Are population pharmacokinetic and/or pharmacodynamic models adequately evaluated? A survey of the literature from 2002 to 2004.
Karl Brendel, Céline Dartois, Emmanuelle Comets, Annabelle Lemenuel-Diot, Christian Laveille, Brigitte Tranchand, Pascal Girard, Céline M. Laffont, France Mentré

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Data Abstraction Form
for population PK/PD publications

MODEL EVALUATION

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Comets E.\textsuperscript{1}, Lemenuel-Diot A.\textsuperscript{3}, Laffont C.M.\textsuperscript{3}, Laveille C.\textsuperscript{4},
Girard P.\textsuperscript{2}, Mentré F.\textsuperscript{1}

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\textsuperscript{2}EA3738, Lyon, France
\textsuperscript{3}SERVIER, Courbevoie, France
\textsuperscript{4}EXPRIMO NV, Lumnen, Belgium

* the two first authors contributed equally to this Data Abstraction Form
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ARTICLE IDENTIFICATION

DATE OF PUBLICATION (YEAR) ...........................................  __ __ __ __
TITLE ................................................................................
................................................................................
................................................................................
FIRST AUTHOR ..................................................................
I. BASIC INTERNAL

Goodness of fit

For the PK, PD study or the PKPD study

Were graphs plotted for basic evaluation?  
☐ Yes  
☐ No

Which graphs are shown in the paper?  
☐ None

(OBS: Observations, PRED: Population Prediction, IPRED: Individual Prediction, WRES: Weighted residuals of population, IWRES: Weighted residuals of individual, COV: Covariates, RES: Difference between PRED and OBS, η_i: interindividual random effects, θ_i: individual parameters, “X”: can be time or dose, Distribution: boxplot, histogram, or QQ plot)

☐ OBS vs X with PRED
☐ PRED vs “X”  
☐ PRED vs OBS  
☐ RES vs PRED
☐ WRES vs “X”  
☐ WRES vs PRED
☐ |WRES| vs PRED
☐ Distribution of RES or WRES
☐ Distribution of θ_i
☐ Distribution of η_i
☐ Others:  ..............................................................
## Uncertainty on parameters

### For the PK study

- [ ] SE or CV or CI on fixed effects
- [ ] SE or CV or CI on variance of random effects
  
  SE or CV or CI are obtained by:
  - [ ] Fisher information matrix
  - [ ] Profile likelihood
  - [ ] Bootstrap

Which type of bootstrap has been performed?
- [ ] On individuals (wild bootstrap)
- [ ] Other, define: ...........................................

Number of bootstrap samples: ............
- [ ] SD of posterior distribution of the parameters (Bayesian methods)
- [ ] Graphs of posterior distribution of the parameters (Bayesian methods)
- [ ] Correlation between estimates were reported
- [ ] Others: ......................................................

### For the PD study (or PKPD study)

- [ ] SE or CV or CI on fixed effects
- [ ] SE or CV or CI on variance of random effects
  
  SE or CV or CI are obtained by:
  - [ ] Fisher information matrix
  - [ ] Profile likelihood
  - [ ] Bootstrap

Which type of bootstrap has been performed?
- [ ] On individuals (wild bootstrap)
- [ ] Other, define: ...........................................

Number of bootstrap samples: ............
- [ ] SD of posterior distribution of the parameters (Bayesian methods)
- [ ] Graphs of posterior distribution of the parameters (Bayesian methods)
- [ ] Correlation between estimates were reported
- [ ] Others: ......................................................
## Evaluation of covariate model

### For the PK study

**Were graphs plotted for evaluation of covariates model?**  
☐ Yes  ☐ No

**Which graphs are shown in the paper?**  
☐ None

(WRES: Weighted residuals of population, IWRES: Weighted residuals of individual, COV: Covariates, RES: Difference between PRED and OBS, \(\eta_i\): interindividual random effects, \(\theta_i\): individual parameters, \(\theta\): population parameters)

- ☐ WRES vs COV  ☐ \(\eta_i\) vs COV
- ☐ RES vs COV  ☐ \(\theta_i\) vs COV
- ☐ Other, define: ..............................................
- ☐ Randomisation test
  - Number of simulations: .......................  
- ☐ Others, define: ..............................................

### For the PD study  (or PKPD study)

**Were graphs plotted for evaluation of covariates model?**  
☐ Yes  ☐ No

**Which graphs are shown in the paper?**  
☐ None

(WRES: Weighted residuals of population, IWRES: Weighted residuals of individual, COV: Covariates, RES: Difference between PRED and OBS, \(\eta_i\): interindividual random effects, \(\theta_i\): individual parameters)

- ☐ WRES vs COV  ☐ \(\eta_i\) vs COV
- ☐ RES vs COV  ☐ \(\theta_i\) vs COV
- ☐ Other, define: ..............................................
- ☐ Randomisation test
  - Number of simulations: .......................  
- ☐ Others, define: ..............................................
### Model sensitivity

#### For the PK study

- [ ] Sensitivity analysis to data outliers
  - Define method: .................................................................

- [ ] Sensitivity analysis to individual outliers
  - Define method: .................................................................

- [ ] Sensitivity analysis with respect to some parameters
  - Define method: .................................................................

#### For the PD study (or PKPD study)

- [ ] Sensitivity analysis to data outliers
  - Define method: .................................................................

- [ ] Sensitivity analysis to individual outliers
  - Define method: .................................................................

- [ ] Sensitivity analysis with respect to some parameters
  - Define method: .................................................................
## II. ADVANCED INTERNAL

### Data splitting

<table>
<thead>
<tr>
<th>For the PK study</th>
<th>□ Yes □ No</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Data (Validation dataset)</strong></td>
<td>Not reported</td>
</tr>
<tr>
<td>Selection</td>
<td></td>
</tr>
<tr>
<td>□ Within patient</td>
<td>□ Between patient</td>
</tr>
<tr>
<td>□ Sequential</td>
<td></td>
</tr>
<tr>
<td>□ Randomisation</td>
<td></td>
</tr>
<tr>
<td>□ Stratification on covariates</td>
<td></td>
</tr>
<tr>
<td>□ Covariate distribution compared between validation and building datasets</td>
<td>Not reported</td>
</tr>
<tr>
<td>Number of subjects (PK):</td>
<td>Not reported</td>
</tr>
<tr>
<td>Number of observations (PK):</td>
<td>Not reported</td>
</tr>
</tbody>
</table>

**Final Data**

Was the data reanalyzed by pooling building and validation datasets?  □ Yes  □ No

<table>
<thead>
<tr>
<th>For the PD study (or PKPD study)</th>
<th>□ Yes □ No</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Data (Validation dataset)</strong></td>
<td>Not reported</td>
</tr>
<tr>
<td>Selection</td>
<td></td>
</tr>
<tr>
<td>□ Within patient</td>
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<td></td>
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<tr>
<td>□ Randomisation</td>
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</tr>
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<tr>
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<td>Not reported</td>
</tr>
<tr>
<td>Number of subjects (PK):</td>
<td>Not reported</td>
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<tr>
<td>Number of observations (PK):</td>
<td>Not reported</td>
</tr>
</tbody>
</table>

**Final dataset**

Was the data reanalyzed by pooling building and validation datasets?  □ Yes  □ No
### Bootstrap

**For the PK study**

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Which type of bootstrap has been performed?
  - [ ] Not reported
  - [ ] On individuals (wild bootstrap)
  - [ ] Stratification on covariates
  - [ ] Others, define: ........................................

- Number of bootstrap samples: ............

**For the PD study (or PKPD study)**

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
</tbody>
</table>

- Which type of bootstrap has been performed?
  - [ ] Not reported
  - [ ] On individuals (wild bootstrap)
  - [ ] Stratification on covariates
  - [ ] Others, define: ........................................

- Number of bootstrap samples: ............

### Cross-validation

**For the PK study**

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
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</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

- How cross-validation was performed?
  - [ ] Not reported
  - [ ] Stratification on covariates
  - [ ] Others, define: ........................................

- Number of groups: ............

**For the PD study (or PKPD study)**

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- How cross-validation was performed?
  - [ ] Not reported
  - [ ] Stratification on covariates
  - [ ] Others, define: ........................................

- Number of groups: ............
Monte Carlo simulation of datasets

For the PK study

<table>
<thead>
<tr>
<th>Question</th>
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<th>No</th>
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</thead>
<tbody>
<tr>
<td>Number of datasets</td>
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<td></td>
</tr>
<tr>
<td>Was design identical to original dataset?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If no, Number of subjects:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other differences, define:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>How simulations were performed?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>With uncertainty on population parameters?</td>
<td></td>
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<tr>
<td>If yes:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- SE only</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Full covariance matrix</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Using bootstrap techniques</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distribution for the population parameter:</td>
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<td></td>
</tr>
<tr>
<td>- Multivariate normal or lognormal</td>
<td></td>
<td></td>
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<tr>
<td>- Full posterior</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Other, define:</td>
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<td></td>
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<tr>
<td>Which Software has been used?</td>
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</tr>
<tr>
<td>- NONMEM</td>
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<tr>
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<td>- R/S</td>
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<td>- TS2</td>
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<tr>
<td>- Not reported</td>
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<tr>
<td>Were simulated datasets fitted?</td>
<td></td>
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</tbody>
</table>

For the PD study (or PKPD study)

<table>
<thead>
<tr>
<th>Question</th>
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<tbody>
<tr>
<td>Number of datasets</td>
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<tr>
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<td></td>
<td></td>
</tr>
<tr>
<td>If no, Number of subjects:</td>
<td></td>
<td></td>
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<tr>
<td>Other differences, define:</td>
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</table>
**Data Abstraction Form for population PK, PD publications**

### Model Evaluation

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>Not reported</th>
</tr>
</thead>
<tbody>
<tr>
<td>How simulations were performed?</td>
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<td></td>
<td>☐ Not reported</td>
</tr>
<tr>
<td>With uncertainty on population parameters?</td>
<td>Yes</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>If yes:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>☐ SE only</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>☐ Full covariance matrix</td>
<td></td>
<td></td>
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<tr>
<td>☐ Using bootstrap techniques</td>
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<td></td>
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<tr>
<td>Distribution for the population parameter:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>☐ Multivariate normal or lognormal</td>
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</tr>
<tr>
<td>☐ Full posterior</td>
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<tr>
<td>☐ Other, define:</td>
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<tr>
<td>Which Software has been used?</td>
<td>☐ NONMEM</td>
<td>☐ SAS</td>
<td>☐ R/S</td>
</tr>
<tr>
<td>☐ Other, define:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Were simulated datasets fitted?</td>
<td>Yes</td>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>

### Other methods

**For the PK study**

| Denomination: | ............................................................... |
| Purpose:      | ............................................................... |
| Method steps: | .................................................................. |

**For the PD study**

| Denomination: | ............................................................... |
| Purpose:      | ............................................................... |
| Method steps: | .................................................................. |
### Metrics

**For the PK study**

**Prediction of validation dataset obtained:**

- [ ] Not reported
- [ ] with the model based on the building dataset without refitting
  - [ ] without covariate
  - [ ] with covariates
- [ ] with the model based on the building dataset and refitting
  - [ ] without covariate
  - [ ] with covariates
- [ ] without a model (Non Compartmental Analysis, individual parameters)
- [ ] Other, define: ..............................................................

**Metrics on observations (concentrations)**

Types of metrics

- [ ] Not reported
- [ ] Prediction errors PE (*residuals RES*)
- [ ] Square prediction errors MSE or Root mean square prediction errors RMSE
- [ ] Absolute prediction errors APE
- [ ] Standardised prediction errors SPE (*weighted residuals WRES*)
- [ ] SPE where E(C) and SD(C) obtained with Monte carlo simulations
- [ ] Other metric : ........................................................................

Tests performed on metrics

- [ ] Yes
- [ ] No
- [ ] Define : ........................................................................

Graphs

- [ ] Yes
- [ ] No
- [ ] Define : ........................................................................
### On individual statistic or parameter

**Estimated parameters**
- □ $\theta_i$
- □ $\eta_i$
- □ All $\theta_i$
- □ Other, define: 

**Statistic on**
- □ AUC$_i$
- □ Clearance$_i$
- □ Other, define: 

**Types of metrics**
- □ Prediction errors PE
- □ Square prediction errors MSE or Root mean square prediction errors RMSE
- □ Absolute prediction errors APE
- □ Standardised prediction errors SPE
- □ Other metric:  

**Tests performed on metrics**
- □ Yes
- □ No

**Graphs**
- □ Yes
- □ No

### On population statistic or parameter

**Estimated parameters**
- □ $\theta$
- □ Variability
- □ Other, define:  

**Statistic on**
- □ AUC
- □ Clearance
- □ mean
- □ quartile
- □ Other, define:  

**Types of metrics**
- □ Prediction errors PE
- □ Square prediction errors MSE or Root mean square prediction errors RMSE
- □ Absolute prediction errors APE
- □ Standardised prediction errors SPE
- □ Other metric:  

**Tests performed on metrics**
- □ Yes
- □ No

**Graphs**
- □ Yes
- □ No
**For the PD study (or PKPD study)**

**Prediction of validation dataset obtained:**
- [ ] Not reported
- [ ] with the model based on the building dataset without refitting
  - [ ] without covariate
  - [ ] with covariates
- [ ] with the model based on the building dataset and refitting
  - [ ] without covariate
  - [ ] with covariates
- [ ] without a model (Non Compartmental Analysis, individual parameters)
- [ ] Other, define: …………………………………………………………………………………

**Metrics on observations (effects)**

<table>
<thead>
<tr>
<th>Types of metrics</th>
<th>[ ] Not reported</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prediction errors PE <em>(residuals RES)</em></td>
<td>[ ]</td>
</tr>
<tr>
<td>Square prediction errors MSE or Root mean square prediction errors RMSE</td>
<td>[ ]</td>
</tr>
<tr>
<td>Absolute prediction errors APE</td>
<td>[ ]</td>
</tr>
<tr>
<td>Standardised prediction errors SPE <em>(weighted residuals WRES)</em></td>
<td>[ ]</td>
</tr>
<tr>
<td>SPE where E(C) and SD(C) obtained with Monte carlo simulations</td>
<td>[ ]</td>
</tr>
<tr>
<td>Other metric : …………………………………………………………………………………</td>
<td>[ ]</td>
</tr>
</tbody>
</table>

**Tests performed on metrics**
- [ ] Yes
- [ ] No

Define : …………………………………………………………………………………

**Graphs**
- [ ] Yes
- [ ] No

Define : …………………………………………………………………………………
## On individual statistic or parameter

<table>
<thead>
<tr>
<th>Estimated parameters</th>
<th>$\theta_i$</th>
<th>$\eta_i$</th>
<th>All $i$</th>
<th>Other, define:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Statistic on</td>
<td>AUC(effet)$_i$</td>
<td>EC50/ED50$_i$</td>
<td>Other, define:</td>
<td></td>
</tr>
</tbody>
</table>

### Types of metrics

- [ ] Prediction errors PE
- [ ] Square prediction errors MSE or Root mean square prediction errors RMSE
- [ ] Absolute prediction errors APE
- [ ] Standardised prediction errors SPE
- [ ] Other metric : 

### Tests performed on metrics

- [ ] Yes
- [ ] No

### Graphs

- [ ] Yes
- [ ] No

## On population statistic or parameter

<table>
<thead>
<tr>
<th>Estimated parameters</th>
<th>$\theta$</th>
<th>Variability</th>
<th>Other, define:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Statistic on</td>
<td>AUC(ef$\text{fet}$)</td>
<td>EC50/ED50$_i$</td>
<td>Other, define:</td>
</tr>
<tr>
<td></td>
<td>mean</td>
<td>quartile</td>
<td></td>
</tr>
</tbody>
</table>

### Types of metrics

- [ ] Prediction errors PE
- [ ] Square prediction errors MSE or Root mean square prediction errors RMSE
- [ ] Absolute prediction errors APE
- [ ] Standardised prediction errors SPE
- [ ] Other metric : 

### Tests performed on metrics

- [ ] Yes
- [ ] No

### Graphs

- [ ] Yes
- [ ] No
### III. EXTERNAL

#### For the PK study

<table>
<thead>
<tr>
<th>Validation dataset</th>
<th>(in comparison to building dataset)</th>
</tr>
</thead>
<tbody>
<tr>
<td>same inclusion criteria</td>
<td>□ Yes □ No □ Not reported</td>
</tr>
<tr>
<td>if no, differences in :</td>
<td>□ Pathology □ Age □ Ethnic group</td>
</tr>
<tr>
<td></td>
<td>□ Other, define: .........................</td>
</tr>
<tr>
<td>similar dose regimen</td>
<td>□ Yes □ No □ Not reported</td>
</tr>
<tr>
<td>if no, differences in :</td>
<td>□ Dose □ Administration rhythm</td>
</tr>
<tr>
<td>similar sampling scheme</td>
<td>□ Yes □ No □ Not reported</td>
</tr>
<tr>
<td>if no:</td>
<td>□ Richer □ More sparse</td>
</tr>
</tbody>
</table>

Number of subjects (PK): ............ □ Not reported
Number of observations (PK): ........... □ Not reported
☐ Covariates compared between the validation and building datasets

#### Final datasets

Were the data reanalyzed by pooling building and validation datasets?
☐ yes  ☐ no

#### For the PD study (or PKPD study)

<table>
<thead>
<tr>
<th>Validation dataset</th>
<th>(in comparison to building dataset)</th>
</tr>
</thead>
<tbody>
<tr>
<td>same inclusion criteria</td>
<td>□ Yes □ No □ Not reported</td>
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<td>□ Pathology □ Age □ Ethnic group</td>
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<td></td>
<td>□ Other, define: .........................</td>
</tr>
<tr>
<td>similar dose regimen</td>
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<td>□ Yes □ No □ Not reported</td>
</tr>
<tr>
<td>if no:</td>
<td>□ Richer □ More sparse</td>
</tr>
</tbody>
</table>

□ Not reported
**Model Evaluation**

<table>
<thead>
<tr>
<th>Number of subjects (PK):</th>
<th>................</th>
<th>□ Not reported</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of observations (PK):</td>
<td>........</td>
<td>□ Not reported</td>
</tr>
<tr>
<td>□ Covariates compared between the validation and building datasets</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Final datasets**

Were the data reanalyzed by pooling building and validation datasets?

□ yes □ no

---

### Monte Carlo simulation of datasets

**For the PK study**

| Yes □ No □ |
|--------------------------|----------------|----------------|
| Number of datasets: | ................ | □ Not reported |

Was design identical to original dataset?

□ Yes □ No □

**If no,** Number of subjects: ................

Other differences, define: ...........................................

How simulations were performed?

□ Not reported

With uncertainty on population parameters?

□ Yes □ No □

If yes:

□ SE only

□ Full covariance matrix

□ Using bootstrap techniques

**Distribution for the population parameter:**

□ Multivariate normal or lognormal

□ Full posterior

□ Other, define: .................................

Which Software has been used?

□ NONMEM □ SAS □ R/S □ TS2 □ Not reported

□ Other, define: ............................................................

Were simulated datasets fitted?

□ Yes □ No □
### For the PD study (or PKPD study)

Yes ☐ No ☐

Number of datasets .............. ☐ Not reported

Was design identical to original dataset? Yes ☐ No ☐

**If no,**
- Number of subjects: ..............
- Other differences, define: ............................................................

How simulations were performed? ☐ Not reported

With uncertainty on population parameters? Yes ☐ No ☐

If yes:
- ☐ SE only
- ☐ Full covariance matrix
- ☐ Using bootstrap techniques

Distribution for the population parameter:
- ☐ Multivariate normal or lognormal
- ☐ Full posterior
- ☐ Other, define: .........................

Which Software has been used?
- ☐ NONMEM
- ☐ SAS
- ☐ R/S
- ☐ TS2
- ☐ Not reported
- ☐ Other, define: .................................................................

Were simulated datasets fitted? Yes ☐ No ☐

---

### Other methods

#### For the PK study

Denomination: .................................................................

Purpose: .................................................................

Method steps: .................................................................

---

#### For the PD study

Denomination: .................................................................

Purpose: .................................................................

Method steps: .................................................................
## Metrics

### For the PK study

**Prediction of validation dataset obtained:**
- [ ] Not reported
- [ ] with the model based on the building dataset without refitting
  - [ ] without covariate
  - [ ] with covariates
- [ ] with the model based on the building dataset and refitting
  - [ ] without covariate
  - [ ] with covariates
- [ ] without a model (Non Compartmental Analysis, individual parameters)
- [ ] Other, define: .................................................................

### Metrics on observations (concentrations)

**Types of metrics**
- [ ] Not reported
- [ ] Prediction errors PE (*residuals RES*)
- [ ] Square prediction errors MSE or Root mean square prediction errors RMSE
- [ ] Absolute prediction errors APE
- [ ] Standardised prediction errors SPE (*weighted residuals WRES*)
- [ ] SPE where E(C) and SD(C) obtained with Monte carlo simulations
- [ ] Other metric : .................................................................

**Tests performed on metrics**
- [ ] Yes
- [ ] No

**Define:** .................................................................

**Graphs**
- [ ] Yes
- [ ] No

**Define:** .................................................................
### On individual statistic or parameter

- Estimated parameters
  - [ ] $\theta_i$
  - [ ] $\eta_i$
  - [ ] All $i$
  - [ ] Other, define: ..........................
- Statistic on
  - [ ] AUC$_i$
  - [ ] Clearance$_i$
  - [ ] Other, define: ..........................
- Types of metrics
  - [ ] Prediction errors PE
  - [ ] Square prediction errors MSE or Root mean square prediction errors RMSE
  - [ ] Absolute prediction errors APE
  - [ ] Standardised prediction errors SPE
  - [ ] Other metric: .................................................................
- Tests performed on metrics
  - [ ] Yes
  - [ ] No
- Graphs
  - [ ] Yes
  - [ ] No
  - [ ] Define: .................................................................

### On population statistic or parameter

- Estimated parameters
  - [ ] $\theta$
  - [ ] Variability
  - [ ] Other, define: ..........................
- Statistic on
  - [ ] AUC
  - [ ] Clearance
  - [ ] mean
  - [ ] quartile
  - [ ] Other, define: ..........................
- Types of metrics
  - [ ] Prediction errors PE
  - [ ] Square prediction errors MSE or Root mean square prediction errors RMSE
  - [ ] Absolute prediction errors APE
  - [ ] Standardised prediction errors SPE
  - [ ] Other metric: .................................................................
- Tests performed on metrics
  - [ ] Yes
  - [ ] No
- Graphs
  - [ ] Yes
  - [ ] No
  - [ ] Define: .................................................................
**For the PD study (or PKPD study)**

**Prediction of validation dataset obtained:**

- [ ] Not reported
- [ ] with the model based on the building dataset without refitting
  - [ ] without covariate
  - [ ] with covariates
- [ ] with the model based on the building dataset and refitting
  - [ ] without covariate
  - [ ] with covariates
- [ ] without a model (Non Compartmental Analysis, individual parameters)
- [ ] Other, define: .................................................................

**Metrics on observations (effects)**

Types of metrics

- [ ] Not reported
- [ ] Prediction errors PE (*residuals RES*)
- [ ] Square prediction errors MSE or Root mean square prediction errors RMSE
- [ ] Absolute prediction errors APE
- [ ] Standardised prediction errors SPE (*weighted residuals WRES*)
- [ ] SPE where E(C) and SD(C) obtained with Monte carlo simulations
- [ ] Other metric : .................................................................

Tests performed on metrics

- [ ] Yes
- [ ] No

- [ ] Define : .................................................................

Graphs

- [ ] Yes
- [ ] No

- [ ] Define : .................................................................
### On individual statistic or parameter

<table>
<thead>
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<th>Estimated parameters</th>
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### Types of metrics

- [ ] Prediction errors PE
- [ ] Square prediction errors MSE or Root mean square prediction errors RMSE
- [ ] Absolute prediction errors APE
- [ ] Standardised prediction errors SPE
- [ ] Other metric: ...

### Tests performed on metrics

- [ ] Yes
- [ ] No

### Graphs

- [ ] Yes
- [ ] No

### On population statistic or parameter

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### Types of metrics

- [ ] Prediction errors PE
- [ ] Square prediction errors MSE or Root mean square prediction errors RMSE
- [ ] Absolute prediction errors APE
- [ ] Standardised prediction errors SPE
- [ ] Other metric: ...

### Tests performed on metrics

- [ ] Yes
- [ ] No

### Graphs

- [ ] Yes
- [ ] No
SUBJECTIVE SYNTHESIS

Was there an attempt to evaluate the model?
☐ No  ☐ Poor  ☐ Good  ☐ Excellent

Was the choice of the metrics appropriate?
☐ No  ☐ Poor  ☐ Good  ☐ Excellent

Was the model evaluated?
☐ No  ☐ Poor  ☐ Good  ☐ Excellent