Norway) are not subject to VAT.
  - We do not have to charge VAT to EU participants who provide their [institutional VAT number](#).
  - EU participants who do not provide a VAT number will be charged VAT at their national rate.

**LIVE ZOOM MEETINGS APRIL 2023**

	Module 1	Module 2	Module 3	Module 4	Module 5	Module 6
14.00-20.00	21 April	24 April	25 April	26 April	27 April	28 April

- These are UK times (British Summer Time).
- You can use this link for a time zone converter: <https://www.timeanddate.com/>
- 14.00 UK time = 09.00 New York / Toronto.

Course participants will be given access to the course website with all the videos, data sets, R solution code and course material as soon as they sign up.

**FREE 1-HOUR FACE-TO-FACE MEETING**

The course fee includes a 1-hour face-to-face meeting with one or both instructors. The meeting needs to take place within 12 months after the last live zoom meeting. You can discuss your own data, but we strongly advice that the statistical topics are within the content of the course. The 1-hour needs to be consumed in one session, and will take place at a mutual convenient time.

**PRE-REQUIRED KNOWLEDGE:**

Working knowledge of R, data exploration, linear regression and GLM (Poisson and Bernoulli). This is a non-technical course. Short revisions are provided.

## COURSE FLYER

### RECOMMEND LITERATURE:

- Zuur, Ieno (2021). *The World of Zero-Inflated Models*. Volume 1: Using GLM.
- Zuur, Ieno (2024). *The World of Zero-Inflated Models*. Volume 2: Using GLMM.
- These books are available from [www.highstat.com](http://www.highstat.com).

Books are not included in the course fee. The course can be followed without purchasing these books.

### SHORT DESCRIPTION OF THE COURSE CONTENT

The course starts with a short revision of data exploration, multiple linear regression and Poisson GLM. We then discuss 3 more models for the analysis of count data, namely the negative binomial, generalised Poisson and Conway-Maxwell-Poisson GLMs. After a short theory presentation on zero-inflated models, we apply all four GLMs, and their zero-inflation cousins on various data sets. We also use the Tweedie GLM and the zero-altered Gamma GLM for the analysis of zero-inflated continuous data.

In the second part of the course, we start with a short revision of linear mixed-effects models. This is followed by a series of exercises in which we analyse zero-inflated count data, continuous data and proportional data using zero-inflated GLMMs.

In this online bonus material (available as on-demand video) we focus on the question: ‘If we were to design a similar study, how many clusters and observations per cluster do we need?’ We will apply simulation studies (power analysis) to answer these questions.

Throughout the course we will use the `glmmTMB` package in R.

### GENERAL

- Please ensure that you have system administration rights to install R and R packages on your computer.
- Instructions what to install is on the course website.

### CANCELLATION POLICY:

What if you are not able to participate? Once participants are given access to course exercises with R solution codes, pdf files of certain book chapters, pdf files of powerpoint files and video solution files, all course fees are non-refundable. However, we will offer you the option to attend a future course or you can authorise a colleague to attend this course.

Terms and conditions: See the footer at [www.highstat.com](http://www.highstat.com).

### REGISTRATION

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Payment via credit card or bank transfer

