

MI

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Packages

```
library(tidyverse)
```

```
-- Attaching core tidyverse packages ----- tidyverse 2.0.0 --
v dplyr      1.1.4      v readr      2.1.5
v forcats    1.0.0      v stringr    1.5.1
v ggplot2    3.5.1      v tibble     3.2.1
v lubridate  1.9.3      v tidyr      1.3.1
v purrr      1.0.2
-- Conflicts ----- tidyverse_conflicts() --
x dplyr::filter() masks stats::filter()
x dplyr::lag()     masks stats::lag()
i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become
```

```
library(here)
```

here() starts at C:/Users/10415/Documents/MSc Biostats/CHL8010/version control/CHL8010_Yanyao

```
library(mice)
```

```
'mice'
```

The following object is masked from 'package:stats':

```
filter
```

The following objects are masked from 'package:base':

cbind, rbind

```
library(plm)
```

'plm'

The following objects are masked from 'package:dplyr':

between, lag, lead

```
library(texreg)
```

Version: 1.39.4

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Author: Philip Leifeld (University of Manchester)

Consider submitting praise using the `praise` or `praise_interactive` functions.
Please cite the JSS article in your publications -- see `citation("texreg")`.

'texreg'

The following object is masked from 'package:tidyr':

extract

Read in data

```
data <- read_csv(here("data", "merged.csv"))
```

Rows: 3720 Columns: 22

-- Column specification -----

Delimiter: ","

chr (3): country_name, ISO, region

dbl (19): year, gdp1000, OECD, OECD2023, popdens, urban, agedep, male_edu, t...

i Use ``spec()`` to retrieve the full column specification for this data.

i Specify the column types or set ``show_col_types = FALSE`` to quiet this message.

MI

```
set.seed(1006742018)
midata <- data |>
  mutate(ISOnum = as.numeric(as.factor(data$ISO))) |>
  select(-country_name, -ISO)

mice0 <- mice(midata, seed = 100, m = 5, maxit = 0, print = F)
```

Warning: Number of logged events: 1

```
meth <- mice0$method
meth[c("urban", "male_edu", "temp", "rainfall1000", "maternalMor", "infantMor",
       "neonatalMor", "under5Mor", "lgdp1000", "popdens")] <- "2l.lmer"

pred <- mice0$predictorMatrix
pred[c("urban", "male_edu", "temp", "rainfall1000", "maternalMor", "infantMor",
       "neonatalMor", "under5Mor", "lgdp1000", "popdens"), "ISOnum"] <- -2

mice.multi.out <- mice(midata, seed = 100, m = 10, maxit = 20,
                       method = meth,
                       predictorMatrix = pred)
```

iter	imp	variable									
1	1	gdp1000	popdens	urban	male_edu	temp	rainfall1000	maternalMor	infantMor	neona	
1	2	gdp1000	popdens	urban	male_edu	temp	rainfall1000	maternalMor	infantMor	neona	
1	3	gdp1000	popdens	urban	male_edu	temp	rainfall1000	maternalMor	infantMor	neona	
1	4	gdp1000	popdens	urban	male_edu	temp	rainfall1000	maternalMor	infantMor	neona	
1	5	gdp1000	popdens	urban	male_edu	temp	rainfall1000	maternalMor	infantMor	neona	
1	6	gdp1000	popdens	urban	male_edu	temp	rainfall1000	maternalMor	infantMor	neona	
1	7	gdp1000	popdens	urban	male_edu	temp	rainfall1000	maternalMor	infantMor	neona	
1	8	gdp1000	popdens	urban	male_edu	temp	rainfall1000	maternalMor	infantMor	neona	
1	9	gdp1000	popdens	urban	male_edu	temp	rainfall1000	maternalMor	infantMor	neona	
1	10	gdp1000	popdens	urban	male_edu	temp	rainfall1000	maternalMor	infantMor	neona	
2	1	gdp1000	popdens	urban	male_edu	temp	rainfall1000	maternalMor	infantMor	neona	
2	2	gdp1000	popdens	urban	male_edu	temp	rainfall1000	maternalMor	infantMor	neona	
2	3	gdp1000	popdens	urban	male_edu	temp	rainfall1000	maternalMor	infantMor	neona	
2	4	gdp1000	popdens	urban	male_edu	temp	rainfall1000	maternalMor	infantMor	neona	
2	5	gdp1000	popdens	urban	male_edu	temp	rainfall1000	maternalMor	infantMor	neona	

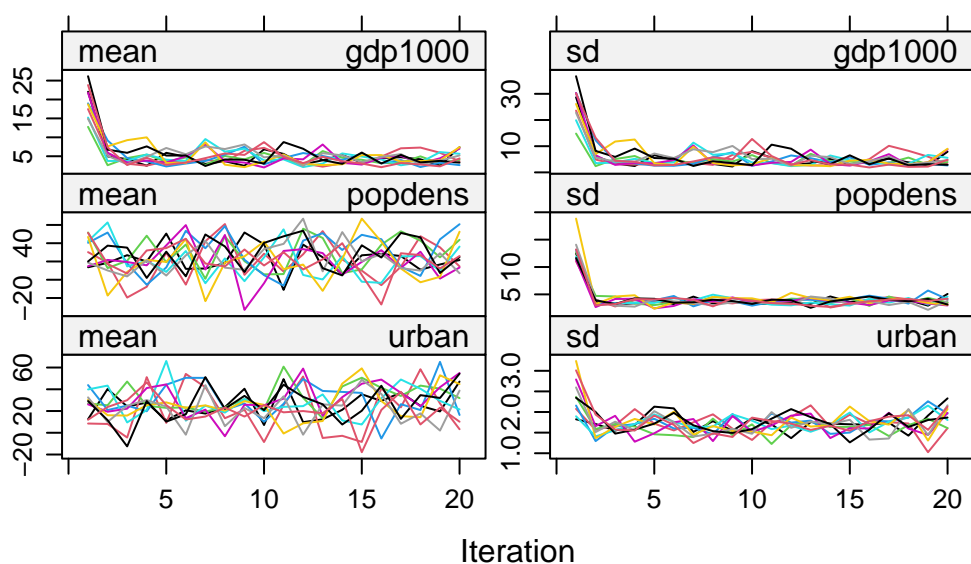
[illegible]

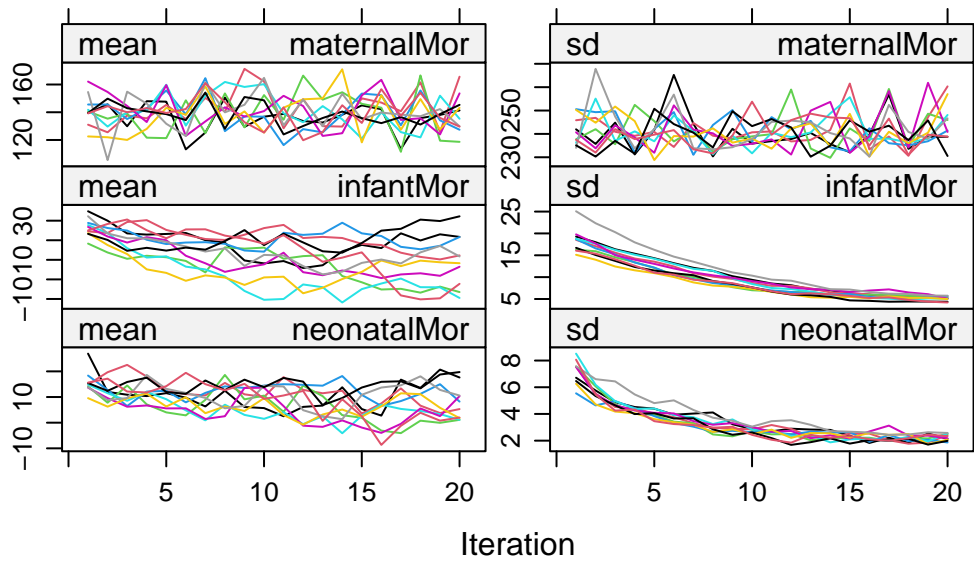
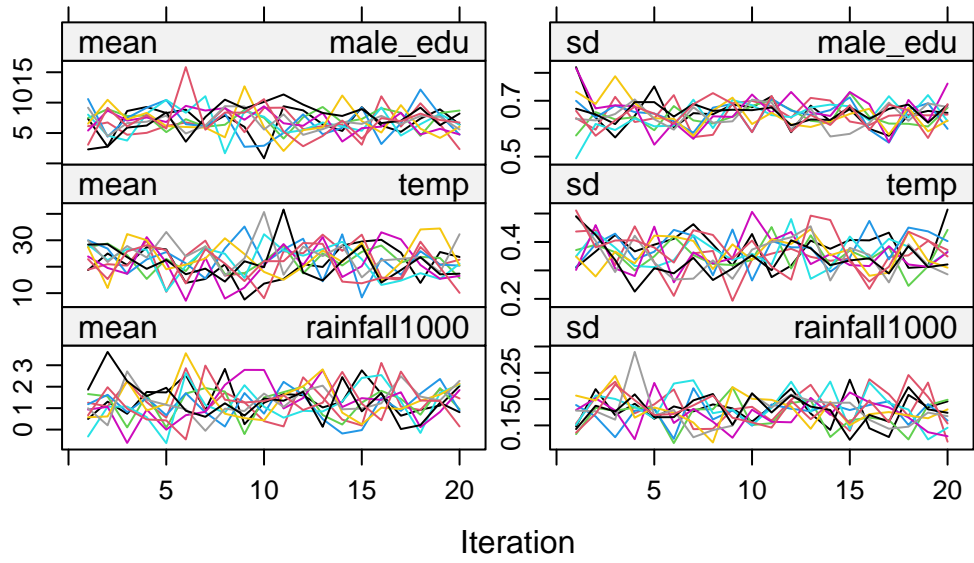
[illegible]

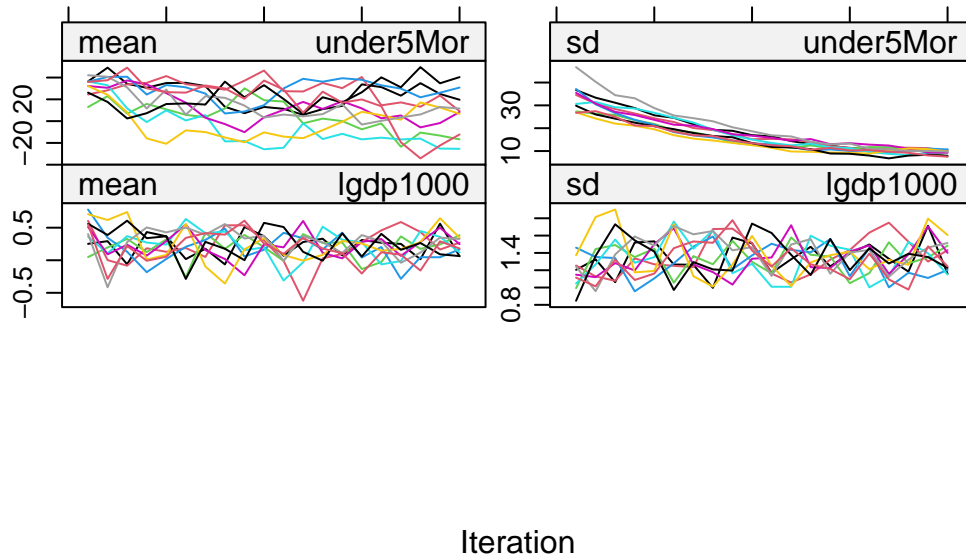
[illegible]

19	8	gdp1000	popdens	urban	male_edu	temp	rainfall1000	maternalMor	infantMor	neor
19	9	gdp1000	popdens	urban	male_edu	temp	rainfall1000	maternalMor	infantMor	neor
19	10	gdp1000	popdens	urban	male_edu	temp	rainfall1000	maternalMor	infantMor	neor
20	1	gdp1000	popdens	urban	male_edu	temp	rainfall1000	maternalMor	infantMor	neor
20	2	gdp1000	popdens	urban	male_edu	temp	rainfall1000	maternalMor	infantMor	neor
20	3	gdp1000	popdens	urban	male_edu	temp	rainfall1000	maternalMor	infantMor	neor
20	4	gdp1000	popdens	urban	male_edu	temp	rainfall1000	maternalMor	infantMor	neor
20	5	gdp1000	popdens	urban	male_edu	temp	rainfall1000	maternalMor	infantMor	neor
20	6	gdp1000	popdens	urban	male_edu	temp	rainfall1000	maternalMor	infantMor	neor
20	7	gdp1000	popdens	urban	male_edu	temp	rainfall1000	maternalMor	infantMor	neor
20	8	gdp1000	popdens	urban	male_edu	temp	rainfall1000	maternalMor	infantMor	neor
20	9	gdp1000	popdens	urban	male_edu	temp	rainfall1000	maternalMor	infantMor	neor
20	10	gdp1000	popdens	urban	male_edu	temp	rainfall1000	maternalMor	infantMor	neor

```
plot(mice.multi.out)
```







Fit models

```
maternal.fit <- with(mice.multi.out, glm(maternalMor~conflict + lgdp1000 + OECD + popdens + urban +
agedep + male_edu + temp + rainfall1000 + earthquake + drought, family = gaussian))
out.maternal <- pool(maternal.fit)
summary(out.maternal)
```

	term	estimate	std.error	statistic	df	p.value
1	(Intercept)	-79.2691335	32.6981026	-2.4242732	353.59109	1.583983e-02
2	conflict	43.2120639	8.2856711	5.2152762	3368.17190	1.946168e-07
3	lgdp1000	-31.2622300	4.5581119	-6.8585921	264.55207	4.903463e-11
4	OECD	72.3956404	13.4296087	5.3907483	178.87524	2.194806e-07
5	popdens	-0.3669031	0.3091484	-1.1868188	30.15532	2.445651e-01
6	urban	0.3550654	0.4206318	0.8441239	23.54342	4.070960e-01
7	agedep	7.5760557	0.2883957	26.2696565	496.50126	5.459129e-96
8	male_edu	-22.6544277	2.1607408	-10.4845652	168.85296	3.997695e-20
9	temp	2.0353069	0.7797616	2.6101657	141.02569	1.002720e-02
10	rainfall1000	-11.2386571	5.5140898	-2.0381709	46.64996	4.722494e-02
11	earthquake	-46.9106978	11.0101648	-4.2606717	3560.06456	2.090896e-05
12	drought	-1.6110503	10.6651918	-0.1510569	3273.06460	8.799402e-01

```

infant.fit <- with(mice.multi.out, glm(infantMor~conflict + lgdp1000 + OECD + popdens + urban
agedep + male_edu + temp + rainfall1000 + earthquake + drought, family = g
out.infant <- pool(infant.fit)
summary(out.infant)

```

	term	estimate	std.error	statistic	df	p.value
1	(Intercept)	9.1511008103	2.86734659	3.19148751	50.48196	2.435805e-03
2	conflict	2.5459312940	0.60128979	4.23411697	3422.19699	2.354861e-05
3	lgdp1000	-5.7347467981	0.31782541	-18.04370125	640.89120	3.673265e-59
4	OECD	2.3493246694	0.95975663	2.44783375	226.26808	1.513314e-02
5	popdens	-0.0157795458	0.02129506	-0.74099547	36.70922	4.634101e-01
6	urban	0.0009808616	0.02863798	0.03425037	28.20999	9.729187e-01
7	agedep	0.5805635203	0.02193773	26.46415165	206.14388	3.194317e-68
8	male_edu	-1.4834625860	0.16946021	-8.75404670	77.85906	3.284155e-13
9	temp	0.2733169838	0.05918600	4.61793329	90.39102	1.278262e-05
10	rainfall1000	-1.3802701271	0.35036483	-3.93952248	125.98046	1.344489e-04
11	earthquake	-1.4432038339	0.79796566	-1.80860393	3653.29619	7.059474e-02
12	drought	-1.6636781515	0.77012041	-2.16028316	3641.45141	3.081580e-02

```

neonatal.fit <- with(mice.multi.out, glm(neonatalMor~conflict + lgdp1000 + OECD + popdens + u
agedep + male_edu + temp + rainfall1000 + earthquake + drought, family = g
out.neonatal <- pool(neonatal.fit)
summary(out.neonatal)

```

	term	estimate	std.error	statistic	df	p.value
1	(Intercept)	11.947273577	1.45054159	8.2364226	39.07561	4.524067e-10
2	conflict	1.853742333	0.28912943	6.4114619	3306.91297	1.646021e-10
3	lgdp1000	-3.059238999	0.15148126	-20.1954950	792.46187	1.729155e-73
4	OECD	0.181310450	0.47007987	0.3857014	169.83650	7.002005e-01
5	popdens	-0.006966479	0.01017163	-0.6848933	37.51197	4.976216e-01
6	urban	-0.004271223	0.01455611	-0.2934317	23.99747	7.717149e-01
7	agedep	0.228593100	0.01075543	21.2537431	155.11627	8.364513e-48
8	male_edu	-0.885845169	0.08651685	-10.2389904	51.89120	4.682138e-14
9	temp	0.139978371	0.02961386	4.7267863	65.82515	1.243950e-05
10	rainfall1000	-0.976282534	0.17600273	-5.5469737	82.42421	3.427708e-07
11	earthquake	0.225059333	0.38335333	0.5870807	3630.94405	5.571860e-01
12	drought	-0.617431999	0.37026349	-1.6675476	3579.06110	9.549305e-02

```

under5.fit <- with(mice.multi.out, glm(under5Mor~conflict + lgdp1000 + OECD + popdens + urban
agedep + male_edu + temp + rainfall1000 + earthquake + drought, family = g

```

```
out.under5 <- pool(under5.fit)
summary(out.under5)
```

	term	estimate	std.error	statistic	df	p.value
1	(Intercept)	1.28114732	4.44081140	0.2884940	77.93805	7.737345e-01
2	conflict	3.05247227	0.99325486	3.0732014	3554.31215	2.133811e-03
3	lgdp1000	-7.40045861	0.52056686	-14.2161540	873.09721	2.075678e-41
4	OECD	6.27355010	1.55869745	4.0248671	314.27284	7.149554e-05
5	popdens	-0.06866520	0.03141265	-2.1859094	68.10958	3.226319e-02
6	urban	0.05548403	0.04118200	1.3472885	50.55906	1.838947e-01
7	agedep	1.04806691	0.03541743	29.5918357	313.35348	9.524987e-93
8	male_edu	-2.57675118	0.26067234	-9.8850196	161.15447	2.625508e-18
9	temp	0.46904243	0.09140552	5.1314455	195.45975	6.908864e-07
10	rainfall1000	-3.63980140	0.55417691	-6.5679413	228.39181	3.402723e-10
11	earthquake	-4.04004434	1.31964245	-3.0614689	3680.26563	2.218440e-03
12	drought	-1.20343860	1.27351999	-0.9449703	3673.19086	3.447362e-01

Coefficients table

```
preds <- as.formula(" ~ conflict + lgdp1000 + OECD + popdens + urban +
                    agedep + male_edu + temp + rainfall1000 + earthquake + drought")

matmormod <- plm(update.formula(preds, maternalMor ~ .), index = c("ISO", "year"),
                 effect = "twoways", model = "within", data = data)
un5mormod <- plm(update.formula(preds, under5Mor ~ .), index = c("ISO", "year"),
                 effect = "twoways", model = "within", data = data)
infmormod <- plm(update.formula(preds, infantMor ~ .), index = c("ISO", "year"),
                 effect = "twoways", model = "within", data = data)
neomormod <- plm(update.formula(preds, neonatalMor ~ .), index = c("ISO", "year"),
                 effect = "twoways", model = "within", data = data)

coefs <- screenreg(list(matmormod, out.maternal, un5mormod, out.under5,
                       infmormod, out.infant, neomormod, out.neonatal),
                  custom.model.names = c("matmor", "matmor.mi", "un5mor", "un5mor.mi",
                                          "infmor", "infmor.mi", "neomor", "neomor.mi"))
coefs
```

=====

	matmor	matmor.mi	un5mor	un5mor.mi	infmor	infmor.mi	
conflict	34.47 *** (4.49)	43.21 *** (8.29)	2.96 *** (0.72)	3.05 ** (0.99)	1.65 *** (0.36)	2.55 *** (0.60)	
lgdp1000	-27.49 *** (4.74)	-31.26 *** (4.56)	-8.70 *** (0.73)	-7.40 *** (0.52)	-6.13 *** (0.37)	-5.73 *** (0.32)	
OECD	28.06 (15.64)	72.40 *** (13.43)	6.62 ** (2.28)	6.27 *** (1.56)	3.22 ** (1.16)	2.35 * (0.96)	
popdens	-0.42 (0.38)	-0.37 (0.31)	-0.34 *** (0.06)	-0.07 * (0.03)	-0.18 *** (0.03)	-0.02 (0.02)	
urban	-8.30 *** (0.99)	0.36 (0.42)	-1.74 *** (0.15)	0.06 (0.04)	-1.01 *** (0.08)	0.00 (0.03)	
agedep	-0.60 (0.34)	7.58 *** (0.29)	-0.06 (0.05)	1.05 *** (0.04)	0.04 (0.02)	0.58 *** (0.02)	
male_edu	-60.63 *** (5.95)	-22.65 *** (2.16)	-9.01 *** (0.85)	-2.58 *** (0.26)	-4.82 *** (0.43)	-1.48 *** (0.17)	
temp	10.52 *** (3.18)	2.04 * (0.78)	2.42 *** (0.52)	0.47 *** (0.09)	1.15 *** (0.26)	0.27 *** (0.06)	
rainfall1000	-4.58 (6.15)	-11.24 * (5.51)	-0.04 (0.97)	-3.64 *** (0.55)	0.02 (0.50)	-1.38 *** (0.35)	
earthquake	4.50 (4.68)	-46.91 *** (11.01)	1.64 * (0.75)	-4.04 ** (1.32)	0.88 * (0.38)	-1.44 (0.80)	
drought	-1.26 (4.18)	-1.61 (10.67)	0.94 (0.65)	-1.20 (1.27)	0.73 * (0.33)	-1.66 * (0.77)	
(Intercept)		-79.27 * (32.70)		1.28 (4.44)		9.15 ** (2.87)	
R^2	0.10		0.15		0.21		
Adj. R^2	0.03		0.10		0.16		
Num. obs.	3223		3618		3618		
nimp		10		10		10	
nobs		3720		3720		3720	

*** p < 0.001; ** p < 0.01; * p < 0.05