

Introducing PoPy

- A **P**opulation PKPD estimation and simulation tool using the **P**ython programming language
- Simple and elegant syntax
- Utilises Cython compilation + MPI parallelisation for speed
- Synthetic population data from a single model file
- Non-derivative parameter estimation method (**PoPy-ND**) based on the BOBYQA algorithm
- Apply FOCE approximation using non-normal error distributions e.g Poisson count data or BLQ data – PoPy avoids the need for LAPLACE approximation

Experiments

- Generate 200 populations with 50 subjects
 - Known true model parameters
 - Estimate parameters using **PoPy-ND** and **Nonmem-FOCEI**
 - Compare parameters using relative error rate
- $$RER = (estimated - true) / true$$
- Compare final objective values using Nonmem EONLY fit

Conclusions

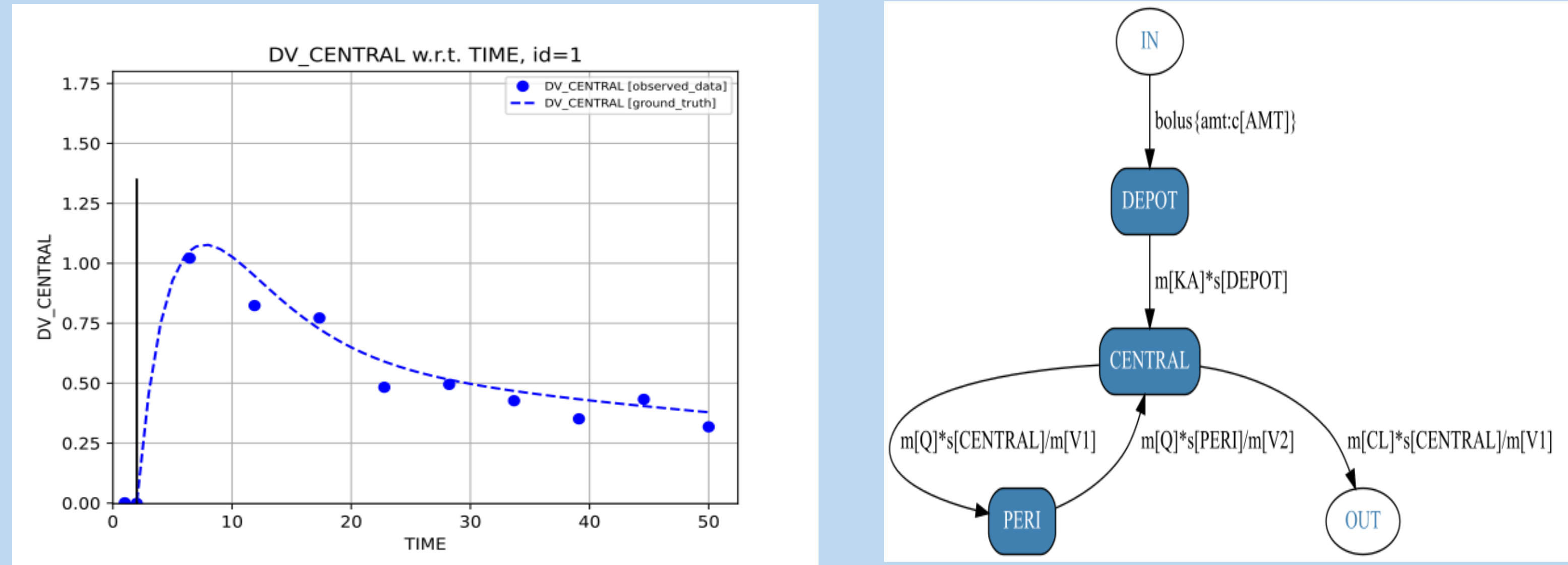
- **PoPy-ND** method gives more robust fitting compared to **Nonmem-FOCEI**
- Lower objective values and more accurate parameter estimation
- **PoPy-ND** takes a little longer to run

More information on PoPy

PoPy v1.0.5 is freely available for non commercial use or 2 month trial period for any purpose.

Website: <https://product.popykpd.com/>
 Mailing List: signup@popykpd.com
 Contact: david@popykpd.com

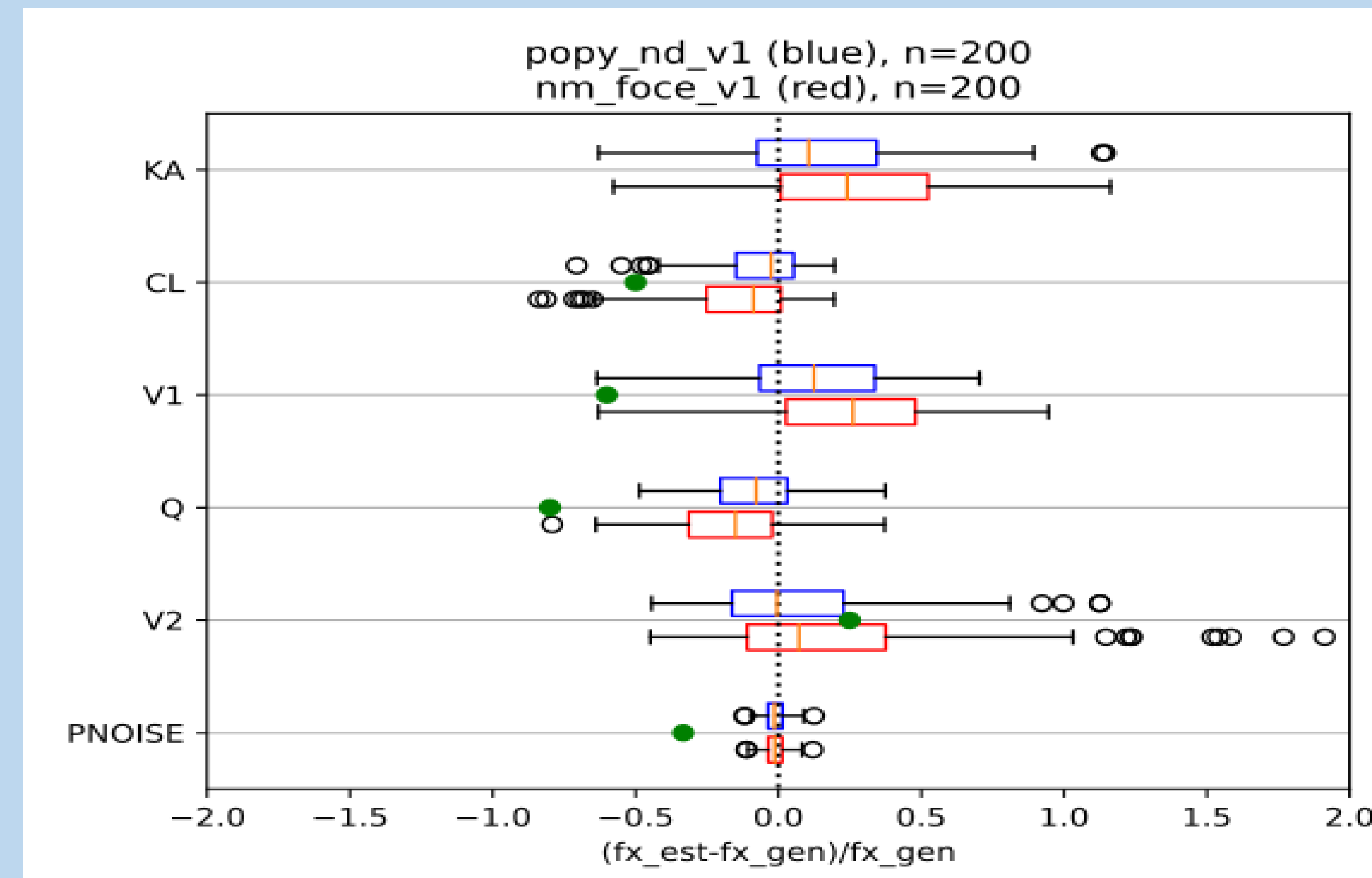
Two compartment PK model – ground truth data



Example PK data for one subject

Compartment diagram generated from differential equations

Two compartment PK model – fitting results

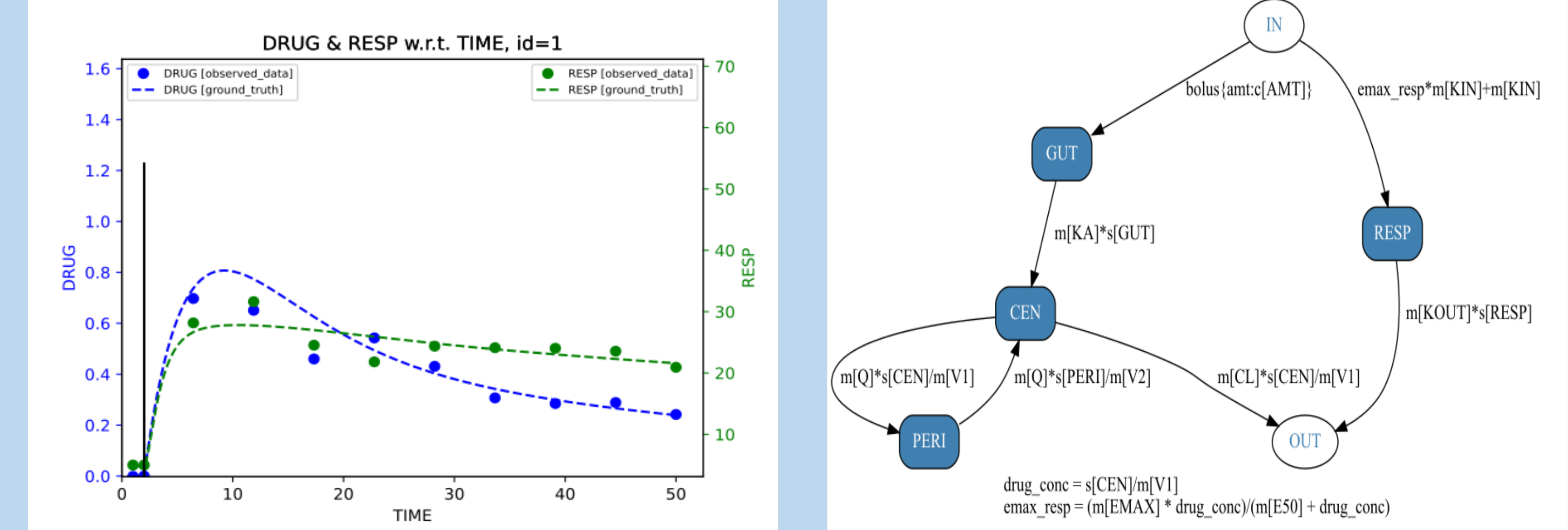


Theta RER for **PoPy-ND** closer to zero than **Nonmem-FOCEI**

Method	THETA RMS RER	Mean FOCEI ObjV	Mean Nonmem-FOCEI ONLY ObjV	Mean Fitting Time (secs)
PoPy-ND	0.2447	-2316.97	-2316.74	226
NM-FOCEI	0.3496	-2315.70	-2315.70	95

Lower RMS RER for **PoPy-ND** and NONMEM agrees that PoPy has found a lower objective function minima on average.

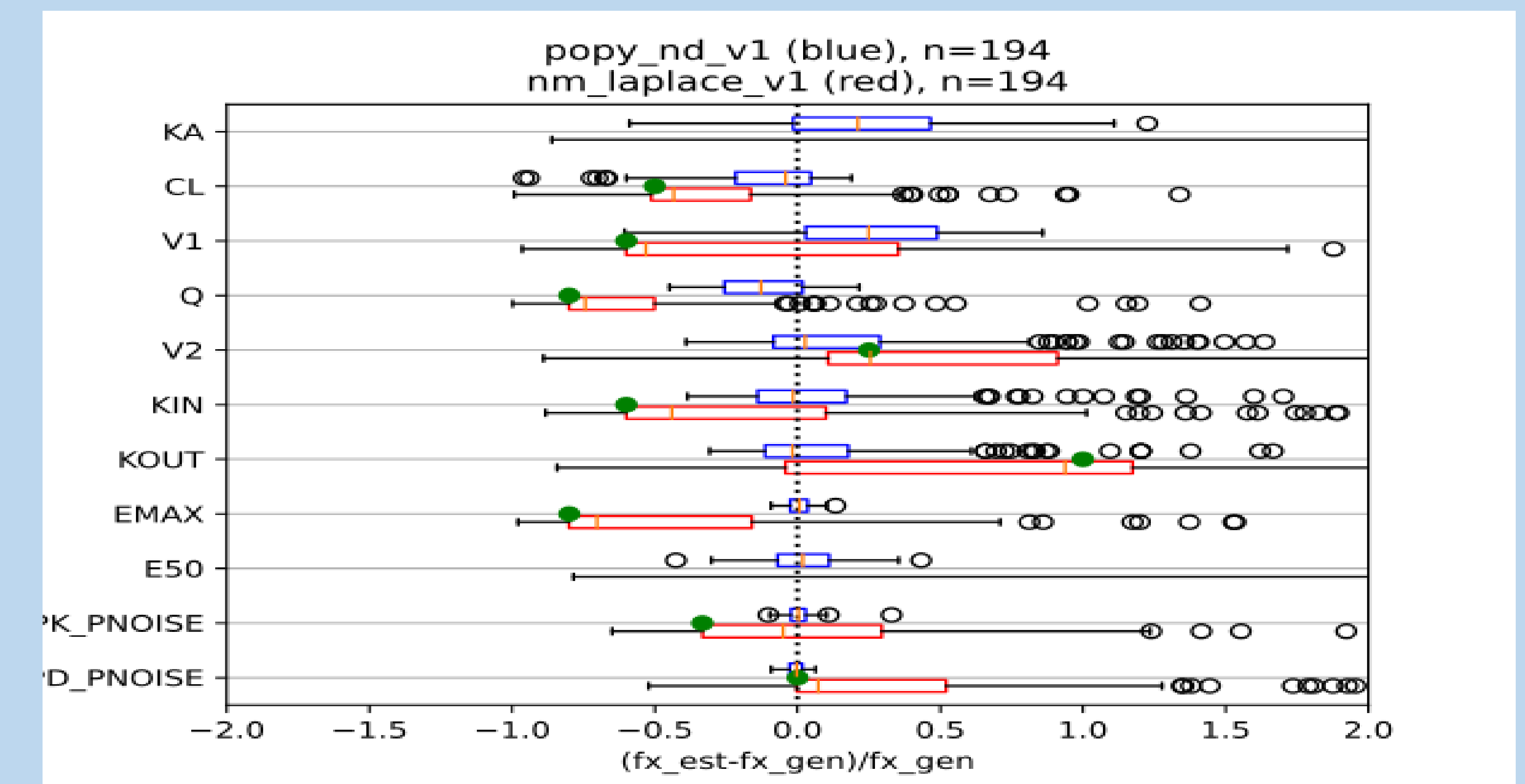
Joint PKPD Model with BLQ PD data – ground truth data



Example PK/PD data for one subject, BLQ=5 for PD

Compartment diagram generated from differential equations

Joint PKPD Model with BLQ PD data – fitting results



Theta RER for **PoPy-ND** closer to zero than **Nonmem-LAPLACEI**

Method	THETA RMS RER	Mean FOCEI ObjV	Mean Nonmem-LAPLACEI ONLY ObjV	Mean Fitting Time (secs)
PoPy-ND	0.4876	-737.77	-733.29	1017
NM-LAPLACEI	9.9823	NA	2418.49	198

Much lower RMS RER and Objective value for **PoPy-ND**. Advantage due to FOCE fitting to BLQ data.