

Additional file 6

Additional file 6.pdf

Title: Comparison of evaluation metrics of 90% imputed dataset with five imputation (m=5) and twenty imputations (m=20)

In the present study, we set the number of imputations (m) to five when handling datasets with varying levels of missing data. For example, using the MICE approach on a dataset with 10% missing values generates five fully imputed datasets. The decision to use a minimum of five imputations was chosen to align with the default setting of the 'mice' package (van Buuren and Groothuis-Oudshoorn, 2011). Additionally, previous studies (Fichman and Cummings, 2003; Graham, 2009; Schafer, 1999) often recommend five imputations as adequate for datasets with moderate missingness. However, van Buuren (2018) recommends using a larger number of imputations to enhance statistical power, though this approach introduces added computational and storage demands (van Buuren, 2018).

We conducted a comparison analysis of the 90% imputed complete datasets with five imputations ($m=5$) against twenty imputations to assess the deviation between the evaluation metrics. Table S6 presents the result of comparison of evaluation metrics of the 90% imputed data using $m=5$ versus $m=20$. The metrics include RMSE (Root Mean Square Error), MAD (Mean Absolute Deviation), BIAS, and PV (Proportionate Variance) for five health indicators: Adolescent Mortality Rate, Under-five Mortality Rate, Infant Mortality Rate, Neonatal Mortality Rate, and Stillbirth Rate.

Evaluation metrics values for the indicators do not show substantial differences between 90% imputed data with $m=5$ and $m=20$. This comparison helped to justify the choice of $m=5$, balancing adequate accuracy with computational efficiency.

Table S6: Comparison of evaluation metrics of 90% imputed dataset with $m=5$ and $m=20$.

Evaluation Metrics		RMSE	MAD	BIAS	PV
Adolescent Mortality Rate	M=5	72.885	58.671	-4.823	0.002
	M=20	72.901	58.733	-4.78	0.001
	difference	-0.016	-0.062	-0.043	0.001
Under-five Mortality Rate	M=5	29.888	20.224	-8.249	0.208
	M=20	34.227	26.297	-9.908	0.001
	difference	-4.339	-6.073	1.659	0.207
Infant Mortality Rate	M=5	17.796	13.267	1.137	0.338
	M=20	17.833	13.201	1.402	0.325
	difference	-0.037	0.066	-0.265	0.013
Neonatal Mortality Rate	M=5	11.712	10.131	-0.57	0.018
	M=20	11.625	10.116	-0.636	0.005
	difference	0.087	0.015	0.066	0.013
Stillbirth Rate	M=5	7.385	5.217	-0.203	0.299
	M=20	8.761	7.341	-0.198	0.006
	difference	-1.376	-2.124	-0.005	0.293