

Supplementary material

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journal name: Statistics and Computing
author name: Matthias Templ
affiliation: School of Business
Institute for Competitiveness and Communication
Empirical Economic and Social Research
Riggenbachstrasse 16
4600 Olten
e-mail address matthias.templ@fhnw.ch

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 results, especially 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 (except 250 for the first setting I), 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.

PCA before and after amputation and imputation

Figure 1 shows the first two principal components in a biplot. In the upper left, the results of the full data set is shown. From the full data set, 20% missings are set in variable ‘speed’ using MAR using probabilities linear to the magnitude of values in variable ‘rr’. The result of one realisation is shown.

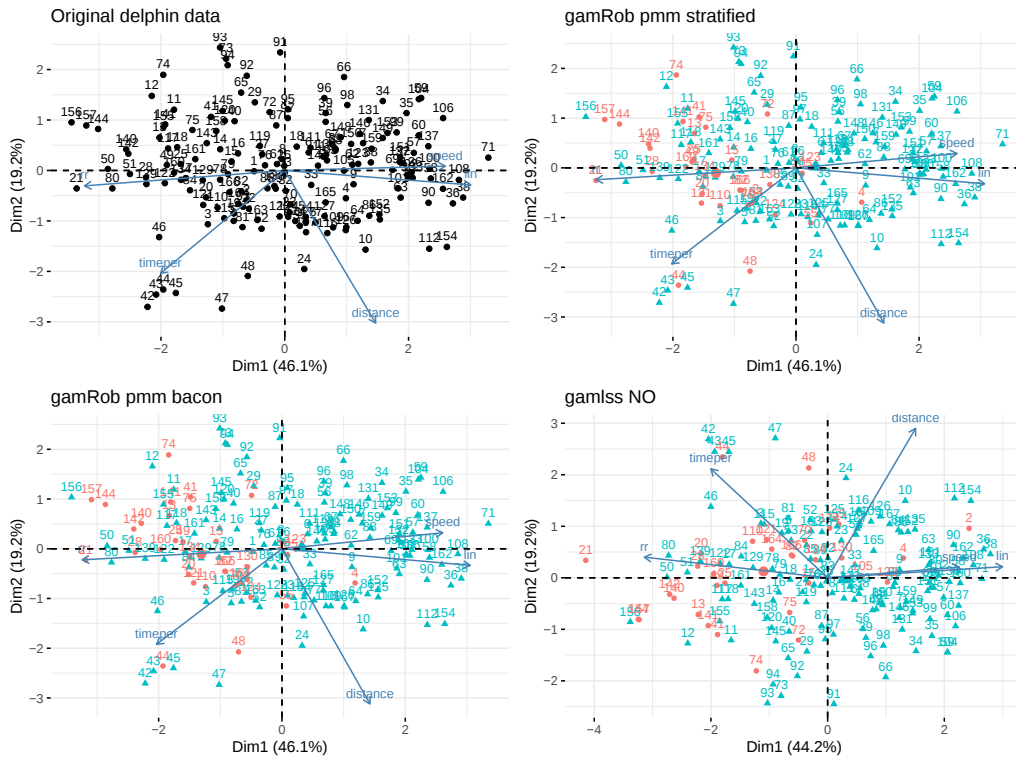


Figure 1: PCA biplot of the first two principal components of the continuous variables of the dolphins data set (speed, rr, lin, distance, timeper).

It can be seen that the loadings change in direction and magnitude most for GAMLSS.

Simulation: Data generation

The simulation results contains three different settings, described in the original article.

For simulation setting II and III: The number of observations of regular non-outlying data points $\mathbf{X}_{\text{reg}}$ 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 for simulation setting II and III 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 variance of the arithmetic mean of the first variable, $\bar{x}_1$ (mean)
- The variance of the correlation coefficient between the first two variables (cor)
- The variance of the regression slope β_1 .

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

Setting I - comparison with other methods

data				simulated		simulated with outliers	
method	R package	imputation uncertainty	model uncert. / bootstrap	CR	RMSE	CR	RMSE
kNN	VIM	median	–	0.83	0.26	0.76	0.34
IRMI MI	VIM	normal	–	0.86	0.27	0.92	0.24
PMM	mice	PMM	classical	0.94	0.25	0.44	0.79
midastouch	mice	midastouch	classical	0.92	0.25	0.43	0.73
missRanger	missRanger	PMM	classical	0.92	0.25	0.79	0.32
imputeRobust/GAM	VIM*	PMM	robust-quantile	0.88	0.25	0.72	0.35
imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.90	0.25	0.72	0.37
imputeRobust/GAM	VIM*	PMM	robust-stratified	0.89	0.25	0.76	0.37
imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.90	0.25	0.75	0.37
imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.83	0.25	0.74	0.36
imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.83	0.26	0.76	0.33
imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.87	0.26	0.74	0.35
imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.91	0.25	0.77	0.34
gamlss-NO	ImputeRobust	PMM	classical	0.89	0.26	0.86	2.04e ⁶²
gamlss-TF	ImputeRobust	PMM	classical	0.92	0.25	–	–

Table 1: Coverage rates and root mean squared errors of the arithmetic mean of the target variable for the simulated data (setting I) and simulated data with outliers. VIM*: available in the development version of VIM at GitHub, <https://github.com/statistikat/VIM>.

Setting II and III

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 2: 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	0.94	0.06
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.96	0.06
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.94	0.06
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.96	0.06
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.94	0.06
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.94	0.06
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.94	0.06
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.94	0.06
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.94	0.06
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.92	0.06
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.96	0.05
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.94	0.05
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.88	0.48
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.94	0.48
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.90	0.48
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.90	0.48
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.48	0.27
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.46	0.28

Table 3: 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	0.84	0.09
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.78	0.08
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.78	0.08
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.82	0.09
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.84	> 1000000000
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.94	> 1000000000
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.88	0.06
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.90	0.06
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.92	0.06
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.84	0.11
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.92	0.07
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.92	0.1
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.88	0.5
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.90	0.5
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.90	0.5
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.88	0.51
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.84	0.27
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.68	0.27

Table 4: 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	0.88	0.08
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.90	0.08
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.92	0.07
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.84	0.09
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.92	0.09
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.94	10269117.91
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.84	0.08
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.84	0.08
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.84	0.08
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.82	0.08
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.92	0.09
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.94	0.09
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.90	0.48
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.92	0.48
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.92	0.48
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.88	0.49
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.86	0.3
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.76	> 1000000000

Table 5: 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	0.96	0.06
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.94	0.06
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.96	0.06
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.94	0.06
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.96	0.06
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.96	0.06
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.90	0.01
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.90	0.01
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.92	0.01
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.92	0.01
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.94	0.02
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.94	0.02
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.88	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	0.90	0.27
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.46	0.14
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.56	0.14

Table 6: 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	0.84	0.09
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.82	0.08
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.86	0.09
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.82	0.08
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.84	0.08
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.86	424.16
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.80	0.05
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.74	0.04
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.62	0.06
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.70	0.05
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.90	0.06
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.76	0.17
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.92	0.28
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.88	0.28
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.82	0.28
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.88	0.28
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.80	0.18
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.96	> 1000000000

Table 7: 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	0.84	0.08
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.84	0.08
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.84	0.09
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.84	0.09
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.84	0.08
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.88	0.08
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.46	0.09
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.38	0.08
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.42	0.1
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.34	0.1
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.58	0.11
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.72	0.21
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.87	0.27
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.91	0.27
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.91	0.27
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.91	0.28
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.87	0.2
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	1.00	> 1000000000

Table 8: 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	0.74	0.09
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.74	0.09
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.70	0.09
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.98	0.08
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.90	0.09
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.84	0.08
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.76	0.08
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.76	0.08
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.80	0.07
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.92	0.07
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.92	0.07
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.86	0.46
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.84	0.46
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.86	0.46
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.92	0.47
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.88	0.27
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.84	0.26

Table 9: 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	0.62	0.13
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.68	0.12
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.60	0.13
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.66	0.12
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.84	> 1000000000
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.82	> 1000000000
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.72	0.11
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.72	0.1
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.66	0.11
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.78	0.11
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.74	0.14
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.76	0.14
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.69	0.48
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.78	0.49
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.80	0.49
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.80	0.5
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.80	0.37
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.94	436449.88

Table 10: 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	0.50	0.15
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.54	0.15
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.56	0.15
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.54	0.15
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.80	0.15
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.70	0.17
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.46	0.14
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.54	0.14
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.52	0.15
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.48	0.15
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.54	0.19
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.54	0.19
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.74	0.49
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.78	0.49
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.74	0.5
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.74	0.52
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.72	0.44
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.94	99956

Table 11: 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	0.88	0.08
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.90	0.08
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.90	0.07
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.88	0.08
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.90	0.07
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.90	0.08
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.72	0.01
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.68	0.01
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.68	0.01
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.72	0.01
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.94	0.01
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.88	0.02
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.66	0.26
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.56	0.26
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.60	0.26
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.78	0.27
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.74	0.14
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.64	0.14

Table 12: 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	0.84	0.1
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.80	0.1
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.78	0.11
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.78	0.11
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.86	0.11
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.88	2053.1
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.50	0.12
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.26	0.12
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.34	0.13
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.36	0.14
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.42	0.16
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.54	0.21
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.51	0.28
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.57	0.28
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.59	0.27
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.61	0.3
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.86	0.28
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	1.00	> 1000000000

Table 13: 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	0.72	0.13
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.78	0.13
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.70	0.15
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.60	0.14
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.82	> 1000000000
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.82	0.62
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.08	0.21
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.08	0.22
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.12	0.22
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.08	0.22
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.08	0.27
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.22	0.23
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.60	0.26
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.72	0.27
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.58	0.27
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.66	0.31
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.88	0.34
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	1.00	> 1000000000

Table 14: 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	0.94	0.04
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.90	0.04
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.92	0.04
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.96	0.04
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.94	0.04
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.96	0.04
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.90	0.04
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.90	0.04
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.90	0.04
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.86	0.04
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.86	0.04
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.86	0.04
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.92	0.48
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.90	0.48
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.88	0.48
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.88	0.48
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.52	0.2
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.56	0.2

Table 15: 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	0.05
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.88	0.04
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.86	0.04
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.86	0.05
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.90	0.05
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.92	8.82
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.94	0.03
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.92	0.04
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.92	0.05
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.90	0.04
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.94	0.05
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.92	0.07
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.90	0.48
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.84	0.49
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.94	0.48
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.94	0.49
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.72	0.25
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.68	0.51

Table 16: 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	0.76	0.06
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.78	0.06
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.82	0.06
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.80	0.06
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.86	0.06
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.84	0.1
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.80	0.05
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.82	0.06
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.80	0.05
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.78	0.06
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.80	0.07
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.74	0.08
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.88	0.48
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.86	0.49
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.90	0.49
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.88	0.49
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.78	0.26
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.84	51002493.25

Table 17: 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	0.94	0.04
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.94	0.04
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.94	0.04
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.94	0.04
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.94	0.04
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.94	0.04
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.80	0.01
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.88	0.01
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.82	0.01
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.90	0.01
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.96	0.01
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.98	0.01
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.90	0.28
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.88	0.28
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.90	0.28
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.94	0.28
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.50	0.11
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.48	0.11

Table 18: 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	0.86	0.05
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.86	0.05
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.84	0.05
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.88	0.05
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.88	0.05
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.90	10.72
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.46	0.04
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.52	0.05
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.50	0.05
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.32	0.05
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.58	0.08
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.82	0.14
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.86	0.27
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.88	0.27
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.88	0.27
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.90	0.28
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.86	0.18
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.96	> 1000000000

Table 19: 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	0.82	0.06
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.82	0.06
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.82	0.06
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.80	0.06
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.84	0.07
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.88	0.7
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.32	0.08
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.22	0.07
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.30	0.08
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.18	0.08
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.42	0.12
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.56	0.09
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.84	0.27
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.90	0.27
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.86	0.27
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.90	0.28
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.90	0.22
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.98	> 1000000000

Table 20: 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	0.82	0.05
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.84	0.05
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.84	0.05
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.80	0.06
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.88	0.05
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.96	0.05
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.64	0.06
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.70	0.06
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.66	0.06
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.80	0.05
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.94	0.04
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.94	0.04
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.70	0.48
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.66	0.49
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.66	0.48
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.68	0.49
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.80	0.2
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.72	0.22

Table 21: 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	0.54	0.09
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.60	0.09
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.52	0.09
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.62	0.09
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.68	0.1
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.86	2.51
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.68	0.06
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.72	0.06
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.60	0.08
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.58	0.08
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.42	0.12
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.60	0.13
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.64	0.46
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.76	0.47
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.60	0.46
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.72	0.48
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.70	0.35
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.88	17433.69

Table 22: 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	0.62	0.1
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.56	0.11
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.50	0.11
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.50	0.11
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.68	0.12
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.72	330258402.23
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.44	0.11
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.42	0.11
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.42	0.11
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.36	0.12
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.20	0.16
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.36	0.17
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.68	0.48
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.66	0.5
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.56	0.5
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.62	0.52
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.72	2253.05
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.84	30648.35

Table 23: 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	0.84	0.05
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.82	0.05
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.88	0.05
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.88	0.05
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.88	0.05
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.24	0.01
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.28	0.01
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.26	0.01
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.38	0.01
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.96	0.01
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.96	0.01
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.48	0.27
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.60	0.27
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.46	0.26
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.62	0.27
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.76	0.11
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.80	0.12

Table 24: 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	0.76	0.07
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.76	0.07
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.66	0.08
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.72	0.08
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.66	0.09
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.84	2907.58
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.12	0.11
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.20	0.1
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.06	0.14
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.08	0.12
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.02	0.2
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.18	0.26
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.58	0.26
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.68	0.26
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.52	0.26
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.68	0.27
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.70	> 1000000000
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.94	889086053.01

Table 25: 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	0.48	0.12
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.46	0.11
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.42	0.12
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.44	0.13
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.48	0.13
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.66	0.14
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.00	0.17
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.00	0.16
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.00	0.19
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.00	0.18
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.00	0.26
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.00	0.25
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.50	0.26
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.60	0.27
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.44	0.27
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.72	0.28
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.54	0.39
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	1.00	> 1000000000

Setting II and III - comparison with other methods

Table 26: 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	-	0.94	0.06
2	mean	IMRI MI	VIM	normal	-	0.94	0.06
3	mean	PMM	mice	PMM	classical	0.94	0.06
4	mean	midastouch	mice	midastouch	classical	0.96	0.06
5	mean	missRanger	missRanger	PMM	classical	0.92	0.06
6	mean	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.94	0.06
7	mean	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.96	0.05
8	mean	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.94	0.06
9	mean	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.92	0.06
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.94	0.06
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.96	0.06
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.94	0.06
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.96	0.06
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.94	0.06
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.94	0.06
16	cor	kNN	VIM	median	-	0.94	0.06
17	cor	IMRI MI	VIM	normal	-	0.98	0.05
18	cor	PMM	mice	PMM	classical	0.96	0.05
19	cor	midastouch	mice	midastouch	classical	0.94	0.05
20	cor	missRanger	missRanger	PMM	classical	0.94	0.06
21	cor	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.94	0.06
22	cor	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.94	0.06
23	cor	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.94	0.06
24	cor	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.94	0.06
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.94	0.06
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.94	0.06
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.94	0.06
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.92	0.06
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.96	0.05
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.94	0.05
31	beta 1	kNN	VIM	median	-	0.94	0.49
32	beta 1	IMRI MI	VIM	normal	-	1.00	0.27
33	beta 1	PMM	mice	PMM	classical	0.46	0.28
34	beta 1	midastouch	mice	midastouch	classical	0.48	0.28
35	beta 1	missRanger	missRanger	PMM	classical	0.90	0.48
36	beta 1	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.90	0.48
37	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.94	0.49
38	beta 1	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.94	0.49
39	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.90	0.49
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.88	0.48
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.94	0.48
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.90	0.48
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.90	0.48
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.48	0.27
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.46	0.28

Table 27: 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	-	0.86	0.08
2	mean	IMRI MI	VIM	normal	-	0.86	0.07
3	mean	PMM	mice	PMM	classical	0.92	0.09
4	mean	midastouch	mice	midastouch	classical	0.86	0.1
5	mean	missRanger	missRanger	PMM	classical	0.82	0.09
6	mean	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.82	0.09
7	mean	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.86	0.1
8	mean	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.88	0.09
9	mean	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.88	0.09
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.84	0.09
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.78	0.08
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.78	0.08
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.82	0.09
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.84	> 1000000000
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.94	> 1000000000
16	cor	kNN	VIM	median	-	0.78	0.08
17	cor	IMRI MI	VIM	normal	-	0.94	0.06
18	cor	PMM	mice	PMM	classical	0.86	0.1
19	cor	midastouch	mice	midastouch	classical	0.84	0.1
20	cor	missRanger	missRanger	PMM	classical	0.76	0.08
21	cor	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.86	0.07
22	cor	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.70	0.09
23	cor	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.84	0.09
24	cor	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.70	0.11
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.88	0.06
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.90	0.06
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.92	0.06
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.84	0.11
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.92	0.07
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.92	0.1
31	beta 1	kNN	VIM	median	-	0.88	0.51
32	beta 1	IMRI MI	VIM	normal	-	1.00	0.27
33	beta 1	PMM	mice	PMM	classical	0.74	0.35
34	beta 1	midastouch	mice	midastouch	classical	0.82	0.32
35	beta 1	missRanger	missRanger	PMM	classical	0.88	0.51
36	beta 1	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.90	0.51
37	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.92	0.58
38	beta 1	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.96	0.58
39	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.88	0.59
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.88	0.5
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.90	0.5
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.90	0.5
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.88	0.51
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.84	0.27
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.68	0.27

Table 28: 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	-	0.90	0.07
3	mean	PMM	mice	PMM	classical	0.90	0.09
4	mean	midastouch	mice	midastouch	classical	0.90	0.08
5	mean	missRanger	missRanger	PMM	classical	0.86	0.08
6	mean	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.88	0.09
7	mean	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.80	0.1
8	mean	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.92	0.08
9	mean	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.84	0.1
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.88	0.08
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.90	0.08
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.92	0.07
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.84	0.09
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.92	0.09
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.94	10269117.91
16	cor	kNN	VIM	median	-	0.70	0.1
17	cor	IMRI MI	VIM	normal	-	0.94	0.06
18	cor	PMM	mice	PMM	classical	0.84	0.12
19	cor	midastouch	mice	midastouch	classical	0.80	0.13
20	cor	missRanger	missRanger	PMM	classical	0.80	0.09
21	cor	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.82	0.09
22	cor	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.42	0.14
23	cor	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.60	0.13
24	cor	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.58	0.14
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.84	0.08
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.84	0.08
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.84	0.08
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.82	0.08
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.92	0.09
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.94	0.09
31	beta 1	kNN	VIM	median	-	0.92	0.5
32	beta 1	IMRI MI	VIM	normal	-	1.00	0.3
33	beta 1	PMM	mice	PMM	classical	0.82	0.34
34	beta 1	midastouch	mice	midastouch	classical	0.86	0.32
35	beta 1	missRanger	missRanger	PMM	classical	0.86	0.51
36	beta 1	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.92	0.51
37	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.90	0.61
38	beta 1	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.88	0.61
39	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.92	0.6
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.90	0.48
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.92	0.48
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.92	0.48
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.88	0.49
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.86	0.3
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.76	> 1000000000

Table 29: 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	-	0.96	0.06
2	mean	IMRI MI	VIM	normal	-	0.96	0.06
3	mean	PMM	mice	PMM	classical	0.96	0.06
4	mean	midastouch	mice	midastouch	classical	0.96	0.06
5	mean	missRanger	missRanger	PMM	classical	0.96	0.06
6	mean	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.96	0.06
7	mean	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.96	0.06
8	mean	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.96	0.06
9	mean	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.96	0.06
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.96	0.06
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.94	0.06
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.96	0.06
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.94	0.06
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.96	0.06
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.96	0.06
16	cor	kNN	VIM	median	-	0.94	0.01
17	cor	IMRI MI	VIM	normal	-	0.94	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	0.88	0.01
22	cor	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.94	0.01
23	cor	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.94	0.01
24	cor	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.94	0.01
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.90	0.01
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.90	0.01
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.92	0.01
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.92	0.01
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.94	0.02
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.94	0.02
31	beta 1	kNN	VIM	median	-	0.78	0.28
32	beta 1	IMRI MI	VIM	normal	-	1.00	0.13
33	beta 1	PMM	mice	PMM	classical	0.48	0.13
34	beta 1	midastouch	mice	midastouch	classical	0.42	0.13
35	beta 1	missRanger	missRanger	PMM	classical	0.82	0.28
36	beta 1	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.94	0.27
37	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.94	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	0.88	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	0.90	0.27
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.46	0.14
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.56	0.14

Table 30: 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	-	0.86	0.09
2	mean	IMRI MI	VIM	normal	-	0.90	0.08
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	0.80	0.09
6	mean	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.76	0.1
7	mean	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.84	0.09
8	mean	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.82	0.1
9	mean	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.76	0.1
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.84	0.09
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.82	0.08
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.86	0.09
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.82	0.08
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.84	0.08
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.86	424.16
16	cor	kNN	VIM	median	-	0.68	0.1
17	cor	IMRI MI	VIM	normal	-	0.88	0.01
18	cor	PMM	mice	PMM	classical	0.06	0.15
19	cor	midastouch	mice	midastouch	classical	0.14	0.16
20	cor	missRanger	missRanger	PMM	classical	0.60	0.07
21	cor	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.38	0.07
22	cor	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.06	0.13
23	cor	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.10	0.14
24	cor	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.08	0.13
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.80	0.05
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.74	0.04
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.62	0.06
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.70	0.05
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.90	0.06
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.76	0.17
31	beta 1	kNN	VIM	median	-	0.82	0.3
32	beta 1	IMRI MI	VIM	normal	-	1.00	0.13
33	beta 1	PMM	mice	PMM	classical	0.90	0.22
34	beta 1	midastouch	mice	midastouch	classical	0.86	0.23
35	beta 1	missRanger	missRanger	PMM	classical	0.70	0.32
36	beta 1	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.78	0.3
37	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.70	0.4
38	beta 1	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.80	0.39
39	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.88	0.41
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.92	0.28
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.88	0.28
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.82	0.28
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.88	0.28
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.80	0.18
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.96	> 1000000000

Table 31: 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	-	0.86	0.08
2	mean	IMRI MI	VIM	normal	-	0.94	0.07
3	mean	PMM	mice	PMM	classical	0.78	0.11
4	mean	midastouch	mice	midastouch	classical	0.84	0.1
5	mean	missRanger	missRanger	PMM	classical	0.80	0.1
6	mean	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.74	0.09
7	mean	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.80	0.11
8	mean	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.78	0.1
9	mean	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.78	0.1
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.84	0.08
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.84	0.08
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.84	0.09
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.84	0.09
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.84	0.08
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.88	0.08
16	cor	kNN	VIM	median	-	0.48	0.14
17	cor	IMRI MI	VIM	normal	-	0.90	0.01
18	cor	PMM	mice	PMM	classical	0.04	0.2
19	cor	midastouch	mice	midastouch	classical	0.00	0.21
20	cor	missRanger	missRanger	PMM	classical	0.36	0.14
21	cor	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.18	0.11
22	cor	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.02	0.19
23	cor	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.04	0.21
24	cor	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.02	0.21
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.46	0.09
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.38	0.08
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.42	0.1
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.34	0.1
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.58	0.11
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.72	0.21
31	beta 1	kNN	VIM	median	-	0.85	0.3
32	beta 1	IMRI MI	VIM	normal	-	1.00	0.14
33	beta 1	PMM	mice	PMM	classical	0.96	0.26
34	beta 1	midastouch	mice	midastouch	classical	0.96	0.24
35	beta 1	missRanger	missRanger	PMM	classical	0.89	0.33
36	beta 1	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.79	0.32
37	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.96	0.48
38	beta 1	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.89	0.47
39	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.85	0.46
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.87	0.27
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.91	0.27
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.91	0.27
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.91	0.28
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.87	0.2
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	1.00	> 1000000000

Table 32: 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	-	0.78	0.09
2	mean	IMRI MI	VIM	normal	-	0.84	0.09
3	mean	PMM	mice	PMM	classical	0.92	0.08
4	mean	midastouch	mice	midastouch	classical	0.90	0.08
5	mean	missRanger	missRanger	PMM	classical	0.72	0.09
6	mean	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.78	0.08
7	mean	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.74	0.09
8	mean	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.78	0.09
9	mean	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.76	0.08
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.76	0.09
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.74	0.09
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.74	0.09
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.70	0.09
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.98	0.08
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.90	0.09
16	cor	kNN	VIM	median	-	0.88	0.07
17	cor	IMRI MI	VIM	normal	-	0.88	0.07
18	cor	PMM	mice	PMM	classical	0.98	0.07
19	cor	midastouch	mice	midastouch	classical	0.90	0.07
20	cor	missRanger	missRanger	PMM	classical	0.80	0.08
21	cor	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.74	0.08
22	cor	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.86	0.07
23	cor	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.88	0.07
24	cor	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.82	0.07
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.84	0.08
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.76	0.08
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.76	0.08
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.80	0.07
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.92	0.07
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.92	0.07
31	beta 1	kNN	VIM	median	-	0.88	0.49
32	beta 1	IMRI MI	VIM	normal	-	1.00	0.24
33	beta 1	PMM	mice	PMM	classical	0.78	0.25
34	beta 1	midastouch	mice	midastouch	classical	0.84	0.25
35	beta 1	missRanger	missRanger	PMM	classical	0.90	0.47
36	beta 1	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.96	0.44
37	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.98	0.49
38	beta 1	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.94	0.49
39	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.90	0.48
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.86	0.46
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.84	0.46
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.86	0.46
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.92	0.47
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.88	0.27
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.84	0.26

Table 33: 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	-	0.68	0.12
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	0.66	0.2
5	mean	missRanger	missRanger	PMM	classical	0.42	0.16
6	mean	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.56	0.14
7	mean	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.56	0.17
8	mean	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.62	0.17
9	mean	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.64	0.15
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.62	0.13
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.68	0.12
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.60	0.13
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.66	0.12
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.84	> 1000000000
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.82	> 1000000000
16	cor	kNN	VIM	median	-	0.48	0.14
17	cor	IMRI MI	VIM	normal	-	0.82	0.07
18	cor	PMM	mice	PMM	classical	0.18	0.24
19	cor	midastouch	mice	midastouch	classical	0.24	0.23
20	cor	missRanger	missRanger	PMM	classical	0.58	0.15
21	cor	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.54	0.15
22	cor	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.24	0.21
23	cor	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.24	0.19
24	cor	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.20	0.22
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.72	0.11
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.72	0.1
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.66	0.11
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.78	0.11
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.74	0.14
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.76	0.14
31	beta 1	kNN	VIM	median	-	0.73	0.52
32	beta 1	IMRI MI	VIM	normal	-	1.00	0.29
33	beta 1	PMM	mice	PMM	classical	0.71	0.51
34	beta 1	midastouch	mice	midastouch	classical	0.84	0.45
35	beta 1	missRanger	missRanger	PMM	classical	0.76	0.55
36	beta 1	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.59	0.52
37	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.92	0.68
38	beta 1	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.78	0.7
39	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.82	0.69
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.69	0.48
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.78	0.49
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.80	0.49
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.80	0.5
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.80	0.37
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.94	436449.88

Table 34: 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	-	0.62	0.14
2	mean	IMRI MI	VIM	normal	-	0.76	0.1
3	mean	PMM	mice	PMM	classical	0.62	0.2
4	mean	midastouch	mice	midastouch	classical	0.70	0.19
5	mean	missRanger	missRanger	PMM	classical	0.40	0.17
6	mean	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.36	0.19
7	mean	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.60	0.2
8	mean	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.56	0.19
9	mean	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.58	0.18
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.50	0.15
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.54	0.15
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.56	0.15
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.54	0.15
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.80	0.15
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.70	0.17
16	cor	kNN	VIM	median	-	0.20	0.21
17	cor	IMRI MI	VIM	normal	-	0.86	0.07
18	cor	PMM	mice	PMM	classical	0.06	0.29
19	cor	midastouch	mice	midastouch	classical	0.04	0.29
20	cor	missRanger	missRanger	PMM	classical	0.26	0.2
21	cor	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.18	0.22
22	cor	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.02	0.29
23	cor	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.10	0.27
24	cor	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.06	0.27
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.46	0.14
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.54	0.14
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.52	0.15
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.48	0.15
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.54	0.19
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.54	0.19
31	beta 1	kNN	VIM	median	-	0.48	0.63
32	beta 1	IMRI MI	VIM	normal	-	1.00	0.29
33	beta 1	PMM	mice	PMM	classical	0.74	0.55
34	beta 1	midastouch	mice	midastouch	classical	0.92	0.46
35	beta 1	missRanger	missRanger	PMM	classical	0.82	0.59
36	beta 1	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.44	0.59
37	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.78	0.77
38	beta 1	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.80	0.76
39	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.78	0.77
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.74	0.49
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.78	0.49
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.74	0.5
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.74	0.52
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.72	0.44
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.94	99956

Table 35: 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	-	0.88	0.08
2	mean	IMRI MI	VIM	normal	-	0.90	0.07
3	mean	PMM	mice	PMM	classical	0.92	0.08
4	mean	midastouch	mice	midastouch	classical	0.92	0.07
5	mean	missRanger	missRanger	PMM	classical	0.88	0.07
6	mean	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.90	0.08
7	mean	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.92	0.07
8	mean	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.92	0.08
9	mean	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.92	0.07
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.88	0.08
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.90	0.08
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.90	0.07
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.88	0.08
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.90	0.07
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.90	0.08
16	cor	kNN	VIM	median	-	0.88	0.01
17	cor	IMRI MI	VIM	normal	-	0.64	0.01
18	cor	PMM	mice	PMM	classical	0.96	0.01
19	cor	midastouch	mice	midastouch	classical	0.88	0.01
20	cor	missRanger	missRanger	PMM	classical	0.78	0.01
21	cor	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.62	0.01
22	cor	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.84	0.01
23	cor	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.82	0.01
24	cor	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.80	0.01
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.72	0.01
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.68	0.01
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.68	0.01
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.72	0.01
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.94	0.01
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.88	0.02
31	beta 1	kNN	VIM	median	-	0.14	0.29
32	beta 1	IMRI MI	VIM	normal	-	1.00	0.12
33	beta 1	PMM	mice	PMM	classical	0.72	0.14
34	beta 1	midastouch	mice	midastouch	classical	0.78	0.13
35	beta 1	missRanger	missRanger	PMM	classical	0.40	0.26
36	beta 1	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.74	0.25
37	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.84	0.28
38	beta 1	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.82	0.28
39	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.88	0.28
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.66	0.26
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.56	0.26
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.60	0.26
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.78	0.27
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.74	0.14
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.64	0.14

Table 36: 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	-	0.82	0.11
2	mean	IMRI MI	VIM	normal	-	0.94	0.07
3	mean	PMM	mice	PMM	classical	0.78	0.18
4	mean	midastouch	mice	midastouch	classical	0.78	0.19
5	mean	missRanger	missRanger	PMM	classical	0.66	0.13
6	mean	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.70	0.13
7	mean	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.66	0.15
8	mean	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.78	0.15
9	mean	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.70	0.14
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.84	0.1
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.80	0.1
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.78	0.11
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.78	0.11
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.86	0.11
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.88	2053.1
16	cor	kNN	VIM	median	-	0.36	0.22
17	cor	IMRI MI	VIM	normal	-	0.92	0.01
18	cor	PMM	mice	PMM	classical	0.00	0.42
19	cor	midastouch	mice	midastouch	classical	0.00	0.43
20	cor	missRanger	missRanger	PMM	classical	0.12	0.2
21	cor	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.06	0.2
22	cor	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.00	0.33
23	cor	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.00	0.33
24	cor	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.00	0.33
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.50	0.12
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.26	0.12
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.34	0.13
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.36	0.14
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.42	0.16
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.54	0.21
31	beta 1	kNN	VIM	median	-	0.18	0.33
32	beta 1	IMRI MI	VIM	normal	-	1.00	0.14
33	beta 1	PMM	mice	PMM	classical	0.92	0.36
34	beta 1	midastouch	mice	midastouch	classical	0.90	0.4
35	beta 1	missRanger	missRanger	PMM	classical	0.65	0.39
36	beta 1	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.27	0.33
37	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.76	0.56
38	beta 1	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.82	0.56
39	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.71	0.57
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.51	0.28
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.57	0.28
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.59	0.27
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.61	0.3
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.86	0.28
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	1.00	> 1000000000

Table 37: 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	-	0.70	0.14
2	mean	IMRI MI	VIM	normal	-	0.88	0.07
3	mean	PMM	mice	PMM	classical	0.70	0.22
4	mean	midastouch	mice	midastouch	classical	0.62	0.22
5	mean	missRanger	missRanger	PMM	classical	0.54	0.16
6	mean	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.48	0.18
7	mean	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.62	0.18
8	mean	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.60	0.19
9	mean	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.46	0.19
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.72	0.13
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.78	0.13
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.70	0.15
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.60	0.14
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.82	> 1000000000
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.82	0.62
16	cor	kNN	VIM	median	-	0.12	0.33
17	cor	IMRI MI	VIM	normal	-	0.88	0.01
18	cor	PMM	mice	PMM	classical	0.00	0.48
19	cor	midastouch	mice	midastouch	classical	0.00	0.48
20	cor	missRanger	missRanger	PMM	classical	0.06	0.29
21	cor	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.02	0.28
22	cor	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.00	0.42
23	cor	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.00	0.42
24	cor	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.00	0.43
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.08	0.21
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.08	0.22
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.12	0.22
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.08	0.22
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.08	0.27
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.22	0.23
31	beta 1	kNN	VIM	median	-	0.22	0.46
32	beta 1	IMRI MI	VIM	normal	-	1.00	0.14
33	beta 1	PMM	mice	PMM	classical	0.88	0.41
34	beta 1	midastouch	mice	midastouch	classical	0.92	0.38
35	beta 1	missRanger	missRanger	PMM	classical	0.68	0.47
36	beta 1	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.18	0.41
37	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.62	0.68
38	beta 1	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.82	0.66
39	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.76	0.68
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.60	0.26
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.72	0.27
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.58	0.27
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.66	0.31
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.88	0.34
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	1.00	> 1000000000

Table 38: 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	-	0.94	0.04
2	mean	IMRI MI	VIM	normal	-	0.90	0.04
3	mean	PMM	mice	PMM	classical	0.94	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	0.90	0.04
9	mean	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.88	0.05
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.94	0.04
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.90	0.04
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.92	0.04
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.96	0.04
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.94	0.04
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.96	0.04
16	cor	kNN	VIM	median	-	0.86	0.04
17	cor	IMRI MI	VIM	normal	-	0.88	0.04
18	cor	PMM	mice	PMM	classical	0.86	0.04
19	cor	midastouch	mice	midastouch	classical	0.86	0.04
20	cor	missRanger	missRanger	PMM	classical	0.94	0.04
21	cor	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.92	0.04
22	cor	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.82	0.04
23	cor	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.88	0.04
24	cor	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.88	0.04
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.90	0.04
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.90	0.04
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.90	0.04
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.86	0.04
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.86	0.04
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.86	0.04
31	beta 1	kNN	VIM	median	-	0.94	0.49
32	beta 1	IMRI MI	VIM	normal	-	1.00	0.2
33	beta 1	PMM	mice	PMM	classical	0.50	0.2
34	beta 1	midastouch	mice	midastouch	classical	0.46	0.2
35	beta 1	missRanger	missRanger	PMM	classical	0.94	0.49
36	beta 1	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.92	0.48
37	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.92	0.49
38	beta 1	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.92	0.49
39	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.90	0.49
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.92	0.48
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.90	0.48
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.88	0.48
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.88	0.48
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.52	0.2
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.56	0.2

Table 39: 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	-	0.86	0.05
2	mean	IMRI MI	VIM	normal	-	0.94	0.04
3	mean	PMM	mice	PMM	classical	0.86	0.05
4	mean	midastouch	mice	midastouch	classical	0.84	0.06
5	mean	missRanger	missRanger	PMM	classical	0.84	0.05
6	mean	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.82	0.05
7	mean	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.82	0.05
8	mean	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.84	0.06
9	mean	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.82	0.05
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.88	0.05
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.88	0.04
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.86	0.04
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.86	0.05
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.90	0.05
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.92	8.82
16	cor	kNN	VIM	median	-	0.84	0.05
17	cor	IMRI MI	VIM	normal	-	1.00	0.03
18	cor	PMM	mice	PMM	classical	0.58	0.1
19	cor	midastouch	mice	midastouch	classical	0.56	0.1
20	cor	missRanger	missRanger	PMM	classical	0.84	0.05
21	cor	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.82	0.05
22	cor	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.46	0.09
23	cor	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.46	0.09
24	cor	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.58	0.09
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.94	0.03
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.92	0.04
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.92	0.05
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.90	0.04
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.94	0.05
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.92	0.07
31	beta 1	kNN	VIM	median	-	0.86	0.5
32	beta 1	IMRI MI	VIM	normal	-	1.00	0.2
33	beta 1	PMM	mice	PMM	classical	0.84	0.29
34	beta 1	midastouch	mice	midastouch	classical	0.78	0.29
35	beta 1	missRanger	missRanger	PMM	classical	0.94	0.5
36	beta 1	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.90	0.5
37	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.86	0.58
38	beta 1	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.82	0.58
39	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.92	0.58
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.90	0.48
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.84	0.49
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.94	0.48
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.94	0.49
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.72	0.25
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.68	0.51

Table 40: 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	-	0.76	0.06
2	mean	IMRI MI	VIM	normal	-	0.84	0.05
3	mean	PMM	mice	PMM	classical	0.78	0.07
4	mean	midastouch	mice	midastouch	classical	0.76	0.07
5	mean	missRanger	missRanger	PMM	classical	0.72	0.07
6	mean	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.68	0.07
7	mean	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.78	0.08
8	mean	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.68	0.08
9	mean	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.78	0.07
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.76	0.06
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.78	0.06
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.82	0.06
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.80	0.06
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.86	0.06
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.84	0.1
16	cor	kNN	VIM	median	-	0.58	0.08
17	cor	IMRI MI	VIM	normal	-	0.92	0.04
18	cor	PMM	mice	PMM	classical	0.36	0.12
19	cor	midastouch	mice	midastouch	classical	0.42	0.12
20	cor	missRanger	missRanger	PMM	classical	0.60	0.08
21	cor	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.66	0.07
22	cor	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.28	0.11
23	cor	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.22	0.12
24	cor	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.32	0.12
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.80	0.05
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.82	0.06
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.80	0.05
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.78	0.06
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.80	0.07
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.74	0.08
31	beta 1	kNN	VIM	median	-	0.70	0.54
32	beta 1	IMRI MI	VIM	normal	-	1.00	0.2
33	beta 1	PMM	mice	PMM	classical	0.68	0.36
34	beta 1	midastouch	mice	midastouch	classical	0.70	0.33
35	beta 1	missRanger	missRanger	PMM	classical	0.86	0.53
36	beta 1	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.70	0.52
37	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.88	0.63
38	beta 1	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.86	0.63
39	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.90	0.63
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.88	0.48
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.86	0.49
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.90	0.49
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.88	0.49
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.78	0.26
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.84	51002493.25

Table 41: 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	-	0.94	0.04
2	mean	IMRI MI	VIM	normal	-	0.94	0.04
3	mean	PMM	mice	PMM	classical	0.94	0.04
4	mean	midastouch	mice	midastouch	classical	0.94	0.04
5	mean	missRanger	missRanger	PMM	classical	0.94	0.04
6	mean	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.94	0.04
7	mean	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.94	0.04
8	mean	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.96	0.04
9	mean	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.94	0.04
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.94	0.04
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.94	0.04
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.94	0.04
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.94	0.04
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.94	0.04
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.94	0.04
16	cor	kNN	VIM	median	-	0.92	0
17	cor	IMRI MI	VIM	normal	-	0.92	0
18	cor	PMM	mice	PMM	classical	0.92	0
19	cor	midastouch	mice	midastouch	classical	0.90	0.01
20	cor	missRanger	missRanger	PMM	classical	0.86	0.01
21	cor	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.78	0.01
22	cor	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.98	0
23	cor	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.94	0
24	cor	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.90	0.01
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.80	0.01
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.88	0.01
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.82	0.01
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.90	0.01
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.96	0.01
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.98	0.01
31	beta 1	kNN	VIM	median	-	0.58	0.29
32	beta 1	IMRI MI	VIM	normal	-	1.00	0.1
33	beta 1	PMM	mice	PMM	classical	0.44	0.11
34	beta 1	midastouch	mice	midastouch	classical	0.42	0.11
35	beta 1	missRanger	missRanger	PMM	classical	0.68	0.28
36	beta 1	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.84	0.27
37	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.96	0.29
38	beta 1	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.96	0.29
39	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.94	0.29
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.90	0.28
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.88	0.28
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.90	0.28
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.94	0.28
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.50	0.11
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.48	0.11

Table 42: 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	-	0.90	0.05
2	mean	IMRI MI	VIM	normal	-	0.92	0.05
3	mean	PMM	mice	PMM	classical	0.82	0.07
4	mean	midastouch	mice	midastouch	classical	0.84	0.07
5	mean	missRanger	missRanger	PMM	classical	0.82	0.05
6	mean	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.78	0.06
7	mean	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.86	0.06
8	mean	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.82	0.06
9	mean	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.80	0.07
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.86	0.05
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.86	0.05
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.84	0.05
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.88	0.05
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.88	0.05
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.90	10.72
16	cor	kNN	VIM	median	-	0.32	0.09
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	0.26	0.08
21	cor	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.20	0.06
22	cor	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.00	0.15
23	cor	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.02	0.16
24	cor	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.00	0.15
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.46	0.04
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.52	0.05
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.50	0.05
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.32	0.05
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.58	0.08
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.82	0.14
31	beta 1	kNN	VIM	median	-	0.54	0.29
32	beta 1	IMRI MI	VIM	normal	-	1.00	0.1
33	beta 1	PMM	mice	PMM	classical	0.96	0.19
34	beta 1	midastouch	mice	midastouch	classical	0.86	0.21
35	beta 1	missRanger	missRanger	PMM	classical	0.66	0.3
36	beta 1	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.54	0.29
37	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.82	0.42
38	beta 1	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.88	0.41
39	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.86	0.4
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.86	0.27
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.88	0.27
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.88	0.27
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.90	0.28
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.86	0.18
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.96	> 1000000000

Table 43: 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	-	0.80	0.07
2	mean	IMRI MI	VIM	normal	-	0.86	0.05
3	mean	PMM	mice	PMM	classical	0.78	0.08
4	mean	midastouch	mice	midastouch	classical	0.78	0.08
5	mean	missRanger	missRanger	PMM	classical	0.74	0.07
6	mean	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.78	0.07
7	mean	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.74	0.07
8	mean	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.76	0.08
9	mean	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.84	0.07
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.82	0.06
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.82	0.06
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.82	0.06
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.80	0.06
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.84	0.07
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.88	0.7
16	cor	kNN	VIM	median	-	0.28	0.12
17	cor	IMRI MI	VIM	normal	-	0.98	0
18	cor	PMM	mice	PMM	classical	0.00	0.21
19	cor	midastouch	mice	midastouch	classical	0.00	0.21
20	cor	missRanger	missRanger	PMM	classical	0.26	0.11
21	cor	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.08	0.1
22	cor	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.00	0.21
23	cor	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.00	0.2
24	cor	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.00	0.2
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.32	0.08
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.22	0.07
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.30	0.08
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.18	0.08
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.42	0.12
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.56	0.09
31	beta 1	kNN	VIM	median	-	0.35	0.33
32	beta 1	IMRI MI	VIM	normal	-	1.00	0.09
33	beta 1	PMM	mice	PMM	classical	0.88	0.26
34	beta 1	midastouch	mice	midastouch	classical	0.84	0.25
35	beta 1	missRanger	missRanger	PMM	classical	0.55	0.35
36	beta 1	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.43	0.33
37	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.90	0.49
38	beta 1	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.69	0.48
39	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.73	0.49
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.84	0.27
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.90	0.27
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.86	0.27
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.90	0.28
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.90	0.22
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.98	> 1000000000

Table 44: 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	-	0.86	0.05
2	mean	IMRI MI	VIM	normal	-	0.84	0.05
3	mean	PMM	mice	PMM	classical	0.94	0.05
4	mean	midastouch	mice	midastouch	classical	0.90	0.05
5	mean	missRanger	missRanger	PMM	classical	0.80	0.05
6	mean	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.78	0.05
7	mean	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.82	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	0.82	0.05
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.84	0.05
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.84	0.05
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.80	0.06
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.88	0.05
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.96	0.05
16	cor	kNN	VIM	median	-	0.74	0.05
17	cor	IMRI MI	VIM	normal	-	0.80	0.05
18	cor	PMM	mice	PMM	classical	0.92	0.04
19	cor	midastouch	mice	midastouch	classical	0.96	0.04
20	cor	missRanger	missRanger	PMM	classical	0.66	0.06
21	cor	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.54	0.07
22	cor	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.82	0.05
23	cor	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.90	0.04
24	cor	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.84	0.05
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.64	0.06
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.70	0.06
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.66	0.06
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.80	0.05
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.94	0.04
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.94	0.04
31	beta 1	kNN	VIM	median	-	0.56	0.51
32	beta 1	IMRI MI	VIM	normal	-	1.00	0.21
33	beta 1	PMM	mice	PMM	classical	0.70	0.21
34	beta 1	midastouch	mice	midastouch	classical	0.80	0.2
35	beta 1	missRanger	missRanger	PMM	classical	0.66	0.49
36	beta 1	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.76	0.47
37	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.82	0.51
38	beta 1	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.88	0.51
39	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.84	0.51
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.70	0.48
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.66	0.49
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.66	0.48
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.68	0.49
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.80	0.2
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.72	0.22

Table 45: 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	-	0.68	0.09
2	mean	IMRI MI	VIM	normal	-	0.82	0.05
3	mean	PMM	mice	PMM	classical	0.70	0.14
4	mean	midastouch	mice	midastouch	classical	0.68	0.13
5	mean	missRanger	missRanger	PMM	classical	0.32	0.12
6	mean	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.32	0.11
7	mean	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.46	0.13
8	mean	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.54	0.13
9	mean	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.52	0.13
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.54	0.09
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.60	0.09
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.52	0.09
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.62	0.09
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.68	0.1
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.86	2.51
16	cor	kNN	VIM	median	-	0.28	0.14
17	cor	IMRI MI	VIM	normal	-	0.84	0.05
18	cor	PMM	mice	PMM	classical	0.00	0.26
19	cor	midastouch	mice	midastouch	classical	0.00	0.25
20	cor	missRanger	missRanger	PMM	classical	0.36	0.13
21	cor	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.32	0.12
22	cor	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.00	0.21
23	cor	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.02	0.21
24	cor	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.04	0.19
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.68	0.06
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.72	0.06
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.60	0.08
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.58	0.08
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.42	0.12
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.60	0.13
31	beta 1	kNN	VIM	median	-	0.46	0.53
32	beta 1	IMRI MI	VIM	normal	-	1.00	0.21
33	beta 1	PMM	mice	PMM	classical	0.58	0.5
34	beta 1	midastouch	mice	midastouch	classical	0.60	0.49
35	beta 1	missRanger	missRanger	PMM	classical	0.60	0.53
36	beta 1	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.36	0.52
37	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.76	0.69
38	beta 1	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.68	0.69
39	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.78	0.69
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.64	0.46
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.76	0.47
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.60	0.46
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.72	0.48
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.70	0.35
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.88	17433.69

Table 46: 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	-	0.54	0.11
2	mean	IMRI MI	VIM	normal	-	0.90	0.05
3	mean	PMM	mice	PMM	classical	0.44	0.16
4	mean	midastouch	mice	midastouch	classical	0.50	0.17
5	mean	missRanger	missRanger	PMM	classical	0.32	0.14
6	mean	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.16	0.15
7	mean	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.42	0.15
8	mean	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.48	0.16
9	mean	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.56	0.15
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.62	0.1
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.56	0.11
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.50	0.11
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.50	0.11
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.68	0.12
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.72	330258402.23
16	cor	kNN	VIM	median	-	0.08	0.19
17	cor	IMRI MI	VIM	normal	-	0.78	0.05
18	cor	PMM	mice	PMM	classical	0.00	0.29
19	cor	midastouch	mice	midastouch	classical	0.00	0.28
20	cor	missRanger	missRanger	PMM	classical	0.18	0.18
21	cor	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.04	0.19
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	0.02	0.26
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.44	0.11
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.42	0.11
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.42	0.11
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.36	0.12
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.20	0.16
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.36	0.17
31	beta 1	kNN	VIM	median	-	0.06	0.63
32	beta 1	IMRI MI	VIM	normal	-	1.00	0.2
33	beta 1	PMM	mice	PMM	classical	0.52	0.59
34	beta 1	midastouch	mice	midastouch	classical	0.52	0.56
35	beta 1	missRanger	missRanger	PMM	classical	0.60	0.59
36	beta 1	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.06	0.6
37	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.62	0.77
38	beta 1	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.64	0.78
39	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.56	0.77
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.68	0.48
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.66	0.5
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.56	0.5
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.62	0.52
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.72	2253.05
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.84	30648.35

Table 47: 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	-	0.84	0.05
2	mean	IMRI MI	VIM	normal	-	0.86	0.05
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	0.84	0.05
6	mean	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.84	0.05
7	mean	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.88	0.05
8	mean	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.86	0.05
9	mean	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.88	0.05
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.84	0.05
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.84	0.05
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.82	0.05
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.88	0.05
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.88	0.05
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.88	0.05
16	cor	kNN	VIM	median	-	0.64	0.01
17	cor	IMRI MI	VIM	normal	-	0.34	0.01
18	cor	PMM	mice	PMM	classical	0.86	0.01
19	cor	midastouch	mice	midastouch	classical	0.90	0.01
20	cor	missRanger	missRanger	PMM	classical	0.34	0.01
21	cor	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.18	0.01
22	cor	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.90	0.01
23	cor	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.88	0.01
24	cor	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.90	0.01
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.24	0.01
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.28	0.01
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.26	0.01
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.38	0.01
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.96	0.01
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.96	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	0.68	0.12
34	beta 1	midastouch	mice	midastouch	classical	0.70	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	0.82	0.29
39	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.68	0.3
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.48	0.27
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.60	0.27
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.46	0.26
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.62	0.27
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.76	0.11
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.80	0.12

Table 48: 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	-	0.76	0.08
2	mean	IMRI MI	VIM	normal	-	0.92	0.04
3	mean	PMM	mice	PMM	classical	0.38	0.17
4	mean	midastouch	mice	midastouch	classical	0.38	0.17
5	mean	missRanger	missRanger	PMM	classical	0.52	0.1
6	mean	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.40	0.11
7	mean	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.46	0.12
8	mean	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.60	0.11
9	mean	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.48	0.12
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.76	0.07
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.76	0.07
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.66	0.08
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.72	0.08
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.66	0.09
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.84	2907.58
16	cor	kNN	VIM	median	-	0.08	0.22
17	cor	IMRI MI	VIM	normal	-	0.74	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	0.02	0.19
21	cor	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.00	0.18
22	cor	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.00	0.34
23	cor	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.00	0.35
24	cor	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.00	0.34
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.12	0.11
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.20	0.1
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.06	0.14
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.08	0.12
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.02	0.2
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.18	0.26
31	beta 1	kNN	VIM	median	-	0.06	0.33
32	beta 1	IMRI MI	VIM	normal	-	1.00	0.11
33	beta 1	PMM	mice	PMM	classical	0.80	0.36
34	beta 1	midastouch	mice	midastouch	classical	0.82	0.37
35	beta 1	missRanger	missRanger	PMM	classical	0.32	0.37
36	beta 1	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.04	0.32
37	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.68	0.58
38	beta 1	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.56	0.58
39	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.58	0.57
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.58	0.26
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.68	0.26
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.52	0.26
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.68	0.27
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.70	> 1000000000
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	0.94	889086053.01

Table 49: 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	-	0.46	0.13
2	mean	IMRI MI	VIM	normal	-	0.94	0.04
3	mean	PMM	mice	PMM	classical	0.26	0.2
4	mean	midastouch	mice	midastouch	classical	0.24	0.19
5	mean	missRanger	missRanger	PMM	classical	0.34	0.14
6	mean	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.14	0.15
7	mean	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.26	0.18
8	mean	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.24	0.17
9	mean	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.30	0.17
10	mean	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.48	0.12
11	mean	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.46	0.11
12	mean	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.42	0.12
13	mean	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.44	0.13
14	mean	gamlss-NO	ImputeRobust	PMM	classical	0.48	0.13
15	mean	gamlss-TF	ImputeRobust	PMM	classical	0.66	0.14
16	cor	kNN	VIM	median	-	0.02	0.29
17	cor	IMRI MI	VIM	normal	-	0.78	0.01
18	cor	PMM	mice	PMM	classical	0.00	0.49
19	cor	midastouch	mice	midastouch	classical	0.00	0.49
20	cor	missRanger	missRanger	PMM	classical	0.00	0.25
21	cor	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.00	0.25
22	cor	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.00	0.42
23	cor	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.00	0.43
24	cor	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.00	0.41
25	cor	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.00	0.17
26	cor	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.00	0.16
27	cor	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.00	0.19
28	cor	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.00	0.18
29	cor	gamlss-NO	ImputeRobust	PMM	classical	0.00	0.26
30	cor	gamlss-TF	ImputeRobust	PMM	classical	0.00	0.25
31	beta 1	kNN	VIM	median	-	0.00	0.5
32	beta 1	IMRI MI	VIM	normal	-	1.00	0.1
33	beta 1	PMM	mice	PMM	classical	0.72	0.43
34	beta 1	midastouch	mice	midastouch	classical	0.74	0.43
35	beta 1	missRanger	missRanger	PMM	classical	0.34	0.47
36	beta 1	imputeRobust/GAM	VIM*	PMM	robust-quantile	0.00	0.43
37	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-quantile	0.42	0.69
38	beta 1	imputeRobust/GAM	VIM*	PMM	robust-stratified	0.42	0.69
39	beta 1	imputeRobust/GAM	VIM*	midastouch	robust-stratified	0.48	0.69
40	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-Bacon	0.50	0.26
41	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-Bacon	0.60	0.27
42	beta 1	imputeRobust/robGAM	VIM*	PMM	robust-stratified	0.44	0.27
43	beta 1	imputeRobust/robGAM	VIM*	midastouch	robust-stratified	0.72	0.28
44	beta 1	gamlss-NO	ImputeRobust	PMM	classical	0.54	0.39
45	beta 1	gamlss-TF	ImputeRobust	PMM	classical	1.00	> 1000000000