

# Supplementary material

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Note: Latest simulation results with (potentially already) increased number of replications are available upon:  
<https://github.com/statistikat/VIM/blob/master/inst/doc/supp.pdf>.

This document includes further simulation results to the article Robust Multiple Imputation with GAM in Statistics and Computing.

Note that the computational costs for GAMLSS is very high. The computations were made on a server with 32 GB RAM and (only) 10 CPUs and parallel computing was applied. The number of simulations is 100, thus so far tendencies are visible that are sufficient to get a clear picture, but the numbers may slightly differ when increasing the number of simulations. This document will be updated as soon as the new results are ready.

## Simulation results

Each table contains three different kind of simulations:

**Data generation 1:** Let

$$\sigma = \begin{pmatrix} 1 & r & 0 \\ r & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$$

where  $r \in \{0.5, 0.95\}$ , and let

$$\mu = \begin{pmatrix} 5 \\ 10 \\ 10 \end{pmatrix}$$

$$\mu_{out} = \begin{pmatrix} 5 + 3.2 \\ 10 + 0.1 \\ 10 - 0.25 \end{pmatrix}$$

The regular data points are now drawn with

$$\mathbf{X}_{reg} \sim \mathcal{N}(\mu, \sigma)$$

while the outliers are drawn with

$$\mathbf{X}_{out} \sim \mathcal{N}(\mu_{out}, \sigma/2)$$

This gives outliers not far from the *cloud* of the non-outliers, thus the choices of values are based on explorative comparisons between the outliers and non-outliers so that both groups are not far from each other but to guarantee separation between them.

The number of observations of regular non-outlying data points  $\mathbf{X}_{reg}$  is varied with  $n \in \{200, 500\}$  and the number of observations in the outlier data set is varied with  $n \cdot 0, n \cdot 0.075, n \cdot 0.15$ .

The missing value rates are set to 0.1 and 0.3 for the first variable of the data set using MAR with selection probabilities proportional to the magnitude of values in the second variable. All in all the following combination of parameters are investigated:

	n	n_outlier	miss_rate	cor
1	200	0.000	0.1	0.50
2	500	0.000	0.1	0.50

3	200	0.075	0.1 0.50
4	500	0.075	0.1 0.50
5	200	0.150	0.1 0.50
6	500	0.150	0.1 0.50
7	200	0.000	0.3 0.50
8	500	0.000	0.3 0.50
9	200	0.075	0.3 0.50
10	500	0.075	0.3 0.50
11	200	0.150	0.3 0.50
12	500	0.150	0.3 0.50
13	200	0.000	0.1 0.95
14	500	0.000	0.1 0.95
15	200	0.075	0.1 0.95
16	500	0.075	0.1 0.95
17	200	0.150	0.1 0.95
18	500	0.150	0.1 0.95
19	200	0.000	0.3 0.95
20	500	0.000	0.3 0.95
21	200	0.075	0.3 0.95
22	500	0.075	0.3 0.95
23	200	0.150	0.3 0.95
24	500	0.150	0.3 0.95

The coverage rate and root mean squared error of the following two estimators in a multiple imputation framework were in focus:

- The arithmetic mean of the first variable,  $\bar{x}_1$ .
  - The correlation coefficient between the first two variables
- All results are rounded to two digits.

**Data generation 2:** The data generation is designed to simulate a dataset for linear regression analysis. Here is the step-by-step data generation process:

1. The number of predictor variables is set to  $p = 4$ .
2. Set the target  $R^2$  value to a predefined value. We use  $R^2 = 0.5$  and  $R^2 = 0.95$ .
3. Allocate a portion of  $R^2$  to the first predictor  $x_1$ , denoted as  $R^2_{x1} = R^2 \times 0.8$ .
4. Define the regression coefficients as  $\beta = \left[1, \frac{\sqrt{2}}{3}, \frac{\sqrt{2}}{3}, \frac{\sqrt{2}}{3}\right]$ .
5. Generate the matrix of predictor variables  $X$  from a standard multivariate normal distribution of dimension  $n \times p$ .
6. Standardize  $X$  to have unit variance for each predictor.
7. Adjust the variance of  $x_1$  to match  $R^2_{x1}$ .
8. Generate the error term,  $\epsilon$ , with a standard deviation to ensure the desired  $R^2$  for the model.
9. Compute the response variable  $y$  using the linear model equation  $y = \beta x^T + \epsilon$ .
10. (Validate the generated data by calculating the empirical  $R^2$  value.)

The generated dataset  $Z$  includes the response variable and the predictor variable. We subtract 1 for the first predictor and add  $\epsilon + 10$  for generating outliers. This results in moderate outliers separated but not far from the main bulk of the regular observations. The missing mechanism for setting missings to the response variable is again MAR with selection probabilities proportional to the magnitude of values in the first predictor variable.

## Simulation results

In this section only the simulations comparing imputeRobust with robGAM and GAMLSS is shown. The next section also compares the results with other methods.

Table 1: Simulation results with the following settings:  $n = 200$  ; missing rate = 0.1 ; correlation = 0.5 ; outlier rate = 0

	kind	method	R package	imputation uncert	bootstrap	CR	RMSE
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.92	0.06
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.92	0.06
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.88	0.06
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.88	0.06
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.92	0.06
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.88	0.06
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.96	0.05
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.96	0.05
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.96	0.05
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.96	0.05
29	cor	gamlss-NO	ImputeRobust	PMM	classical	1.00	0.05
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.96	0.05
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.92	0.48
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	1.00	0.49
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	1.00	0.48
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.96	0.49
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.52	0.24
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.64	0.23

Table 2: Simulation results with the following settings:  $n = 200$  ; missing rate = 0.1 ; correlation = 0.5 ; outlier rate = 0.075

	kind	method	R package	imputation uncert	bootstrap	CR	RMSE
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.96	0.07
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.88	0.08
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.84	0.08
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.92	0.07
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.92	0.08
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.96	> 1000000000
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.72	0.08
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.76	0.08
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.64	0.12
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.84	0.08
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.88	0.08
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.84	0.09
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.92	0.49
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.96	0.49
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.92	0.49
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.96	0.5
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.84	0.27
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.68	3.73

Table 3: Simulation results with the following settings:  $n = 200$  ; missing rate = 0.1 ; correlation = 0.5 ; outlier rate = 0.15

	kind	method	R package	imputation uncert	bootstrap	CR	RMSE
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.92	0.07
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.88	0.07
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.92	0.08
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.92	0.08
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.88	0.09
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.92	298219.92
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.72	0.1
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.76	0.08
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.64	0.11
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.72	0.1
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.88	0.11
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.84	0.16
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.96	0.49
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.96	0.49
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.92	0.49
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.92	0.5
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.92	0.29
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.88	14016227.46

Table 4: Simulation results with the following settings:  $n = 200$  ; missing rate = 0.1 ; correlation = 0.95 ; outlier rate = 0

	kind	method	R package	imputation uncert	bootstrap	CR	RMSE
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.92	0.06
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.92	0.06
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.92	0.06
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.88	0.06
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.92	0.06
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.88	0.06
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.96	0.01
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.96	0.01
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.96	0.01
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.96	0.01
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.96	0.02
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.96	0.01
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.84	0.27
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.88	0.27
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.92	0.27
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.84	0.27
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.52	0.11
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.64	0.12

Table 5: Simulation results with the following settings:  $n = 200$  ; missing rate = 0.1 ; correlation = 0.95 ; outlier rate = 0.075

	kind	method	R package	imputation uncert	bootstrap	CR	RMSE
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.92	0.07
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.92	0.07
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.96	0.07
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.88	0.07
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.96	0.07
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.96	73
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.80	0.06
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.76	0.04
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.88	0.04
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.72	0.04
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.92	0.09
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.88	0.19
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.88	0.27
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.80	0.28
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.88	0.27
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.88	0.28
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.80	0.19
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.92	> 1000000000

Table 6: Simulation results with the following settings:  $n = 200$  ; missing rate = 0.1 ; correlation = 0.95 ; outlier rate = 0.15

	kind	method	R package	imputation uncert	bootstrap	CR	RMSE
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.80	0.09
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.80	0.09
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.76	0.1
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.80	0.09
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.88	0.09
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.80	0.1
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.56	0.07
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.48	0.09
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.40	0.1
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.28	0.1
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.68	0.11
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.64	0.17
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.84	0.28
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.80	0.28
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.80	0.28
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.80	0.28
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.92	0.22
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	1.00	> 1000000000

Table 7: Simulation results with the following settings:  $n = 200$  ; missing rate = 0.3 ; correlation = 0.5 ; outlier rate = 0

	kind	method	R package	imputation uncert	bootstrap	CR	RMSE
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.76	0.09
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.76	0.1
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.72	0.1
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.80	0.09
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.88	0.08
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.92	0.09
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.84	0.08
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.84	0.07
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.76	0.07
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.84	0.07
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.92	0.06
30	cor	gamlss-TF	ImputeRobust	PMM	classical	1.00	0.05
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.92	0.45
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.96	0.45
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.96	0.44
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.88	0.46
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.88	0.78
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.88	0.25

Table 8: Simulation results with the following settings:  $n = 200$  ; missing rate = 0.3 ; correlation = 0.5 ; outlier rate = 0.075

	kind	method	R package	imputation uncert	bootstrap	CR	RMSE
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.60	0.13
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.64	0.13
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.64	0.14
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.64	0.13
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.76	0.15
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.84	0.12
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.64	0.11
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.80	0.11
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.60	0.12
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.68	0.1
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.80	0.14
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.72	0.13
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.76	0.49
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.72	0.51
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.68	0.51
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.80	0.51
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.84	0.35
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.88	100959.16

Table 9: Simulation results with the following settings:  $n = 200$  ; missing rate = 0.3 ; correlation = 0.5 ; outlier rate = 0.15

	kind	method	R package	imputation uncert	bootstrap	CR	RMSE
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.56	0.13
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.48	0.15
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.52	0.15
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.60	0.14
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.88	> 1000000000
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.84	0.13
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.60	0.13
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.64	0.14
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.60	0.15
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.56	0.14
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.64	0.18
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.56	0.17
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.84	0.48
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.80	0.48
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.72	0.49
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.72	0.52
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.88	0.39
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.88	> 1000000000

Table 10: Simulation results with the following settings:  $n = 200$  ; missing rate = 0.3 ; correlation = 0.95 ; outlier rate = 0

	kind	method	R package	imputation uncert	bootstrap	CR	RMSE
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.84	0.08
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.84	0.09
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.84	0.08
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.84	0.09
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.92	0.08
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.88	0.08
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.80	0.01
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.92	0.01
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.84	0.01
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.88	0.01
29	cor	gamlss-NO	ImputeRobust	PMM	classical	1.00	0.01
30	cor	gamlss-TF	ImputeRobust	PMM	classical	1.00	0.02
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.64	0.25
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.64	0.25
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.80	0.24
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.76	0.26
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.92	0.12
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.88	0.12

Table 11: Simulation results with the following settings:  $n = 200$  ; missing rate = 0.3 ; correlation = 0.95 ; outlier rate = 0.075

	kind	method	R package	imputation uncert	bootstrap	CR	RMSE
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.76	0.09
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.72	0.09
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.72	0.1
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.76	0.09
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.88	0.1
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.80	550.87
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.40	0.09
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.32	0.11
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.44	0.13
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.44	0.14
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.24	0.2
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.52	0.24
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.28	0.29
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.56	0.29
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.40	0.29
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.68	0.3
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.88	0.28
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.96	44486285.25

Table 12: Simulation results with the following settings:  $n = 200$  ; missing rate = 0.3 ; correlation = 0.95 ; outlier rate = 0.15

	kind	method	R package	imputation uncert	bootstrap	CR	RMSE
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.80	0.12
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.76	0.12
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.76	0.14
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.72	0.14
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.80	0.12
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.84	0.23
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.08	0.19
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.08	0.21
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.00	0.21
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.04	0.22
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.04	0.26
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.16	0.27
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.67	0.26
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.71	0.27
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.54	0.27
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.54	0.28
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	1.00	0.32
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	1.00	1904497.73

Table 13: Simulation results with the following settings:  $n = 500$  ; missing rate = 0.1 ; correlation = 0.5 ; outlier rate = 0

	kind	method	R package	imputation uncert	bootstrap	CR	RMSE
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.92	0.04
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.92	0.04
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.92	0.04
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.92	0.05
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.88	0.04
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.92	0.04
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.84	0.05
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.80	0.05
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.88	0.05
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.76	0.05
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.84	0.04
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.88	0.04
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.96	0.49
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.84	0.5
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.88	0.49
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.92	0.5
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.40	0.22
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.44	0.22

Table 14: Simulation results with the following settings:  $n = 500$  ; missing rate = 0.1 ; correlation = 0.5 ; outlier rate = 0.075

	kind	method	R package	imputation uncert	bootstrap	CR	RMSE
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.88	0.04
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.88	0.04
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.84	0.05
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.80	0.04
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.88	0.05
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.92	0.05
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.92	0.04
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.96	0.03
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.96	0.04
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.92	0.04
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.92	0.06
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.92	0.05
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.92	0.48
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.96	0.49
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.92	0.48
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.92	0.49
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.72	0.22
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.64	0.21

Table 15: Simulation results with the following settings:  $n = 500$  ; missing rate = 0.1 ; correlation = 0.5 ; outlier rate = 0.15

	kind	method	R package	imputation uncert	bootstrap	CR	RMSE
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.84	0.06
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.76	0.07
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.84	0.06
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.72	0.07
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.84	0.07
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.84	0.07
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.92	0.04
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.88	0.04
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.88	0.05
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.88	0.05
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.76	0.08
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.88	0.06
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.80	0.48
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.92	0.49
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.88	0.49
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.88	0.49
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.88	0.24
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.84	130215.08

Table 16: Simulation results with the following settings:  $n = 500$  ; missing rate = 0.1 ; correlation = 0.95 ; outlier rate = 0

	kind	method	R package	imputation uncert	bootstrap	CR	RMSE
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.92	0.04
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.92	0.04
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.92	0.04
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.92	0.04
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.92	0.04
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.92	0.04
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.76	0.01
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.80	0.01
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.72	0.01
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.88	0.01
29	cor	gamlss-NO	ImputeRobust	PMM	classical	1.00	0.01
30	cor	gamlss-TF	ImputeRobust	PMM	classical	1.00	0.01
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.80	0.28
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.88	0.28
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.80	0.28
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.92	0.28
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.64	0.11
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.56	0.11

Table 17: Simulation results with the following settings:  $n = 500$  ; missing rate = 0.1 ; correlation = 0.95 ; outlier rate = 0.075

	kind	method	R package	imputation uncert	bootstrap	CR	RMSE
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.88	0.04
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.88	0.04
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.92	0.05
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.84	0.05
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.96	0.05
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.84	83.11
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.60	0.04
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.64	0.04
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.48	0.03
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.60	0.06
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.52	0.08
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.80	0.05
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.84	0.27
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.88	0.27
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.92	0.27
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.92	0.28
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.92	0.18
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	1.00	> 1000000000



Table 18: Simulation results with the following settings:  $n = 500$  ; missing rate = 0.1 ; correlation = 0.95 ; outlier rate = 0.15

	kind	method	R package	imputation uncert	bootstrap	CR	RMSE
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.80	0.07
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.80	0.07
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.80	0.07
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.80	0.07
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.80	0.07
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.80	0.07
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.28	0.07
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.20	0.07
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.32	0.06
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.16	0.07
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.32	0.12
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.48	0.31
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.80	0.27
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.68	0.27
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.72	0.27
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.76	0.28
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.92	10045.94
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	1.00	> 1000000000

Table 19: Simulation results with the following settings:  $n = 500$  ; missing rate = 0.3 ; correlation = 0.5 ; outlier rate = 0

	kind	method	R package	imputation uncert	bootstrap	CR	RMSE
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.68	0.06
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.72	0.06
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.76	0.05
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.80	0.05
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.88	0.05
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.88	0.06
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.64	0.06
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.72	0.06
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.64	0.07
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.80	0.05
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.84	0.05
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.92	0.05
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.72	0.48
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.68	0.48
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.72	0.48
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.92	0.49
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.84	0.2
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.76	0.19

Table 20: Simulation results with the following settings:  $n = 500$  ; missing rate = 0.3 ; correlation = 0.5 ; outlier rate = 0.075

	kind	method	R package	imputation uncert	bootstrap	CR	RMSE
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.64	0.08
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.52	0.09
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.56	0.09
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.56	0.09
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.76	0.09
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.72	> 1000000000
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.60	0.07
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.56	0.07
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.64	0.06
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.64	0.07
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.56	0.12
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.52	0.11
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.72	0.45
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.84	0.46
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.60	0.45
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.80	0.47
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.72	0.34
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.92	0.83

Table 21: Simulation results with the following settings:  $n = 500$  ; missing rate = 0.3 ; correlation = 0.5 ; outlier rate = 0.15

	kind	method	R package	imputation uncert	bootstrap	CR	RMSE
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.48	0.12
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.36	0.11
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.36	0.12
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.40	0.12
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.52	0.13
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.64	0.12
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.52	0.1
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.48	0.11
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.48	0.11
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.40	0.13
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.28	0.16
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.40	0.2
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.75	0.49
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.62	0.5
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.58	0.5
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.62	0.52
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.92	0.4
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.96	23339.72

Table 22: Simulation results with the following settings:  $n = 500$  ; missing rate = 0.3 ; correlation = 0.95 ; outlier rate = 0

	kind	method	R package	imputation uncert	bootstrap	CR	RMSE
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.84	0.05
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.76	0.05
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.80	0.05
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.80	0.05
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.84	0.05
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.84	0.05
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.24	0.01
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.24	0.01
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.28	0.01
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.36	0.01
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.96	0.01
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.92	0.01
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.56	0.27
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.52	0.27
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.64	0.26
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.56	0.28
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.84	0.11
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.84	0.11

Table 23: Simulation results with the following settings:  $n = 500$  ; missing rate = 0.3 ; correlation = 0.95 ; outlier rate = 0.075

	kind	method	R package	imputation uncert	bootstrap	CR	RMSE
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.64	0.09
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.60	0.08
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.60	0.09
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.60	0.09
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.60	0.1
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.84	0.07
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.12	0.12
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.12	0.09
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.12	0.12
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.20	0.11
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.04	0.2
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.24	0.28
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.60	0.25
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.76	0.26
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.64	0.25
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.68	0.27
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.60	0.32
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	1.00	> 1000000000

Table 24: Simulation results with the following settings:  $n = 500$  ; missing rate = 0.3 ; correlation = 0.95 ; outlier rate = 0.15

	kind	method	R package	imputation uncert	bootstrap	CR	RMSE
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.52	0.11
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.44	0.11
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.40	0.12
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.44	0.11
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.44	0.15
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.52	11905.32
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.00	0.16
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.00	0.15
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.00	0.18
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.00	0.2
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.00	0.28
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.00	0.22
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.56	0.27
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.60	0.28
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.32	0.27
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.56	0.29
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.60	0.35
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	1.00	> 1000000000

# Extended simulation results showing comparisons with other methods.

Table 25: Simulation results with the following settings:  $n = 200$  ; missing rate = 0.1 ; correlation = 0.5 ; outlier rate = 0

	kind	method	R package	imputation uncert	bootstrap	CR	RMSE
1	mean	kNN	VIM	median	-	0.92	0.06
2	mean	IMRI MI	VIM	normal	-	0.88	0.06
3	mean	PMM	mice	PMM	classical	0.92	0.06
4	mean	midastouch	mice	midastouch	classical	0.92	0.06
5	mean	missRanger	missRanger	PMM	classical	0.88	0.06
6	mean	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.88	0.06
7	mean	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.88	0.07
8	mean	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.92	0.06
9	mean	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.84	0.07
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.92	0.06
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.92	0.06
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.88	0.06
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.88	0.06
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.92	0.06
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.88	0.06
16	cor	kNN	VIM	median	-	0.96	0.05
17	cor	IMRI MI	VIM	normal	-	0.96	0.05
18	cor	PMM	mice	PMM	classical	0.96	0.05
19	cor	midastouch	mice	midastouch	classical	0.96	0.05
20	cor	missRanger	missRanger	PMM	classical	0.96	0.05
21	cor	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.96	0.05
22	cor	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.96	0.05
23	cor	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.92	0.05
24	cor	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.92	0.06
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.96	0.05
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.96	0.05
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.96	0.05
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.96	0.05
29	cor	gamlss-NO	ImputeRobust	PMM	classical	1.00	0.05
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.96	0.05
31	beta 1	kNN	VIM	median	-	0.96	0.5
32	beta 1	IMRI MI	VIM	normal	-	1.00	0.24
33	beta 1	PMM	mice	PMM	classical	0.52	0.23
34	beta 1	midastouch	mice	midastouch	classical	0.52	0.24
35	beta 1	missRanger	missRanger	PMM	classical	1.00	0.49
36	beta 1	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.92	0.48
37	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.96	0.49
38	beta 1	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.96	0.49
39	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.96	0.49
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.92	0.48
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	1.00	0.49
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	1.00	0.48
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.96	0.49
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.52	0.24
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.64	0.23

Table 26: Simulation results with the following settings:  $n = 200$  ; missing rate = 0.1 ; correlation = 0.5 ; outlier rate = 0.075

	kind	method	R package	imputation uncert	bootstrap	CR	RMSE
1	mean	kNN	VIM	median	-	0.92	0.08
2	mean	IMRI MI	VIM	normal	-	0.92	0.07
3	mean	PMM	mice	PMM	classical	0.92	0.08
4	mean	midastouch	mice	midastouch	classical	0.92	0.08
5	mean	missRanger	missRanger	PMM	classical	0.92	0.08
6	mean	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.88	0.08
7	mean	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.88	0.08
8	mean	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.88	0.08
9	mean	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.84	0.09
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.96	0.07
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.88	0.08
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.84	0.08
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.92	0.07
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.92	0.08
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.96	> 1000000000
16	cor	kNN	VIM	median	-	0.72	0.12
17	cor	IMRI MI	VIM	normal	-	0.88	0.08
18	cor	PMM	mice	PMM	classical	0.76	0.13
19	cor	midastouch	mice	midastouch	classical	0.88	0.12
20	cor	missRanger	missRanger	PMM	classical	0.84	0.09
21	cor	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.80	0.08
22	cor	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.76	0.1
23	cor	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.64	0.11
24	cor	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.64	0.13
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.72	0.08
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.76	0.08
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.64	0.12
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.84	0.08
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.88	0.08
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.84	0.09
31	beta 1	kNN	VIM	median	-	0.88	0.5
32	beta 1	IMRI MI	VIM	normal	-	1.00	0.26
33	beta 1	PMM	mice	PMM	classical	0.84	0.32
34	beta 1	midastouch	mice	midastouch	classical	0.88	0.29
35	beta 1	missRanger	missRanger	PMM	classical	0.88	0.5
36	beta 1	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.88	0.51
37	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.84	0.58
38	beta 1	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.92	0.59
39	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.92	0.58
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.92	0.49
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.96	0.49
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.92	0.49
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.96	0.5
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.84	0.27
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.68	3.73

Table 27: Simulation results with the following settings:  $n = 200$  ; missing rate = 0.1 ; correlation = 0.5 ; outlier rate = 0.15

	kind	method	R package	imputation uncert	bootstrap	CR	RMSE
1	mean	kNN	VIM	median	-	0.88	0.08
2	mean	IMRI MI	VIM	normal	-	0.92	0.07
3	mean	PMM	mice	PMM	classical	0.92	0.08
4	mean	midastouch	mice	midastouch	classical	0.92	0.1
5	mean	missRanger	missRanger	PMM	classical	0.84	0.08
6	mean	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.84	0.09
7	mean	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.88	0.09
8	mean	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.80	0.11
9	mean	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.76	0.11
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.92	0.07
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.88	0.07
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.92	0.08
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.92	0.08
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.88	0.09
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.92	298219.92
16	cor	kNN	VIM	median	-	0.60	0.12
17	cor	IMRI MI	VIM	normal	-	0.92	0.07
18	cor	PMM	mice	PMM	classical	0.68	0.15
19	cor	midastouch	mice	midastouch	classical	0.60	0.14
20	cor	missRanger	missRanger	PMM	classical	0.72	0.1
21	cor	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.68	0.11
22	cor	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.64	0.15
23	cor	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.32	0.15
24	cor	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.44	0.15
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.72	0.1
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.76	0.08
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.64	0.11
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.72	0.1
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.88	0.11
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.84	0.16
31	beta 1	kNN	VIM	median	-	0.88	0.53
32	beta 1	IMRI MI	VIM	normal	-	1.00	0.26
33	beta 1	PMM	mice	PMM	classical	0.88	0.37
34	beta 1	midastouch	mice	midastouch	classical	1.00	0.34
35	beta 1	missRanger	missRanger	PMM	classical	0.96	0.52
36	beta 1	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.88	0.53
37	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.92	0.62
38	beta 1	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.92	0.61
39	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.88	0.64
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.96	0.49
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.96	0.49
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.92	0.49
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.92	0.5
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.92	0.29
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.88	14016227.46

Table 28: Simulation results with the following settings:  $n = 200$  ; missing rate = 0.1 ; correlation = 0.95 ; outlier rate = 0

	kind	method	R package	imputation uncert	bootstrap	CR	RMSE
1	mean	kNN	VIM	median	-	0.92	0.06
2	mean	IMRI MI	VIM	normal	-	0.92	0.06
3	mean	PMM	mice	PMM	classical	0.92	0.06
4	mean	midastouch	mice	midastouch	classical	0.92	0.06
5	mean	missRanger	missRanger	PMM	classical	0.92	0.06
6	mean	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.92	0.06
7	mean	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.88	0.06
8	mean	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.92	0.06
9	mean	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.88	0.06
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.92	0.06
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.92	0.06
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.92	0.06
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.88	0.06
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.92	0.06
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.88	0.06
16	cor	kNN	VIM	median	-	1.00	0.01
17	cor	IMRI MI	VIM	normal	-	0.96	0.01
18	cor	PMM	mice	PMM	classical	0.96	0.01
19	cor	midastouch	mice	midastouch	classical	0.96	0.01
20	cor	missRanger	missRanger	PMM	classical	0.96	0.01
21	cor	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.96	0.01
22	cor	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.96	0.01
23	cor	imputeRobust/GAM	VIM*	PMM	robust-stratified	1.00	0.01
24	cor	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.96	0.01
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.96	0.01
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.96	0.01
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.96	0.01
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.96	0.01
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.96	0.02
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.96	0.01
31	beta 1	kNN	VIM	median	-	0.92	0.28
32	beta 1	IMRI MI	VIM	normal	-	1.00	0.11
33	beta 1	PMM	mice	PMM	classical	0.64	0.11
34	beta 1	midastouch	mice	midastouch	classical	0.48	0.12
35	beta 1	missRanger	missRanger	PMM	classical	0.88	0.27
36	beta 1	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.92	0.27
37	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.92	0.28
38	beta 1	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.96	0.28
39	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.96	0.28
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.84	0.27
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.88	0.27
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.92	0.27
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.84	0.27
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.52	0.11
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.64	0.12

Table 29: Simulation results with the following settings:  $n = 200$  ; missing rate = 0.1 ; correlation = 0.95 ; outlier rate = 0.075

	kind	method	R package	imputation uncert	bootstrap	CR	RMSE
1	mean	kNN	VIM	median	-	0.96	0.07
2	mean	IMRI MI	VIM	normal	-	0.96	0.07
3	mean	PMM	mice	PMM	classical	0.92	0.08
4	mean	midastouch	mice	midastouch	classical	0.92	0.08
5	mean	missRanger	missRanger	PMM	classical	0.88	0.07
6	mean	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.84	0.07
7	mean	imputeRobust/GAM	VIM*	midastouch	robust-quantile	1.00	0.07
8	mean	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.84	0.08
9	mean	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.88	0.08
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.92	0.07
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.92	0.07
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.96	0.07
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.88	0.07
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.96	0.07
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.96	73
16	cor	kNN	VIM	median	-	0.72	0.09
17	cor	IMRI MI	VIM	normal	-	1.00	0.01
18	cor	PMM	mice	PMM	classical	0.16	0.17
19	cor	midastouch	mice	midastouch	classical	0.24	0.17
20	cor	missRanger	missRanger	PMM	classical	0.72	0.08
21	cor	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.44	0.1
22	cor	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.20	0.12
23	cor	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.16	0.15
24	cor	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.12	0.14
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.80	0.06
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.76	0.04
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.88	0.04
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.72	0.04
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.92	0.09
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.88	0.19
31	beta 1	kNN	VIM	median	-	0.68	0.29
32	beta 1	IMRI MI	VIM	normal	-	1.00	0.14
33	beta 1	PMM	mice	PMM	classical	1.00	0.22
34	beta 1	midastouch	mice	midastouch	classical	0.92	0.23
35	beta 1	missRanger	missRanger	PMM	classical	0.92	0.31
36	beta 1	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.88	0.29
37	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.88	0.4
38	beta 1	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.88	0.39
39	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.92	0.4
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.88	0.27
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.80	0.28
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.88	0.27
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.88	0.28
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.80	0.19
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.92	> 1000000000



Table 30: Simulation results with the following settings:  $n = 200$  ; missing rate = 0.1 ; correlation = 0.95 ; outlier rate = 0.15

	kind	method	R package	imputation uncert	bootstrap	CR	RMSE
1	mean	kNN	VIM	median	-	0.84	0.1
2	mean	IMRI MI	VIM	normal	-	0.88	0.07
3	mean	PMM	mice	PMM	classical	0.84	0.11
4	mean	midastouch	mice	midastouch	classical	0.80	0.11
5	mean	missRanger	missRanger	PMM	classical	0.76	0.1
6	mean	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.64	0.1
7	mean	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.72	0.11
8	mean	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.76	0.1
9	mean	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.68	0.12
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.80	0.09
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.80	0.09
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.76	0.1
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.80	0.09
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.88	0.09
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.80	0.1
16	cor	kNN	VIM	median	-	0.44	0.16
17	cor	IMRI MI	VIM	normal	-	0.88	0.01
18	cor	PMM	mice	PMM	classical	0.04	0.19
19	cor	midastouch	mice	midastouch	classical	0.00	0.2
20	cor	missRanger	missRanger	PMM	classical	0.36	0.14
21	cor	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.12	0.13
22	cor	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.04	0.21
23	cor	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.08	0.17
24	cor	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.00	0.18
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.56	0.07
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.48	0.09
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.40	0.1
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.28	0.1
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.68	0.11
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.64	0.17
31	beta 1	kNN	VIM	median	-	0.72	0.33
32	beta 1	IMRI MI	VIM	normal	-	1.00	0.13
33	beta 1	PMM	mice	PMM	classical	0.92	0.29
34	beta 1	midastouch	mice	midastouch	classical	1.00	0.26
35	beta 1	missRanger	missRanger	PMM	classical	0.92	0.34
36	beta 1	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.60	0.33
37	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.72	0.48
38	beta 1	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.84	0.48
39	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.92	0.48
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.84	0.28
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.80	0.28
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.80	0.28
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.80	0.28
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.92	0.22
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	1.00	> 1000000000

Table 31: Simulation results with the following settings:  $n = 200$  ; missing rate = 0.3 ; correlation = 0.5 ; outlier rate = 0

	kind	method	R package	imputation uncert	bootstrap	CR	RMSE
1	mean	kNN	VIM	median	-	0.80	0.09
2	mean	IMRI MI	VIM	normal	-	0.84	0.08
3	mean	PMM	mice	PMM	classical	0.88	0.08
4	mean	midastouch	mice	midastouch	classical	0.88	0.08
5	mean	missRanger	missRanger	PMM	classical	0.76	0.08
6	mean	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.76	0.08
7	mean	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.88	0.08
8	mean	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.84	0.08
9	mean	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.84	0.09
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.76	0.09
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.76	0.1
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.72	0.1
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.80	0.09
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.88	0.08
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.92	0.09
16	cor	kNN	VIM	median	-	0.92	0.07
17	cor	IMRI MI	VIM	normal	-	0.92	0.07
18	cor	PMM	mice	PMM	classical	0.88	0.06
19	cor	midastouch	mice	midastouch	classical	0.92	0.07
20	cor	missRanger	missRanger	PMM	classical	0.76	0.08
21	cor	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.76	0.08
22	cor	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.92	0.07
23	cor	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.88	0.06
24	cor	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.88	0.07
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.84	0.08
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.84	0.07
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.76	0.07
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.84	0.07
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.92	0.06
30	cor	gamlss-TF	ImputeRobust	PMM	classical	1.00	0.05
31	beta 1	kNN	VIM	median	-	0.92	0.48
32	beta 1	IMRI MI	VIM	normal	-	1.00	0.24
33	beta 1	PMM	mice	PMM	classical	0.76	0.25
34	beta 1	midastouch	mice	midastouch	classical	0.84	0.23
35	beta 1	missRanger	missRanger	PMM	classical	1.00	0.46
36	beta 1	imputeRobust/GAM	VIM*	PMM	robust-quantile	1.00	0.43
37	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-quantile	1.00	0.48
38	beta 1	imputeRobust/GAM	VIM*	PMM	robust-stratified	1.00	0.48
39	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-stratified	1.00	0.47
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.92	0.45
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.96	0.45
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.96	0.44
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.88	0.46
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.88	0.78
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.88	0.25

Table 32: Simulation results with the following settings:  $n = 200$  ; missing rate = 0.3 ; correlation = 0.5 ; outlier rate = 0.075

	kind	method	R package	imputation uncert	bootstrap	CR	RMSE
1	mean	kNN	VIM	median	-	0.72	0.12
2	mean	IMRI MI	VIM	normal	-	0.88	0.08
3	mean	PMM	mice	PMM	classical	0.76	0.19
4	mean	midastouch	mice	midastouch	classical	0.80	0.16
5	mean	missRanger	missRanger	PMM	classical	0.48	0.16
6	mean	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.52	0.14
7	mean	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.80	0.14
8	mean	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.72	0.15
9	mean	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.68	0.17
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.60	0.13
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.64	0.13
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.64	0.14
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.64	0.13
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.76	0.15
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.84	0.12
16	cor	kNN	VIM	median	-	0.56	0.15
17	cor	IMRI MI	VIM	normal	-	0.80	0.08
18	cor	PMM	mice	PMM	classical	0.32	0.24
19	cor	midastouch	mice	midastouch	classical	0.16	0.25
20	cor	missRanger	missRanger	PMM	classical	0.56	0.15
21	cor	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.60	0.16
22	cor	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.28	0.22
23	cor	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.04	0.23
24	cor	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.24	0.21
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.64	0.11
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.80	0.11
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.60	0.12
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.68	0.1
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.80	0.14
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.72	0.13
31	beta 1	kNN	VIM	median	-	0.72	0.52
32	beta 1	IMRI MI	VIM	normal	-	1.00	0.3
33	beta 1	PMM	mice	PMM	classical	0.80	0.5
34	beta 1	midastouch	mice	midastouch	classical	0.72	0.48
35	beta 1	missRanger	missRanger	PMM	classical	0.80	0.55
36	beta 1	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.52	0.54
37	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.84	0.7
38	beta 1	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.92	0.7
39	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.84	0.7
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.76	0.49
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.72	0.51
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.68	0.51
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.80	0.51
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.84	0.35
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.88	100959.16

Table 33: Simulation results with the following settings:  $n = 200$  ; missing rate = 0.3 ; correlation = 0.5 ; outlier rate = 0.15

	kind	method	R package	imputation uncert	bootstrap	CR	RMSE
1	mean	kNN	VIM	median	-	0.68	0.14
2	mean	IMRI MI	VIM	normal	-	0.88	0.08
3	mean	PMM	mice	PMM	classical	0.72	0.18
4	mean	midastouch	mice	midastouch	classical	0.96	0.16
5	mean	missRanger	missRanger	PMM	classical	0.40	0.17
6	mean	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.48	0.17
7	mean	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.68	0.17
8	mean	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.44	0.2
9	mean	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.52	0.2
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.56	0.13
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.48	0.15
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.52	0.15
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.60	0.14
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.88	> 1000000000
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.84	0.13
16	cor	kNN	VIM	median	-	0.36	0.16
17	cor	IMRI MI	VIM	normal	-	0.96	0.07
18	cor	PMM	mice	PMM	classical	0.12	0.28
19	cor	midastouch	mice	midastouch	classical	0.12	0.27
20	cor	missRanger	missRanger	PMM	classical	0.24	0.19
21	cor	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.32	0.2
22	cor	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.12	0.26
23	cor	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.12	0.26
24	cor	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.04	0.26
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.60	0.13
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.64	0.14
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.60	0.15
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.56	0.14
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.64	0.18
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.56	0.17
31	beta 1	kNN	VIM	median	-	0.64	0.6
32	beta 1	IMRI MI	VIM	normal	-	1.00	0.3
33	beta 1	PMM	mice	PMM	classical	0.72	0.53
34	beta 1	midastouch	mice	midastouch	classical	0.96	0.42
35	beta 1	missRanger	missRanger	PMM	classical	0.96	0.59
36	beta 1	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.52	0.58
37	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.80	0.75
38	beta 1	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.80	0.75
39	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.84	0.77
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.84	0.48
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.80	0.48
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.72	0.49
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.72	0.52
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.88	0.39
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.88	> 1000000000

Table 34: Simulation results with the following settings:  $n = 200$  ; missing rate = 0.3 ; correlation = 0.95 ; outlier rate = 0

	kind	method	R package	imputation uncert	bootstrap	CR	RMSE
1	mean	kNN	VIM	median	-	0.84	0.09
2	mean	IMRI MI	VIM	normal	-	0.88	0.08
3	mean	PMM	mice	PMM	classical	0.88	0.08
4	mean	midastouch	mice	midastouch	classical	0.92	0.08
5	mean	missRanger	missRanger	PMM	classical	0.88	0.08
6	mean	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.88	0.08
7	mean	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.84	0.09
8	mean	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.88	0.09
9	mean	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.80	0.09
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.84	0.08
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.84	0.09
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.84	0.08
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.84	0.09
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.92	0.08
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.88	0.08
16	cor	kNN	VIM	median	-	0.96	0.01
17	cor	IMRI MI	VIM	normal	-	0.80	0.01
18	cor	PMM	mice	PMM	classical	0.96	0.01
19	cor	midastouch	mice	midastouch	classical	0.96	0.01
20	cor	missRanger	missRanger	PMM	classical	0.88	0.01
21	cor	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.80	0.01
22	cor	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.96	0.01
23	cor	imputeRobust/GAM	VIM*	PMM	robust-stratified	1.00	0.01
24	cor	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.88	0.01
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.80	0.01
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.92	0.01
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.84	0.01
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.88	0.01
29	cor	gamlss-NO	ImputeRobust	PMM	classical	1.00	0.01
30	cor	gamlss-TF	ImputeRobust	PMM	classical	1.00	0.02
31	beta 1	kNN	VIM	median	-	0.16	0.29
32	beta 1	IMRI MI	VIM	normal	-	1.00	0.11
33	beta 1	PMM	mice	PMM	classical	0.80	0.12
34	beta 1	midastouch	mice	midastouch	classical	0.84	0.13
35	beta 1	missRanger	missRanger	PMM	classical	0.48	0.26
36	beta 1	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.84	0.24
37	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.96	0.28
38	beta 1	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.96	0.27
39	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.96	0.28
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.64	0.25
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.64	0.25
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.80	0.24
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.76	0.26
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.92	0.12
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.88	0.12

Table 35: Simulation results with the following settings:  $n = 200$  ; missing rate = 0.3 ; correlation = 0.95 ; outlier rate = 0.075

	kind	method	R package	imputation uncert	bootstrap	CR	RMSE
1	mean	kNN	VIM	median	-	0.84	0.09
2	mean	IMRI MI	VIM	normal	-	0.92	0.06
3	mean	PMM	mice	PMM	classical	0.80	0.16
4	mean	midastouch	mice	midastouch	classical	0.80	0.17
5	mean	missRanger	missRanger	PMM	classical	0.56	0.12
6	mean	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.72	0.11
7	mean	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.68	0.14
8	mean	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.64	0.15
9	mean	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.80	0.13
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.76	0.09
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.72	0.09
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.72	0.1
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.76	0.09
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.88	0.1
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.80	550.87
16	cor	kNN	VIM	median	-	0.40	0.19
17	cor	IMRI MI	VIM	normal	-	0.92	0.01
18	cor	PMM	mice	PMM	classical	0.00	0.41
19	cor	midastouch	mice	midastouch	classical	0.00	0.42
20	cor	missRanger	missRanger	PMM	classical	0.12	0.22
21	cor	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.00	0.19
22	cor	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.00	0.33
23	cor	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.00	0.34
24	cor	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.00	0.32
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.40	0.09
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.32	0.11
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.44	0.13
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.44	0.14
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.24	0.2
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.52	0.24
31	beta 1	kNN	VIM	median	-	0.24	0.34
32	beta 1	IMRI MI	VIM	normal	-	1.00	0.15
33	beta 1	PMM	mice	PMM	classical	0.92	0.38
34	beta 1	midastouch	mice	midastouch	classical	0.80	0.37
35	beta 1	missRanger	missRanger	PMM	classical	0.68	0.4
36	beta 1	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.24	0.35
37	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.80	0.58
38	beta 1	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.68	0.57
39	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.84	0.57
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.28	0.29
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.56	0.29
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.40	0.29
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.68	0.3
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.88	0.28
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.96	44486285.25

Table 36: Simulation results with the following settings:  $n = 200$  ; missing rate = 0.3 ; correlation = 0.95 ; outlier rate = 0.15

	kind	method	R package	imputation uncert	bootstrap	CR	RMSE
1	mean	kNN	VIM	median	-	0.72	0.14
2	mean	IMRI MI	VIM	normal	-	0.88	0.06
3	mean	PMM	mice	PMM	classical	0.68	0.2
4	mean	midastouch	mice	midastouch	classical	0.68	0.21
5	mean	missRanger	missRanger	PMM	classical	0.60	0.17
6	mean	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.56	0.17
7	mean	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.72	0.17
8	mean	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.56	0.2
9	mean	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.68	0.2
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.80	0.12
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.76	0.12
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.76	0.14
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.72	0.14
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.80	0.12
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.84	0.23
16	cor	kNN	VIM	median	-	0.12	0.3
17	cor	IMRI MI	VIM	normal	-	0.88	0.01
18	cor	PMM	mice	PMM	classical	0.00	0.5
19	cor	midastouch	mice	midastouch	classical	0.00	0.49
20	cor	missRanger	missRanger	PMM	classical	0.16	0.31
21	cor	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.00	0.3
22	cor	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.00	0.44
23	cor	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.00	0.43
24	cor	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.00	0.43
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.08	0.19
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.08	0.21
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.00	0.21
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.04	0.22
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.04	0.26
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.16	0.27
31	beta 1	kNN	VIM	median	-	0.12	0.49
32	beta 1	IMRI MI	VIM	normal	-	1.00	0.14
33	beta 1	PMM	mice	PMM	classical	1.00	0.38
34	beta 1	midastouch	mice	midastouch	classical	0.92	0.38
35	beta 1	missRanger	missRanger	PMM	classical	0.62	0.46
36	beta 1	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.33	0.4
37	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.92	0.66
38	beta 1	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.75	0.66
39	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.71	0.66
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.67	0.26
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.71	0.27
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.54	0.27
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.54	0.28
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	1.00	0.32
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	1.00	1904497.73

Table 37: Simulation results with the following settings:  $n = 500$  ; missing rate = 0.1 ; correlation = 0.5 ; outlier rate = 0

	kind	method	R package	imputation uncert	bootstrap	CR	RMSE
1	mean	kNN	VIM	median	-	0.88	0.04
2	mean	IMRI MI	VIM	normal	-	0.88	0.04
3	mean	PMM	mice	PMM	classical	0.92	0.04
4	mean	midastouch	mice	midastouch	classical	0.92	0.04
5	mean	missRanger	missRanger	PMM	classical	0.88	0.04
6	mean	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.88	0.04
7	mean	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.92	0.04
8	mean	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.96	0.04
9	mean	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.88	0.04
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.92	0.04
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.92	0.04
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.92	0.04
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.92	0.05
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.88	0.04
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.92	0.04
16	cor	kNN	VIM	median	-	0.80	0.05
17	cor	IMRI MI	VIM	normal	-	0.84	0.04
18	cor	PMM	mice	PMM	classical	0.84	0.04
19	cor	midastouch	mice	midastouch	classical	0.88	0.04
20	cor	missRanger	missRanger	PMM	classical	0.88	0.05
21	cor	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.88	0.05
22	cor	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.84	0.04
23	cor	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.76	0.04
24	cor	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.84	0.04
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.84	0.05
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.80	0.05
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.88	0.05
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.76	0.05
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.84	0.04
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.88	0.04
31	beta 1	kNN	VIM	median	-	0.84	0.5
32	beta 1	IMRI MI	VIM	normal	-	1.00	0.22
33	beta 1	PMM	mice	PMM	classical	0.44	0.22
34	beta 1	midastouch	mice	midastouch	classical	0.40	0.22
35	beta 1	missRanger	missRanger	PMM	classical	0.84	0.5
36	beta 1	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.92	0.49
37	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.96	0.5
38	beta 1	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.92	0.5
39	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.96	0.51
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.96	0.49
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.84	0.5
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.88	0.49
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.92	0.5
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.40	0.22
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.44	0.22



Table 38: Simulation results with the following settings:  $n = 500$  ; missing rate = 0.1 ; correlation = 0.5 ; outlier rate = 0.075

	kind	method	R package	imputation uncert	bootstrap	CR	RMSE
1	mean	kNN	VIM	median	-	0.88	0.05
2	mean	IMRI MI	VIM	normal	-	0.96	0.04
3	mean	PMM	mice	PMM	classical	0.84	0.05
4	mean	midastouch	mice	midastouch	classical	0.84	0.05
5	mean	missRanger	missRanger	PMM	classical	0.80	0.05
6	mean	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.80	0.05
7	mean	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.80	0.06
8	mean	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.88	0.05
9	mean	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.84	0.06
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.88	0.04
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.88	0.04
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.84	0.05
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.80	0.04
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.88	0.05
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.92	0.05
16	cor	kNN	VIM	median	-	0.92	0.05
17	cor	IMRI MI	VIM	normal	-	1.00	0.03
18	cor	PMM	mice	PMM	classical	0.52	0.11
19	cor	midastouch	mice	midastouch	classical	0.52	0.1
20	cor	missRanger	missRanger	PMM	classical	0.88	0.05
21	cor	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.88	0.05
22	cor	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.52	0.08
23	cor	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.40	0.09
24	cor	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.36	0.09
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.92	0.04
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.96	0.03
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.96	0.04
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.92	0.04
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.92	0.06
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.92	0.05
31	beta 1	kNN	VIM	median	-	0.92	0.5
32	beta 1	IMRI MI	VIM	normal	-	1.00	0.18
33	beta 1	PMM	mice	PMM	classical	0.84	0.28
34	beta 1	midastouch	mice	midastouch	classical	0.80	0.29
35	beta 1	missRanger	missRanger	PMM	classical	0.96	0.51
36	beta 1	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.88	0.5
37	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.88	0.58
38	beta 1	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.88	0.59
39	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.96	0.57
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.92	0.48
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.96	0.49
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.92	0.48
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.92	0.49
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.72	0.22
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.64	0.21

Table 39: Simulation results with the following settings:  $n = 500$  ; missing rate = 0.1 ; correlation = 0.5 ; outlier rate = 0.15

	kind	method	R package	imputation uncert	bootstrap	CR	RMSE
1	mean	kNN	VIM	median	-	0.84	0.06
2	mean	IMRI MI	VIM	normal	-	0.80	0.06
3	mean	PMM	mice	PMM	classical	0.76	0.08
4	mean	midastouch	mice	midastouch	classical	0.76	0.07
5	mean	missRanger	missRanger	PMM	classical	0.68	0.07
6	mean	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.68	0.08
7	mean	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.76	0.07
8	mean	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.72	0.07
9	mean	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.76	0.08
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.84	0.06
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.76	0.07
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.84	0.06
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.72	0.07
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.84	0.07
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.84	0.07
16	cor	kNN	VIM	median	-	0.60	0.07
17	cor	IMRI MI	VIM	normal	-	0.96	0.03
18	cor	PMM	mice	PMM	classical	0.40	0.12
19	cor	midastouch	mice	midastouch	classical	0.36	0.12
20	cor	missRanger	missRanger	PMM	classical	0.80	0.07
21	cor	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.60	0.06
22	cor	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.20	0.11
23	cor	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.20	0.12
24	cor	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.24	0.12
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.92	0.04
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.88	0.04
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.88	0.05
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.88	0.05
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.76	0.08
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.88	0.06
31	beta 1	kNN	VIM	median	-	0.76	0.51
32	beta 1	IMRI MI	VIM	normal	-	1.00	0.21
33	beta 1	PMM	mice	PMM	classical	0.56	0.36
34	beta 1	midastouch	mice	midastouch	classical	0.80	0.32
35	beta 1	missRanger	missRanger	PMM	classical	0.88	0.51
36	beta 1	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.72	0.52
37	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.80	0.63
38	beta 1	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.68	0.62
39	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.80	0.62
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.80	0.48
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.92	0.49
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.88	0.49
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.88	0.49
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.88	0.24
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.84	130215.08

Table 40: Simulation results with the following settings:  $n = 500$  ; missing rate = 0.1 ; correlation = 0.95 ; outlier rate = 0

	kind	method	R package	imputation uncert	bootstrap	CR	RMSE
1	mean	kNN	VIM	median	-	0.92	0.04
2	mean	IMRI MI	VIM	normal	-	0.92	0.04
3	mean	PMM	mice	PMM	classical	0.92	0.04
4	mean	midastouch	mice	midastouch	classical	0.92	0.04
5	mean	missRanger	missRanger	PMM	classical	0.92	0.04
6	mean	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.92	0.04
7	mean	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.92	0.04
8	mean	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.92	0.04
9	mean	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.92	0.04
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.92	0.04
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.92	0.04
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.92	0.04
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.92	0.04
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.92	0.04
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.92	0.04
16	cor	kNN	VIM	median	-	0.88	0.01
17	cor	IMRI MI	VIM	normal	-	0.92	0.01
18	cor	PMM	mice	PMM	classical	0.92	0
19	cor	midastouch	mice	midastouch	classical	0.92	0.01
20	cor	missRanger	missRanger	PMM	classical	0.80	0.01
21	cor	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.72	0.01
22	cor	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.92	0.01
23	cor	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.88	0.01
24	cor	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.92	0.01
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.76	0.01
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.80	0.01
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.72	0.01
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.88	0.01
29	cor	gamlss-NO	ImputeRobust	PMM	classical	1.00	0.01
30	cor	gamlss-TF	ImputeRobust	PMM	classical	1.00	0.01
31	beta 1	kNN	VIM	median	-	0.56	0.29
32	beta 1	IMRI MI	VIM	normal	-	1.00	0.11
33	beta 1	PMM	mice	PMM	classical	0.44	0.11
34	beta 1	midastouch	mice	midastouch	classical	0.40	0.11
35	beta 1	missRanger	missRanger	PMM	classical	0.64	0.28
36	beta 1	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.80	0.28
37	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.92	0.29
38	beta 1	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.88	0.29
39	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.92	0.29
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.80	0.28
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.88	0.28
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.80	0.28
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.92	0.28
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.64	0.11
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.56	0.11

Table 41: Simulation results with the following settings:  $n = 500$  ; missing rate = 0.1 ; correlation = 0.95 ; outlier rate = 0.075

	kind	method	R package	imputation uncert	bootstrap	CR	RMSE
1	mean	kNN	VIM	median	-	0.88	0.05
2	mean	IMRI MI	VIM	normal	-	0.92	0.04
3	mean	PMM	mice	PMM	classical	0.88	0.07
4	mean	midastouch	mice	midastouch	classical	0.84	0.07
5	mean	missRanger	missRanger	PMM	classical	0.88	0.05
6	mean	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.80	0.05
7	mean	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.84	0.06
8	mean	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.88	0.06
9	mean	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.88	0.06
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.88	0.04
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.88	0.04
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.92	0.05
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.84	0.05
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.96	0.05
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.84	83.11
16	cor	kNN	VIM	median	-	0.28	0.1
17	cor	IMRI MI	VIM	normal	-	1.00	0
18	cor	PMM	mice	PMM	classical	0.00	0.18
19	cor	midastouch	mice	midastouch	classical	0.00	0.18
20	cor	missRanger	missRanger	PMM	classical	0.36	0.07
21	cor	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.24	0.06
22	cor	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.00	0.15
23	cor	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.00	0.12
24	cor	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.00	0.15
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.60	0.04
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.64	0.04
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.48	0.03
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.60	0.06
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.52	0.08
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.80	0.05
31	beta 1	kNN	VIM	median	-	0.60	0.3
32	beta 1	IMRI MI	VIM	normal	-	1.00	0.09
33	beta 1	PMM	mice	PMM	classical	1.00	0.22
34	beta 1	midastouch	mice	midastouch	classical	0.88	0.22
35	beta 1	missRanger	missRanger	PMM	classical	0.64	0.3
36	beta 1	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.56	0.3
37	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.88	0.42
38	beta 1	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.68	0.42
39	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-stratified	1.00	0.42
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.84	0.27
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.88	0.27
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.92	0.27
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.92	0.28
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.92	0.18
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	1.00	> 1000000000

Table 42: Simulation results with the following settings:  $n = 500$  ; missing rate = 0.1 ; correlation = 0.95 ; outlier rate = 0.15

	kind	method	R package	imputation uncert	bootstrap	CR	RMSE
1	mean	kNN	VIM	median	-	0.76	0.07
2	mean	IMRI MI	VIM	normal	-	0.80	0.05
3	mean	PMM	mice	PMM	classical	0.80	0.09
4	mean	midastouch	mice	midastouch	classical	0.76	0.08
5	mean	missRanger	missRanger	PMM	classical	0.68	0.08
6	mean	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.76	0.08
7	mean	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.72	0.07
8	mean	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.72	0.09
9	mean	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.68	0.09
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.80	0.07
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.80	0.07
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.80	0.07
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.80	0.07
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.80	0.07
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.80	0.07
16	cor	kNN	VIM	median	-	0.36	0.12
17	cor	IMRI MI	VIM	normal	-	1.00	0
18	cor	PMM	mice	PMM	classical	0.00	0.22
19	cor	midastouch	mice	midastouch	classical	0.00	0.22
20	cor	missRanger	missRanger	PMM	classical	0.28	0.1
21	cor	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.08	0.1
22	cor	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.00	0.18
23	cor	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.00	0.2
24	cor	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.00	0.18
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.28	0.07
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.20	0.07
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.32	0.06
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.16	0.07
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.32	0.12
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.48	0.31
31	beta 1	kNN	VIM	median	-	0.52	0.32
32	beta 1	IMRI MI	VIM	normal	-	1.00	0.1
33	beta 1	PMM	mice	PMM	classical	0.92	0.25
34	beta 1	midastouch	mice	midastouch	classical	0.84	0.26
35	beta 1	missRanger	missRanger	PMM	classical	0.72	0.34
36	beta 1	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.52	0.32
37	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.88	0.49
38	beta 1	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.76	0.49
39	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.88	0.47
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.80	0.27
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.68	0.27
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.72	0.27
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.76	0.28
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.92	10045.94
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	1.00	> 1000000000

Table 43: Simulation results with the following settings:  $n = 500$  ; missing rate = 0.3 ; correlation = 0.5 ; outlier rate = 0

	kind	method	R package	imputation uncert	bootstrap	CR	RMSE
1	mean	kNN	VIM	median	-	0.80	0.05
2	mean	IMRI MI	VIM	normal	-	0.80	0.06
3	mean	PMM	mice	PMM	classical	0.80	0.06
4	mean	midastouch	mice	midastouch	classical	0.88	0.06
5	mean	missRanger	missRanger	PMM	classical	0.72	0.06
6	mean	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.72	0.06
7	mean	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.68	0.06
8	mean	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.76	0.06
9	mean	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.76	0.05
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.68	0.06
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.72	0.06
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.76	0.05
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.80	0.05
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.88	0.05
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.88	0.06
16	cor	kNN	VIM	median	-	0.72	0.05
17	cor	IMRI MI	VIM	normal	-	0.88	0.05
18	cor	PMM	mice	PMM	classical	0.92	0.05
19	cor	midastouch	mice	midastouch	classical	0.92	0.05
20	cor	missRanger	missRanger	PMM	classical	0.68	0.06
21	cor	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.56	0.07
22	cor	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.84	0.05
23	cor	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.76	0.05
24	cor	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.80	0.05
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.64	0.06
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.72	0.06
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.64	0.07
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.80	0.05
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.84	0.05
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.92	0.05
31	beta 1	kNN	VIM	median	-	0.68	0.51
32	beta 1	IMRI MI	VIM	normal	-	1.00	0.2
33	beta 1	PMM	mice	PMM	classical	0.72	0.2
34	beta 1	midastouch	mice	midastouch	classical	0.72	0.2
35	beta 1	missRanger	missRanger	PMM	classical	0.72	0.49
36	beta 1	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.84	0.47
37	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.88	0.51
38	beta 1	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.88	0.52
39	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.92	0.51
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.72	0.48
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.68	0.48
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.72	0.48
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.92	0.49
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.84	0.2
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.76	0.19

Table 44: Simulation results with the following settings:  $n = 500$  ; missing rate = 0.3 ; correlation = 0.5 ; outlier rate = 0.075

	kind	method	R package	imputation uncert	bootstrap	CR	RMSE
1	mean	kNN	VIM	median	-	0.64	0.09
2	mean	IMRI MI	VIM	normal	-	0.88	0.04
3	mean	PMM	mice	PMM	classical	0.64	0.14
4	mean	midastouch	mice	midastouch	classical	0.56	0.14
5	mean	missRanger	missRanger	PMM	classical	0.28	0.12
6	mean	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.28	0.12
7	mean	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.52	0.12
8	mean	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.56	0.12
9	mean	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.56	0.13
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.64	0.08
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.52	0.09
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.56	0.09
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.56	0.09
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.76	0.09
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.72	> 1000000000
16	cor	kNN	VIM	median	-	0.44	0.12
17	cor	IMRI MI	VIM	normal	-	0.84	0.05
18	cor	PMM	mice	PMM	classical	0.00	0.25
19	cor	midastouch	mice	midastouch	classical	0.00	0.25
20	cor	missRanger	missRanger	PMM	classical	0.40	0.11
21	cor	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.20	0.12
22	cor	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.00	0.2
23	cor	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.00	0.21
24	cor	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.00	0.2
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.60	0.07
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.56	0.07
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.64	0.06
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.64	0.07
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.56	0.12
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.52	0.11
31	beta 1	kNN	VIM	median	-	0.64	0.51
32	beta 1	IMRI MI	VIM	normal	-	1.00	0.21
33	beta 1	PMM	mice	PMM	classical	0.56	0.5
34	beta 1	midastouch	mice	midastouch	classical	0.72	0.49
35	beta 1	missRanger	missRanger	PMM	classical	0.68	0.51
36	beta 1	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.44	0.5
37	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.76	0.67
38	beta 1	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.68	0.68
39	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.80	0.68
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.72	0.45
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.84	0.46
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.60	0.45
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.80	0.47
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.72	0.34
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.92	0.83

Table 45: Simulation results with the following settings:  $n = 500$  ; missing rate = 0.3 ; correlation = 0.5 ; outlier rate = 0.15

	kind	method	R package	imputation uncert	bootstrap	CR	RMSE
1	mean	kNN	VIM	median	-	0.48	0.13
2	mean	IMRI MI	VIM	normal	-	0.96	0.04
3	mean	PMM	mice	PMM	classical	0.36	0.16
4	mean	midastouch	mice	midastouch	classical	0.36	0.17
5	mean	missRanger	missRanger	PMM	classical	0.20	0.15
6	mean	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.12	0.16
7	mean	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.24	0.18
8	mean	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.36	0.17
9	mean	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.12	0.18
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.48	0.12
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.36	0.11
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.36	0.12
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.40	0.12
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.52	0.13
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.64	0.12
16	cor	kNN	VIM	median	-	0.12	0.17
17	cor	IMRI MI	VIM	normal	-	0.76	0.05
18	cor	PMM	mice	PMM	classical	0.00	0.28
19	cor	midastouch	mice	midastouch	classical	0.00	0.28
20	cor	missRanger	missRanger	PMM	classical	0.36	0.15
21	cor	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.12	0.18
22	cor	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.00	0.26
23	cor	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.00	0.26
24	cor	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.00	0.26
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.52	0.1
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.48	0.11
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.48	0.11
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.40	0.13
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.28	0.16
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.40	0.2
31	beta 1	kNN	VIM	median	-	0.04	0.64
32	beta 1	IMRI MI	VIM	normal	-	1.00	0.21
33	beta 1	PMM	mice	PMM	classical	0.71	0.58
34	beta 1	midastouch	mice	midastouch	classical	0.54	0.54
35	beta 1	missRanger	missRanger	PMM	classical	0.58	0.59
36	beta 1	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.00	0.6
37	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.58	0.78
38	beta 1	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.46	0.78
39	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.54	0.77
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.75	0.49
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.62	0.5
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.58	0.5
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.62	0.52
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.92	0.4
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.96	23339.72



Table 46: Simulation results with the following settings:  $n = 500$  ; missing rate = 0.3 ; correlation = 0.95 ; outlier rate = 0

	kind	method	R package	imputation uncert	bootstrap	CR	RMSE
1	mean	kNN	VIM	median	-	0.80	0.05
2	mean	IMRI MI	VIM	normal	-	0.84	0.05
3	mean	PMM	mice	PMM	classical	0.80	0.05
4	mean	midastouch	mice	midastouch	classical	0.80	0.05
5	mean	missRanger	missRanger	PMM	classical	0.76	0.05
6	mean	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.80	0.05
7	mean	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.80	0.05
8	mean	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.84	0.05
9	mean	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.80	0.05
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.84	0.05
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.76	0.05
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.80	0.05
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.80	0.05
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.84	0.05
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.84	0.05
16	cor	kNN	VIM	median	-	0.56	0.01
17	cor	IMRI MI	VIM	normal	-	0.44	0.01
18	cor	PMM	mice	PMM	classical	0.88	0.01
19	cor	midastouch	mice	midastouch	classical	0.84	0.01
20	cor	missRanger	missRanger	PMM	classical	0.32	0.01
21	cor	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.20	0.01
22	cor	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.88	0.01
23	cor	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.88	0.01
24	cor	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.92	0.01
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.24	0.01
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.24	0.01
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.28	0.01
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.36	0.01
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.96	0.01
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.92	0.01
31	beta 1	kNN	VIM	median	-	0.00	0.3
32	beta 1	IMRI MI	VIM	normal	-	1.00	0.11
33	beta 1	PMM	mice	PMM	classical	0.76	0.11
34	beta 1	midastouch	mice	midastouch	classical	0.64	0.11
35	beta 1	missRanger	missRanger	PMM	classical	0.16	0.28
36	beta 1	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.56	0.26
37	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.72	0.3
38	beta 1	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.56	0.3
39	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.64	0.3
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.56	0.27
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.52	0.27
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.64	0.26
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.56	0.28
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.84	0.11
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.84	0.11

Table 47: Simulation results with the following settings:  $n = 500$  ; missing rate = 0.3 ; correlation = 0.95 ; outlier rate = 0.075

	kind	method	R package	imputation uncert	bootstrap	CR	RMSE
1	mean	kNN	VIM	median	-	0.68	0.09
2	mean	IMRI MI	VIM	normal	-	0.88	0.04
3	mean	PMM	mice	PMM	classical	0.28	0.17
4	mean	midastouch	mice	midastouch	classical	0.36	0.19
5	mean	missRanger	missRanger	PMM	classical	0.44	0.11
6	mean	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.24	0.12
7	mean	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.48	0.12
8	mean	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.48	0.13
9	mean	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.36	0.14
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.64	0.09
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.60	0.08
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.60	0.09
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.60	0.09
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.60	0.1
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.84	0.07
16	cor	kNN	VIM	median	-	0.04	0.24
17	cor	IMRI MI	VIM	normal	-	0.80	0.01
18	cor	PMM	mice	PMM	classical	0.00	0.44
19	cor	midastouch	mice	midastouch	classical	0.00	0.45
20	cor	missRanger	missRanger	PMM	classical	0.12	0.2
21	cor	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.00	0.18
22	cor	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.00	0.35
23	cor	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.00	0.32
24	cor	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.00	0.32
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.12	0.12
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.12	0.09
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.12	0.12
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.20	0.11
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.04	0.2
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.24	0.28
31	beta 1	kNN	VIM	median	-	0.12	0.34
32	beta 1	IMRI MI	VIM	normal	-	1.00	0.1
33	beta 1	PMM	mice	PMM	classical	0.88	0.36
34	beta 1	midastouch	mice	midastouch	classical	0.64	0.36
35	beta 1	missRanger	missRanger	PMM	classical	0.32	0.36
36	beta 1	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.00	0.32
37	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.64	0.56
38	beta 1	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.64	0.57
39	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.72	0.57
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.60	0.25
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.76	0.26
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.64	0.25
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.68	0.27
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.60	0.32
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	1.00	> 1000000000

Table 48: Simulation results with the following settings:  $n = 500$  ; missing rate = 0.3 ; correlation = 0.95 ; outlier rate = 0.15

	kind	method	R package	imputation uncert	bootstrap	CR	RMSE
1	mean	kNN	VIM	median	-	0.40	0.14
2	mean	IMRI MI	VIM	normal	-	0.92	0.04
3	mean	PMM	mice	PMM	classical	0.32	0.2
4	mean	midastouch	mice	midastouch	classical	0.28	0.21
5	mean	missRanger	missRanger	PMM	classical	0.16	0.15
6	mean	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.12	0.17
7	mean	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.36	0.16
8	mean	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.40	0.18
9	mean	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.40	0.17
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.52	0.11
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.44	0.11
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.40	0.12
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.44	0.11
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.44	0.15
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.52	11905.32
16	cor	kNN	VIM	median	-	0.04	0.28
17	cor	IMRI MI	VIM	normal	-	0.80	0.01
18	cor	PMM	mice	PMM	classical	0.00	0.49
19	cor	midastouch	mice	midastouch	classical	0.00	0.48
20	cor	missRanger	missRanger	PMM	classical	0.00	0.27
21	cor	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.00	0.25
22	cor	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.00	0.41
23	cor	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.00	0.41
24	cor	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.00	0.42
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.00	0.16
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.00	0.15
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.00	0.18
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.00	0.2
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.00	0.28
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.00	0.22
31	beta 1	kNN	VIM	median	-	0.00	0.5
32	beta 1	IMRI MI	VIM	normal	-	1.00	0.11
33	beta 1	PMM	mice	PMM	classical	0.72	0.43
34	beta 1	midastouch	mice	midastouch	classical	0.60	0.42
35	beta 1	missRanger	missRanger	PMM	classical	0.36	0.47
36	beta 1	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.00	0.43
37	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.32	0.69
38	beta 1	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.52	0.68
39	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.52	0.68
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.56	0.27
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.60	0.28
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.32	0.27
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.56	0.29
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.60	0.35
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	1.00	> 1000000000