**Methods for Missing Data Handling in Randomized Clinical Trials with
Non-normal Endpoints with Application to a Phase III Rheumatoid Arthritis
Clinical Trial
Supplementary Document**

Chunpeng Fan^{1,*}, Donghui Zhang¹, Lynn Wei¹, and Gary Koch²

¹ Department of Biostatistics and Programming, Sanofi US Inc.

55 Corporate Drive, Bridgewater, NJ 08807, U.S.A.

² Department of Biostatistics, The University of North Carolina at Chapel Hill

135 Dauer Drive, Campus Box 7420, Chapel Hill, NC 27599, U.S.A.

**email:* Chunpeng.Fan@sanofi.com

1. Supplementary Simulation Studies

1.1 *Simulation results for all 117 scenarios under the null hypothesis*

In Section 3. Simulation Studies of the main article, we only showed results for selected scenarios of the totally 117 scenarios with balanced design under the null hypothesis. Table 3 in this Supplementary Document show results for all the 117 scenarios with balanced design and Table 4 reports the results for all the 117 scenarios with unbalanced design.

Results in Table 3 reveal that when one of Propositions 1 to 3 holds, the MRI, MRI₁, and LRCF methods have optimal performance; when all three propositions are severely violated by different MNAR at the first post-baseline time point (i.e. $\gamma_{11} = 1$ and $\beta_{11} \neq \beta_{12}$ in I.73.-I.75. and I.79.-I.81.), the type I error rates by these three methods may also be heavily inflated.

Results in Table 4 are similar to those in Table 3, which means the performance of all the investigated methods in unbalanced studies is similar to that in balanced studies.

[Table 1 about here.]

[Table 2 about here.]

[Table 3 about here.]

[Table 4 about here.]

1.2 *Simulation Studies to Compare the Estimated Variance of the Test Statistic of the Mean Rank Imputation Method by Theorem 2 and by Huang et al. (2013)*

Simulation studies were also conducted to show that the estimated variance of the test statistic of the mean rank imputation method Z by Huang et al. (2013) is not a consistent estimator in some scenarios. Five scenarios with normal marginal distributions under the alternative hypothesis were selected and defined by distributional parameters and missing mechanism parameters as in Table 5. Definitions of these parameters follow those in Section 3 of the main article. With 5,000 simulations for each scenario, the empirical variance of the 5,000 Z 's from the 5,000 generated random samples, the mean of 5,000 $\hat{\sigma}^2$ from Theorem 2,

and the mean of 5,000 $\hat{\sigma}_1^2$ by Huang et al. (2013) were calculated and are reported in Table 5.

[Table 5 about here.]

Results in Table 5 show that in some scenarios, for example, Scenarios III.2 to III.5, the variance estimator $\hat{\sigma}_1^2$ by Huang et al. (2013) may be a biased estimator and the bias may be even larger in some cases, e.g. Scenarios III.3 to III.5. In all these scenarios, the variance estimator $\hat{\sigma}^2$ in Theorem 2 of the main article still performs well.

References

Huang, X., Jiao, L., Wei, L., Quan, H., Teoh, L., and Koch, G. G. (2013). Missing radiographic data handling in randomized clinical trials in rheumatoid arthritis. *Journal of Biopharmaceutical Statistics* **23**, 1435–1452.

Table 1
Simulation Scenarios Under the Null Hypothesis with Normal Distributions

Scenario	Treatment	Distribution						Missing Mechanism					Missing Rate at	
		Type	μ_1	μ_2	σ_1^2	σ_2^2	ρ	β_1	γ_{11}	β_2	γ_{21}	γ_{22}	T ₁	T ₂
I.1.-I.9. (MAR)	Trt ₁	N	1	1, 2, 3	1	2	0.6, 0.2	-0.85	0	-1.3	0	1	0.30	0.60
	Trt ₂	N	1	1, 2, 3	1	2	0.6, 0.2	-1.73	0	-2.8	0	1	0.15	0.30
I.10.-I.18. (P3) (MAR)	Trt ₁	N	1	1, 2, 3	1	2	0.6, 0.2	-0.85	0	-1.3	0	1	0.30	0.60
	Trt ₂	N	1	1, 2, 3	1	2	0.6, 0.2	-1.73	0	-1.3	0	1	0.15	0.50
I.19.-I.27. (MAR)	Trt ₁	N	1	1, 2, 3	1	2	0.6, 0.2	-0.85	0	-1.3	0	1	0.30	0.60
	Trt ₂	N	1	1, 2, 3	1	2	0.6, 0.2	-1.73	0	-0.8	0	1	0.15	0.60
I.28.-I.36. (MAR)	Trt ₁	N	1	1, 2, 3	1	2	0.6, 0.2	-0.85	0	-1.3	0	1	0.30	0.60
	Trt ₂	N	1	1, 2, 3	1	2	0.6, 0.2	-0.85	0	-1.3	0	1	0.30	0.60
I.37.-I.39. (MNAR)	Trt ₁	N	1	1	1	2	0.6, 0.2	-0.85	0	-2.4	1	1	0.30	0.60
	Trt ₂	N	1	1	1	2	0.6, 0.2	-1.73	0	-4.4	1	1	0.15	0.30
I.40.-I.42. (MNAR)	Trt ₁	N	1	2	1	2	0.6, 0.2	-0.85	0	-3.4	1	1	0.30	0.60
	Trt ₂	N	1	2	1	2	0.6, 0.2	-1.73	0	-5.4	1	1	0.15	0.30
I.43.-I.45. (MNAR)	Trt ₁	N	1	3	1	2	0.6, 0.2	-0.85	0	-4.4	1	1	0.30	0.60
	Trt ₂	N	1	3	1	2	0.6, 0.2	-1.73	0	-6.4	1	1	0.15	0.30
I.46.-I.48. (P3) (MNAR)	Trt ₁	N	1	1	1	2	0.6, 0.2	-0.85	0	-2.4	1	1	0.30	0.60
	Trt ₂	N	1	1	1	2	0.6, 0.2	-1.73	0	-2.4	1	1	0.15	0.50
I.49.-I.51. (P3) (MNAR)	Trt ₁	N	1	2	1	2	0.6, 0.2	-0.85	0	-3.4	1	1	0.30	0.60
	Trt ₂	N	1	2	1	2	0.6, 0.2	-1.73	0	-3.4	1	1	0.15	0.50
I.52.-I.54. (P3) (MNAR)	Trt ₁	N	1	3	1	2	0.6, 0.2	-0.85	0	-4.4	1	1	0.30	0.60
	Trt ₂	N	1	3	1	2	0.6, 0.2	-1.73	0	-4.4	1	1	0.15	0.50
I.55.-I.57. (MNAR)	Trt ₁	N	1	1	1	2	0.6, 0.2	-0.85	0	-2.4	1	1	0.30	0.60
	Trt ₂	N	1	1	1	2	0.6, 0.2	-1.73	0	-1.8	1	1	0.15	0.60
I.58.-I.60. (MNAR)	Trt ₁	N	1	2	1	2	0.6, 0.2	-0.85	0	-3.4	1	1	0.30	0.60
	Trt ₂	N	1	2	1	2	0.6, 0.2	-1.73	0	-2.8	1	1	0.15	0.60
I.61.-I.63. (MNAR)	Trt ₁	N	1	3	1	2	0.6, 0.2	-0.85	0	-4.4	1	1	0.30	0.60
	Trt ₂	N	1	3	1	2	0.6, 0.2	-1.73	0	-3.8	1	1	0.15	0.60
I.64.-I.66. (P2) (MNAR)	Trt ₁	N	1	1	1	2	0.6, 0.2	-0.85	0	-2.4	1	1	0.30	0.60
	Trt ₂	N	1	1	1	2	0.6, 0.2	-0.85	0	-2.4	1	1	0.30	0.60
I.67.-I.69. (P2) (MNAR)	Trt ₁	N	1	2	1	2	0.6, 0.2	-0.85	0	-3.4	1	1	0.30	0.60
	Trt ₂	N	1	2	1	2	0.6, 0.2	-0.85	0	-3.4	1	1	0.30	0.60
I.70.-I.72. (P2) (MNAR)	Trt ₁	N	1	3	1	2	0.6, 0.2	-0.85	0	-4.4	1	1	0.30	0.60
	Trt ₂	N	1	3	1	2	0.6, 0.2	-0.85	0	-4.4	1	1	0.30	0.60
I.73.-I.75. (MNAR)	Trt ₁	N	1	1	1	2	0.6, 0.2	-2.00	1	-3.0	1	1	0.30	0.60
	Trt ₂	N	1	1	1	2	0.6, 0.2	-3.00	1	-5.4	1	1	0.15	0.30
I.76.-I.78. (P3) (MNAR)	Trt ₁	N	1	1	1	2	0.6, 0.2	-2.00	1	-3.0	1	1	0.30	0.60
	Trt ₂	N	1	1	1	2	0.6, 0.2	-3.00	1	-3.0	1	1	0.15	0.55
I.79.-I.81. (MNAR)	Trt ₁	N	1	1	1	2	0.6, 0.2	-2.00	1	-3.0	1	1	0.30	0.60
	Trt ₂	N	1	1	1	2	0.6, 0.2	-3.00	1	-2.6	1	1	0.15	0.60
I.82.-I.84. (P2) (MNAR)	Trt ₁	N	1	1	1	2	0.6, 0.2	-2.00	1	-3.0	1	1	0.30	0.60
	Trt ₂	N	1	1	1	2	0.6, 0.2	-2.00	1	-3.0	1	1	0.30	0.60

Table 2
Simulation Scenarios Under the Null Hypothesis with LogNormal Distributions

Scenario	Treatment	Distribution						Missing Mechanism					Missing Rate at	
		Type	μ_1	μ_2	σ_1^2	σ_2^2	ρ	β_1	γ_{11}	β_2	γ_{21}	γ_{22}	T ₁	T ₂
I.85.-I.87. (MAR)	Trt ₁	LN	1	1	1	2.4	0.6, 0.2	-0.85	0	-3.6	0	1	0.30	0.60
	Trt ₂	LN	1	1	1	2.4	0.6, 0.2	-1.73	0	-7.4	0	1	0.15	0.30
I.88.-I.90. (P3) (MAR)	Trt ₁	LN	1	1	1	2.4	0.6, 0.2	-0.85	0	-3.6	0	1	0.30	0.60
	Trt ₂	LN	1	1	1	2.4	0.6, 0.2	-1.73	0	-3.6	0	1	0.15	0.50
I.91.-I.93. (MAR)	Trt ₁	LN	1	1	1	2.4	0.6, 0.2	-0.85	0	-3.6	0	1	0.30	0.60
	Trt ₂	LN	1	1	1	2.4	0.6, 0.2	-1.73	0	-2.8	0	1	0.15	0.60
I.94.-I.96. (P2) (MAR)	Trt ₁	LN	1	1	1	2.4	0.6, 0.2	-0.85	0	-3.6	0	1	0.30	0.60
	Trt ₂	LN	1	1	1	2.4	0.6, 0.2	-0.85	0	-3.6	0	1	0.30	0.60
I.97.-I.99. (MNAR)	Trt ₁	LN	1	1	1	2.4	0.6, 0.2	-0.85	0	-7.8	1	1	0.30	0.60
	Trt ₂	LN	1	1	1	2.4	0.6, 0.2	-1.73	0	-19.0	1	1	0.15	0.30
I.100.-I.102. (P3) (MNAR)	Trt ₁	LN	1	1	1	2.4	0.6, 0.2	-0.85	0	-7.8	1	1	0.30	0.60
	Trt ₂	LN	1	1	1	2.4	0.6, 0.2	-1.73	0	-7.8	1	1	0.15	0.50
I.103.-I.105. (MNAR)	Trt ₁	LN	1	1	1	2.4	0.6, 0.2	-0.85	0	-7.8	1	1	0.30	0.60
	Trt ₂	LN	1	1	1	2.4	0.6, 0.2	-1.73	0	-6.0	1	1	0.15	0.60
I.106.-I.108. (P2) (MNAR)	Trt ₁	LN	1	1	1	2.4	0.6, 0.2	-0.85	0	-7.8	1	1	0.30	0.60
	Trt ₂	LN	1	1	1	2.4	0.6, 0.2	-0.85	0	-7.8	1	1	0.30	0.60
I.109.-I.111. (MNAR)	Trt ₁	LN	1	1	1	2.4	0.6, 0.2	-5.00	1	-5.0	1	1	0.30	0.60
	Trt ₂	LN	1	1	1	2.4	0.6, 0.2	-8.10	1	-13.0	1	1	0.15	0.30
I.112.-I.114. (MNAR)	Trt ₁	LN	1	1	1	2.4	0.6, 0.2	-5.00	1	-5.0	1	1	0.30	0.60
	Trt ₂	LN	1	1	1	2.4	0.6, 0.2	-8.10	1	-5.0	1	1	0.15	0.60
I.115.-I.117. (P2) (MNAR)	Trt ₁	LN	1	1	1	2.4	0.6, 0.2	-5.00	1	-5.0	1	1	0.30	0.60
	Trt ₂	LN	1	1	1	2.4	0.6, 0.2	-5.00	1	-5.0	1	1	0.30	0.60

Table 3

Simulation Studies to Compare Type I Error Rates of the Proposed Mean Rank Imputation (MRI) and Select Traditional Methods (Balanced Design, 5,000 Simulations, 5% Test, Rejection Rates in Percentages)

Method	Nonparametric		Parametric		Nonparametric		Parametric		Nonparametric		Parametric	
	RR	Median	RR	Mean	RR	Median	RR	Mean	RR	Median	RR	Mean
I.1. $\mu_2 = 1, \rho_1 = 0.6, \rho_2 = 0.6$												
Complete	4.3	0.008	4.7	-0.002	4.3	-0.001	4.6	-0.001	4.5	-0.000	4.7	-0.001
Completers	9.3	-0.179	9.5	-0.176	14.9	-0.265	15.4	-0.261	5.1	-0.059	5.4	-0.057
LOCF	4.7	0.044	4.9	0.010	5.3	-0.019	5.9	-0.060	5.5	0.071	5.8	0.054
LE	20.8	0.334	20.4	0.343	14.3	0.252	14.7	0.273	26.1	0.415	25.0	0.388
MRI ₁	5.7	-	-	-	4.7	-	-	-	8.3	-	-	-
MRI	5.8	0.126	-	-	4.9	0.042	-	-	8.3	-	-	-
LRCF	6.2	-	-	-	4.8	-	-	-	10.7	-	-	-
MMRM	-	-	6.4	-0.001	-	-	6.3	0.002	-	-	6.2	0.002
MMRM _R	6.1	-	-	-	5.8	-	-	-	6.1	-	-	-
I.2. $\mu_2 = 1, \rho_1 = 0.6, \rho_2 = 0.2$												
I.3. $\mu_2 = 1, \rho_1 = 0.2, \rho_2 = 0.2$												
Complete	4.3	0.008	4.7	-0.002	4.3	-0.001	4.6	-0.001	4.5	-0.000	4.7	-0.001
Completers	9.3	-0.179	9.5	-0.176	14.9	-0.265	15.4	-0.261	5.1	-0.059	5.4	-0.057
LOCF	23.4	-0.264	23.1	-0.249	33.9	-0.329	34.2	-0.319	18.0	-0.242	16.4	-0.204
LE	6.0	0.081	6.0	0.084	4.9	-0.000	5.1	0.014	7.8	0.140	7.7	0.129
MRI ₁	5.7	-	-	-	4.7	-	-	-	8.3	-	-	-
MRI	5.8	0.126	-	-	4.9	0.042	-	-	8.3	0.257	-	-
LRCF	6.2	-	-	-	4.8	-	-	-	10.7	-	-	-
MMRM	-	-	6.4	-0.001	-	-	6.3	0.002	-	-	6.2	0.002
MMRM _R	4.2	-	-	-	4.8	-	-	-	5.9	-	-	-
I.4. $\mu_2 = 2, \rho_1 = 0.6, \rho_2 = 0.6$												
I.5. $\mu_2 = 2, \rho_1 = 0.6, \rho_2 = 0.2$												
Complete	4.3	0.008	4.7	-0.002	4.3	-0.001	4.6	-0.001	4.5	-0.000	4.7	-0.001
Completers	9.3	-0.179	9.5	-0.176	14.9	-0.265	15.4	-0.261	5.1	-0.059	5.4	-0.057
LOCF	23.4	-0.264	23.1	-0.249	33.9	-0.329	34.2	-0.319	18.0	-0.242	16.4	-0.204
LE	6.0	0.081	6.0	0.084	4.9	-0.000	5.1	0.014	7.8	0.140	7.7	0.129
MRI ₁	5.7	-	-	-	4.7	-	-	-	8.3	-	-	-
MRI	5.8	0.126	-	-	4.9	0.042	-	-	8.3	0.257	-	-
LRCF	6.2	-	-	-	4.8	-	-	-	10.7	-	-	-
MMRM	-	-	6.4	-0.001	-	-	6.3	0.002	-	-	6.2	0.002
MMRM _R	4.2	-	-	-	4.8	-	-	-	5.9	-	-	-
I.6. $\mu_2 = 2, \rho_1 = 0.2, \rho_2 = 0.2$												
I.7. $\mu_2 = 3, \rho_1 = 0.6, \rho_2 = 0.6$												
I.8. $\mu_2 = 3, \rho_1 = 0.6, \rho_2 = 0.2$												
Complete	4.3	0.008	4.7	-0.002	4.3	-0.001	4.6	-0.001	4.5	-0.000	4.7	-0.001
Completers	9.3	-0.179	9.5	-0.176	14.9	-0.265	15.4	-0.261	5.1	-0.059	5.4	-0.057
LOCF	65.5	-0.586	63.0	-0.508	74.6	-0.654	73.6	-0.578	56.2	-0.563	52.5	-0.463
LE	10.4	-0.163	10.4	-0.175	16.2	-0.241	16.1	-0.245	7.3	-0.114	8.1	-0.130
MRI ₁	5.7	-	-	-	4.7	-	-	-	8.3	-	-	-
MRI	5.8	0.126	-	-	4.9	0.042	-	-	8.3	0.257	-	-
LRCF	6.2	-	-	-	4.8	-	-	-	10.7	-	-	-
MMRM	-	-	6.4	-0.001	-	-	6.3	0.002	-	-	6.2	0.002
MMRM _R	3.4	-	-	-	3.9	-	-	-	5.6	-	-	-
I.9. $\mu_2 = 3, \rho_1 = 0.2, \rho_2 = 0.2$												
I.10. $\mu_2 = 1, \rho_1 = 0.6, \rho_2 = 0.6$ (P3)												
I.11. $\mu_2 = 1, \rho_1 = 0.6, \rho_2 = 0.2$												
Complete	4.3	0.008	4.7	-0.002	4.3	-0.001	4.6	-0.001	4.5	-0.000	4.7	-0.001
Completers	5.0	0.003	4.9	-0.001	9.7	-0.204	10.2	-0.203	4.8	-0.003	4.9	0.0007
LOCF	4.7	0.001	4.9	-0.003	8.4	-0.099	8.9	-0.116	5.1	0.006	5.1	-0.002
LE	5.3	-0.007	5.0	-0.006	7.1	-0.137	6.6	-0.119	4.7	0.004	4.9	-0.005
MRI ₁	4.9	-	-	-	6.4	-	-	-	4.7	-	-	-
MRI	5.1	0.011	-	-	6.4	-0.204	-	-	4.9	-0.011	-	-
LRCF	5.1	-	-	-	7.5	-	-	-	5.1	-	-	-
MMRM	-	-	6.7	-0.003	-	-	6.9	-0.001	-	-	6.9	-0.001
MMRM _R	6.7	-	-	-	6.7	-	-	-	6.7	-	-	-
I.12. $\mu_2 = 1, \rho_1 = 0.2, \rho_2 = 0.2$ (P3)												
I.13. $\mu_2 = 2, \rho_1 = 0.6, \rho_2 = 0.6$ (P3)												
I.14. $\mu_2 = 2, \rho_1 = 0.6, \rho_2 = 0.2$												
Complete	4.3	0.008	4.7	-0.002	4.3	-0.001	4.6	-0.001	4.5	-0.000	4.7	-0.001
Completers	5.0	0.003	4.9	-0.001	9.7	-0.204	10.2	-0.203	4.8	-0.003	4.9	0.0007
LOCF	4.5	-0.006	4.8	-0.002	8.1	-0.100	9.2	-0.115	4.6	-0.004	4.6	-0.000
LE	4.8	-0.003	4.9	-0.005	7.2	-0.131	7.0	-0.118	4.8	0.006	4.9	-0.003
MRI ₁	4.9	-	-	-	6.4	-	-	-	4.7	-	-	-
MRI	5.1	0.011	-	-	6.4	-0.204	-	-	4.9	-0.011	-	-
LRCF	5.1	-	-	-	7.5	-	-	-	5.1	-	-	-
MMRM	-	-	6.7	-0.003	-	-	6.9	-0.001	-	-	6.9	-0.001
MMRM _R	4.4	-	-	-	5.0	-	-	-	6.1	-	-	-
I.15. $\mu_2 = 2, \rho_1 = 0.2, \rho_2 = 0.2$ (P3)												
I.16. $\mu_2 = 3, \rho_1 = 0.6, \rho_2 = 0.6$ (P3)												
I.17. $\mu_2 = 3, \rho_1 = 0.6, \rho_2 = 0.2$												
Complete	4.3	0.008	4.7	-0.002	4.3	-0.001	4.6	-0.001	4.5	-0.000	4.7	-0.001
Completers	5.0	0.003	4.9	-0.001	9.7	-0.204	10.2	-0.203	4.8	-0.003	4.9	0.0007
LOCF	4.8	0.005	4.8	-0.000	7.2	-0.082	7.9	-0.114	4.5	0.004	4.5	0.001
LE	4.6	0.000	4.8	-0.003	7.3	-0.126	7.0	-0.117	4.7	-0.002	4.7	-0.002
MRI ₁	4.9	-	-	-	6.4	-	-	-	4.7	-	-	-
MRI	5.1	0.011	-	-	6.4	-0.204	-	-	4.9	-0.011	-	-
LRCF	5.1	-	-	-	7.5	-	-	-	5.1	-	-	-
MMRM	-	-	6.7	-0.003	-	-	6.9	-0.001	-	-	6.9	-0.001
MMRM _R	3.0	-	-	-	3.9	-	-	-	5.4	-	-	-

Table 3
Simulation Studies to Compare Type I Error Rates of the Proposed Mean Rank Imputation (MRI) and Select Traditional Methods (Balanced Design, 5,000 Simulations, 5% Test, Rejection Rates in Percentages) - Cont'd

Method	Nonparametric		Parametric		Nonparametric		Parametric		Nonparametric		Parametric	
	RR	Median	RR	Mean	RR	Median	RR	Mean	RR	Median	RR	Mean
I.19. $\mu_2 = 3, \rho_1 = 0.6, \rho_2 = 0.6$												
Complete	4.3	0.008	4.7	-0.002	4.3	-0.001	4.6	-0.001	4.5	-0.000	4.7	-0.001
Completers	5.5	0.072	5.2	0.072	8.3	-0.185	8.7	-0.179	5.3	0.023	4.9	0.025
LOCF	5.2	0.003	5.1	-0.003	8.2	-0.095	9.2	-0.118	5.1	0.016	5.1	-0.003
LE	6.7	-0.140	6.6	-0.112	12.6	-0.278	12.1	-0.227	6.8	-0.129	6.6	-0.112
MRI ₁	4.9	-	-	-	6.9	-	-	-	5.2	-	-	-
MRI	5.1	-0.062	-	-	7.1	-0.315	-	-	5.4	-0.115	-	-
LRCF	5.7	-	-	-	10.3	-	-	-	5.9	-	-	-
MMRM	-	-	7.1	-0.003	-	-	7.3	-0.001	-	-	7.4	-0.001
MMRM _R	7.5	-	-	-	7.7	-	-	-	7.5	-	-	-
I.22. $\mu_2 = 3, \rho_1 = 0.6, \rho_2 = 0.6$												
Complete	4.3	0.008	4.7	-0.002	4.3	-0.001	4.6	-0.001	4.5	-0.000	4.7	-0.001
Completers	5.5	0.072	5.2	0.072	8.3	-0.185	8.7	-0.179	5.3	0.023	4.9	0.025
LOCF	8.1	0.100	7.7	0.101	4.9	0.014	5.0	-0.014	8.4	0.104	7.9	0.101
LE	5.1	-0.006	4.9	-0.007	7.9	-0.152	7.6	-0.122	5.0	-0.007	5.0	-0.007
MRI ₁	4.9	-	-	-	6.9	-	-	-	5.2	-	-	-
MRI	5.1	-0.062	-	-	7.1	-0.315	-	-	5.4	-0.115	-	-
LRCF	5.7	-	-	-	10.3	-	-	-	5.9	-	-	-
MMRM	-	-	7.1	-0.003	-	-	7.3	-0.001	-	-	7.4	-0.001
MMRM _R	4.4	-	-	-	5.8	-	-	-	6.6	-	-	-
I.23. $\mu_2 = 3, \rho_1 = 0.6, \rho_2 = 0.2$												
Complete	4.3	0.008	4.7	-0.002	4.3	-0.001	4.6	-0.001	4.5	-0.000	4.7	-0.001
Completers	5.5	0.072	5.2	0.072	8.3	-0.185	8.7	-0.179	5.3	0.023	4.9	0.025
LOCF	8.1	0.100	7.7	0.101	4.9	0.014	5.0	-0.014	8.4	0.104	7.9	0.101
LE	5.1	-0.006	4.9	-0.007	7.9	-0.152	7.6	-0.122	5.0	-0.007	5.0	-0.007
MRI ₁	4.9	-	-	-	6.9	-	-	-	5.2	-	-	-
MRI	5.1	-0.062	-	-	7.1	-0.315	-	-	5.4	-0.115	-	-
LRCF	5.7	-	-	-	10.3	-	-	-	5.9	-	-	-
MMRM	-	-	7.1	-0.003	-	-	7.3	-0.001	-	-	7.4	-0.001
MMRM _R	4.4	-	-	-	5.8	-	-	-	6.6	-	-	-
I.24. $\mu_2 = 3, \rho_1 = 0.2, \rho_2 = 0.2$												
Complete	4.3	0.008	4.7	-0.002	4.3	-0.001	4.6	-0.001	4.5	-0.000	4.7	-0.001
Completers	5.5	0.072	5.2	0.072	8.3	-0.185	8.7	-0.179	5.3	0.023	4.9	0.025
LOCF	16.1	0.216	15.3	0.206	7.8	0.141	6.4	0.091	14.9	0.222	13.8	0.206
LE	6.5	0.100	6.4	0.097	5.0	-0.045	5.0	-0.018	6.4	0.086	6.6	0.097
MRI ₁	4.9	-	-	-	6.9	-	-	-	5.2	-	-	-
MRI	5.1	-0.062	-	-	7.1	-0.315	-	-	5.4	-0.115	-	-
LRCF	5.7	-	-	-	10.3	-	-	-	5.9	-	-	-
MMRM	-	-	7.1	-0.003	-	-	7.3	-0.001	-	-	7.4	-0.001
MMRM _R	2.6	-	-	-	4.4	-	-	-	5.7	-	-	-
I.25. $\mu_2 = 3, \rho_1 = 0.6, \rho_2 = 0.6$												
Complete	4.3	0.008	4.7	-0.002	4.3	-0.001	4.6	-0.001	4.5	-0.000	4.7	-0.001
Completers	5.5	0.072	5.2	0.072	8.3	-0.185	8.7	-0.179	5.3	0.023	4.9	0.025
LOCF	16.1	0.216	15.3	0.206	7.8	0.141	6.4	0.091	14.9	0.222	13.8	0.206
LE	6.5	0.100	6.4	0.097	5.0	-0.045	5.0	-0.018	6.4	0.086	6.6	0.097
MRI ₁	4.9	-	-	-	6.9	-	-	-	5.2	-	-	-
MRI	5.1	-0.062	-	-	7.1	-0.315	-	-	5.4	-0.115	-	-
LRCF	5.7	-	-	-	10.3	-	-	-	5.9	-	-	-
MMRM	-	-	7.1	-0.003	-	-	7.3	-0.001	-	-	7.4	-0.001
MMRM _R	2.6	-	-	-	4.4	-	-	-	5.7	-	-	-
I.26. $\mu_2 = 3, \rho_1 = 0.6, \rho_2 = 0.2$												
Complete	4.3	0.008	4.7	-0.002	4.3	-0.001	4.6	-0.001	4.5	-0.000	4.7	-0.001
Completers	5.0	0.001	5.1	0.001	9.2	-0.211	9.7	-0.202	4.9	0.009	5.0	0.003
LOCF	5.0	0.004	5.3	-0.002	8.3	-0.100	8.4	-0.115	5.1	0.004	4.9	-0.001
LE	5.1	0.005	4.8	-0.005	7.0	-0.145	6.6	-0.118	4.9	0.008	5.0	-0.004
MRI ₁	5.0	-	-	-	5.8	-	-	-	5.1	-	-	-
MRI	5.0	-0.012	-	-	5.8	-0.203	-	-	5.1	0.011	-	-
LRCF	5.0	-	-	-	7.2	-	-	-	5.2	-	-	-
MMRM	-	-	6.8	-0.001	-	-	7.0	0.001	-	-	6.6	0.001
MMRM _R	6.9	-	-	-	6.6	-	-	-	6.6	-	-	-
I.27. $\mu_2 = 3, \rho_1 = 0.2, \rho_2 = 0.2$												
Complete	4.3	0.008	4.7	-0.002	4.3	-0.001	4.6	-0.001	4.5	-0.000	4.7	-0.001
Completers	5.0	0.001	5.1	0.001	9.2	-0.211	9.7	-0.202	4.9	0.009	5.0	0.003
LOCF	5.0	0.004	5.3	-0.002	8.3	-0.100	8.4	-0.115	5.1	0.004	4.9	-0.001
LE	5.1	0.005	4.8	-0.005	7.0	-0.145	6.6	-0.118	4.9	0.008	5.0	-0.004
MRI ₁	5.0	-	-	-	5.8	-	-	-	5.1	-	-	-
MRI	5.0	-0.012	-	-	5.8	-0.203	-	-	5.1	0.011	-	-
LRCF	5.0	-	-	-	7.2	-	-	-	5.2	-	-	-
MMRM	-	-	6.8	-0.001	-	-	7.0	0.001	-	-	6.6	0.001
MMRM _R	6.9	-	-	-	6.6	-	-	-	6.6	-	-	-
I.28. $\mu_2 = 1, \rho_1 = 0.6, \rho_2 = 0.6$												
Complete	4.3	0.008	4.7	-0.002	4.3	-0.001	4.6	-0.001	4.5	-0.000	4.7	-0.001
Completers	5.0	0.001	5.1	0.001	9.2	-0.211	9.7	-0.202	4.9	0.009	5.0	0.003
LOCF	5.0	0.004	5.3	-0.002	8.3	-0.100	8.4	-0.115	5.1	0.004	4.9	-0.001
LE	5.1	0.005	4.8	-0.005	7.0	-0.145	6.6	-0.118	4.9	0.008	5.0	-0.004
MRI ₁	5.0	-	-	-	5.8	-	-	-	5.1	-	-	-
MRI	5.0	-0.012	-	-	5.8	-0.203	-	-	5.1	0.011	-	-
LRCF	5.0	-	-	-	7.2	-	-	-	5.2	-	-	-
MMRM	-	-	6.8	-0.001	-	-	7.0	0.001	-	-	6.6	0.001
MMRM _R	6.9	-	-	-	6.6	-	-	-	6.6	-	-	-
I.29. $\mu_2 = 1, \rho_1 = 0.6, \rho_2 = 0.2$												
Complete	4.3	0.008	4.7	-0.002	4.3	-0.001	4.6	-0.001	4.5	-0.000	4.7	-0.001
Completers	5.0	0.001	5.1	0.001	9.2	-0.211	9.7	-0.202	4.9	0.009	5.0	0.003
LOCF	5.0	0.004	5.3	-0.002	8.3	-0.100	8.4	-0.115	5.1	0.004	4.9	-0.001
LE	5.1	0.005	4.8	-0.005	7.0	-0.145	6.6	-0.118	4.9	0.008	5.0	-0.004
MRI ₁	5.0	-	-	-	5.8	-	-	-	5.1	-	-	-
MRI	5.0	-0.012	-	-	5.8	-0.203	-	-	5.1	0.011	-	-
LRCF	5.0	-	-	-	7.2	-	-	-	5.2	-	-	-
MMRM	-	-	6.8	-0.001	-	-	7.0	0.001	-	-	6.6	0.001
MMRM _R	6.9	-	-	-	6.6	-	-	-	6.6	-	-	-
I.30. $\mu_2 = 1, \rho_1 = 0.2, \rho_2 = 0.2$												
Complete	4.3	0.008	4.7	-0.002	4.3	-0.001	4.6	-0.001	4.5	-0.000	4.7	-0.001
Completers	5.0	0.001	5.1	0.001	9.2	-0.211	9.7	-0.202	4.9	0.009	5.0	0.003
LOCF	5.0	0.004	5.3	-0.002	8.3	-0.100	8.4	-0.115	5.1	0.004	4.9	-0.001
LE	5.1	0.005	4.8	-0.005	7.0	-0.145	6.6	-0.118	4.9	0.008	5.0	-0.004
MRI ₁	5.0	-	-	-	5.8	-	-	-	5.1	-	-	-
MRI	5.0	-0.012	-	-	5.8	-0.203	-	-	5.1	0.011	-	-
LRCF	5.0	-	-	-	7.2	-	-	-	5.2	-	-	-
MMRM	-	-	6.8	-0.001	-	-	7.0	0.001	-	-	6.6	0.001
MMRM _R	6.9	-	-	-	6.6	-	-	-	6.6	-	-	-
I.31. $\mu_2 = 2, \rho_1 = 0.6, \rho_2 = 0.6$												
Complete	4.3	0.008	4.7	-0.002	4.3	-0.001	4.6	-0.001	4.5	-0.000	4.7	-0.001
Completers	5.0	0.001	5.1	0.001	9.2	-0.211	9.7	-0.202	4.9	0.009	5.0	0.003
LOCF	4.7	0.002	4.8	-0.001	7.8	-0.096	8.4	-0.114	4.8	-0.004	4.6	0.001
LE	4.9	0.005	4.9	-0.004	7.1	-0.133	6.5	-0.117	4.9	0.006	5.1	-0.002
MRI ₁	5.0	-	-	-	5.8	-	-	-	5.1	-	-	-
MRI	5.0	-0.012	-	-	5.8	-0.203	-	-	5.1	0.011	-	-
LRCF	5.0	-	-	-	7.2	-	-	-	5.2	-	-	-
MMRM	-	-	6.8	-0.001	-	-	7.0	0.001	-	-	6.6	0.001
MMRM _R	4.4	-	-	-	5.4	-	-	-	6.0	-	-	-
I.32. $\mu_2 = 2, \rho_1 = 0.6, \rho_2 = 0.2$												
Complete	4.3	0.008	4.7	-0.002	4.3	-0.001	4.6	-0.001	4.5	-0.000	4.7	-0.001
Completers	5.0	0.001	5.1	0.001	9.2	-0.211	9.7	-0.202	4.9	0.009	5.0	0.003
LOCF	4.7	0.002	4.8	-0.001	7.8	-0.096	8.4	-0.114	4.8	-0.004	4.6	0.001
LE	4.9	0.005	4.9	-0.004	7.1	-0.133	6.5	-0.117	4.9	0.006	5.1	-0.002
MRI ₁	5.0	-	-	-	5.8	-	-	-	5.1	-	-	-
MRI	5.0	-0.012	-	-								

Table 3
Simulation Studies to Compare Type I Error Rates of the Proposed Mean Rank Imputation (MRI) and Select Traditional Methods (Balanced Design, 5,000 Simulations, 5% Test, Rejection Rates in Percentages) - Cont'd

Method	Nonparametric		Parametric		Nonparametric		Parametric		Nonparametric		Parametric	
	RR	Median	RR	Mean	RR	Median	RR	Mean	RR	Median	RR	Mean
	I.37. $\mu_2 = 1, \rho_1 = 0.6, \rho_2 = 0.6$				I.38. $\mu_2 = 1, \rho_1 = 0.6, \rho_2 = 0.2$				I.39. $\mu_2 = 1, \rho_1 = 0.2, \rho_2 = 0.2$			
Complete	4.3	0.008	4.7	-0.002	4.3	-0.001	4.6	-0.001	4.5	-0.000	4.7	-0.001
Completers	34.2	-0.389	34.6	-0.385	43.0	-0.453	45.9	-0.455	27.9	-0.361	28.4	-0.354
LOCF	5.1	-0.025	5.0	-0.046	5.1	-0.001	5.2	-0.044	5.5	-0.033	6.0	-0.056
LE	13.4	0.209	14.8	0.284	16.3	0.220	21.1	0.359	11.9	0.178	14.5	0.277
MRI ₁	4.7	-	-	-	5.0	-	-	-	5.4	-	-	-
MRI	4.8	-0.058	-	-	5.1	-0.015	-	-	5.3	-0.085	-	-
LRCF	4.8	-	-	-	4.2	-	-	-	5.6	-	-	-
MMRM	-	-	20.9	-0.260	-	-	14.6	-0.193	-	-	31.2	-0.368
MMRM _R	26.2	-	-	-	19.6	-	-	-	33.0	-	-	-
	I.40. $\mu_2 = 2, \rho_1 = 0.6, \rho_2 = 0.6$				I.41. $\mu_2 = 2, \rho_1 = 0.6, \rho_2 = 0.2$				I.42. $\mu_2 = 2, \rho_1 = 0.2, \rho_2 = 0.2$			
Complete	4.3	0.008	4.7	-0.002	4.3	-0.001	4.6	-0.001	4.5	-0.000	4.7	-0.001
Completers	34.2	-0.389	34.6	-0.385	43.0	-0.453	45.9	-0.455	27.9	-0.361	28.4	-0.354
LOCF	38.8	-0.310	37.4	-0.295	37.3	-0.304	39.3	-0.312	38.7	-0.333	38.6	-0.319
LE	5.0	-0.030	4.9	0.035	5.8	-0.016	6.2	0.091	5.0	-0.053	5.1	0.014
MRI ₁	4.7	-	-	-	5.0	-	-	-	5.4	-	-	-
MRI	4.8	-0.058	-	-	5.1	-0.015	-	-	5.3	-0.085	-	-
LRCF	4.8	-	-	-	4.2	-	-	-	5.6	-	-	-
MMRM	-	-	20.9	-0.260	-	-	14.6	-0.193	-	-	31.2	-0.368
MMRM _R	17.3	-	-	-	11.2	-	-	-	28.1	-	-	-
	I.43. $\mu_2 = 3, \rho_1 = 0.6, \rho_2 = 0.6$				I.44. $\mu_2 = 3, \rho_1 = 0.6, \rho_2 = 0.2$				I.45. $\mu_2 = 3, \rho_1 = 0.2, \rho_2 = 0.2$			
Complete	4.3	0.008	4.7	-0.002	4.3	-0.001	4.6	-0.001	4.5	-0.000	4.7	-0.001
Completers	34.2	-0.389	34.6	-0.385	43.0	-0.453	45.9	-0.455	27.9	-0.361	28.4	-0.354
LOCF	83.0	-0.573	83.1	-0.544	83.6	-0.610	85.7	-0.580	81.3	-0.622	82.2	-0.582
LE	17.5	-0.256	14.9	-0.213	14.2	-0.238	11.7	-0.177	19.6	-0.287	17.2	-0.249
MRI ₁	4.7	-	-	-	5.0	-	-	-	5.4	-	-	-
MRI	4.8	-0.058	-	-	5.1	-0.015	-	-	5.3	-0.085	-	-
LRCF	4.8	-	-	-	4.2	-	-	-	5.6	-	-	-
MMRM	-	-	20.9	-0.260	-	-	14.6	-0.193	-	-	31.2	-0.368
MMRM _R	10.5	-	-	-	6.6	-	-	-	24.3	-	-	-
	I.46. $\mu_2 = 1, \rho_1 = 0.6, \rho_2 = 0.6$ (P3)				I.47. $\mu_2 = 1, \rho_1 = 0.6, \rho_2 = 0.2$				I.48. $\mu_2 = 1, \rho_1 = 0.2, \rho_2 = 0.2$ (P3)			
Complete	4.3	0.008	4.7	-0.002	4.3	-0.001	4.6	-0.001	4.5	-0.000	4.7	-0.001
Completers	4.8	-0.001	4.9	-0.000	6.1	-0.091	6.5	-0.100	4.8	-0.010	4.7	0.001
LOCF	4.5	-0.012	4.6	-0.002	5.0	0.022	5.1	0.011	5.1	-0.001	4.8	-0.001
LE	4.9	-0.009	5.1	-0.004	5.8	0.031	5.8	0.080	5.1	-0.017	5.3	-0.002
MRI ₁	4.6	-	-	-	5.2	-	-	-	4.8	-	-	-
MRI	4.7	-0.010	-	-	5.2	0.048	-	-	5.0	-0.012	-	-
LRCF	4.7	-	-	-	5.6	-	-	-	5.1	-	-	-
MMRM	-	-	6.8	-0.001	-	-	12.0	0.174	-	-	6.3	-0.000
MMRM _R	8.7	-	-	-	10.9	-	-	-	6.1	-	-	-
	I.49. $\mu_2 = 2, \rho_1 = 0.6, \rho_2 = 0.6$ (P3)				I.50. $\mu_2 = 2, \rho_1 = 0.6, \rho_2 = 0.2$				I.51. $\mu_2 = 2, \rho_1 = 0.2, \rho_2 = 0.2$ (P3)			
Complete	4.3	0.008	4.7	-0.002	4.3	-0.001	4.6	-0.001	4.5	-0.000	4.7	-0.001
Completers	4.8	-0.013	4.8	0.0002	6.2	-0.104	6.4	-0.111	4.9	0.005	5.0	0.004
LOCF	4.5	-0.002	4.4	-0.003	4.7	0.033	4.6	0.016	5.0	0.006	4.7	-0.001
LE	4.8	-0.013	4.7	-0.007	5.3	0.039	5.5	0.070	5.2	-0.004	4.9	-0.004
MRI ₁	4.6	-	-	-	4.7	-	-	-	4.6	-	-	-
MRI	4.9	-0.010	-	-	4.8	0.074	-	-	4.8	-0.011	-	-
LRCF	4.7	-	-	-	5.0	-	-	-	5.1	-	-	-
MMRM	-	-	10.1	-0.004	-	-	16.3	0.245	-	-	8.2	0.007
MMRM _R	10.2	-	-	-	17.0	-	-	-	8.9	-	-	-
	I.52. $\mu_2 = 3, \rho_1 = 0.6, \rho_2 = 0.6$ (P3)				I.53. $\mu_2 = 3, \rho_1 = 0.6, \rho_2 = 0.2$				I.54. $\mu_2 = 3, \rho_1 = 0.2, \rho_2 = 0.2$ (P3)			
Complete	4.3	0.008	4.7	-0.002	4.3	-0.001	4.6	-0.001	4.5	-0.000	4.7	-0.001
Completers	5.0	0.011	4.9	0.007	6.4	-0.110	6.2	-0.123	5.1	-0.005	5.1	-0.002
LOCF	4.5	-0.001	4.8	-0.001	5.4	0.037	5.3	0.037	4.5	-0.003	4.9	-0.003
LE	4.6	-0.006	4.5	-0.006	5.3	0.032	5.6	0.075	4.5	-0.011	4.7	-0.009
MRI ₁	4.7	-	-	-	4.8	-	-	-	4.8	-	-	-
MRI	4.8	-0.023	-	-	5.0	0.096	-	-	5.1	-0.027	-	-
LRCF	4.8	-	-	-	5.2	-	-	-	4.7	-	-	-
MMRM	-	-	14.7	0.003	-	-	20.7	0.319	-	-	10.9	0.003
MMRM _R	11.0	-	-	-	22.2	-	-	-	12.1	-	-	-

Table 3
Simulation Studies to Compare Type I Error Rates of the Proposed Mean Rank Imputation (MRI) and Select Traditional Methods (Balanced Design, 5,000 Simulations, 5% Test, Rejection Rates in Percentages) - Cont'd

Method	Nonparametric		Parametric		Nonparametric		Parametric		Nonparametric		Parametric	
	RR	Median	RR	Mean	RR	Median	RR	Mean	RR	Median	RR	Mean
	I.55. $\mu_2 = 1, \rho_1 = 0.6, \rho_2 = 0.6$				I.56. $\mu_2 = 1, \rho_1 = 0.6, \rho_2 = 0.2$				I.57. $\mu_2 = 1, \rho_1 = 0.2, \rho_2 = 0.2$			
Complete	4.3	0.008	4.7	-0.002	4.3	-0.001	4.6	-0.001	4.5	-0.000	4.7	-0.001
Completers	8.1	0.152	8.0	0.142	5.3	0.056	4.9	0.032	7.8	0.140	7.1	0.132
LOCF	4.6	-0.018	4.4	-0.001	5.3	0.018	5.0	0.012	5.0	-0.006	4.6	-0.000
LE	5.8	-0.150	5.9	-0.093	5.6	-0.080	5.4	-0.015	5.9	-0.130	6.4	-0.097
MRI ₁	4.6	-	-	-	5.2	-	-	-	5.0	-	-	-
MRI	4.9	0.028	-	-	5.3	0.095	-	-	5.1	0.031	-	-
LRCF	4.9	-	-	-	6.5	-	-	-	5.1	-	-	-
MMRM	-	-	9.6	0.101	-	-	23.2	0.316	-	-	9.7	0.141
MMRM _R	12.3	-	-	-	21.4	-	-	-	9.5	-	-	-
	I.58. $\mu_2 = 2, \rho_1 = 0.6, \rho_2 = 0.6$				I.59. $\mu_2 = 2, \rho_1 = 0.6, \rho_2 = 0.2$				I.60. $\mu_2 = 2, \rho_1 = 0.2, \rho_2 = 0.2$			
Complete	4.3	0.008	4.7	-0.002	4.3	-0.001	4.6	-0.001	4.5	-0.000	4.7	-0.001
Completers	8.1	0.152	8.0	0.142	5.3	0.056	4.9	0.032	7.8	0.140	7.1	0.132
LOCF	7.9	0.091	7.4	0.085	10.2	0.121	8.9	0.099	8.0	0.087	8.3	0.092
LE	4.9	-0.015	4.8	-0.006	6.4	0.031	6.1	0.073	4.9	-0.002	5.0	-0.004
MRI ₁	4.6	-	-	-	5.2	-	-	-	5.0	-	-	-
MRI	4.9	0.028	-	-	5.3	0.095	-	-	5.1	0.031	-	-
LRCF	4.9	-	-	-	6.5	-	-	-	5.1	-	-	-
MMRM	-	-	9.6	0.101	-	-	23.2	0.316	-	-	9.7	0.141
MMRM _R	8.9	-	-	-	23.6	-	-	-	9.8	-	-	-
	I.61. $\mu_2 = 3, \rho_1 = 0.6, \rho_2 = 0.6$				I.62. $\mu_2 = 3, \rho_1 = 0.6, \rho_2 = 0.2$				I.63. $\mu_2 = 3, \rho_1 = 0.2, \rho_2 = 0.2$			
Complete	4.3	0.008	4.7	-0.002	4.3	-0.001	4.6	-0.001	4.5	-0.000	4.7	-0.001
Completers	8.1	0.152	8.0	0.142	5.3	0.056	4.9	0.032	7.8	0.140	7.1	0.132
LOCF	16.0	0.170	16.4	0.172	18.9	0.198	17.5	0.187	15.7	0.183	15.9	0.185
LE	6.4	0.934	5.7	0.081	9.7	0.134	10.0	0.160	6.6	0.090	6.7	0.088
MRI ₁	4.6	-	-	-	5.2	-	-	-	5.0	-	-	-
MRI	4.9	0.028	-	-	5.3	0.095	-	-	5.1	0.031	-	-
LRCF	4.9	-	-	-	6.5	-	-	-	5.1	-	-	-
MMRM	-	-	9.6	0.101	-	-	23.2	0.316	-	-	9.7	0.141
MMRM _R	5.6	-	-	-	23.4	-	-	-	9.8	-	-	-
	I.64. $\mu_2 = 1, \rho_1 = 0.6, \rho_2 = 0.6$ (P2)				I.65. $\mu_2 = 1, \rho_1 = 0.6, \rho_2 = 0.2$				I.66. $\mu_2 = 1, \rho_1 = 0.2, \rho_2 = 0.2$ (P2)			
Complete	4.3	0.008	4.7	-0.002	4.3	-0.001	4.6	-0.001	4.5	-0.000	4.7	-0.001
Completers	5.0	-0.009	4.9	0.001	6.1	-0.095	6.5	-0.100	4.6	-0.009	4.8	0.001
LOCF	4.8	-0.012	4.8	-0.002	5.1	0.026	4.8	0.011	4.7	-0.012	4.5	-0.001
LE	5.0	-0.008	4.9	-0.004	5.5	0.023	5.9	0.081	4.9	-0.010	5.1	-0.001
MRI ₁	4.8	-	-	-	4.9	-	-	-	4.8	-	-	-
MRI	4.8	-0.008	-	-	5.0	0.055	-	-	4.8	-0.011	-	-
LRCF	4.9	-	-	-	5.4	-	-	-	4.9	-	-	-
MMRM	-	-	7.2	0.000	-	-	11.3	0.175	-	-	6.0	-0.000
MMRM _R	9.3	-	-	-	10.8	-	-	-	6.1	-	-	-
	I.67. $\mu_2 = 2, \rho_1 = 0.6, \rho_2 = 0.6$ (P2)				I.68. $\mu_2 = 2, \rho_1 = 0.6, \rho_2 = 0.2$				I.69. $\mu_2 = 2, \rho_1 = 0.2, \rho_2 = 0.2$ (P2)			
Complete	4.3	0.008	4.7	-0.002	4.3	-0.001	4.6	-0.001	4.5	-0.000	4.7	-0.001
Completers	5.0	-0.009	4.9	0.001	6.1	-0.095	6.5	-0.100	4.6	-0.009	4.8	0.001
LOCF	4.4	-0.008	4.3	-0.002	4.6	0.023	4.6	0.005	4.8	-0.010	4.5	-0.002
LE	4.9	-0.018	4.6	-0.003	6.1	0.030	5.8	0.075	5.0	-0.017	4.9	-0.002
MRI ₁	4.8	-	-	-	4.9	-	-	-	4.8	-	-	-
MRI	4.8	-0.008	-	-	5.0	0.055	-	-	4.8	-0.011	-	-
LRCF	4.9	-	-	-	5.4	-	-	-	4.9	-	-	-
MMRM	-	-	7.2	0.000	-	-	11.3	0.175	-	-	6.0	-0.000
MMRM _R	6.7	-	-	-	12.1	-	-	-	6.3	-	-	-
	I.70. $\mu_2 = 3, \rho_1 = 0.6, \rho_2 = 0.6$ (P2)				I.71. $\mu_2 = 3, \rho_1 = 0.6, \rho_2 = 0.2$				I.72. $\mu_2 = 3, \rho_1 = 0.2, \rho_2 = 0.2$ (P2)			
Complete	4.3	0.008	4.7	-0.002	4.3	-0.001	4.6	-0.001	4.5	-0.000	4.7	-0.001
Completers	5.0	-0.009	4.9	0.001	6.1	-0.095	6.5	-0.100	4.6	-0.009	4.8	0.001
LOCF	5.0	-0.001	4.8	-0.001	5.0	0.008	5.0	-0.001	5.1	-0.009	5.1	-0.003
LE	4.6	-0.020	4.7	-0.003	5.5	0.037	5.6	0.069	4.6	-0.020	4.8	-0.003
MRI ₁	4.8	-	-	-	4.9	-	-	-	4.8	-	-	-
MRI	4.8	-0.008	-	-	5.0	0.055	-	-	4.8	-0.011	-	-
LRCF	4.9	-	-	-	5.4	-	-	-	4.9	-	-	-
MMRM	-	-	7.2	0.000	-	-	11.3	0.175	-	-	6.0	-0.000
MMRM _R	4.6	-	-	-	11.9	-	-	-	6.6	-	-	-

Table 3
Simulation Studies to Compare Type I Error Rates of the Proposed Mean Rank Imputation (MRI) and Select Traditional Methods (Balanced Design, 5,000 Simulations, 5% Test, Rejection Rates in Percentages) - Cont'd

Method	Nonparametric		Parametric		Nonparametric		Parametric		Nonparametric		Parametric	
	RR	Median	RR	Mean	RR	Median	RR	Mean	RR	Median	RR	Mean
	I.73. $\mu_2 = 1, \rho_1 = 0.6, \rho_2 = 0.6$				I.74. $\mu_2 = 1, \rho_1 = 0.6, \rho_2 = 0.2$				I.75. $\mu_2 = 1, \rho_1 = 0.2, \rho_2 = 0.2$			
Complete	4.3	0.008	4.7	-0.002	4.3	-0.001	4.6	-0.001	4.5	-0.000	4.7	-0.001
Completers	40.8	-0.398	42.4	-0.402	56.2	-0.502	59.7	-0.512	27.4	-0.337	29.0	-0.335
LOCF	13.2	-0.143	15.0	-0.183	19.7	-0.196	22.5	-0.251	11.7	-0.140	13.2	-0.174
LE	4.7	-0.047	4.9	0.061	5.3	-0.104	4.6	0.034	4.7	-0.015	5.0	0.065
MRI ₁	10.5	-	-	-	14.6	-	-	-	10.0	-	-	-
MRI	10.8	-0.148	-	-	15.2	-0.202	-	-	10.3	-0.131	-	-
LRCF	9.9	-	-	-	13.2	-	-	-	8.7	-	-	-
MMRM	-	-	26.7	-0.299	-	-	32.1	-0.341	-	-	29.3	-0.335
MMRM _R	28.0	-	-	-	33.5	-	-	-	28.5	-	-	-
	I.76. $\mu_2 = 1, \rho_1 = 0.6, \rho_2 = 0.6$ (P3)				I.77. $\mu_2 = 1, \rho_1 = 0.6, \rho_2 = 0.2$				I.78. $\mu_2 = 1, \rho_1 = 0.2, \rho_2 = 0.2$ (P3)			
Complete	4.3	0.008	4.7	-0.002	4.3	-0.001	4.6	-0.001	4.5	-0.000	4.7	-0.001
Completers	4.6	-0.008	4.5	-0.001	6.7	-0.099	6.6	-0.106	4.9	-0.013	4.9	0.001
LOCF	4.8	-0.004	4.5	-0.001	5.1	0.024	4.7	0.012	4.8	-0.003	4.6	0.000
LE	4.8	-0.006	4.9	-0.003	5.8	0.040	6.1	0.076	5.0	-0.006	5.1	0.000
MRI ₁	4.9	-	-	-	5.2	-	-	-	5.1	-	-	-
MRI	5.2	-0.010	-	-	5.4	0.071	-	-	5.4	0.010	-	-
LRCF	4.7	-	-	-	5.3	-	-	-	4.9	-	-	-
MMRM	-	-	8.4	-0.002	-	-	14.4	0.200	-	-	6.3	0.001
MMRM _R	7.8	-	-	-	15.7	-	-	-	6.7	-	-	-
	I.79. $\mu_2 = 1, \rho_1 = 0.6, \rho_2 = 0.6$				I.80. $\mu_2 = 1, \rho_1 = 0.6, \rho_2 = 0.2$				I.81. $\mu_2 = 1, \rho_1 = 0.2, \rho_2 = 0.2$			
Complete	4.3	0.008	4.7	-0.002	4.3	-0.001	4.6	-0.001	4.5	-0.000	4.7	-0.001
Completers	5.0	0.037	5.0	0.035	6.8	-0.091	7.1	-0.100	5.5	0.062	5.5	0.076
LOCF	7.2	-0.107	7.3	-0.093	8.5	-0.102	8.9	-0.119	5.2	-0.053	5.1	-0.043
LE	10.4	-0.184	12.4	-0.233	10.4	-0.204	10.4	-0.203	7.4	-0.120	8.7	-0.172
MRI ₁	9.3	-	-	-	9.4	-	-	-	6.8	-	-	-
MRI	9.6	-0.104	-	-	9.6	-0.099	-	-	7.1	-0.013	-	-
LRCF	7.7	-	-	-	8.1	-	-	-	5.4	-	-	-
MMRM	-	-	5.8	-0.012	-	-	6.5	0.073	-	-	6.2	0.080
MMRM _R	6.9	-	-	-	6.7	-	-	-	6.6	-	-	-
	I.82. $\mu_2 = 1, \rho_1 = 0.6, \rho_2 = 0.6$ (P2)				I.83. $\mu_2 = 1, \rho_1 = 0.6, \rho_2 = 0.2$				I.84. $\mu_2 = 1, \rho_1 = 0.2, \rho_2 = 0.2$ (P2)			
Complete	4.3	0.008	4.7	-0.002	4.3	-0.001	4.6	-0.001	4.5	-0.000	4.7	-0.001
Completers	4.6	-0.003	4.5	0.002	10.2	-0.164	10.6	-0.173	4.7	-0.007	4.6	0.003
LOCF	4.7	-0.000	4.4	0.001	5.8	-0.059	6.5	-0.074	4.3	-0.000	4.3	0.002
LE	4.7	-0.010	4.8	0.001	5.1	-0.090	4.7	-0.029	4.4	-0.005	4.3	0.002
MRI ₁	4.6	-	-	-	5.2	-	-	-	4.7	-	-	-
MRI	4.7	-0.010	-	-	5.2	-0.073	-	-	4.6	0.011	-	-
LRCF	4.8	-	-	-	5.4	-	-	-	4.5	-	-	-
MMRM	-	-	5.2	0.003	-	-	4.8	-0.003	-	-	4.8	0.003
MMRM _R	6.3	-	-	-	5.7	-	-	-	5.0	-	-	-
	I.85. $\rho_1 = 0.6, \rho_2 = 0.6$				I.86. $\rho_1 = 0.6, \rho_2 = 0.2$				I.87. $\rho_1 = 0.2, \rho_2 = 0.2$			
Complete	4.3	0.025	3.5	-0.008	4.3	-0.003	3.6	-0.042	4.5	-0.001	3.4	-0.049
Completers	14.8	-0.500	17.1	-1.558	31.6	-0.872	34.9	-3.985	5.5	-0.224	6.2	-0.743
LOCF	4.4	0.426	10.9	-0.126	9.5	-0.170	28.1	-3.245	5.0	0.447	7.6	-1.424
LE	12.3	1.924	4.1	-0.126	5.3	1.269	8.8	-2.127	16.0	2.537	4.0	-0.306
MRI ₁	8.9	-	-	-	5.5	-	-	-	16.5	-	-	-
MRI	9.2	0.376	-	-	5.8	0.226	-	-	17.1	0.862	-	-
LRCF	11.1	-	-	-	5.9	-	-	-	21.3	-	-	-
MMRM	-	-	29.5	0.109	-	-	26.4	-0.239	-	-	23.9	0.838
MMRM _R	9.5	-	-	-	10.2	-	-	-	9.9	-	-	-
	I.88. $\rho_1 = 0.6, \rho_2 = 0.6$ (P3)				I.89. $\rho_1 = 0.6, \rho_2 = 0.2$				I.90. $\rho_1 = 0.2, \rho_2 = 0.2$ (P3)			
Complete	4.3	0.025	3.5	-0.008	4.3	-0.003	3.6	-0.042	4.5	-0.001	3.4	-0.049
Completers	4.6	-0.008	3.5	0.016	18.5	-0.670	17.6	-3.215	4.4	-0.019	3.1	0.028
LOCF	4.5	-0.006	4.1	-0.010	15.0	-0.636	14.7	-1.816	4.8	0.014	3.5	0.005
LE	4.8	-0.016	4.3	-0.039	12.7	-1.237	10.4	-1.845	5.0	-0.014	4.0	-0.025
MRI ₁	4.6	-	-	-	7.8	-	-	-	4.6	-	-	-
MRI	4.8	-0.048	-	-	8.1	-0.466	-	-	4.9	-0.082	-	-
LRCF	4.7	-	-	-	9.4	-	-	-	4.9	-	-	-
MMRM	-	-	32.9	-0.059	-	-	30.1	-1.002	-	-	27.5	0.088
MMRM _R	11.9	-	-	-	12.6	-	-	-	12.6	-	-	-

Table 3
Simulation Studies to Compare Type I Error Rates of the Proposed Mean Rank Imputation (MRI) and Select Traditional Methods (Balanced Design, 5,000 Simulations, 5% Test, Rejection Rates in Percentages) - Cont'd

Method	Nonparametric		Parametric		Nonparametric		Parametric		Nonparametric		Parametric	
	RR	Median	RR	Mean	RR	Median	RR	Mean	RR	Median	RR	Mean
Complete Completers LOCF LE MRI ₁ MRI LRCF MMRM MMRM _R	I.91. $\rho_1 = 0.6, \rho_2 = 0.6$				I.92. $\rho_1 = 0.6, \rho_2 = 0.2$				I.93. $\rho_1 = 0.2, \rho_2 = 0.2$			
	4.3	0.025	3.5	-0.008	4.3	-0.003	3.6	-0.042	4.5	-0.001	3.4	-0.049
	5.4	0.132	3.3	0.370	15.0	-0.589	11.9	-3.026	4.5	0.053	2.8	0.216
	4.8	0.112	3.8	0.287	11.9	-0.405	9.4	-1.281	4.9	0.238	3.7	0.540
	5.4	-0.436	4.3	-0.007	17.0	-1.368	9.8	-1.574	5.3	-0.142	3.8	0.247
	5.0	-	-	-	13.2	-	-	-	5.9	-	-	-
	5.3	-0.126	-	-	9.6	-0.704	-	-	5.8	-0.285	-	-
	5.4	-	-	-	13.2	-	-	-	5.9	-	-	-
	-	-	33.9	-0.139	-	-	30.1	-1.307	-	-	28.2	-0.168
14.4	-	-	-	15.5	-	-	-	15.1	-	-	-	
Complete Completers LOCF LE MRI ₁ MRI LRCF MMRM MMRM _R	I.94. $\rho_1 = 0.6, \rho_2 = 0.6$ (P2)				I.95. $\rho_1 = 0.6, \rho_2 = 0.2$				I.96. $\rho_1 = 0.2, \rho_2 = 0.2$ (P2)			
	4.3	0.025	3.5	-0.008	4.3	-0.003	3.6	-0.042	4.5	-0.001	3.4	-0.049
	4.8	-0.005	3.3	-0.031	17.1	-0.672	13.5	-3.180	4.8	-0.005	2.9	0.062
	5.0	-0.012	4.1	-0.006	13.9	-0.622	11.5	-1.802	5.2	0.001	3.6	0.019
	5.2	-0.021	4.2	-0.041	12.3	-1.233	8.8	-1.836	5.2	-0.012	3.8	-0.015
	5.0	-	-	-	7.7	-	-	-	5.2	-	-	-
	5.0	-0.045	-	-	7.7	-0.448	-	-	5.3	0.069	-	-
	5.1	-	-	-	9.1	-	-	-	5.3	-	-	-
	-	-	30.5	-0.034	-	-	28.2	-0.874	-	-	26.0	0.113
12.1	-	-	-	12.7	-	-	-	13.0	-	-	-	
Complete Completers LOCF LE MRI ₁ MRI LRCF MMRM MMRM _R	I.97. $\rho_1 = 0.6, \rho_2 = 0.6$				I.98. $\rho_1 = 0.6, \rho_2 = 0.2$				I.99. $\rho_1 = 0.2, \rho_2 = 0.2$			
	4.3	0.025	3.5	-0.008	4.3	-0.003	3.6	-0.042	4.5	-0.001	3.4	-0.049
	61.4	-0.752	92.7	-1.517	65.3	-0.819	95.9	-1.693	53.9	-0.744	89.2	-1.565
	6.1	-0.122	7.6	-0.356	5.0	0.039	5.9	-0.202	5.7	-0.074	6.3	-0.252
	9.2	0.365	7.8	0.960	12.1	0.405	12.1	1.419	12.7	0.443	10.7	1.302
	5.1	-	-	-	4.9	-	-	-	5.9	-	-	-
	5.4	-0.089	-	-	5.0	-0.026	-	-	5.8	-0.104	-	-
	5.2	-	-	-	4.0	-	-	-	5.4	-	-	-
	-	-	77.5	-1.611	-	-	62.4	-1.229	-	-	89.3	-1.776
60.1	-	-	-	46.7	-	-	-	69.5	-	-	-	
Complete Completers LOCF LE MRI ₁ MRI LRCF MMRM MMRM _R	I.100. $\rho_1 = 0.6, \rho_2 = 0.6$ (P3)				I.101. $\rho_1 = 0.6, \rho_2 = 0.2$				I.102. $\rho_1 = 0.2, \rho_2 = 0.2$ (P3)			
	4.3	0.025	3.5	-0.008	4.3	-0.003	3.6	-0.042	4.5	-0.001	3.4	-0.049
	5.1	0.017	3.4	-0.031	8.7	-0.351	10.3	-2.374	5.2	-0.004	3.6	-0.040
	4.6	0.020	3.9	-0.043	8.6	-0.552	10.0	-2.010	5.0	-0.000	4.0	-0.050
	4.7	0.035	4.4	-0.068	8.2	-0.571	8.8	-2.035	5.0	0.023	4.3	-0.075
	4.6	-	-	-	7.2	-	-	-	4.7	-	-	-
	4.9	-0.081	-	-	7.5	-0.280	-	-	5.1	-0.119	-	-
	4.8	-	-	-	7.6	-	-	-	4.9	-	-	-
	-	-	19.2	-0.077	-	-	17.0	-0.456	-	-	15.1	0.079
5.8	-	-	-	6.2	-	-	-	6.0	-	-	-	
Complete Completers LOCF LE MRI ₁ MRI LRCF MMRM MMRM _R	I.103. $\rho_1 = 0.6, \rho_2 = 0.6$				I.104. $\rho_1 = 0.6, \rho_2 = 0.2$				I.105. $\rho_1 = 0.2, \rho_2 = 0.2$			
	4.3	0.025	3.5	-0.008	4.3	-0.003	3.6	-0.042	4.5	-0.001	3.4	-0.049
	12.0	0.194	15.4	0.295	7.4	0.113	8.3	0.174	10.3	0.180	13.4	0.302
	4.7	-0.033	4.6	-0.039	5.0	-0.004	4.5	-0.017	5.3	-0.094	4.8	-0.067
	6.3	-0.554	5.4	-0.371	7.4	-0.541	5.3	-0.330	7.4	-0.557	5.8	-0.447
	4.8	-	-	-	5.1	-	-	-	4.7	-	-	-
	5.0	0.012	-	-	5.2	0.071	-	-	4.9	-0.011	-	-
	5.0	-	-	-	5.7	-	-	-	4.6	-	-	-
	-	-	22.2	0.302	-	-	48.6	0.916	-	-	16.7	0.346
18.7	-	-	-	35.5	-	-	-	16.2	-	-	-	
Complete Completers LOCF LE MRI ₁ MRI LRCF MMRM MMRM _R	I.106. $\rho_1 = 0.6, \rho_2 = 0.6$ (P2)				I.107. $\rho_1 = 0.6, \rho_2 = 0.2$				I.108. $\rho_1 = 0.2, \rho_2 = 0.2$ (P2)			
	4.3	0.025	3.5	-0.008	4.3	-0.003	3.6	-0.042	4.5	-0.001	3.4	-0.049
	4.6	-0.001	4.3	0.003	5.6	-0.079	6.2	-0.130	5.2	-0.015	5.1	-0.002
	5.0	-0.008	4.3	-0.028	5.1	0.090	4.2	0.021	5.0	-0.016	4.0	-0.029
	5.1	-0.007	4.1	-0.058	4.8	-0.032	4.2	0.062	5.2	-0.016	4.4	-0.055
	4.9	-	-	-	5.4	-	-	-	4.5	-	-	-
	5.1	-0.011	-	-	5.4	0.066	-	-	4.6	-0.013	-	-
	4.8	-	-	-	5.4	-	-	-	4.8	-	-	-
	-	-	15.0	-0.017	-	-	23.5	0.569	-	-	7.6	0.009
9.4	-	-	-	13.0	-	-	-	7.2	-	-	-	

Table 3
Simulation Studies to Compare Type I Error Rates of the Proposed Mean Rank Imputation (MRI) and Select Traditional Methods (Balanced Design, 5,000 Simulations, 5% Test, Rejection Rates in Percentages) - Cont'd

Method	Nonparametric		Parametric		Nonparametric		Parametric		Nonparametric		Parametric	
	RR	Median	RR	Mean	RR	Median	RR	Mean	RR	Median	RR	Mean
	I.109. $\rho_1 = 0.6, \rho_2 = 0.6$				I.110. $\rho_1 = 0.6, \rho_2 = 0.2$				I.111. $\rho_1 = 0.2, \rho_2 = 0.2$			
Complete	4.3	0.025	3.5	-0.008	4.3	-0.003	3.6	-0.042	4.5	-0.001	3.4	-0.049
Completers	79.8	-0.737	96.9	-1.223	86.9	-0.844	99.0	-1.438	70.7	-0.746	94.2	-1.308
LOCF	32.5	-0.394	67.8	-0.796	33.8	-0.388	70.5	-0.830	29.5	-0.360	68.6	-0.811
LE	5.2	0.016	7.1	-0.254	6.0	-0.129	6.1	-0.217	4.5	0.095	5.5	-0.157
MRI ₁	41.9	-	-	-	44.2	-	-	-	47.4	-	-	-
MRI	42.7	-0.377	-	-	45.1	-0.358	-	-	47.7	-0.396	-	-
LRCF	38.4	-	-	-	36.5	-	-	-	39.8	-	-	-
MMRM	-	-	95.2	-1.234	-	-	94.9	-1.301	-	-	95.2	-1.351
MMRM _R	83.7	-	-	-	82.6	-	-	-	82.1	-	-	-
	I.112. $\rho_1 = 0.6, \rho_2 = 0.6$				I.113. $\rho_1 = 0.6, \rho_2 = 0.2$				I.114. $\rho_1 = 0.2, \rho_2 = 0.2$			
Complete	4.3	0.025	3.5	-0.008	4.3	-0.003	3.6	-0.042	4.5	-0.001	3.4	-0.049
Completers	5.1	-0.008	5.0	-0.003	7.1	-0.082	6.9	-0.121	5.0	0.017	4.8	0.010
LOCF	29.0	-0.405	50.3	-0.587	31.3	-0.375	50.1	-0.583	26.7	-0.353	47.2	-0.563
LE	29.5	-0.273	52.6	-0.266	37.5	-0.899	54.5	-1.271	26.5	-0.682	51.0	1.211
MRI ₁	34.9	-	-	-	33.8	-	-	-	36.5	-	-	-
MRI	36.3	-0.273	-	-	35.1	-0.228	-	-	38.0	-0.243	-	-
LRCF	30.0	-	-	-	26.3	-	-	-	28.0	-	-	-
MMRM	-	-	15.3	-0.075	-	-	10.8	0.115	-	-	6.8	0.065
MMRM _R	10.0	-	-	-	8.6	-	-	-	6.6	-	-	-
	I.115. $\rho_1 = 0.6, \rho_2 = 0.6$ (P2)				I.116. $\rho_1 = 0.6, \rho_2 = 0.2$				I.117. $\rho_1 = 0.2, \rho_2 = 0.2$ (P2)			
Complete	4.3	0.025	3.5	-0.008	4.3	-0.003	3.6	-0.042	4.5	-0.001	3.4	-0.049
Completers	5.2	-0.001	5.3	0.003	7.2	-0.092	7.1	-0.134	5.1	0.004	4.8	-0.004
LOCF	4.8	0.007	4.7	0.000	4.8	-0.022	4.8	-0.023	4.3	-0.011	4.8	-0.004
LE	4.9	0.001	4.8	-0.002	6.7	-0.223	5.3	-0.065	4.9	-0.001	5.2	-0.005
MRI ₁	4.7	-	-	-	4.8	-	-	-	4.9	-	-	-
MRI	4.8	0.009	-	-	4.8	0.010	-	-	4.9	-0.010	-	-
LRCF	4.9	-	-	-	4.6	-	-	-	4.4	-	-	-
MMRM	-	-	10.4	0.002	-	-	8.0	0.050	-	-	4.9	0.000
MMRM _R	8.2	-	-	-	7.1	-	-	-	5.8	-	-	-

Table 4

Simulation Studies to Compare Type I Error Rates of the Proposed Mean Rank Imputation (MRI) and Select Traditional Methods (Unbalanced Design with Sample Size 40 for Treatment 1 and 160 for Treatment 2, 5,000 Simulations, 5% Test, Rejection Rates in Percentages)

Method	Nonparametric		Parametric		Nonparametric		Parametric		Nonparametric		Parametric	
	RR	Median	RR	Mean	RR	Median	RR	Mean	RR	Median	RR	Mean
I.1. $\mu_2 = 1, \rho_1 = 0.6, \rho_2 = 0.6$												
Complete	5.5	-0.006	5.5	-0.002	5.6	-0.006	5.3	-0.000	5.2	0.008	5.2	-0.001
Completers	8.1	-0.179	8.3	-0.181	10.6	-0.269	11.3	-0.269	5.5	-0.066	5.7	-0.066
LOCF	4.2	0.041	5.0	0.006	4.3	-0.035	5.3	-0.066	4.0	0.073	5.5	0.048
LE	14.9	0.333	12.2	0.338	10.7	0.252	8.8	0.266	18.1	0.400	14.5	0.380
MRI ₁	4.2	-	-	-	4.6	-	-	-	5.6	-	-	-
MRI	5.9	0.120	-	-	5.5	0.035	-	-	7.1	0.236	-	-
LRCF	5.5	-	-	-	4.6	-	-	-	7.2	-	-	-
MMRM	-	-	6.1	-0.005	-	-	6.3	-0.004	-	-	6.5	-0.004
MMRM _R	6.7	-	-	-	6.7	-	-	-	6.8	-	-	-
I.2. $\mu_2 = 1, \rho_1 = 0.6, \rho_2 = 0.2$												
Complete	5.5	-0.006	5.5	-0.002	5.7	-0.006	5.3	-0.000	5.2	0.008	5.2	-0.001
Completers	8.1	-0.179	8.3	-0.181	10.6	-0.269	11.3	-0.269	5.5	-0.066	5.7	-0.066
LOCF	4.2	0.041	5.0	0.006	4.3	-0.035	5.3	-0.066	4.0	0.073	5.5	0.048
LE	14.9	0.333	12.2	0.338	10.7	0.252	8.8	0.266	18.1	0.400	14.5	0.380
MRI ₁	4.2	-	-	-	4.6	-	-	-	5.6	-	-	-
MRI	5.9	0.120	-	-	5.5	0.035	-	-	7.1	0.236	-	-
LRCF	5.5	-	-	-	4.6	-	-	-	7.2	-	-	-
MMRM	-	-	6.1	-0.005	-	-	6.3	-0.004	-	-	6.5	-0.004
MMRM _R	6.7	-	-	-	6.7	-	-	-	6.8	-	-	-
I.3. $\mu_2 = 1, \rho_1 = 0.2, \rho_2 = 0.2$												
Complete	5.5	-0.006	5.5	-0.002	5.7	-0.006	5.3	-0.000	5.2	0.008	5.2	-0.001
Completers	8.1	-0.179	8.3	-0.181	10.6	-0.269	11.3	-0.269	5.5	-0.066	5.7	-0.066
LOCF	4.2	0.041	5.0	0.006	4.3	-0.035	5.3	-0.066	4.0	0.073	5.5	0.048
LE	14.9	0.333	12.2	0.338	10.7	0.252	8.8	0.266	18.1	0.400	14.5	0.380
MRI ₁	4.2	-	-	-	4.6	-	-	-	5.6	-	-	-
MRI	5.9	0.120	-	-	5.5	0.035	-	-	7.1	0.236	-	-
LRCF	5.5	-	-	-	4.6	-	-	-	7.2	-	-	-
MMRM	-	-	6.1	-0.005	-	-	6.3	-0.004	-	-	6.5	-0.004
MMRM _R	6.7	-	-	-	6.7	-	-	-	6.8	-	-	-
I.4. $\mu_2 = 2, \rho_1 = 0.6, \rho_2 = 0.6$												
Complete	5.5	-0.006	5.5	-0.002	5.7	-0.006	5.3	-0.000	5.2	0.008	5.2	-0.001
Completers	8.1	-0.179	8.3	-0.181	10.6	-0.269	11.3	-0.269	5.5	-0.066	5.7	-0.066
LOCF	15.7	-0.272	17.6	-0.254	22.8	-0.334	25.2	-0.326	12.9	-0.238	13.8	-0.212
LE	5.7	0.071	5.1	0.078	5.1	-0.002	4.5	0.006	6.6	0.135	5.9	0.120
MRI ₁	4.2	-	-	-	4.6	-	-	-	5.6	-	-	-
MRI	5.9	0.120	-	-	5.5	0.035	-	-	7.1	0.236	-	-
LRCF	5.5	-	-	-	4.6	-	-	-	7.2	-	-	-
MMRM	-	-	6.1	-0.005	-	-	6.3	-0.004	-	-	6.5	-0.004
MMRM _R	4.8	-	-	-	4.9	-	-	-	6.3	-	-	-
I.5. $\mu_2 = 2, \rho_1 = 0.6, \rho_2 = 0.2$												
Complete	5.5	-0.006	5.5	-0.002	5.7	-0.006	5.3	-0.000	5.2	0.008	5.2	-0.001
Completers	8.1	-0.179	8.3	-0.181	10.6	-0.269	11.3	-0.269	5.5	-0.066	5.7	-0.066
LOCF	15.7	-0.272	17.6	-0.254	22.8	-0.334	25.2	-0.326	12.9	-0.238	13.8	-0.212
LE	5.7	0.071	5.1	0.078	5.1	-0.002	4.5	0.006	6.6	0.135	5.9	0.120
MRI ₁	4.2	-	-	-	4.6	-	-	-	5.6	-	-	-
MRI	5.9	0.120	-	-	5.5	0.035	-	-	7.1	0.236	-	-
LRCF	5.5	-	-	-	4.6	-	-	-	7.2	-	-	-
MMRM	-	-	6.1	-0.005	-	-	6.3	-0.004	-	-	6.5	-0.004
MMRM _R	4.8	-	-	-	4.9	-	-	-	6.3	-	-	-
I.6. $\mu_2 = 2, \rho_1 = 0.2, \rho_2 = 0.2$												
Complete	5.5	-0.006	5.5	-0.002	5.7	-0.006	5.3	-0.000	5.2	0.008	5.2	-0.001
Completers	8.1	-0.179	8.3	-0.181	10.6	-0.269	11.3	-0.269	5.5	-0.066	5.7	-0.066
LOCF	44.8	-0.584	43.1	-0.514	53.2	-0.649	52.4	-0.586	38.6	-0.564	36.0	-0.472
LE	9.0	-0.173	8.4	-0.182	12.6	-0.250	11.8	-0.254	7.1	-0.113	6.6	-0.140
MRI ₁	4.2	-	-	-	4.6	-	-	-	5.6	-	-	-
MRI	5.9	0.120	-	-	5.5	0.035	-	-	7.1	0.236	-	-
LRCF	5.5	-	-	-	4.6	-	-	-	7.2	-	-	-
MMRM	-	-	6.1	-0.005	-	-	6.3	-0.004	-	-	6.5	-0.004
MMRM _R	4.1	-	-	-	4.4	-	-	-	6.7	-	-	-
I.7. $\mu_2 = 3, \rho_1 = 0.6, \rho_2 = 0.6$												
Complete	5.5	-0.006	5.5	-0.002	5.7	-0.006	5.3	-0.000	5.2	0.008	5.2	-0.001
Completers	8.1	-0.179	8.3	-0.181	10.6	-0.269	11.3	-0.269	5.5	-0.066	5.7	-0.066
LOCF	44.8	-0.584	43.1	-0.514	53.2	-0.649	52.4	-0.586	38.6	-0.564	36.0	-0.472
LE	9.0	-0.173	8.4	-0.182	12.6	-0.250	11.8	-0.254	7.1	-0.113	6.6	-0.140
MRI ₁	4.2	-	-	-	4.6	-	-	-	5.6	-	-	-
MRI	5.9	0.120	-	-	5.5	0.035	-	-	7.1	0.236	-	-
LRCF	5.5	-	-	-	4.6	-	-	-	7.2	-	-	-
MMRM	-	-	6.1	-0.005	-	-	6.3	-0.004	-	-	6.5	-0.004
MMRM _R	4.1	-	-	-	4.4	-	-	-	6.7	-	-	-
I.8. $\mu_2 = 3, \rho_1 = 0.6, \rho_2 = 0.2$												
Complete	5.5	-0.006	5.5	-0.002	5.7	-0.006	5.3	-0.000	5.2	0.008	5.2	-0.001
Completers	8.1	-0.179	8.3	-0.181	10.6	-0.269	11.3	-0.269	5.5	-0.066	5.7	-0.066
LOCF	44.8	-0.584	43.1	-0.514	53.2	-0.649	52.4	-0.586	38.6	-0.564	36.0	-0.472
LE	9.0	-0.173	8.4	-0.182	12.6	-0.250	11.8	-0.254	7.1	-0.113	6.6	-0.140
MRI ₁	4.2	-	-	-	4.6	-	-	-	5.6	-	-	-
MRI	5.9	0.120	-	-	5.5	0.035	-	-	7.1	0.236	-	-
LRCF	5.5	-	-	-	4.6	-	-	-	7.2	-	-	-
MMRM	-	-	6.1	-0.005	-	-	6.3	-0.004	-	-	6.5	-0.004
MMRM _R	4.1	-	-	-	4.4	-	-	-	6.7	-	-	-
I.9. $\mu_2 = 3, \rho_1 = 0.2, \rho_2 = 0.2$												
Complete	5.5	-0.006	5.5	-0.002	5.7	-0.006	5.3	-0.000	5.2	0.008	5.2	-0.001
Completers	8.1	-0.179	8.3	-0.181	10.6	-0.269	11.3	-0.269	5.5	-0.066	5.7	-0.066
LOCF	44.8	-0.584	43.1	-0.514	53.2	-0.649	52.4	-0.586	38.6	-0.564	36.0	-0.472
LE	9.0	-0.173	8.4	-0.182	12.6	-0.250	11.8	-0.254	7.1	-0.113	6.6	-0.140
MRI ₁	4.2	-	-	-	4.6	-	-	-	5.6	-	-	-
MRI	5.9	0.120	-	-	5.5	0.035	-	-	7.1	0.236	-	-
LRCF	5.5	-	-	-	4.6	-	-	-	7.2	-	-	-
MMRM	-	-	6.1	-0.005	-	-	6.3	-0.004	-	-	6.5	-0.004
MMRM _R	4.1	-	-	-	4.4	-	-	-	6.7	-	-	-
I.10. $\mu_2 = 1, \rho_1 = 0.6, \rho_2 = 0.6$ (P3)												
Complete	5.5	-0.006	5.5	-0.002	5.7	-0.006	5.3	-0.000	5.2	0.008	5.2	-0.001
Completers	5.5	-0.003	5.6	-0.007	8.2	-0.201	9.3	-0.211	5.4	-0.008	5.6	-0.008
LOCF	5.0	-0.000	5.1	-0.005	7.1	-0.101	7.1	-0.120	5.0	0.007	4.9	-0.006
LE	5.3	0.002	5.3	-0.006	6.8	-0.148	7.0	-0.121	5.3	0.008	5.6	-0.007
MRI ₁	3.8	-	-	-	5.2	-	-	-	3.8	-	-	-
MRI	5.5	-0.013	-	-	6.4	-0.213	-	-	5.5	-0.014	-	-
LRCF	5.3	-	-	-	6.7	-	-	-	5.1	-	-	-
MMRM	-	-	6.6	-0.000	-	-	6.7	0.001	-	-	7.0	-0.004
MMRM _R	6.7	-	-	-	7.3	-	-	-	7.0	-	-	-
I.11. $\mu_2 = 1, \rho_1 = 0.6, \rho_2 = 0.2$												
Complete	5.5	-0.006	5.5	-0.002	5.7	-0.006	5.3	-0.000	5.2	0.008	5.2	-0.001
Completers	5.5	-0.003	5.6	-0.007	8.2	-0.201	9.3	-0.211	5.4	-0.008	5.6	-0.008
LOCF	5.0	-0.000	5.1	-0.005	7.1	-0.101	7.1	-0.120	5.0	0.007	4.9	-0.006
LE	5.3	0.002	5.3	-0.006	6.8	-0.148	7.0	-0.121	5.3	0.008	5.6	-0.007
MRI ₁	3.8	-	-	-	5.2	-	-	-	3.8	-	-	-
MRI	5.5	-0.013	-	-	6.4	-0.213	-	-	5.5	-0.014	-	-
LRCF	5.3	-	-	-	6.7	-	-	-	5.1	-	-	-
MMRM	-	-	6.6	-0.000	-	-	6.7	0.001	-	-	7.0	-0.004
MMRM _R	6.7	-	-	-	7.3	-	-	-	7.0	-	-	-
I.12. $\mu_2 = 1, \rho_1 = 0.2, \rho_2 = 0.2$ (P3)												
Complete	5.5	-0.006	5.5	-0.002	5.7	-0.006	5.3	-0.000	5.2	0.008	5.2	-0.001
Completers	5.5	-0.003	5.6	-0.007	8.2	-0.201	9.3	-0.211	5.4	-0.008	5.6	-0.008
LOCF	4.6	-0.006	4.9	-0.007	6.7	-0.098	8.2	-0.122	4.8	-0.005	5.0	-0.008
LE	4.8	0.001	5.1	-0.008	6.8	-0.135	6.8	-0.123	4.8	0.008	5.0	-0.009
MRI ₁	3.8	-	-	-	5							

Table 4
Simulation Studies to Compare Type I Error Rates of the Proposed Mean Rank Imputation (MRI) and Select Traditional Methods (Unbalanced Design with Sample Size 40 for Treatment 1 and 160 for Treatment 2, 5,000 Simulations, 5% Test, Rejection Rates in Percentages) - Cont'd

Method	Nonparametric		Parametric		Nonparametric		Parametric		Nonparametric		Parametric		
	RR	Median	RR	Mean	RR	Median	RR	Mean	RR	Median	RR	Mean	
I.19. $\mu_2 = 3, \rho_1 = 0.6, \rho_2 = 0.6$	Complete	5.5	-0.006	5.5	-0.002	5.7	-0.006	5.3	-0.000	5.2	0.008	5.2	-0.001
	Completers	5.7	0.071	5.8	0.065	7.4	-0.173	8.2	-0.188	5.6	0.025	5.5	0.016
	LOCF	5.2	0.003	5.1	-0.006	7.4	-0.091	6.8	-0.121	5.1	0.009	4.8	-0.007
	LE	5.7	-0.135	6.5	-0.111	9.9	-0.282	9.1	-0.227	6.1	-0.127	6.4	-0.113
	MRI ₁	4.0	-	-	-	5.5	-	-	-	3.7	-	-	-
	MRI	5.7	-0.069	-	-	6.9	-0.327	-	-	5.6	-0.125	-	-
	LRCF	5.2	-	-	-	8.5	-	-	-	5.2	-	-	-
	MMRM	-	-	6.8	-0.001	-	-	6.9	-0.000	-	-	6.7	-0.006
	MMRM _R	6.9	-	-	-	7.2	-	-	-	7.0	-	-	-
I.22. $\mu_2 = 3, \rho_1 = 0.6, \rho_2 = 0.6$	Complete	5.5	-0.006	5.5	-0.002	5.7	-0.006	5.3	-0.000	5.2	0.008	5.2	-0.001
	Completers	5.7	0.071	5.8	0.065	7.4	-0.173	8.2	-0.188	5.6	0.025	5.5	0.016
	LOCF	6.6	0.100	5.9	0.096	4.7	0.011	5.1	-0.020	7.2	0.102	6.0	0.094
	LE	4.6	-0.004	4.7	-0.010	6.7	-0.145	6.8	-0.126	4.6	-0.004	4.9	-0.012
	MRI ₁	4.0	-	-	-	5.5	-	-	-	3.7	-	-	-
	MRI	5.7	-0.069	-	-	6.9	-0.327	-	-	5.6	-0.125	-	-
	LRCF	5.2	-	-	-	8.5	-	-	-	5.2	-	-	-
	MMRM	-	-	6.8	-0.002	-	-	6.9	-0.001	-	-	6.7	-0.006
	MMRM _R	4.6	-	-	-	5.0	-	-	-	6.5	-	-	-
I.23. $\mu_2 = 3, \rho_1 = 0.6, \rho_2 = 0.2$	Complete	5.5	-0.006	5.5	-0.002	5.7	-0.006	5.3	-0.000	5.2	0.008	5.2	-0.001
	Completers	5.7	0.071	5.8	0.065	7.4	-0.173	8.2	-0.188	5.6	0.025	5.5	0.016
	LOCF	6.6	0.100	5.9	0.096	4.7	0.011	5.1	-0.020	7.2	0.102	6.0	0.094
	LE	4.6	-0.004	4.7	-0.010	6.7	-0.145	6.8	-0.126	4.6	-0.004	4.9	-0.012
	MRI ₁	4.0	-	-	-	5.5	-	-	-	3.7	-	-	-
	MRI	5.7	-0.069	-	-	6.9	-0.327	-	-	5.6	-0.125	-	-
	LRCF	5.2	-	-	-	8.5	-	-	-	5.2	-	-	-
	MMRM	-	-	6.8	-0.002	-	-	6.9	-0.001	-	-	6.7	-0.006
	MMRM _R	4.6	-	-	-	5.0	-	-	-	6.5	-	-	-
I.24. $\mu_2 = 3, \rho_1 = 0.2, \rho_2 = 0.2$	Complete	5.5	-0.006	5.5	-0.002	5.7	-0.006	5.3	-0.000	5.2	0.008	5.2	-0.001
	Completers	5.7	0.071	5.8	0.065	7.4	-0.173	8.2	-0.188	5.6	0.025	5.5	0.016
	LOCF	11.3	0.209	9.2	0.197	5.9	0.135	5.3	0.081	10.6	0.214	8.9	0.195
	LE	4.7	0.093	5.3	0.091	4.5	-0.039	4.6	-0.025	5.1	0.092	5.5	0.089
	MRI ₁	4.0	-	-	-	5.5	-	-	-	3.7	-	-	-
	MRI	5.7	-0.069	-	-	6.9	-0.327	-	-	5.6	-0.125	-	-
	LRCF	5.2	-	-	-	8.5	-	-	-	5.2	-	-	-
	MMRM	-	-	6.8	-0.003	-	-	6.9	-0.002	-	-	6.7	-0.006
	MMRM _R	3.8	-	-	-	4.3	-	-	-	6.8	-	-	-
I.25. $\mu_2 = 3, \rho_1 = 0.6, \rho_2 = 0.6$	Complete	5.5	-0.006	5.5	-0.002	5.7	-0.006	5.3	-0.000	5.2	0.008	5.2	-0.001
	Completers	5.7	0.071	5.8	0.065	7.4	-0.173	8.2	-0.188	5.6	0.025	5.5	0.016
	LOCF	11.3	0.209	9.2	0.197	5.9	0.135	5.3	0.081	10.6	0.214	8.9	0.195
	LE	4.7	0.093	5.3	0.091	4.5	-0.039	4.6	-0.025	5.1	0.092	5.5	0.089
	MRI ₁	4.0	-	-	-	5.5	-	-	-	3.7	-	-	-
	MRI	5.7	-0.069	-	-	6.9	-0.327	-	-	5.6	-0.125	-	-
	LRCF	5.2	-	-	-	8.5	-	-	-	5.2	-	-	-
	MMRM	-	-	6.8	-0.003	-	-	6.9	-0.002	-	-	6.7	-0.006
	MMRM _R	3.8	-	-	-	4.3	-	-	-	6.8	-	-	-
I.26. $\mu_2 = 3, \rho_1 = 0.6, \rho_2 = 0.2$	Complete	5.5	-0.006	5.5	-0.002	5.7	-0.006	5.3	-0.000	5.2	0.008	5.2	-0.001
	Completers	5.7	0.071	5.8	0.065	7.4	-0.173	8.2	-0.188	5.6	0.025	5.5	0.016
	LOCF	11.3	0.209	9.2	0.197	5.9	0.135	5.3	0.081	10.6	0.214	8.9	0.195
	LE	4.7	0.093	5.3	0.091	4.5	-0.039	4.6	-0.025	5.1	0.092	5.5	0.089
	MRI ₁	4.0	-	-	-	5.5	-	-	-	3.7	-	-	-
	MRI	5.7	-0.069	-	-	6.9	-0.327	-	-	5.6	-0.125	-	-
	LRCF	5.2	-	-	-	8.5	-	-	-	5.2	-	-	-
	MMRM	-	-	6.8	-0.003	-	-	6.9	-0.002	-	-	6.7	-0.006
	MMRM _R	3.8	-	-	-	4.3	-	-	-	6.8	-	-	-
I.27. $\mu_2 = 3, \rho_1 = 0.2, \rho_2 = 0.2$	Complete	5.5	-0.006	5.5	-0.002	5.7	-0.006	5.3	-0.000	5.2	0.008	5.2	-0.001
	Completers	5.7	0.071	5.8	0.065	7.4	-0.173	8.2	-0.188	5.6	0.025	5.5	0.016
	LOCF	11.3	0.209	9.2	0.197	5.9	0.135	5.3	0.081	10.6	0.214	8.9	0.195
	LE	4.7	0.093	5.3	0.091	4.5	-0.039	4.6	-0.025	5.1	0.092	5.5	0.089
	MRI ₁	4.0	-	-	-	5.5	-	-	-	3.7	-	-	-
	MRI	5.7	-0.069	-	-	6.9	-0.327	-	-	5.6	-0.125	-	-
	LRCF	5.2	-	-	-	8.5	-	-	-	5.2	-	-	-
	MMRM	-	-	6.8	-0.003	-	-	6.9	-0.002	-	-	6.7	-0.006
	MMRM _R	3.8	-	-	-	4.3	-	-	-	6.8	-	-	-
I.28. $\mu_2 = 1, \rho_1 = 0.6, \rho_2 = 0.6$	Complete	5.5	-0.006	5.5	-0.002	5.7	-0.006	5.3	-0.000	5.2	0.008	5.2	-0.001
	Completers	5.6	0.002	5.5	-0.005	8.2	-0.206	8.7	-0.209	5.2	-0.007	5.1	-0.005
	LOCF	5.1	-0.002	4.9	-0.004	6.8	-0.096	6.8	-0.119	4.9	-0.005	4.8	-0.005
	LE	5.4	-0.007	5.4	-0.005	6.7	-0.139	6.9	-0.119	5.3	0.009	5.7	-0.005
	MRI ₁	5.1	-	-	-	7.1	-	-	-	5.1	-	-	-
	MRI	5.5	-0.011	-	-	6.6	-0.214	-	-	5.5	-0.023	-	-
	LRCF	5.3	-	-	-	6.8	-	-	-	5.0	-	-	-
	MMRM	-	-	6.5	0.001	-	-	6.5	0.003	-	-	6.8	-0.003
	MMRM _R	6.7	-	-	-	6.8	-	-	-	7.0	-	-	-
I.29. $\mu_2 = 1, \rho_1 = 0.6, \rho_2 = 0.2$	Complete	5.5	-0.006	5.5	-0.002	5.7	-0.006	5.3	-0.000	5.2	0.008	5.2	-0.001
	Completers	5.6	0.002	5.5	-0.005	8.2	-0.206	8.7	-0.209	5.2	-0.007	5.1	-0.005
	LOCF	5.1	-0.002	4.9	-0.004	6.8	-0.096	6.8	-0.119	4.9	-0.005	4.8	-0.005
	LE	5.4	-0.007	5.4	-0.005	6.7	-0.139	6.9	-0.119	5.3	0.009	5.7	-0.005
	MRI ₁	5.1	-	-	-	7.1	-	-	-	5.1	-	-	-
	MRI	5.5	-0.011	-	-	6.6	-0.214	-	-	5.5	-0.023	-	-
	LRCF	5.3	-	-	-	6.8	-	-	-	5.0	-	-	-
	MMRM	-	-	6.5	0.001	-	-	6.5	0.003	-	-	6.8	-0.003
	MMRM _R	6.7	-	-	-	6.8	-	-	-	7.0	-	-	-
I.30. $\mu_2 = 1, \rho_1 = 0.2, \rho_2 = 0.2$	Complete	5.5	-0.006	5.5	-0.002	5.7	-0.006	5.3	-0.000	5.2	0.008	5.2	-0.001
	Completers	5.6	0.002	5.5	-0.005	8.2	-0.206	8.7	-0.209	5.2	-0.007	5.1	-0.005
	LOCF	5.1	-0.002	4.9	-0.004	6.8	-0.096	6.8	-0.119	4.9	-0.005	4.8	-0.005
	LE	5.4	-0.007	5.4	-0.005	6.7	-0.139	6.9	-0.119	5.3	0.009	5.7	-0.005
	MRI ₁	5.1	-	-	-	7.1	-	-	-	5.1	-	-	-
	MRI	5.5	-0.011	-	-	6.6	-0.214	-	-	5.5	-0.023	-	-
	LRCF	5.3	-	-	-	6.8	-	-	-	5.0	-	-	-
	MMRM	-	-	6.5	0.001	-	-	6.5	0.003	-	-	6.8	-0.003
	MMRM _R	6.7	-	-	-	6.8	-	-	-	7.0	-	-	-
I.31. $\mu_2 = 2, \rho_1 = 0.6, \rho_2 = 0.6$	Complete	5.5	-0.006	5.5	-0.002	5.7	-0.006	5.3	-0.000	5.2	0.008	5.2	-0.001
	Completers	5.6	0.002	5.5	-0.005	8.2	-0.206	8.7	-0.209	5.2	-0.007	5.1	-0.005
	LOCF	4.9	0.001	4.9	-0.006	6.7	-0.094	8.3	-0.120	4.9	0.000	5.0	-0.006
	LE	4.9	0.000	5.1	-0.006	6.6	-0.128	6.6	-0.121	4.9	-0.004	5.1	-0.007
	MRI ₁	5.1	-	-	-	7.1	-	-	-	5.1	-	-	-
	MRI	5.5	-0.011	-	-	6.6	-0.214	-	-	5.5	-0.023	-	-
	LRCF	5.3	-	-	-	6.8	-	-	-	5.0	-	-	-
	MMRM	-	-	6.5	0.000	-	-	6.5	0.002	-	-	6.8	-0.003
	MMRM _R	4.5	-	-	-	4.9	-	-	-	6.3	-	-	-
I.32. $\mu_2 = 2, \rho_1 = 0.6, \rho_2 = 0.2$	Complete	5.5	-0.006	5.5	-0.002	5.7	-0.006	5.3	-0.000	5.2	0.008	5.2	-0.001
	Completers	5.6	0.002	5.5	-0.005	8.2	-0.206	8.7	-0.209	5.2	-0.007	5.1	-0.005
	LOCF	4.9	0.001	4.9	-0.006	6.7	-0.094	8.3	-0.120	4.9	0.000	5.0	-0.006
	LE	4.9	0.000	5.1	-0.006	6.6	-0.128	6.6	-0.121	4.9	-0.004	5.1	-0.007
	MRI ₁	5.1	-	-	-	7.1	-	-	-	5.1	-	-	-
	MRI	5.5	-0.011	-	-	6.6	-0.214	-	-	5.5	-0.023	-	-
	LRCF	5.3	-	-</									

Table 4
Simulation Studies to Compare Type I Error Rates of the Proposed Mean Rank Imputation (MRI) and Select Traditional Methods (Unbalanced Design with Sample Size 40 for Treatment 1 and 160 for Treatment 2, 5,000 Simulations, 5% Test, Rejection Rates in Percentages) - Cont'd

Method	Nonparametric		Parametric		Nonparametric		Parametric		Nonparametric		Parametric	
	RR	Median	RR	Mean	RR	Median	RR	Mean	RR	Median	RR	Mean
I.37. $\mu_2 = 1, \rho_1 = 0.6, \rho_2 = 0.6$												
Complete	5.5	-0.006	5.5	-0.002	5.7	-0.006	5.3	-0.000	5.2	0.008	5.2	-0.001
Completers	20.7	-0.396	21.4	-0.393	25.1	-0.449	28.5	-0.464	17.1	-0.376	18.0	-0.360
LOCF	4.8	-0.022	5.2	-0.050	4.7	-0.001	5.2	-0.048	4.6	-0.029	5.4	-0.057
LE	10.6	0.210	8.6	0.282	13.3	0.224	12.0	0.358	11.2	0.193	9.3	0.279
MRI ₁	4.1	-	-	-	4.6	-	-	-	4.6	-	-	-
MRI	5.7	-0.060	-	-	5.4	-0.038	-	-	6.3	-0.092	-	-
LRCF	5.1	-	-	-	4.5	-	-	-	5.4	-	-	-
MMRM	-	-	16.3	-0.266	-	-	12.1	-0.200	-	-	19.6	-0.373
MMRM _R	20.6	-	-	-	17.5	-	-	-	22.1	-	-	-
I.40. $\mu_2 = 2, \rho_1 = 0.6, \rho_2 = 0.6$												
Complete	5.5	-0.006	5.5	-0.002	5.7	-0.006	5.3	-0.000	5.2	0.008	5.2	-0.001
Completers	20.7	-0.396	21.4	-0.393	25.1	-0.449	28.5	-0.464	17.1	-0.376	18.0	-0.360
LOCF	25.4	-0.317	26.4	-0.300	23.8	-0.298	28.2	-0.317	24.8	-0.323	27.5	-0.321
LE	5.6	-0.028	4.9	0.032	6.0	-0.006	5.2	0.088	5.8	-0.047	5.3	0.015
MRI ₁	4.1	-	-	-	4.6	-	-	-	4.6	-	-	-
MRI	5.7	-0.060	-	-	5.4	-0.038	-	-	6.3	-0.092	-	-
LRCF	5.1	-	-	-	4.5	-	-	-	5.4	-	-	-
MMRM	-	-	16.3	-0.266	-	-	12.1	-0.200	-	-	19.6	-0.373
MMRM _R	12.3	-	-	-	9.5	-	-	-	17.2	-	-	-
I.41. $\mu_2 = 2, \rho_1 = 0.6, \rho_2 = 0.2$												
Complete	5.5	-0.006	5.5	-0.002	5.7	-0.006	5.3	-0.000	5.2	0.008	5.2	-0.001
Completers	20.7	-0.396	21.4	-0.393	25.1	-0.449	28.5	-0.464	17.1	-0.376	18.0	-0.360
LOCF	25.4	-0.317	26.4	-0.300	23.8	-0.298	28.2	-0.317	24.8	-0.323	27.5	-0.321
LE	5.6	-0.028	4.9	0.032	6.0	-0.006	5.2	0.088	5.8	-0.047	5.3	0.015
MRI ₁	4.1	-	-	-	4.6	-	-	-	4.6	-	-	-
MRI	5.7	-0.060	-	-	5.4	-0.038	-	-	6.3	-0.092	-	-
LRCF	5.1	-	-	-	4.5	-	-	-	5.4	-	-	-
MMRM	-	-	16.3	-0.266	-	-	12.1	-0.200	-	-	19.6	-0.373
MMRM _R	12.3	-	-	-	9.5	-	-	-	17.2	-	-	-
I.42. $\mu_2 = 2, \rho_1 = 0.2, \rho_2 = 0.2$												
Complete	5.5	-0.006	5.5	-0.002	5.7	-0.006	5.3	-0.000	5.2	0.008	5.2	-0.001
Completers	20.7	-0.396	21.4	-0.393	25.1	-0.449	28.5	-0.464	17.1	-0.376	18.0	-0.360
LOCF	62.8	-0.576	64.8	-0.550	63.9	-0.601	68.7	-0.587	60.6	-0.629	62.2	-0.585
LE	13.1	-0.272	12.0	-0.219	10.7	-0.245	9.7	-0.181	14.6	-0.279	12.6	-0.249
MRI ₁	4.1	-	-	-	4.6	-	-	-	4.6	-	-	-
MRI	5.7	-0.060	-	-	5.4	-0.038	-	-	6.3	-0.092	-	-
LRCF	5.1	-	-	-	4.5	-	-	-	5.4	-	-	-
MMRM	-	-	16.3	-0.266	-	-	12.1	-0.200	-	-	19.6	-0.373
MMRM _R	8.0	-	-	-	6.3	-	-	-	13.6	-	-	-
I.43. $\mu_2 = 3, \rho_1 = 0.6, \rho_2 = 0.6$												
Complete	5.5	-0.006	5.5	-0.002	5.7	-0.006	5.3	-0.000	5.2	0.008	5.2	-0.001
Completers	20.7	-0.397	21.4	-0.393	25.1	-0.449	28.5	-0.464	17.1	-0.376	18.0	-0.360
LOCF	62.8	-0.576	64.8	-0.550	63.9	-0.601	68.7	-0.587	60.6	-0.629	62.2	-0.585
LE	13.1	-0.272	12.0	-0.219	10.7	-0.245	9.7	-0.181	14.6	-0.279	12.6	-0.249
MRI ₁	4.1	-	-	-	4.6	-	-	-	4.6	-	-	-
MRI	5.7	-0.060	-	-	5.4	-0.038	-	-	6.3	-0.092	-	-
LRCF	5.1	-	-	-	4.5	-	-	-	5.4	-	-	-
MMRM	-	-	16.3	-0.266	-	-	12.1	-0.200	-	-	19.6	-0.373
MMRM _R	8.0	-	-	-	6.3	-	-	-	13.6	-	-	-
I.44. $\mu_2 = 3, \rho_1 = 0.6, \rho_2 = 0.2$												
Complete	5.5	-0.006	5.5	-0.002	5.7	-0.006	5.3	-0.000	5.2	0.008	5.2	-0.001
Completers	20.7	-0.397	21.4	-0.393	25.1	-0.449	28.5	-0.464	17.1	-0.376	18.0	-0.360
LOCF	62.8	-0.576	64.8	-0.550	63.9	-0.601	68.7	-0.587	60.6	-0.629	62.2	-0.585
LE	13.1	-0.272	12.0	-0.219	10.7	-0.245	9.7	-0.181	14.6	-0.279	12.6	-0.249
MRI ₁	4.1	-	-	-	4.6	-	-	-	4.6	-	-	-
MRI	5.7	-0.060	-	-	5.4	-0.038	-	-	6.3	-0.092	-	-
LRCF	5.1	-	-	-	4.5	-	-	-	5.4	-	-	-
MMRM	-	-	16.3	-0.266	-	-	12.1	-0.200	-	-	19.6	-0.373
MMRM _R	8.0	-	-	-	6.3	-	-	-	13.6	-	-	-
I.45. $\mu_2 = 3, \rho_1 = 0.2, \rho_2 = 0.2$												
Complete	5.5	-0.006	5.5	-0.002	5.7	-0.006	5.3	-0.000	5.2	0.008	5.2	-0.001
Completers	20.7	-0.397	21.4	-0.393	25.1	-0.449	28.5	-0.464	17.1	-0.376	18.0	-0.360
LOCF	62.8	-0.576	64.8	-0.550	63.9	-0.601	68.7	-0.587	60.6	-0.629	62.2	-0.585
LE	13.1	-0.272	12.0	-0.219	10.7	-0.245	9.7	-0.181	14.6	-0.279	12.6	-0.249
MRI ₁	4.1	-	-	-	4.6	-	-	-	4.6	-	-	-
MRI	5.7	-0.060	-	-	5.4	-0.038	-	-	6.3	-0.092	-	-
LRCF	5.1	-	-	-	4.5	-	-	-	5.4	-	-	-
MMRM	-	-	16.3	-0.266	-	-	12.1	-0.200	-	-	19.6	-0.373
MMRM _R	8.0	-	-	-	6.3	-	-	-	13.6	-	-	-
I.46. $\mu_2 = 1, \rho_1 = 0.6, \rho_2 = 0.6$ (P3)												
Complete	5.5	-0.006	5.5	-0.002	5.7	-0.006	5.3	-0.000	5.2	0.008	5.2	-0.001
Completers	5.3	-0.005	5.1	-0.010	5.4	-0.105	6.3	-0.110	5.4	0.000	5.6	-0.005
LOCF	4.9	-0.002	5.2	-0.005	4.9	0.037	5.2	0.008	5.4	0.005	5.5	-0.001
LE	5.0	0.002	4.8	-0.005	5.7	0.046	5.1	0.079	5.2	0.011	5.5	-0.000
MRI ₁	3.7	-	-	-	4.6	-	-	-	3.9	-	-	-
MRI	5.5	-0.017	-	-	5.5	0.034	-	-	5.8	-0.011	-	-
LRCF	5.0	-	-	-	5.2	-	-	-	5.5	-	-	-
MMRM	-	-	7.0	-0.008	-	-	9.7	0.168	-	-	7.2	-0.004
MMRM _R	9.3	-	-	-	10.2	-	-	-	8.0	-	-	-
I.47. $\mu_2 = 1, \rho_1 = 0.6, \rho_2 = 0.2$												
Complete	5.5	-0.006	5.5	-0.002	5.7	-0.006	5.3	-0.000	5.2	0.008	5.2	-0.001
Completers	5.3	-0.005	5.1	-0.010	5.4	-0.105	6.3	-0.110	5.4	0.000	5.6	-0.005
LOCF	4.9	-0.002	5.2	-0.005	4.9	0.037	5.2	0.008	5.4	0.005	5.5	-0.001
LE	5.0	0.002	4.8	-0.005	5.7	0.046	5.1	0.079	5.2	0.011	5.5	-0.000
MRI ₁	3.7	-	-	-	4.6	-	-	-	3.9	-	-	-
MRI	5.5	-0.017	-	-	5.5	0.034	-	-	5.8	-0.011	-	-
LRCF	5.0	-	-	-	5.2	-	-	-	5.5	-	-	-
MMRM	-	-	7.0	-0.008	-	-	9.7	0.168	-	-	7.2	-0.004
MMRM _R	9.3	-	-	-	10.2	-	-	-	8.0	-	-	-
I.48. $\mu_2 = 1, \rho_1 = 0.2, \rho_2 = 0.2$ (P3)												
Complete	5.5	-0.006	5.5	-0.002	5.7	-0.006	5.3	-0.000	5.2	0.008	5.2	-0.001
Completers	5.3	-0.005	5.1	-0.010	5.4	-0.105	6.3	-0.110	5.4	0.000	5.6	-0.005
LOCF	5.1	-0.009	4.7	-0.006	4.4	0.023	5.0	0.002	5.3	-0.001	5.4	-0.003
LE	5.0	0.000	4.9	-0.006	5.4	0.048	5.1	0.072	5.4	0.002	5.9	-0.001
MRI ₁	3.7	-	-	-	4.6	-	-	-	3.9	-	-	-
MRI	5.5	-0.017	-	-	5.5	0.034	-	-	5.8	-0.011	-	-
LRCF	5.0	-	-	-	5.2	-	-	-	5.5	-	-	-
MMRM	-	-	7.0	-0.008	-	-	9.7	0.168	-	-	7.2	-0.004
MMRM _R	6.4	-	-	-	9.5	-	-	-	7.5	-	-	-
I.49. $\mu_2 = 2, \rho_1 = 0.6, \rho_2 = 0.6$ (P3)												
Complete	5.5	-0.006	5.5	-0.002	5.7	-0.006	5.3	-0.000	5.2	0.008	5.2	-0.001
Completers	5.3	-0.005	5.1	-0.010	5.4	-0.105	6.3	-0.110	5.4	0.000	5.6	-0.005
LOCF	5.1	-0.009	4.7	-0.006	4.4	0.023	5.0	0.002	5.3	-0.001	5.4	-0.003
LE	5.0	0.000	4.9	-0.006	5.4	0.048	5.1	0.072	5.4	0.002	5.9	-0.001
MRI ₁	3.7	-	-	-	4.6	-	-	-	3.9	-	-	-
MRI	5.5	-0.017	-	-	5.5	0.034	-	-	5.8	-0.011	-	-
LRCF	5.0	-	-	-	5.2	-	-	-	5.5	-	-	-

Table 4
Simulation Studies to Compare Type I Error Rates of the Proposed Mean Rank Imputation (MRI) and Select Traditional Methods (Unbalanced Design with Sample Size 40 for Treatment 1 and 160 for Treatment 2, 5,000 Simulations, 5% Test, Rejection Rates in Percentages) - Cont'd

Method	Nonparametric		Parametric		Nonparametric		Parametric		Nonparametric		Parametric	
	RR	Median	RR	Mean	RR	Median	RR	Mean	RR	Median	RR	Mean
	I.55. $\mu_2 = 1, \rho_1 = 0.6, \rho_2 = 0.6$				I.56. $\mu_2 = 1, \rho_1 = 0.6, \rho_2 = 0.2$				I.57. $\mu_2 = 1, \rho_1 = 0.2, \rho_2 = 0.2$			
Complete	5.5	-0.005	5.5	-0.002	5.7	-0.006	5.3	-0.000	5.2	0.008	5.2	-0.001
Completers	7.5	0.139	7.2	0.130	4.9	0.045	5.1	0.023	7.3	0.136	6.6	0.127
LOCF	5.3	0.001	5.2	-0.004	5.0	0.032	5.2	0.010	5.8	0.002	5.3	0.000
LE	5.4	-0.149	5.9	-0.093	4.9	-0.087	4.9	-0.015	5.5	-0.120	6.1	-0.094
MRI ₁	3.7	-	-	-	4.5	-	-	-	3.6	-	-	-
MRI	5.6	-0.010	-	-	5.7	0.075	-	-	5.4	0.031	-	-
LRCF	5.2	-	-	-	5.6	-	-	-	5.4	-	-	-
MMRM	-	-	8.1	0.092	-	-	15.7	0.309	-	-	8.5	0.137
MMRM _R	10.5	-	-	-	15.0	-	-	-	8.8	-	-	-
	I.58. $\mu_2 = 2, \rho_1 = 0.6, \rho_2 = 0.6$				I.59. $\mu_2 = 2, \rho_1 = 0.6, \rho_2 = 0.2$				I.60. $\mu_2 = 2, \rho_1 = 0.2, \rho_2 = 0.2$			
Complete	5.5	-0.006	5.5	-0.002	5.7	-0.006	5.3	-0.000	5.2	0.008	5.2	-0.001
Completers	7.5	0.139	7.2	0.130	4.9	0.045	5.1	0.023	7.3	0.136	6.6	0.127
LOCF	7.2	0.090	6.6	0.081	7.6	0.119	7.6	0.097	7.7	0.089	7.2	0.093
LE	4.8	0.011	5.1	-0.008	5.0	0.047	5.1	0.072	5.0	0.000	5.6	-0.001
MRI ₁	3.7	-	-	-	4.5	-	-	-	3.6	-	-	-
MRI	5.6	-0.010	-	-	5.7	0.075	-	-	5.4	0.031	-	-
LRCF	5.2	-	-	-	5.6	-	-	-	5.4	-	-	-
MMRM	-	-	8.1	0.092	-	-	15.7	0.309	-	-	8.5	0.137
MMRM _R	7.8	-	-	-	15.8	-	-	-	9.5	-	-	-
	I.61. $\mu_2 = 3, \rho_1 = 0.6, \rho_2 = 0.6$				I.62. $\mu_2 = 3, \rho_1 = 0.6, \rho_2 = 0.2$				I.63. $\mu_2 = 3, \rho_1 = 0.2, \rho_2 = 0.2$			
Complete	5.5	-0.006	5.5	-0.002	5.7	-0.006	5.3	-0.000	5.2	0.008	5.2	-0.001
Completers	7.5	0.139	7.2	0.130	4.9	0.045	5.1	0.023	7.3	0.136	6.6	0.127
LOCF	12.1	0.173	11.3	0.166	12.8	0.192	12.7	0.184	12.3	0.184	11.0	0.185
LE	5.1	0.093	5.3	0.077	7.0	0.136	7.5	0.159	5.6	0.101	6.1	0.091
MRI ₁	3.7	-	-	-	4.5	-	-	-	3.6	-	-	-
MRI	5.6	-0.010	-	-	5.7	0.075	-	-	5.4	0.031	-	-
LRCF	5.2	-	-	-	5.6	-	-	-	5.4	-	-	-
MMRM	-	-	8.1	0.092	-	-	15.7	0.309	-	-	8.5	0.137
MMRM _R	5.9	-	-	-	17.0	-	-	-	10.8	-	-	-
	I.64. $\mu_2 = 1, \rho_1 = 0.6, \rho_2 = 0.6$ (P2)				I.65. $\mu_2 = 1, \rho_1 = 0.6, \rho_2 = 0.2$				I.66. $\mu_2 = 1, \rho_1 = 0.2, \rho_2 = 0.2$ (P2)			
Complete	5.5	-0.006	5.5	-0.002	5.7	-0.006	5.3	-0.000	5.2	0.008	5.2	-0.001
Completers	5.0	0.004	4.7	-0.008	5.4	-0.108	6.0	-0.107	5.5	-0.007	5.5	-0.003
LOCF	4.9	0.003	4.9	-0.004	5.1	0.033	5.2	0.009	5.4	0.006	5.6	-0.000
LE	5.1	-0.003	5.2	-0.004	6.1	0.041	5.4	0.080	5.5	0.007	5.3	0.001
MRI ₁	5.0	-	-	-	6.1	-	-	-	5.1	-	-	-
MRI	5.5	-0.011	-	-	5.5	0.032	-	-	5.7	-0.010	-	-
LRCF	5.0	-	-	-	5.4	-	-	-	5.8	-	-	-
MMRM	-	-	6.7	-0.006	-	-	9.5	0.170	-	-	6.8	-0.002
MMRM _R	9.1	-	-	-	10.2	-	-	-	7.9	-	-	-
	I.67. $\mu_2 = 2, \rho_1 = 0.6, \rho_2 = 0.6$ (P2)				I.68. $\mu_2 = 2, \rho_1 = 0.6, \rho_2 = 0.2$				I.69. $\mu_2 = 2, \rho_1 = 0.2, \rho_2 = 0.2$ (P2)			
Complete	5.5	-0.006	5.5	-0.002	5.7	-0.006	5.3	-0.000	5.2	0.008	5.2	-0.001
Completers	5.0	0.004	4.7	-0.008	5.4	-0.108	6.0	-0.107	5.5	-0.007	5.5	-0.003
LOCF	4.8	-0.004	4.8	-0.005	4.7	0.024	5.0	0.003	5.4	-0.003	5.4	-0.001
LE	5.1	0.004	5.1	-0.005	5.4	0.046	5.3	0.074	5.5	0.001	5.6	0.000
MRI ₁	5.0	-	-	-	6.1	-	-	-	5.1	-	-	-
MRI	5.5	-0.011	-	-	5.5	0.032	-	-	5.7	-0.010	-	-
LRCF	5.0	-	-	-	5.4	-	-	-	5.8	-	-	-
MMRM	-	-	6.7	-0.006	-	-	9.5	0.170	-	-	6.8	-0.002
MMRM _R	6.5	-	-	-	9.6	-	-	-	7.3	-	-	-
	I.70. $\mu_2 = 3, \rho_1 = 0.6, \rho_2 = 0.6$ (P2)				I.71. $\mu_2 = 3, \rho_1 = 0.6, \rho_2 = 0.2$				I.72. $\mu_2 = 3, \rho_1 = 0.2, \rho_2 = 0.2$ (P2)			
Complete	5.5	-0.006	5.5	-0.002	5.7	-0.006	5.3	-0.000	5.2	0.008	5.2	-0.001
Completers	5.0	0.004	4.7	-0.008	5.4	-0.108	6.0	-0.107	5.5	-0.007	5.5	-0.003
LOCF	5.0	-0.002	5.0	-0.006	4.6	0.005	5.4	-0.003	5.1	-0.006	5.3	-0.002
LE	4.9	-0.008	4.9	-0.005	5.1	0.036	5.5	0.067	5.6	0.007	5.5	-0.000
MRI ₁	5.0	-	-	-	6.1	-	-	-	5.1	-	-	-
MRI	5.5	-	-	-	5.5	0.032	-	-	5.7	-0.010	-	-
LRCF	5.0	-	-	-	5.4	-	-	-	5.8	-	-	-
MMRM	-	-	6.7	-0.006	-	-	9.5	0.170	-	-	6.8	-0.002
MMRM _R	4.7	-	-	-	9.8	-	-	-	7.6	-	-	-

Table 4
Simulation Studies to Compare Type I Error Rates of the Proposed Mean Rank Imputation (MRI) and Select Traditional Methods (Unbalanced Design with Sample Size 40 for Treatment 1 and 160 for Treatment 2, 5,000 Simulations, 5% Test, Rejection Rates in Percentages) - Cont'd

Method	Nonparametric		Parametric		Nonparametric		Parametric		Nonparametric		Parametric	
	RR	Median	RR	Mean	RR	Median	RR	Mean	RR	Median	RR	Mean
	I.73. $\mu_2 = 1, \rho_1 = 0.6, \rho_2 = 0.6$				I.74. $\mu_2 = 1, \rho_1 = 0.6, \rho_2 = 0.2$				I.75. $\mu_2 = 1, \rho_1 = 0.2, \rho_2 = 0.2$			
Complete	5.5	-0.006	5.5	-0.002	5.7	-0.006	5.3	-0.000	5.2	0.008	5.2	-0.001
Completers	24.8	-0.402	26.5	-0.410	35.8	-0.506	39.8	-0.519	17.4	-0.340	18.5	-0.341
LOCF	8.5	-0.138	9.8	-0.186	12.2	-0.190	15.5	-0.255	8.7	-0.140	9.8	-0.177
LE	6.1	-0.045	5.3	0.061	6.2	-0.108	5.1	0.033	6.0	-0.008	5.6	-0.065
MRI ₁	6.0	-	-	-	8.5	-	-	-	6.7	-	-	-
MRI	8.9	-0.156	-	-	11.5	-0.218	-	-	9.2	-0.141	-	-
LRCF	7.9	-	-	-	9.8	-	-	-	8.2	-	-	-
MMRM	-	-	19.1	-0.303	-	-	22.9	-0.347	-	-	18.8	-0.339
MMRM _R	20.9	-	-	-	24.3	-	-	-	19.2	-	-	-
	I.76. $\mu_2 = 1, \rho_1 = 0.6, \rho_2 = 0.6$ (P3)				I.77. $\mu_2 = 1, \rho_1 = 0.6, \rho_2 = 0.2$				I.78. $\mu_2 = 1, \rho_1 = 0.2, \rho_2 = 0.2$ (P3)			
Complete	5.5	-0.006	5.5	-0.002	5.7	-0.006	5.3	-0.000	5.2	0.008	5.2	-0.001
Completers	5.0	-0.052	5.0	-0.055	8.1	-0.188	8.8	-0.188	4.8	-0.011	4.8	-0.010
LOCF	6.7	-0.104	6.5	-0.105	7.4	-0.114	7.4	-0.139	5.5	-0.066	5.6	-0.061
LE	6.7	-0.139	8.5	-0.182	7.3	-0.174	7.6	-0.158	5.7	-0.071	7.5	-0.126
MRI ₁	6.0	-	-	-	7.7	-	-	-	5.1	-	-	-
MRI	8.7	-0.121	-	-	9.3	-0.137	-	-	7.6	-0.057	-	-
LRCF	7.1	-	-	-	7.0	-	-	-	5.9	-	-	-
MMRM	-	-	6.2	-0.074	-	-	5.5	-0.015	-	-	5.2	-0.007
MMRM _R	7.3	-	-	-	6.6	-	-	-	5.4	-	-	-
	I.79. $\mu_2 = 2, \rho_1 = 0.6, \rho_2 = 0.6$				I.80. $\mu_2 = 2, \rho_1 = 0.6, \rho_2 = 0.2$				I.81. $\mu_2 = 2, \rho_1 = 0.2, \rho_2 = 0.2$			
Complete	5.5	-0.006	5.5	-0.002	5.7	-0.006	5.3	-0.000	5.2	0.008	5.2	-0.001
Completers	5.3	0.025	5.3	0.026	5.9	-0.106	6.3	-0.110	5.9	0.068	5.5	0.069
LOCF	6.7	-0.103	6.2	-0.096	7.0	-0.098	6.9	-0.123	5.6	-0.050	5.5	-0.045
LE	8.2	-0.178	10.5	-0.234	8.1	-0.204	9.1	-0.204	6.4	-0.109	9.0	-0.172
MRI ₁	6.0	-	-	-	7.4	-	-	-	4.9	-	-	-
MRI	8.5	-0.112	-	-	9.0	-0.116	-	-	7.7	-0.034	-	-
LRCF	7.1	-	-	-	7.0	-	-	-	5.9	-	-	-
MMRM	-	-	5.5	-0.016	-	-	6.0	0.068	-	-	6.0	0.075
MMRM _R	6.7	-	-	-	6.4	-	-	-	5.9	-	-	-
	I.82. $\mu_2 = 3, \rho_1 = 0.6, \rho_2 = 0.6$ (P2)				I.83. $\mu_2 = 3, \rho_1 = 0.6, \rho_2 = 0.2$				I.84. $\mu_2 = 3, \rho_1 = 0.2, \rho_2 = 0.2$ (P2)			
Complete	5.5	-0.006	5.5	-0.002	5.7	-0.006	5.3	-0.000	5.2	0.008	5.2	-0.001
Completers	4.9	-0.005	5.1	-0.007	7.9	-0.179	8.8	-0.185	4.8	-0.010	4.9	-0.007
LOCF	5.1	-0.001	5.6	-0.002	5.3	-0.054	5.6	-0.080	5.2	-0.002	5.1	-0.003
LE	5.2	-0.005	5.4	0.000	5.5	-0.093	5.4	-0.032	5.3	0.002	5.4	-0.000
MRI ₁	5.4	-	-	-	6.4	-	-	-	5.4	-	-	-
MRI	6.2	-0.011	-	-	5.9	-0.095	-	-	6.0	-0.012	-	-
LRCF	5.5	-	-	-	5.3	-	-	-	5.5	-	-	-
MMRM	-	-	5.5	-0.004	-	-	5.4	-0.012	-	-	5.0	-0.005
MMRM _R	6.4	-	-	-	6.7	-	-	-	5.2	-	-	-
	I.85. $\rho_1 = 0.6, \rho_2 = 0.6$				I.86. $\rho_1 = 0.6, \rho_2 = 0.2$				I.87. $\rho_1 = 0.2, \rho_2 = 0.2$			
Complete	5.5	-0.012	8.2	0.105	5.7	-0.011	8.0	0.121	5.2	0.029	8.5	0.082
Completers	11.1	-0.509	31.1	-1.567	19.2	-0.889	49.4	-3.970	5.9	-0.207	19.1	-0.776
LOCF	3.7	0.425	19.7	-1.245	6.2	-0.207	40.1	-3.226	3.7	0.418	18.9	-1.433
LE	8.7	1.938	6.9	-0.128	4.3	1.230	16.0	-2.109	9.9	2.481	7.6	-0.317
MRI ₁	5.7	-	-	-	4.2	-	-	-	9.4	-	-	-
MRI	8.4	36.3	-	-	6.2	0.230	-	-	13.2	0.873	-	-
LRCF	8.1	-	-	-	5.6	-	-	-	13.4	-	-	-
MMRM	-	-	31.2	-0.004	-	-	29.4	-0.463	-	-	21.5	0.381
MMRM _R	11.5	-	-	-	11.6	-	-	-	11.0	-	-	-
	I.88. $\rho_1 = 0.6, \rho_2 = 0.6$ (P3)				I.89. $\rho_1 = 0.6, \rho_2 = 0.2$				I.90. $\rho_1 = 0.2, \rho_2 = 0.2$ (P3)			
Complete	5.5	-0.012	8.2	0.105	5.7	-0.011	8.0	0.121	5.2	0.029	8.5	0.082
Completers	5.5	0.004	11.2	-0.034	13.5	-0.649	35.0	-3.244	5.4	0.023	11.3	-0.050
LOCF	5.0	0.001	7.7	-0.041	11.2	-0.666	24.8	-1.840	5.2	0.015	9.3	-0.048
LE	5.2	-0.026	7.4	-0.066	10.2	-1.254	17.8	-1.866	4.8	0.015	8.2	-0.073
MRI ₁	3.9	-	-	-	5.8	-	-	-	4.0	-	-	-
MRI	5.6	-0.038	-	-	7.2	-0.459	-	-	5.4	-0.070	-	-
LRCF	5.0	-	-	-	7.2	-	-	-	5.2	-	-	-
MMRM	-	-	31.8	-0.326	-	-	30.6	-1.357	-	-	22.7	-0.329
MMRM _R	12.3	-	-	-	12.6	-	-	-	12.6	-	-	-

Table 4
Simulation Studies to Compare Type I Error Rates of the Proposed Mean Rank Imputation (MRI) and Select Traditional Methods (Unbalanced Design with Sample Size 40 for Treatment 1 and 160 for Treatment 2, 5,000 Simulations, 5% Test, Rejection Rates in Percentages) - Cont'd

Method	Nonparametric		Parametric		Nonparametric		Parametric		Nonparametric		Parametric	
	RR	Median	RR	Mean	RR	Median	RR	Mean	RR	Median	RR	Mean
	I.91. $\rho_1 = 0.6, \rho_2 = 0.6$				I.92. $\rho_1 = 0.6, \rho_2 = 0.2$				I.93. $\rho_1 = 0.2, \rho_2 = 0.2$			
Complete	5.5	-0.012	8.2	0.105	5.7	-0.011	8.0	0.121	5.2	0.029	8.5	0.082
Completers	6.0	0.142	7.6	0.327	12.0	-0.586	30.1	-3.034	5.2	0.081	9.1	0.160
LOCF	5.6	0.099	6.0	0.259	10.2	-0.435	18.5	-1.300	5.9	0.242	6.4	0.492
LE	6.1	-0.465	7.5	-0.030	12.7	-1.406	16.6	-1.589	5.9	-0.188	7.3	0.203
MRI ₁	4.2	-	-	-	6.7	-	-	-	4.1	-	-	-
MRI	5.7	-0.124	-	-	8.3	-0.725	-	-	5.8	-0.271	-	-
LRCF	5.5	-	-	-	9.9	-	-	-	5.9	-	-	-
MMRM	-	-	31.2	-0.353	-	-	29.5	-1.567	-	-	22.6	-0.523
MMRM _R	13.1	-	-	-	14.1	-	-	-	13.5	-	-	-
	I.94. $\rho_1 = 0.6, \rho_2 = 0.6$ (P2)				I.95. $\rho_1 = 0.6, \rho_2 = 0.2$				I.96. $\rho_1 = 0.2, \rho_2 = 0.2$ (P2)			
Complete	5.5	-0.012	8.2	0.105	5.7	-0.011	8.0	0.121	5.2	0.029	8.5	0.082
Completers	5.4	0.010	9.9	-0.031	13.2	-0.647	31.5	-3.239	5.5	0.007	9.8	-0.045
LOCF	5.0	-0.001	7.3	-0.037	10.8	-0.635	21.9	-1.834	5.2	0.001	8.2	-0.042
LE	5.6	0.001	6.9	-0.060	10.1	-1.240	16.0	-1.857	5.1	-0.012	7.8	-0.065
MRI ₁	5.3	-	-	-	7.4	-	-	-	5.5	-	-	-
MRI	5.6	-0.040	-	-	7.2	-0.464	-	-	5.8	-0.089	-	-
LRCF	5.3	-	-	-	7.3	-	-	-	5.6	-	-	-
MMRM	-	-	29.9	-0.279	-	-	28.3	-1.282	-	-	21.5	-0.324
MMRM _R	12.2	-	-	-	13.1	-	-	-	12.5	-	-	-
	I.97. $\rho_1 = 0.6, \rho_2 = 0.6$				I.98. $\rho_1 = 0.6, \rho_2 = 0.2$				I.99. $\rho_1 = 0.2, \rho_2 = 0.2$			
Complete	5.5	-0.012	8.2	0.105	5.7	-0.011	8.0	0.121	5.2	0.029	8.5	0.082
Completers	36.5	-0.758	82.9	-1.521	39.1	-0.813	88.3	-1.706	29.9	-0.750	77.5	-1.571
LOCF	5.0	-0.147	12.3	-0.360	4.4	0.035	10.3	-0.215	4.1	-0.058	10.9	-0.262
LE	7.8	0.364	4.5	0.955	10.0	0.395	4.6	1.403	10.4	0.434	4.4	1.288
MRI ₁	4.1	-	-	-	4.5	-	-	-	4.5	-	-	-
MRI	5.7	-0.094	-	-	5.4	-0.030	-	-	5.5	-0.104	-	-
LRCF	5.1	-	-	-	4.6	-	-	-	4.9	-	-	-
MMRM	-	-	58.0	-1.505	-	-	47.0	-1.138	-	-	64.2	-1.791
MMRM _R	42.2	-	-	-	33.7	-	-	-	45.8	-	-	-
	I.100. $\rho_1 = 0.6, \rho_2 = 0.6$ (P3)				I.101. $\rho_1 = 0.6, \rho_2 = 0.2$				I.102. $\rho_1 = 0.2, \rho_2 = 0.2$ (P3)			
Complete	5.5	-0.012	8.2	0.105	5.7	-0.011	8.0	0.121	5.2	0.029	8.5	0.082
Completers	5.2	0.014	6.8	-0.001	5.1	-0.057	9.5	-0.130	5.2	-0.000	6.3	0.004
LOCF	4.6	-0.013	7.8	-0.027	4.7	0.106	7.1	0.024	4.6	0.003	7.6	-0.023
LE	4.7	-0.029	7.8	-0.057	5.1	-0.042	7.1	0.063	4.8	-0.003	7.8	-0.053
MRI ₁	3.8	-	-	-	4.0	-	-	-	3.4	-	-	-
MRI	5.4	-0.011	-	-	5.5	0.070	-	-	5.4	-0.012	-	-
LRCF	4.7	-	-	-	4.8	-	-	-	5.0	-	-	-
MMRM	-	-	9.2	0.149	-	-	8.8	0.724	-	-	3.6	0.024
MMRM _R	8.8	-	-	-	10.5	-	-	-	6.4	-	-	-
	I.103. $\rho_1 = 0.6, \rho_2 = 0.6$				I.104. $\rho_1 = 0.6, \rho_2 = 0.2$				I.105. $\rho_1 = 0.2, \rho_2 = 0.2$			
Complete	5.5	-0.012	8.2	0.105	5.7	-0.011	8.0	0.121	5.2	0.029	8.5	0.082
Completers	10.3	0.205	7.3	0.293	6.9	0.128	5.2	0.172	9.1	0.202	6.2	0.306
LOCF	4.8	-0.031	8.0	-0.041	4.6	0.030	7.6	-0.019	4.9	-0.084	8.0	-0.066
LE	5.7	-0.578	9.7	-0.378	7.0	-0.551	9.3	-0.336	6.1	-0.526	10.7	-0.451
MRI ₁	3.5	-	-	-	3.7	-	-	-	3.3	-	-	-
MRI	5.5	0.010	-	-	5.4	0.068	-	-	5.4	-0.013	-	-
LRCF	4.7	-	-	-	4.8	-	-	-	4.6	-	-	-
MMRM	-	-	7.9	46.4	-	-	20.1	1.074	-	-	7.6	0.365
MMRM _R	12.5	-	-	-	22.9	-	-	-	10.2	-	-	-
	I.106. $\rho_1 = 0.6, \rho_2 = 0.6$ (P2)				I.107. $\rho_1 = 0.6, \rho_2 = 0.2$				I.108. $\rho_1 = 0.2, \rho_2 = 0.2$ (P2)			
Complete	5.5	-0.012	8.2	0.105	5.7	-0.011	8.0	0.121	5.2	0.029	8.5	0.082
Completers	4.7	0.011	6.2	0.000	4.9	-0.057	9.1	-0.130	5.1	0.010	5.8	0.005
LOCF	4.8	-0.017	7.3	-0.024	4.7	0.086	6.7	0.026	4.6	0.010	7.3	-0.021
LE	4.9	-0.024	7.3	-0.051	4.8	-0.030	6.9	0.067	4.8	0.005	7.5	-0.048
MRI ₁	4.7	-	-	-	5.0	-	-	-	4.5	-	-	-
MRI	5.2	-0.011	-	-	5.1	0.068	-	-	5.1	-0.017	-	-
LRCF	4.5	-	-	-	4.9	-	-	-	4.5	-	-	-
MMRM	-	-	9.4	0.143	-	-	8.2	0.718	-	-	4.0	0.023
MMRM _R	8.7	-	-	-	10.7	-	-	-	6.5	-	-	-

Table 4
Simulation Studies to Compare Type I Error Rates of the Proposed Mean Rank Imputation (MRI) and Select Traditional Methods (Unbalanced Design with Sample Size 40 for Treatment 1 and 160 for Treatment 2, 5,000 Simulations, 5% Test, Rejection Rates in Percentages) - Cont'd

Method	Nonparametric		Parametric		Nonparametric		Parametric		Nonparametric		Parametric	
	RR	Median	RR	Mean	RR	Median	RR	Mean	RR	Median	RR	Mean
	I.109. $\rho_1 = 0.6, \rho_2 = 0.6$				I.110. $\rho_1 = 0.6, \rho_2 = 0.2$				I.111. $\rho_1 = 0.2, \rho_2 = 0.2$			
Complete	5.5	-0.012	8.2	0.105	5.7	-0.011	8.0	0.121	5.2	0.029	8.5	0.082
Completers	53.9	-0.730	88.6	-1.232	62.1	-0.844	93.8	-1.443	42.5	-0.765	83.0	-1.310
LOCF	19.0	-0.405	56.4	-0.796	19.6	-0.388	58.7	-0.827	16.9	-0.369	57.6	-0.807
LE	5.6	-0.012	8.4	-0.244	5.9	-0.161	7.8	-0.207	4.7	0.089	6.8	-0.148
MRI ₁	22.0	-	-	-	24.4	-	-	-	26.2	-	-	-
MRI	29.9	-0.393	-	-	30.3	-0.367	-	-	32.4	-0.401	-	-
LRCF	26.9	-	-	-	25.5	-	-	-	27.2	-	-	-
MMRM	-	-	82.9	-1.218	-	-	84.6	-1.284	-	-	80.9	-1.347
MMRM _R	62.1	-	-	-	62.4	-	-	-	58.6	-	-	-
	I.112. $\rho_1 = 0.6, \rho_2 = 0.6$				I.113. $\rho_1 = 0.6, \rho_2 = 0.2$				I.114. $\rho_1 = 0.2, \rho_2 = 0.2$			
Complete	5.5	-0.012	8.2	0.105	5.7	-0.011	8.0	0.121	5.2	0.029	8.5	0.082
Completers	5.2	-0.001	6.7	-0.006	6.0	-0.083	11.1	-0.125	5.3	0.008	6.4	0.008
LOCF	18.1	-0.402	38.8	-0.582	19.2	-0.375	38.3	-0.576	16.7	-0.360	36.4	-0.557
LE	18.1	-0.822	41.0	-1.253	23.9	-0.894	41.5	-1.255	16.3	-0.651	40.4	-1.197
MRI ₁	17.9	-	-	-	16.9	-	-	-	17.8	-	-	-
MRI	27.4	-0.294	-	-	25.9	-0.236	-	-	28.5	-0.244	-	-
LRCF	21.3	-	-	-	17.7	-	-	-	19.8	-	-	-
MMRM	-	-	13.1	-0.048	-	-	8.7	0.129	-	-	6.3	0.066
MMRM _R	9.9	-	-	-	8.4	-	-	-	6.7	-	-	-
	I.115. $\rho_1 = 0.6, \rho_2 = 0.6$ (P2)				I.116. $\rho_1 = 0.6, \rho_2 = 0.2$				I.117. $\rho_1 = 0.2, \rho_2 = 0.2$ (P2)			
Complete	5.5	-0.012	8.2	0.105	5.7	-0.011	8.0	0.121	5.2	0.029	8.5	0.082
Completers	5.3	0.005	6.4	-0.000	6.2	-0.100	11.6	-0.138	5.1	-0.002	6.5	-0.005
LOCF	5.1	-0.016	5.6	-0.002	5.8	-0.028	5.9	-0.023	4.8	-0.008	5.3	-0.004
LE	5.4	-0.007	5.7	-0.004	6.6	-0.247	6.3	-0.064	4.7	0.010	5.8	-0.005
MRI ₁	5.3	-	-	-	5.7	-	-	-	5.2	-	-	-
MRI	5.8	-0.010	-	-	5.7	-0.008	-	-	5.6	-0.012	-	-
LRCF	5.5	-	-	-	5.4	-	-	-	5.0	-	-	-
MMRM	-	-	10.3	0.021	-	-	8.3	0.066	-	-	6.5	0.003
MMRM _R	8.5	-	-	-	8.0	-	-	-	6.5	-	-	-

Table 5
Simulations to Compare the Estimated Variance of the Test Statistic of the Mean Rank Imputation Method by $\hat{\sigma}^2$ in Theorem 2 and $\hat{\sigma}_1^2$ in Huang et al. (2013)
 (5,000 Simulations)

Scenario	Treatment	Distribution						Missing Mechanism				Missing Rate at		Empirical Var(Z)	Average $\hat{\sigma}^2$	Average $\hat{\sigma}_1^2$
		Type	μ_1	μ_2	σ_1^2	σ_2^2	ρ	β_1	γ_{11}	β_2	γ_{21}	γ_{22}	T ₁	T ₂		
III.1 (P3) (MNAR)	Trt ₁	N	1.2	2.4	1	2	0.6	-0.8	0	-9	1	1	0.31	0.33	7.37	7.35
	Trt ₂	N	1	2	1	2	0.6	-1.7	0	-9	1	1	0.15	0.17		
III.2 (P3) (MNAR)	Trt ₁	N	1.2	4.4	1	2	0.6	-0.8	0	-9	1	1	0.31	0.39	5.49	5.62
	Trt ₂	N	1	2	1	2	0.6	-1.7	0	-9	1	1	0.15	0.17		
III.3 (P3) (MNAR)	Trt ₁	N	1.2	6.4	1	2	0.6	-0.8	0	-9	1	1	0.31	0.52	5.39	5.47
	Trt ₂	N	1	2	1	2	0.6	-1.7	0	-9	1	1	0.15	0.17		
III.4 (P3) (MNAR)	Trt ₁	N	1.2	8.4	1	2	0.6	-0.8	0	-9	1	1	0.31	0.71	6.26	6.17
	Trt ₂	N	1	2	1	2	0.6	-1.7	0	-9	1	1	0.15	0.17		
III.5 (P3) (MNAR)	Trt ₁	N	1.2	10.4	1	2	0.6	-0.8	0	-9	1	1	0.31	0.88	7.09	6.99
	Trt ₂	N	1	2	1	2	0.6	-1.7	0	-9	1	1	0.15	0.17		