UiO : Centre for Educational Measurement
Det utdanningsvitenskapelige fakultet

Missing Data Treatment

A hand-on illustration using R package mice

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28 Feburary 2022

Structure

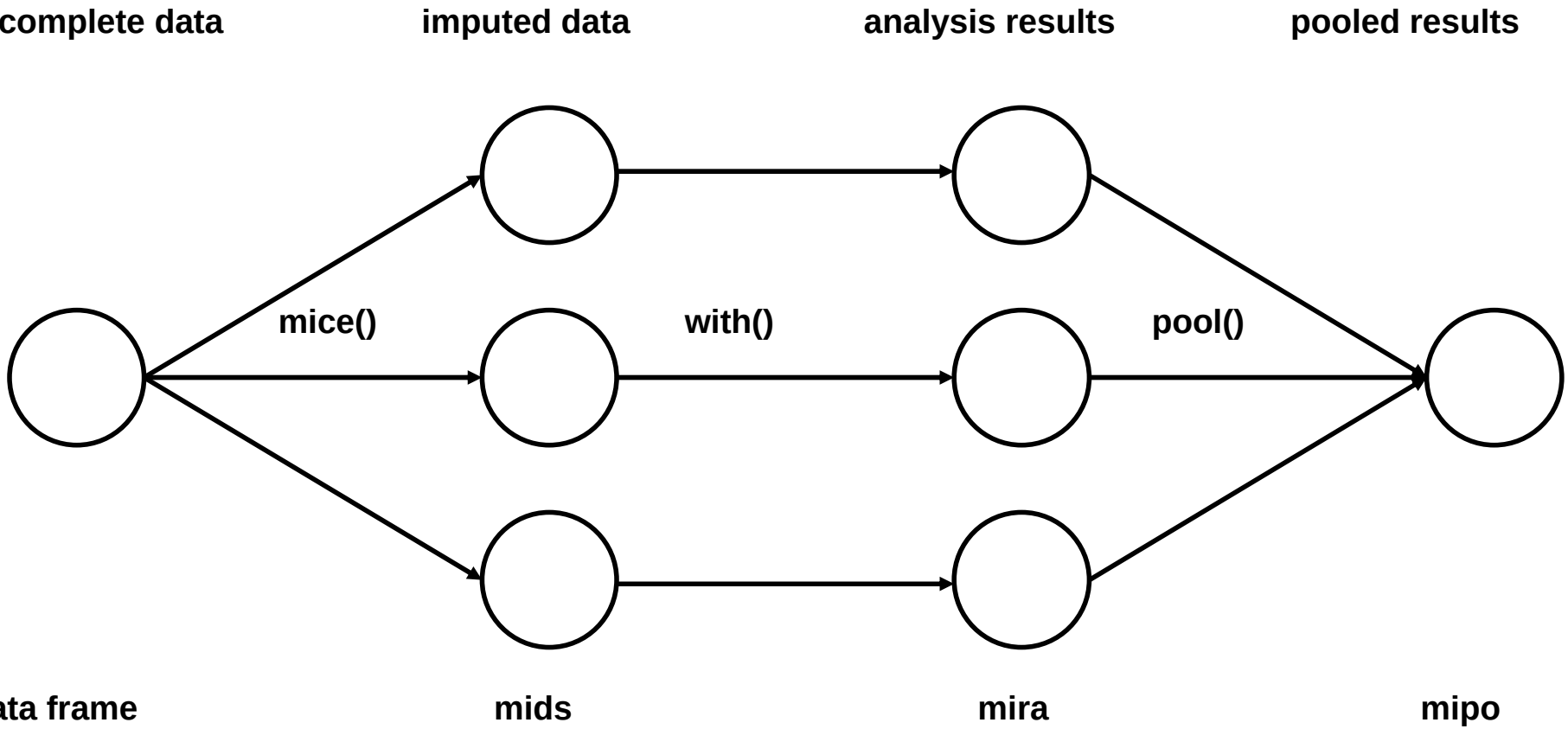
Summary

- Complete-case analyses:
  - ✗ Wasteful
  - ✗ Biased
- Two approaches:
  1. Joint modelling (JM, Schafer, 1997)
  2. Fully conditional specification (FCS)
  - ☞ FCS aka multivariate imputation by chained equations (MICE, van Buuren & Groothuis-Oudshoorn, 2011)
- Existing R packages:
  - ➤ Amelia, Hmisc, jomo, mi, mice, norm, norm2, pan
  - ✍ See Table 5.1, Kleinke et al. (2020) (p. 134) for popularity contest across various MI packages
  - ✍ See Table 6, Grund et al. (2018) (pp. 134–135) for missing data treatment for multilevel models

Data Missing Mechanism (Rubin, 1976)

- Missing completely at random (**MCAR**)
  - ✎ missingness of variables is independent of the variables considered in the study
  - ✓ no treatment required, complete-case analyses valid and unbiased
- Missing at random (**MAR**)
  - ✎ missingness depends exclusively on observable variables
  - ✓ the assumption behind most MI procedures, including mice
- Missing not at random (**MNAR**)
  - ✎ missingness depends on unobservable but important variables of interest in the study
  - ✓ exact treatment rather complicated (Rose, 2013)
  - ✓ in practice: introduce lots of covariates and hope MNAR $\approxeq$ MAR
- Ignorable = { MCAR, MAR }; Nonignorable = { MNAR }

mice Process (van Buuren & Groothuis-Oudshoorn, 2011)



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